THE BIRDS OF CELEBES

AND

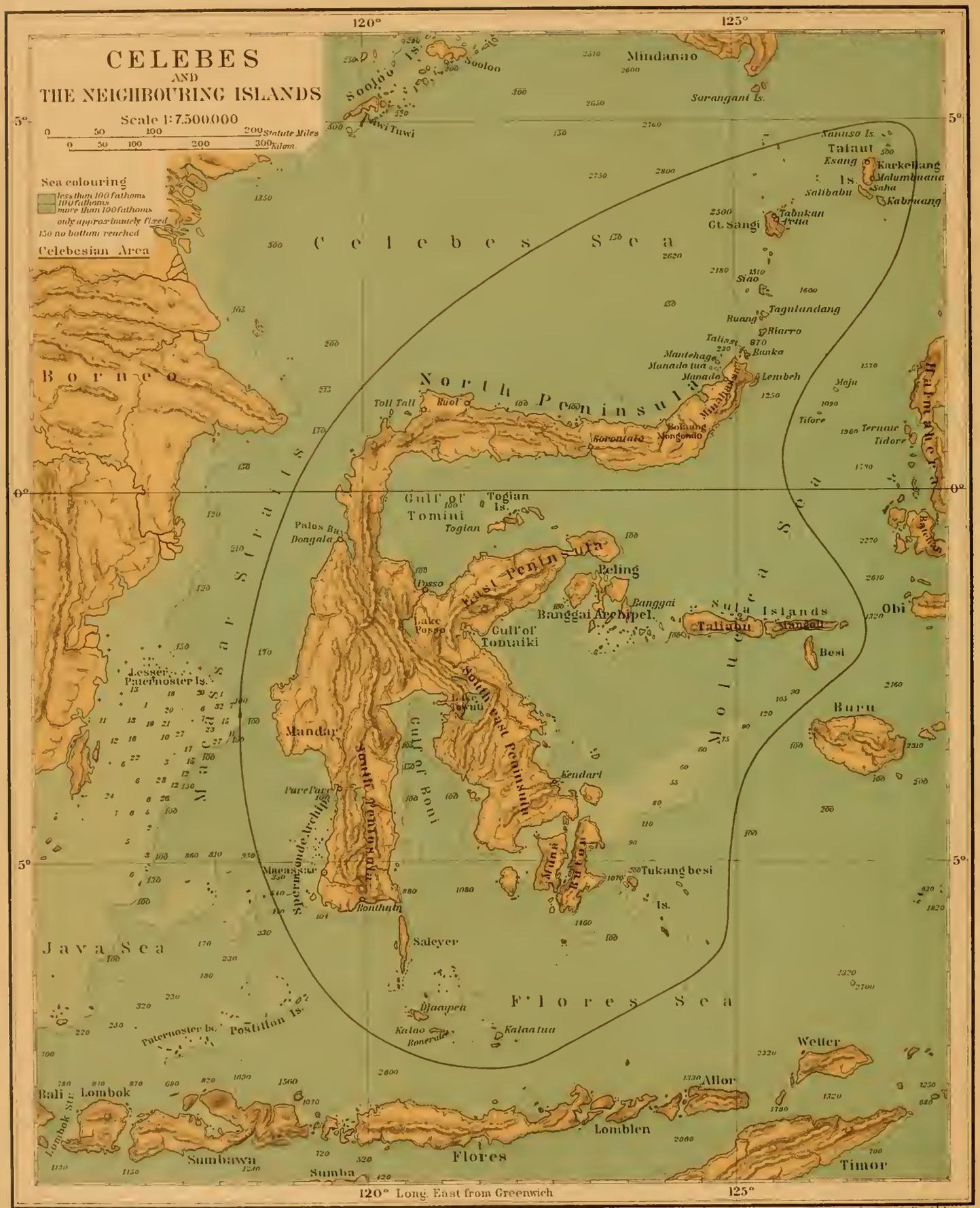
THE NEIGHBOURING ISLANDS.

BY

A. B. MEYER AND L. W. WIGLESWORTH.

WITH 45 PLATES (42 COLOURED) AND 7 COLOURED MAPS.

BERLIN:
R. FRIEDLÄNDER & SOHN.
1898.


CELEBES
AND
THE NEIGHBOURING ISLANDS
Scale 1:7,500,000
0 50 100 200 300 Statute Miles
0 50 100 200 300 Kilom.
Sea colouring
less than 100 fathoms
100 fathoms
more than 100 fathoms
only approximately fixed
150 no bottom reached
Celebesian Area
120°
125°
5°
0°
Mindanao
Sooloo
Sooloo Is.
Tawi Tawi
Surangani Is.
Sangihe Is.
Talaut
Esang
Karkelang
Malumbanaia
Saha
Is.
Salibabu
Kabruang
Gt. Sangi
Tabukan
Arella
Celebes Sea
Siao
Tagulandang
Ruang
Biaro
Talisse
Bunka
Manuehage
Manado tua
Manado
Lembeh
Maju
Halmahera
Tifore
Ternate
Tidore
Borneo
North Peninsula
Toli Toli
Buol
Minahassa
Gorontalo
Bolaang Mongondo
Makassar Strait
Gulf of Tomini
Togian Is.
Togian
Palos Bay
Dongala
East Peninsula
Peling
Banggai Archipel.
Banggai
Sula Islands
Taliabu
Mangole
Obi
Besi
Lake Posso
Gulf of Tomaiki
Lesser Paternoster Is.
Mandar
South East Peninsula
Lake Towuti
Buru
Gulf of Boni
Kendari
Pare Pare
Spermonde Archipel.
Tukang besi Is.
Macassar
Bonthain
Saleyer
Java Sea
Djampea
Kalao
Bonerate
Kalaatua
Paternoster Is.
Postillon Is.
Flores Sea
Weiter
Bali
Lombok
Lombok Str.
Sumbawa
Sumba
Flores
Lomblen
Allor
Timor
120° Long. East from Greenwich
125°
Wagner & Debes Geogr. Estab. Leipsic


CELEBES
Scale 1:3.930.000
Statute Miles
Kilom.
Heights in feet
120°
122°
124°
North Peninsula
Gulf of Tomini
Togian Islands
East Peninsula
Peling Strait
Peling
Banggai Archipelago
Banggai
Greyhound Strait
Sula Islands
Taliabu
Gulf of Tomaiki
Lake Posso
Tomori
Takalekadjo Mts.
Luhu
Lake Matanna
Lake Towuti
South-east Peninsula
Gulf of Boni
South Peninsula
Mandar
Gowa
Macassar
Peak of Bonthain c.9800
Kambaino
Muna
Buton
Tukang besi Islands
Saleyer Island
In the Minahassa:
1 Mt. Dua Sudara c.4500
2 Mt. Klabat c.6000
3 Mt. Lokon c.5200
4 Mt. Masarang c.4200
5 Mt. Soputan c.5900
6 Lake Lahendong (Linow)
7 Kakas-kassen
8 Rurukan
9 Remboken
10 Langowan
Posso
Todjo
Parigi
Palos Bay
Dongala
Tomini
Cape Dondo
Buol
Gorontalo Distr.
Bolaang Mongondo
Manado
Kema
Tondano
Belang
Kendari
Palopo
Borau
Lake Tempe
Pare Pare
Boni
Bonthain
Bulekomba
Kadjang
122° Long. East from Greenwich
Wagner & Debes Geogr. Estabt. Leipsic

THE BIRDS OF CELEBES

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INTRODUCTION.

TRAVEL AND LITERATURE. — SEASONS AND WINDS IN THE EAST INDIAN ARCHIPELAGO. — MIGRATION OF BIRDS IN THE EAST INDIAN ARCHIPELAGO. — VARIATION. — GEOGRAPHICAL DISTRIBUTION.

(THE COMPLETE WORK CONSISTS OF 2 VOLUMES OF XXXII, *130* AND 962 PAGES WITH 45 PLATES (42 COLOURED) AND 7 COLOURED MAPS. — PRICE 240 MARK = 12 £.)

BERLIN:
R. FRIEDLÄNDER & SOHN.
1898.

PREFACE.

When we began this work six years ago, we were under the impression that it would not be premature to write "The Birds of Celebes", but the further we proceeded, the more we became aware how impossible it is at present to give a complete history of the species, as many undoubtedly still remain to be discovered in the interior and the mountains, not to speak of the islands; and in the case of others whose names are familiar to ornithologists, we encountered a great lack of knowledge touching their local distribution, their subtile variations — individual, geographical, seasonal, sexual, and developmental, — their movements or, as the case may be, migrations, with the questions bearing thereon of seasons, climate, flowering of plants, ripening of fruits and the like, their nidification and moulting, habits and economy. We, therefore, are conscious of the imperfection of our work and shall be entirely satisfied if it be useful to future workers on the Celebesian Avifauna, not doubting that a classical work could be ultimately written on the subject, of the standard of Naumann's "Vögel Deutschlands" in 12 volumes.

The principles of nomenclature are now again in process of development and, consequently, unsettled; it is impossible to meet with the approval of every one in this respect. Our endeavours to give nomenclatory expression to the minute variations of groups of individuals not yet formed into species or subspecies led us to adopt an innovation discussed on pp. 52, 53 and elsewhere in the text; we anticipate that ere long this will be superseded by something better, and only regard it ourselves as a first step towards indicating those minute complex variations of a species within itself, which occur in Nature and are of such great importance in the study of evolution.

In our synonymy an attempt at completeness has rarely been made, except in the case of endemic Celebesian birds; and, instead of an aimless repetition of the fuller synonymies in, for instance, the "Catalogue of Birds" and the "Ornitologia

della Papuasia, etc.", reference is given to the authors of these works, to whom we feel deeply indebted, as indeed every ornithologist will be. As to the abbreviation of authors' names, we had proceeded too far to remodel them when the German list was issued, but we have introduced the methods recommended there at the headings of the species.

We have never used the term "Malay Archipelago", so much in vogue since Wallace, because this expression is incorrect in this sense, that not all the inhabitants of the islands comprehended are Malays. It is the "East Indian Archipelago" of which we speak, having in view the island-world from Sumatra to the Solomon Islands and from the Philippines to the Lesser Sundas.

As to localities we have been as accurate as possible, but unfortunately it is only in recent times that collectors have attached the exact locality to every specimen. Formerly "Manila" meant the whole of the Philippines, "Manado" the whole Minahassa (Northern Celebes), "Macassar" the southern part of Celebes; though, for instance, Mr. Wallace did not shoot all of his birds labelled Macassar near that town, but some at Maros and elsewhere. Of course we could not eliminate these inaccuracies. The future writer on the Birds of Celebes will happily have to deal with more exact data.

Our artist, Mr. Geisler of the Dresden Museum, wishes us to draw attention to the circumstance that the dull colours of some of our plates have been intentionally used at our request, the exact hue of the specimen painted being aimed at, sometimes at the cost of the artistic effect and clearness of tint usually seen in the English productions.

And now we have the agreeable duty of thanking all those who have lent us their welcome aid during our six years' work. In the first place Dr. P. and Dr. F. Sarasin of Basel, who placed their highly valuable and important collections entirely at our disposal; and not less the Hon. Walter Rothschild of Tring, who joined us in engaging native hunters for completing our collections and for making investigations on much new ground in our Area, as will be seen throughout the book. Mr. Nehrkorn of Riddagshausen most generously furnished us with a MS. descriptive of the eggs of Celebesian birds in his celebrated collection, and many are now described for the first time. Dr. van der Stok of Batavia and Prof. Neumayer of Hamburg helped us with our meteorological maps, as mentioned pp. *21* and *37* of the Introduction. Dr. Bowdler Sharpe of London had the great kindness to send us the proof-sheets of his part of vol. XXVI of the "Catalogue of Birds", not yet out. Mr. Veen of Kele Londej (Minahassa) and Mr. North of Sydney sent us some notes bearing upon the question of migration,

quoted in our Introduction, pp. *39* and *47*. For the transmission of specimens we are much indebted to the following gentlemen: Prof. W. Blasius of Brunswick, Dr. Büttikofer of Leyden (now Rotterdam), Dr. A. Dubois of Brussels, Mr. Gurney of Norwich, Mr. Hartert of Tring, Prof. Hertwig of Munich, Prof. v. Koch of Darmstadt, Dr. v. Lorenz of Vienna, Mr. Pleske of St. Petersburg, Dr. E. P. Ramsay of Sydney, Prof. Reichenow of Berlin, and Mr. W. Schlüter of Halle; as well as for special information to Prof. de Groot of Leyden, Resident Jellesma of Manado, Prof. Kern of Leyden, Prof. Newton of Cambridge, Dr. Oustalet of Paris, Dr. Riedel of the Hague, and Count Salvadori of Turin. Inspector Lehnig of the Dresden Museum has assisted us in drawing up the lists of Geographical Distribution and of Local Avifaunas, the alphabetical Index and list of abbreviations, and has supported us in other ways; as has also Miss C. S. Fox of London by her aid in the correction of the proofs.

Should we, unhappily, have forgotten any one in rendering our thanks, we apologize for such an omission.

Finally our sincere thanks are due to the Publishers for their compliance in all our wishes as to the fashion of the book.

Royal Zoological Museum, Dresden, April 30th, 1898.

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ALPHABETICAL LIST OF ABBREVIATIONS OF AUTHORS' NAMES, TITLES OF BOOKS, JOURNALS, ETC.

Our abbreviations were made before the issue of the list used in the "Zoological Record", which is recommended by the "Deutschen Zoologische Gesellschaft" as a model for such, or we would have adopted at least a part of them, but many are far too long to be made use of in a synonymy, and others are not practical.

Portions of abbreviations here enclosed in brackets are often omitted in the text.

Abh. (Ber.) Mus. Dresden = Abhandlungen und Berichte des Kgl. Zoologischen und Anthropologisch-Ethnographischen Museums zu Dresden.

Abh. (Naturw.) Ver. Bremen = Abhandlungen herausgegeben vom naturwissenschaftlichen Vereine zu Bremen.

Abh. Senckenb. Naturf. Ges. = Abhandlungen herausgegeben von der Senckenbergischen naturforschenden Gesellschaft. Frankfurt am Main.

Acta (Nova) Acad. Leop. (Carol.) = Nova Acta Academiae Caesareae Leopoldino-Carolinae Germanicae Naturae Curiosorum. Also = Verhandlungen der Kaiserlichen Leopoldinisch-Carolinischen Deutschen Akademie der Naturforscher.

Alb., Nat. Hist. B. = E. Albin: Natural history of British Birds. 1738—40.

Am. Journ. of Sc. & Arts = American Journal of Science and Arts.

Ann. (K. K.) Nat. Hofmus. (Wien) = Annalen des K. K. Naturhistorischen Hofmuseums zu Wien.

Ann. Mus. Civ. Gen. = Annali del Museo Civico di Storia Naturale di Genova.

Ann. (& Mag.) N. H. = The Annals and Magazine of Natural History, including Zoology, Botany, and Geology.

Ann. Sc. Nat. = Annales des Sciences Naturelles. Zoologie et Paléontologie.

Arch. Nat. = Archiv für Naturgeschichte.

Atti Ac. Sc. Tor(ino). = Atti della Reale Accademia delle Scienze di Torino.

Atti Soc. It. Sc. Nat. Mil. = Atti della Società italiana di Scienze naturali. Milano.

Audubon, B. N. Am. = J. J. Audubon: The Birds of America. 1826 seq.

Auk = The Auk. Quarterly Journal of Ornithology.

Ausland = Das Ausland. Wochenschrift für Länder- und Völkerkunde.

Baird, Brew. & Ridg., Water B. N. Am. = S. F. Baird, T. M. Brewer, and R. Ridgway: The Water Birds of North America. 1884. (Memoirs of the Museum of Comparative Zoölogy at Harvard College, Vol. VII and XIII.)

Baldamus, Leben europ. Kuck. = E. Baldamus: Das Leben der europäischen Kuckucke. Nebst Beiträgen zur Lebenskunde der übrigen parasitischen Kuckucke und Stärlinge. 1892.

Bartl., (Mon.) Weaver-b. = A. D. Bartlett: A Monograph of the Weaver-birds. 1888.

Bechst., Naturg. Deutschl. = J. M. Bechstein: Gemeinnützige Naturgeschichte Deutschlands, nach allen 3 Reichen. 2. verb. Aufl. 1801—1809.

Bechst., Orn. Taschenb. = J. M. Bechstein: Ornithologisches Taschenbuch von und für Deutschland. 1802—12.

Begbie, Malay Penin. = P. J. Begbie: The Malayan Peninsula; history, manners and customs of the inhabitants, politics, natural history etc. 1834.

Bijdr. (t. d.) Dierk. = Bijdragen tot de Dierkunde. Uitgegeven door het K. Zoologisch Genootschap "Natura artis magistra", Amsterdam.

Bijdr. taal, land, volkenk. Ned. Ind. = Bijdragen tot de Taal-, Land- en Volkenkunde van Nederlandsch Indië.

Blanf., Faun. Br. Ind(ia) B. = The Fauna of British India, incl. Ceylon and Burma. Ed. by W. T. Blanford. Birds, by E. W. Oates and W. T. Blanford. 1889—1895.

Blak., Amend. List B. Jap. = T. W. Blakiston: Amended List of the Birds of Japan, according to Geographical Distribution. 1884.

W. Blas., Braunschw. Anzeigen = W. Blasius in the "Braunschweigischen Anzeigen" (Newspaper).

W. Blas., Russ's Isis = W. Blasius in Karl Russ' "Isis": Zeitschrift für alle naturwissenschaftlichen Liebhabereien.

Blyth, B. Burmah = E. Blyth: A Catalogue of the Mammals and Birds of Burmah (Journal of the Asiatic Society of Bengal, 1875, pt. II, extra number).

Blyth, Cat. (B.) Mus. A(s). S. (B.) = E. Blyth: A Catalogue of the Birds in the Museum of the Asiatic Society. 1849.

Bodd., Tabl. Pl. Enl. = M. Boddaert: Table des planches enluminéez d'histoire nat., de d'Aubenton. 1783.

Boll. Mus. Torino = Bollettino dei Musei di Zoologia ed Anatomia comparata della R. Università di Torino.

Bonn., Tabl. Enc. Méth. = Encyclopédie méthodique, ou par ordre de matière, par une société de gens de lettres. — Histoire naturelle. — Tableau encyclopédique et méthodique: Ornithologie. Par l'abbé Bonnaterre, 1790.

Bourjot, Perr. = A. Bourjot St.-Hilaire: Histoire Naturelle des Perroquets, vol. III, 1837—38 (vols. I and II by Le Vaillant, 1801 and 1805).

Bourns & Worces., B. Menage Exped. = F. S. Bourns and D. C. Worcester: Preliminary Notes on the Birds and Mammals collected by the Menage Scientific Expedition to the Philippine Islands (Occasional Papers of the Minnesota Academy of Natural Sciences, Vol. I No. 1). 1894.

Bp., Cat. Ucc. Eur. = C. L. Bonaparte: Catalogo metodico degli Uccelli Europei. (Annali delle scienze naturali. Tom. VIII. 2ª semestre.) 1842.

Bp., Comp. List B. Eur. & N. Am. = C. L. Bonaparte: A geographical and comparative list of the Birds of Europe and North America. 1838.

Bp., Consp. = C. L. Bonaparte: Conspectus generum avium. 1850—65.

Bp., Consp. Vol. Anisod. = C. L. Bonaparte: Conspectus Volucrum Anisodactylorum. 1854.

Bp., Consp. Vol. Zygod. = C. L. Bonaparte: Conspectus Volucrum Zygodactylorum. 1854.

Bp., Coup d'Oeil Ordre Pig. = C. L. Bonaparte: Coup d'Oeil sur l'Ordre des Pigeons. (Comptes Rendus hebdomadaires des séances de l'Académie des Sciences, Paris. — Articles in vols. XXXIX, 1854; XL, 1855; XLIII, 1856.)

Bp., Icon. des Pig. = C. L. Bonaparte: Iconographie des Pigeons. 1857.

Bp., Notes Orn. Coll. Delattre = C. L. Bonaparte: Notes ornithologiques sur les collections rapportées en 1853, par M. A. Delattre, et classification parallélique des Passereaux chanteurs. Paris 1854.

Brehm, Tierl. = Brehms Tierleben. Allgemeine Kunde des Tierreichs. 3. gänzlich neubearbeitete Auflage. Vögel. 1891.

Brehm, Vög. Deutschl. = C. L. Brehm: Handbuch der Naturgeschichte aller Vögel Deutschlands. 1831.

Briss., Orn. = M. J. Brisson: Ornithologia s. synopsis methodica, sist. Avium divisionem in ordines etc. 1760.

Brügg., Abh. Ver. Bremen = F. Brüggemann in Abhandlungen herausgegeben vom naturwissenschaftlichen Vereine zu Bremen.

Bütt., (Zool. Erg.) Weber's Reise (Ostind.) = J. Büttikofer in: Zoologische Ergebnisse einer Reise in Niederländisch Ost-Indien. Herausgegeben von Max Weber. 1890—97.

Buff., H. N. Ois. = G. L. Leclerc comte de Buffon, de Montbeillard (et l'abbé Bexon): Histoire naturelle des Oiseaux. 10 vols. (Small fol. ed.) 1770—86.

Bull. Ac. Imp. Mosc. = Bulletin de la Société Impériale des Naturalistes de Moscou.

Bull. Ac. Sc. Petersb. = Bulletin de l'Académie Impériale des Sciences de St. Pétersbourg.

Bull. Brit. Orn. Club = Bulletin of the British Ornithologists' Club.

Bull. Mus. Belg. = Bulletin du Musée Royal d'Histoire Naturelle de Belgique.

Bull. Mus. Comp. Zool. Cambridge = Bulletin of the Museum of Comparative Zoölogy at Harvard College, Cambridge, Mass.

Bull. of the U. S. Geol. and Geogr. Survey = Bulletin of the United States Geological and Geographical Survey of the Territories.

Bull. Soc. Philom. (Paris) = Bulletin de la Société Philomatique de Paris.

Bull. S(oc). Z(ool). Fr(ance) = Bulletin de la Société zoologique de France.

Bull. U. S. Nat. Mus. = Bulletin of the U. S. National Museum.

Buller, B. N. Zeal. = W. L. Buller: A History of the Birds of New Zealand. I. ed. 1873; 2. ed. 1888.

Butler, Foreign Finches = A. G. Butler, Foreign Finches in captivity. 1894—96.

Cab. & Hein., Mus. Hein. = J. Cabanis & F. Heine jun.: Museum Heineanum. Verzeichniss der ornithologischen Sammlung des Oberamtmanns F. Heine. 1850—63.

Calc. Journ. Nat. Hist. = Calcutta Journal of Natural History.

Campb., Ber. II. Orn. Congress Budapest = A. J. Campbell, in: Zweiter internationaler ornithologischer Congress. Budapest 1891. Hauptbericht. II. Wissenschaftlicher Theil. 1892.

Cass., B. Calif. = J. Cassin: Illustrations of the Birds of California, Texas, Oregon, British and Russian America. 1853—55.

Cass., Cat. Halc. Philad. Mus. = J. Cassin: Catalogue of the Halcyonidae in the Collection of the Academy of Natural Sciences of Philadelphia. 1852.

Cass., U. S. Expl. Exp(ed). 2nd ed. = J. Cassin: United States Exploring Expedition. — Mammalogy and Ornithology. 1858.

Cat. B. = Catalogue of the Birds in the British Museum.

C. R. Congr. Int. des sc. géogr. à Paris = Congrès international des sciences géographiques tenu à Paris 1875. Compte rendu des séances. 1878—80.

C(omptes) R(end). = Comptes rendus hebdomadaires des séances de l'Académie des sciences, Paris.

Cretzschm. in Rüpp. Atlas = (W. P.) E. Rüppell: Atlas zu der Reise im nördlichen Afrika. 2. Abtheilung Vögel. Bearbeitet von P. J. Cretzschmar. 1826.

Cuv., Règne An. = G. Cuvier: Le règne animal, distribué d'après son organisation. 1829—30.

Darwin, Anim. & Plants = C. Darwin: The variation of animals and plants under domestication. 1868—69.

D'Aubent., Pl. Enl. = D'Aubenton le jeune: Planches enluminées d'histoire naturelle par Martinet, exécutées par D'Aubenton le jeune. 1765.

Daud., Tr. d'Orn. = F. M. Daudin: Traité élémentaire et complet d'Ornithologie, ou histoire naturelle des Oiseaux. 1800.

David et Oust., Ois. Chine = A. David et E. Oustalet: Les Oiseaux de la Chine. 1877.

Des Murs & Prév., Voy. Vénus, Zool. = Des Murs et Prévost, in the Voyage autour du monde sur la frégatte "la Vénus", commandée par A du Petit-Thouars. 1845—64.

Deutsche geogr. Blätter = Deutsche geographische Blätter, herausgegeben von der Geographischen Gesellschaft in Bremen.

Diggles, Orn. Austr. = S. Diggles: The Ornithology of Australia. 1866—70.

Direct. Ind. Arch. = A. G. Findlay: A Directory for the navigation of the Indian Archipelago. 1870.

Drap., Dict. Class. Hist. N(at.). = Drapiez: Dictionnaire classique des sciences naturelles etc. 1828—45.

Dresser, B. Eur. = H. E. Dresser: A history of the birds of Europe, including all the species inhabiting the Western Palaearctic Region. 1871—81, 1895—96.

Dresser, Mon. Corac. = H. E. Dresser: A Monograph of the Coraciidae. 1893.

Dresser, Monogr. Merop. = H. E. Dresser: A Monograph of the Meropidae. 1884—86.

Dumont, Dict. Sc. Nat. = C. H. F. Dumont: Dictionnaire des sciences naturelles. 1828—45.

Edw., Birds = G. Edwards: A natural history of uncommon Birds, and of some other rare and nondescribed animals, Quadrupedes, Reptiles, Fishes, Insects etc. 1743—51.

Edw., Glean. = G. Edwards: Gleanings of natural history, exhibiting figures of Quadrupeds, Birds, Insects, Plants etc. 1758—64.

Elliot, Monogr. Bucerot. = D. G. Elliot: A monograph of the Bucerotidae, or family of the Hornbills. 1882.

Elliot, Monogr. Pitt. = D. G. Elliot: A Monograph of the Pittidae. 1893—95.

Festschr. Vers. Naturf. Braunschw. 1897 = Festschrift der Herzoglichen Technischen Hochschule bei Gelegenheit der 69. Versammlung Deutscher Naturforscher und Aerzte in Braunschweig. 1897.

Festschrift zool.-bot. Ges. = Festschrift zur Feier des 25jährigen Bestehens der k. k. zoologisch-botanischen Gesellschaft in Wien. 1876.

de Fil., Mus. Mediol. = Ph. de Filippi: Museum Mediolanum, N. 1, Animalia Vertebrata, Classis II. Aves. 1847.

Finsch, J. Mus. Godef. = O. Finsch: Zur Ornithologie der Südsee-Inseln. I. Die Vögel der Palaugruppe. II. Ueber neue und weniger gekannte Vögel von den Viti-, Samoa- und Carolinen-Inseln. (Journal des Museum Godeffroy. Heft VIII, XII.) 1875—76.

Finsch, N(eu) G(uinea) = O. Finsch: Neu-Guinea und seine Bewohner. 1865.

Finsch, Papag. = O. Finsch: Die Papageien. 1867—68.

Finsch, Vög. der Südsee = O. Finsch: Ueber Vögel der Südsee, in Mittheilungen des ornithologischen Vereins in Wien, 1884.

Finsch & Hartl., Orn. Centralpol. = O. Finsch & G. Hartlaub: Beitrag zur Fauna Centralpolynesiens. Ornithologie der Viti-, Samoa- und Tonga-Inseln. 1867.

Finsch & Hartl., Vög. O. Afr. = O. Finsch und G. Hartlaub: Die Vögel Ost-Afrikas. (C. C. von der Decken: Reisen in Ost-Afrika. 4. Bd.) 1870.

Flem., Phil. of Zool. = J. Fleming: Philosophy of zoology; or a general view of the structure, functions and classification of animals. 1822.

Forst., Descr. An. = J. R. Forsteri: Descriptiones animalium in itinere ad Maris Australis terras 1772—74 suscepto observatorum. Ed. H. Lichtenstein. 1844.

Forst(er), Zool. Ind. = J. R. Forster: Zoologia Indica. 1781.

Fraser, Zool. Typ. (Av.) = L. Fraser: Zoologia Typica, or figures of new and rare Mammals and Birds. 1841—9.

Fritsch, Vög. Eur. = A. Fritsch: Vögel Europa's. 1871.

Gadow, Vög. in Bronn's Kl. u. Ord. = H. G. Bronn's Klassen und Ordnungen des Thier-Reichs, wissenschaftlich dargestellt in Wort und Bild. 6. Band. IV. Abth. Vögel. Von E. Selenka u. H. Gadow. 1891-3.

Gätke, Vogelw. Helgol. = H. Gätke: Die Vogelwarte Helgoland. 1891.

Garnot, Voy. Coquille, Zool. Atl. = Voyage autour du monde, exécuté par ordre du roi, sur la Corvette d. S.. M. la Coquille pendant les années 1822—25. Publié par L. J. Duperrey. Zoologie, par Lesson et Garnot. 1826.

Gefied. Welt = Die gefiederte Welt. Wochenschrift für Vogelliebhaber,- Züchter und -Händler. Herausg. von K. Russ.

Gerini, Orn. Meth. Dig. = Giovanni Gerini: Storia Naturale degli uccelli, trattata con metodo e adornata di figure intagliate in rame e miniata al naturale. Firenze 1767—76.

Gigl., Avif. Italica = E. H. Giglioli: Avifauna Italica. Elenco delle specie di uccelli stazionarie o di passagio in Italia. 1886.

Gigl., Avif. Ital. pt. I = E. H. Giglioli: Primo resoconto dei risultati della inchiesta ornitologica in Italia. I. Avifauna Italica. 1889.

Gigl. & Manz., Icon. Avif. Ital. = E. H. Giglioli & A. Manzella: Iconografia dell' Avifauna Italica, ovvero Tavole illustranti le specie di Uccelli che trovansi in Italia, con brevi descrizioni e note. 1882—84.

Gld., B. Eur. = John Gould: The Birds of Europe. 1832—37.

G(ou)ld., B. Asia = John Gould: The Birds of Asia. 1850—1883. [Completed by R. Bowdler Sharpe.]

Gld., B. Austr. = John Gould: The Birds of Australia. 1848—69.

Gld., B. Gr. Brit. = John Gould: The Birds of Great Britain. 1862—1873.

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Oustal., Mon. Megap. = E. Oustalet: Monographie des Oiseaux de la Famille des Mégapodes. 1880—81. In: Annales des Sciences naturelles. Zoologie.

Pall., Reis. Russ. Reichs = P. S. Pallas: Reisen durch verschiedene Provinzen des Russischen Reichs in den Jahren 1768—74. 1771—76.

Pall., Zoogr. Rosso-Asiat. = P. S. Pallas: Zoographia Rosso-Asiatica, sistens omnium animalium in extenso imperio Rossico et adjacentibus maribus observatorum recensionem, domicilia, mores et descriptiones, anatomen atque icones plurimorum. 1811.

Peale, U. S. Expl. Exped., Zool. = United States Exploring Expedition. Vol. VIII: Mammalia and Ornithology by T. R. Peale. 1848.

Pelz., Reise der Novara, Zool. or Novara Reise, Vög. = Reise der oesterreichischen Fregatte Novara um die Erde, 1857—59. Bd. I: Vögel von A. v. Pelzeln. 1865.

Penn., Ind. Zool. = T. Pennant: Indian zoology; including "Faunula Indica" etc. 1790.

Petermann's Mitth. = Petermann's Geographische Mittheilungen.

Pleske, Vög. Russ. Reichs = Th. Pleske: Ornithographia Rossica. Die Vogelfauna des Russischen Reichs. II. Sylviinae. 1891.

Pr. Acad. (N. Sc.) Philad. = Proceedings of the Academy of Natural Sciences of Philadelphia.

Pr. L. Soc. N. S. W. = Proceedings of the Linnean Society of New South Wales.

P. U. S. Nat. Mus. = Proceedings of the U. S. National Museum.

P. Z. S. = Proceedings of the Zoological Society of London.

Prév. & Knip, Pig. = C. J. Temminck: Histoire naturelle générale des Pigeons avec figures en couleurs peintes, etc. Tome II. cont. les Pigeons exotiques de M^me^ Knip. Le texte par F. Prévost. 1838—43.

Proc. Boston Soc. Nat. Hist. = Proceedings of the Boston Society of Natural History.

Quoy & Gaim., Voy. Astr. (Zool.) = Quoy & Gaimard in: Voyage autour du monde de la corvette L'Astrolabe exécuté 1826—29 sous le commandement de Dumont d'Urville. Zoologie. 1830—33.

Radde, Reise S.-O. Sibir. = G. Radde: Reisen im Süden von Ost-Sibirien, 1855—59. 1862—63.

Rams(ay), Tab. List (Austr. B.) = E. P. Ramsay: Tabular list of all the Australian birds at present known to the author, showing the distribution of the species over the continent of Australia and adjacent islands. 1888.

W. Rams., Tweedd. Orn. Works = The ornithological works of Arthur, IX. Marquis of Tweeddale. Ed. by R. G. W. Ramsay. 1881.

Rchb., Columbariae or Tauben = H. G. L. Reichenbach: Die vollständigste Naturgeschichte der Tauben und taubenartigen Vögel. Columbariae. 1848.

Rchb., Fulicariae, Novit. = H. G. L. Reichenbach: Die vollständigste Naturgeschichte der Sumpfvögel: Novitiae ad synopsin avium. III. Rasores: Scharrvögel. I. Fulicariae: Wasserhühner. 1851.

Rchb., Handb. Picinae = H. G. L. Reichenbach: Handbuch der speciellen Ornithologie. Picinae. 1854.

Rchb., Grallat. = H. G. L. Reichenbach: Die vollständigste Naturgeschichte der Sumpfvögel: Aves Grallatores. 1851.

Reichb., Hb. sp. Orn. Alcedin. = L. Reichenbach: Handbuch der speciellen Ornithologie. Alcedineae. 1851.

Reichb., Hb. sp. Orn. Meropinae = L. Reichenbach: Handbuch der speciellen Ornithologie. Meropinae. 1852.

Reichb., Hb. Scansoriae = L. Reichenbach: Handbuch der speciellen Ornithologie. Scansoriae. 1853.

Rchb., Syn. Av. Gallinac. = L. Reichenbach: Synopsis avium. Gallinaceae. 1848.

Rchb., S. A., Natatores = H. G. L. Reichenbach: Die vollständigste Naturgeschichte der Schwimmvögel: Aves Natatores. Synopsis Avium. Vol. I. Natatores. 1845.

Rchb., Syst. Av. (Natur.) = L. Reichenbach: Avium systema naturale. Das natürliche System der Vögel. Vorläufer einer Iconographie der Arten der Vögel aller Welttheile. 1850. Also under the title: Ornithologie méthodique ou exposé des genres des oiseaux de toutes les parties du monde. Prodrome d'une iconographie des espèces des oiseaux ou synopsis avium.

Rchnw., Vogelb. = A. Reichenow: Vogelbilder aus fernen Zonen. Abbildungen und Beschreibungen der Papageien. 1878—83.

Rchnw., Consp. Psitt. = A. Reichenow: Conspectus Psittacorum. Systematische Uebersicht aller bekannten Papageienarten. In: Journal für Ornithologie. 1882.

Rchw., Vög. Deutsch O.-Afr. = Deutsch-Ostafrika. Thierwelt Ostafrikas und der Nachbargebiete. III. Bd. 2. Lf. Vögel von A. Reichenow. 1894.

Reinw., Reis. Ind. Arch. (in 1821) = C. G. C. Reinwardt's Reis naar het oostelijk gedeelte van den Indischen Archipel in het jaar 1821. Uitgegeven door W. H. de Vriese. 1858.

Rev. Zool. = Revue zoologique, par la Société Cuvierienne.

Ridgw., (B. N. Am.) Landb. N. Am. = S. F. Baird, T. M. Brewer, and R. Ridgway: A History of North American Birds, Land Birds. 1874.

Ridgw., Man. N. Am. Birds = R. Ridgway: A manual of North American Birds. 1887.

Ridgw., Sm. Rep. = R. Ridgway: in the Annual Report of the Board of Regents of the Smithsonian Institution.

Rosenb., Mal. Arch. = C. B. H. v. Rosenberg: Der malayische Archipel. Land und Leute. 1878.

Rosenb., Reistogt. in Gorontalo = C. B. H. v. Rosenberg: Reistogten in de afdeeling Gorontalo. 1865.

Rothsch., Av. Laysan = W. Rothschild: The Avifauna of Laysan and the neighbouring Islands; with a complete History to date of the Birds of the Hawaiian Possessions. 1893.

Rowl., Orn. Misc. = Ornithological Miscellany. Ed. by G. D. Rowley. 1875—78.

Russ, Einheim. Stubenvög. = K. Russ: Handbuch für Vogelliebhaber, -Züchter und -Händler. II. Einheimische Stubenvögel. 1873.

Russ, Fremdl. Stubenvög. = K. Russ: Die fremdländischen Stubenvögel. 1879—98.

Sail. Direct. = A. G. Findlay: A Directory for the Navigation of the Indian Archipelago etc. 1870.

Salvad., Agg. Orn. Pap. = T. Salvadori: Aggiunte alla ornitologia della Papuasia e delle Molucche. 1889—91.

Salvad., Orn. Pap. = T. Salvadori: Ornitologia della Papuasia e delle Molucche. 1880—82.

Salvad., Cat. Ucc. (di) Borneo = Catalogo sistematico degli uccelli di Borneo di T. Salvadori con note ed osservazioni di G. Doria ed O. Beccari intorno alle specie da essi raccolte nel Ragiato di Sarawak. Annali del Museo Civico di Storia naturale di Genova. Vol. V. 1874.

Sb. Ges. natf. Freunde zu Berlin = Sitzungs-Bericht der Gesellschaft naturforschender Freunde zu Berlin.

Schinz, Abbild. Vög. = H. R. Schinz: Naturgeschichte und Abbildungen der Vögel. Nach den neuesten Systemen bearbeitet. (1831—33.) 1835—36.

Schinz, Nat. Vög. — H. R. Schinz: Naturgeschichte der Vögel. Mit kolorirten Abbildungen nach der Natur und den vorzüglichsten naturwissenschaftlichen Werken gezeichnet. Neueste (2.) umgearbeitete und sehr vermehrte Ausgabe. 1846—53.

Schl., De Dierent. = H. Schlegel & P. J. Witkamp: De dierentuin van het kon. zoolog. Genootschap Natura Artis Magistra. Amsterdam. 1872.

Schl., Handl. d.) Dierk. = H. Schlegel: Handleiding tot de beoefening der dierkunde. 1857—58.

Schl., Mus. P.-B. = Muséum d'Histoire Naturelle des Pays-Bas. Par H. Schlegel. Revue méthodique et critique des collections. 1862—94.

Schl., N. T. D. or Ned. Tdschr. = H. Schlegel in Nederlandsch Tijdschrift voor de Dierkunde, uitgegeven door het Koninklijk zoologisch Genootschap Natura Artis Magistra. 3. deel. 1866.

Schl., Rev. Accip. = H. Schlegel: Revue de la Collection des Oiseaux de Proie faisant partie du Musée des Pays-Bas. Accipitres. 1873. (In Mus. d'H. N. d. P.-B.)

Schl., Rev. Alcedin. = H. Schlegel: Revue de la Collection des Alcédines faisant partie du Musée des Pays-Bas. 1874. (In Mus. d'H. N. d. P.-B.)

Schl., Rev. Noctuae = H. Schlegel: Revue de la Collection des Oiseaux de Proie faisant partie du Musée des Pays-Bas. Aves Noctuae. 1873. (In Mus. d'H. N. d. P.-B.)

Schl., Revue Pitta = H. Schlegel: Revue de la Collection des Brèves (Pittae) faisant partie du Musée des Pays-Bas. 1874. (In Mus. d'H. N. d. P.-B.)

Schl., Rev. Psitt. = H. Schlegel: Revue de la Collection des Perroquets (Psittaci) faisant partie du Musée des Pays-Bas. 1874. (In Mus. d'H. N. d. P.-B.)

Schl., Valkv. Ned. Ind. = H. Schlegel: De vogels van Nederlandsch-Indië, beschreven en afgebeeld. — Les oiseaux des Indes Néerlandaises, décrits et figurés. Monographie 3, Valkvogels (Accipitres). 1866.

Schl., Vog. Ned. Ind. Ijsvogels Alcedin. = H. Schlegel: De vogels van Nederlandsch Indië, beschreven en afgebeeld. — Les oiseaux des Indes Néerlandaises, décrits et figurés. Monographie 2, Ijsvogels, (Martins-Pêcheurs). 1864.

Schl., Vog. Ned. Ind. Pitta = H. Schlegel: De vogels van Nederlandsch Indië, beschreven en afgebeeld. — Les oiseaux des Indes Néerlandaises, décrits et figurés. Monographie 1, Pitta. 1863.

Schl. & Pollen, Faun. Madag. = F. P. L. Pollen et D. C. van Dam: Recherches sur la faune de Madagascar et de ses dépendances. 2. partie: Mammifères et Oiseaux par H. Schlegel et F. P. L. Pollen. 1868.

Schmeltz, Eth. Abth. Mus. Godef. = J. D. E. Schmeltz, & R. Krause: Die Ethnographisch-Anthropologische Abtheilung des Museum Godeffroy in Hamburg. 1881.

Schrenck, Reise Amurl ande, Vög. = L. v. Schrenck: Reisen und Forschungen im Amur-Lande, 1854—56. Bd. I, 2. Vögel des Amur-Landes. 1860.

Selat., List. Vert. An. = List of the vertebrated animals now or lately living in the Gardens of the Zoological Society of London. 8. ed. 1883. By P. L. Selater.

Selat., Voy. Chall. B. = P. L. Selater in Report on the scientific results of the voyage of H. M. S. Challenger, 1873—76. Zoology. Vol. II. 1881.

Scopoli, Del. Flor. & Faun. Insubr. = J. A. Scopoli: Ornithological papers from his Deliciae florae et faunae insubricae. 1786—88. Ed. by A. Newton (Willughby Soc. 1882).

Seebohm, B. Japan. (Emp.) = H. Seebohm: The Birds of the Japanese Empire. 1890.

Seebohm, (Hist.) Brit(ish) B. = H. Seebohm: A history of British birds with illustrations of their eggs. 1883—85.

Seeb., Distr. Charadr. = H. Seebohm: The geographical distribution of the family Charadriidae or the Plovers, Sandpipers, Snipes and their allies. 1888.

Selby, Nat. Libr., Parrots = The Naturalist's Library. Conducted by William Jardine. Ornithology Vol. VI. Parrots by P. J. Selby. 1836.

Selby, Natur. Libr., Pig. = The Naturalist's Library. Conducted by William Jardine. Ornithology Vol. V, part. III, Pigeons by P. J. Selby. 1835.

Sharpe, Mitth. Zool. Mus. Dr. = R. B. Sharpe in Mittheilungen aus dem K. Zoologischen Museum zu Dresden.

Sharpe, Monogr. Alcedin. = R. B. Sharpe: A monograph of the Alcedinidae. 1868—71.

Sharpe, Rep. Trans. Venus Exp. B. Kerguelen = Account of the Petrological, Botanical and Zoological Collections made in Kerguelen's Land and Rodriguez during the Transit of Venus Expedition carried out in 1874—75. Birds by R. B. Sharpe. 1879.

Sharpe, Report Voy. "Alert" = Report on the zoological collections made in the Indo-Pacific Ocean during the voyage of H. M. S. "Alert", 1881—82. 1884.

Sharpe, Yarkand Mission, Aves = Scientific results of the second Yarkand Mission, based upon the collections of the late F. Stoliczka. 1878—91.

Sh. & Dresser, B. Eur(ope) = H. E. Dresser: A history of the birds of Europe, including all the species inhabiting the Western Palaearctic Region. 1871—81.

Sharpe & Wyatt, Mon. Hirund. = R. B. Sharpe & C. W. Wyatt: A monograph of the Hirundinidae, or family of Swallows. 1885—94.

Shaw, Gen. Zool. = G. Shaw: General zoology, or systematic natural history, with plates from the first authorities and most select specimens, engraved principally by Heath. Continued by Stephens. 1800—19.

Shelley, B. Egypt. = G. E. Shelley: A Handbook to the Birds of Egypt. 1872.

Shelley, Monogr. Nect. = G. E. Shelley: A monograph of the Nectariniidae, or family of Sun-birds. 1876—80.

Sitzb. Ak. Wien = Sitzungsberichte der math.-naturw. Classe der Kais. Akademie der Wissenschaften, Wien.

Sitzb. Ak. Wiss. Berlin = Sitzungsberichte der Königlich Preussischen Akademie der Wissenschaften zu Berlin.

Sitzb. Ges. Isis, Dresden = Sitzungsberichte und Abhandlungen der Naturwissenschaftlichen Gesellschaft Isis in Dresden.

Sonn(erat), Voy. N(ouv). Guin. = P. Sonnerat: Voyage à la nouvelle Guinée, dans lequel on trouve la description des lieux, des observations physiques et morales, et des détails rélatifs à l'histoire naturelle dans le règne animal et le règne végétal. 1776.

Souancé, Icon. Perr. = C. de Souancé: Iconographie des Perroquets non figurés dans les publications de Levaillant et de Bourjot Saint-Hilaire. 1857.

Sparrm., Mus. Carls. = A. Sparrman: Museum Carlsonianum, in quo novas et selectas Aves coloribus ad vivum brevique descriptione illustratas. 1786—89.

Steere, Coll. B. Philip. (Is.) = J. B. Steere: A List of the Birds and Mammals collected by the Steere Expedition to the Philippines. 1890.

Steph., Gen. Zool. = G. Shaw: General zoology, or systematic natural history, with plates from the first authorities and most select specimens, engraved principally by Heath. Continued by J. F. Stephens. 1800—19.

S(tr). F. = Stray Feathers. A Journal of Ornithology for India and its dependencies.

Strickl., Contr. Orn. = H. E. Strickland in W. Jardine's Contributions to Ornithology. 1848—53.

Strickl., Orn. Syn. = Ornithological Synonyms. Edited by H. E. Strickland and W. Jardine. Vol. I. Accipitres. 1855.

Studer, Reis. or Voy. Gazelle-(Reise) = Th. Studer: Die Forschungsreise S. M. S. "Gazelle" in den Jahren 1874 bis 1876. III. Theil, Zoologie und Geologie. 1889.

Sundev., Tentamen or Av. Meth. Tent. = C. J. Sundevall: Methodi naturalis avium disponendarum tentamen. Försök till fogelklassens naturenliga uppställning. 1872.

Sw(ain)s., B. W. Afr. = The Naturalist's Library. Edited by W. Jardine. Vol. XI—XII. Ornithology. Birds of Western Africa. By W. Swainson. 1837.

Sws., Zool. Illustr. = W. Swainson: Zoological illustrations, or original figures and descriptions of new, rare or otherwise interesting animals, selected chiefly from the classes of ornithology, entomology and conchology etc. 1820—23, 1829—33.

Tacz., (Faun.) Orn. Sib. Orient = L. Taczanowski: Faune ornithologique de la Sibérie Orientale. 1891—93.

T(d.) Ned. Aard. Gen(oots.) = Tijdschrift van het Kon. Nederlandsch Aardrijkskundig Genootschap, gevestigd te Amsterdam.

Temm., Coup d'Oeil génér. Possess. Néerl. = C. J. Temminck: Coup d'oeil général sur les possessions Néerlandaises dans l'Inde Archipélagique. 1846—49.

Temm., Man. d'Orn. = C. J. Temminck: Manuel d'ornithologie, ou tablean systématique des Oiseaux, qui se trouvent en Europe, précédé d'une analyse du système général d'ornithologie, et suivi d'une table alphabétique des espèces. 2e édit. 1820, 1835, 1839, 1840.

Temm., Pig. et Gall. = C. J. Temminck: Histoire naturelle générale des Pigeons et des Gallinacées, accompagnée avec pl. anatomiques. 1813—15.

Temm., Pl. Col. = C. J. Temminck: Nouveau recueil de planches coloriées d'Oiseaux, pour servir de suite et de complément aux planches enluminées de Buffon, édit. de l'imprimerie royale 1778. Publié par C. J. Temminck et M. Laugier, Baron de Chartrouse; d'après les dessins de Nic. Huet fils et Prêtre. 1820—39.

Temm & Knip, Pig. = C. J. Temminck: Histoire naturelle générale des Pigeons avec figures en couleurs peintes, par Mme Knip, née Pauline de Courcelles. Le texte par C. J. Temminck. 1808—11.

Temm. & Schl., Faun. Jap. Aves = P. F. de Siebold: Fauna Japonica. Conjunctis studiis C. J. Temminck et H. Schlegel pro vertebratis atque W. de Haan pro invertebratis elahorata. Oiseaux. 1833.

Thienem., Fortpfl(anz.) Vög. = F. A. L. Thienemann: Fortpflanzungsgeschichte der gesammten Vögel. Mit 100 Tafeln Abbildungen von Vogeleiern. 1845—56.

Thunb., Act. Holm. = C. P. Thunberg in Kongliga Svenska Vetenskaps Akademiens Handlingar, Vol. XXXIII. 1772.

Tr. As. Soc. Jap. = Transactions of the Asiatic Society of Japan.

Tr. Chicago Ac. Sc. = Transactions of the Chicago Academy of Science.

Tr. L(inn). S(oc). = Transactions of the Linnean Society of London.

Tr. Z. S. = Transactions of the Zoological Society of London.

Tr. & Pr. N. Z. Inst. = Transactions and Proceedings of the New Zealand Institute.

Tristr., Cat. (Coll.) B. = Catalogue of a Collection of Birds belonging to H. B. Tristram. 1889.

Tunstall, Orn. Brit. = M. Tunstall's Ornithologia Britannica [1771]. Ed. by A. Newton. (Willughby Society 1880.)

Tweedd., Orn. Works = The ornithological works of Arthur, IX. Marquis of Tweeddale. Ed. by R. G. W. Ramsay. 1881.

Verh. D. Zool. Ges. = Verhandlungen der Deutschen Zoologischen Gesellschaft.

Verh. Ges. Erdkunde Berlin = Verhandlungen der Gesellschaft für Erdkunde zu Berlin.

Verh). z.-b. Ges. Wien = Verhandlungen der k. k. zoologisch-botanischen Gesellschaft in Wien.

Verr. in Vinson's Voy. Madag. Annex B. = J. Verreaux in Vinson's Voyage à Madagascar. 1865.

Vieill., Analyse = L. P. Vieillot: Analyse d'une nouvelle ornithologie élémentaire. 1816. (Ed. by H. Saunders, Willughby Soc. 1883.)

Vieill., Enc. Méth. = Encyclopédie méthodique, ou par ordre de matière, par une société de gens de lettres. — Histoirenaturelle. Oiseaux, Ovipares et Serpents. (Oiseaux par R. J. E. Mauduit, revis. et augm. par Vieillot.) 1784—1820.

Vieill., Gall. Ois. = L. P. Vieillot: Galérie des Oiseaux du cabinet d'histoire naturelle du jardin du roi, ou description et figures coloriées des Oiseaux qui entrent dans la collection du muséum d'histoire naturelle de Paris. (Continuation de l'hist. natur. des Oiseaux dorés), dessinée (et lithogr.) d'après nature, par P. L. Oudart, et décrite par L. J. P. Vieillot. 1820—26.

Vieill., N. D. = L. P. Vieillot: Nouveau Dictionnaire d'Histoire Naturelle, 2e éd. (Articles contributed between 1816—19.)

Vig., Zool. J(ou)rn. = N. A. Vigors in the Zoological Journal. 1824—35.

Wagl., Mon. Psitt. = J. G. Wagler: Monographia Psittacorum. (Aus dem 1. Bde. der Denkschriften der Königl. Akademie der Wissenschaften in München 1832.) Besonders abgedruckt 1835.

Wagl., Syst. Av., = J. Wagler: Systema Avium. 1827.

Wald., Orn. Works = The ornithological works of Arthur, IX. Marquis of Tweeddale. Ed. by R. G. W. Ramsay. 1881.

Wall., Island Life = A. R. Wallace: Island Life: or, the phenomena and causes of insular faunas and floras. 1880.

Wall., Malay Archip. = A. R. Wallace: The Malay Archipelago. 1869.

Wallace, Geogr. Distr. Anim. = A. R. Wallace: The geographical distribution of Animals. With a study of the relations of living and extinct faunas as elucidating the past changes of the earth's surface. 1876.

Weber, Zool. Ergebnisse = Zoologische Ergebnisse einer Reise in Niederländisch Ost-Indien. Herausgegeben von Max Weber. 1890—97.

Whitehd., Expl. (Expd.) Kini Balu = J. Whitehead: Exploration of Mount Kina Balu, North Borneo. 1893.

Wieg. Arch. = Archiv für Naturgeschichte. Gegründet von A. F. A. Wiegmann.

Wiglesw., Aves Polyn. = L. W. Wiglesworth: Aves Polynesiae. A catalogue of the birds of the Polynesian Subregion (not including the Sandwich Islands). 1891. In: Abhandlungen und Berichte des Königl. Zoologischen und Anthropologisch-Ethnographischen Museums zu Dresden. 1890/91 Nr. 6.

Wilson, B. Sandw. Is. = Scott B. Wilson: Aves Hawaiiensis. The Birds of the Sandwich Islands. Assisted by A. H. Evans. 1890—96.

Z. (Ges.) Erdk., Berlin = Zeitschrift der Gesellschaft für Erdkunde zu Berlin.

Z. wiss. Zool. = Zeitschrift für wissenschaftliche Zoologie.

Zool. Garten = Der Zoologische Garten. Zeitschrift für Beobachtung, Pflege und Zucht der Thiere.

Zool. Jahrb. Abt. f. Syst. = Zoologische Jahrbücher. Abtheilung für Systematik, Geographie und Biologie der Thiere.

Ztschr. ges. Orn. = Zeitschrift für die gesammte Ornithologie.

Ztschr. wiss. Geogr. = Zeitschrift für wissenschaftliche Geographie.

NOTANDA ET CORRIGENDA.

Page *120* in Introduction, cancel the number 42, making the total 87 instead of 88.
» 4, line 30, for Forster read Forsten.
» 4, » 31, add Saleyer (Everett *a 22*) and Togian (Meyer).
» 8, » 18, 19, alter the reference-letter *b* into *a*.
» 28, » 16, instead of chocolate-brown rufous, read chocolate-brown, without rufous.
» 53, » 18, for *H. indus* and *H. indus—girrenera*, read *H. indus* and *H. indus girrenera*.
» 55, » 26, add Togian (Meyer).
» 63, » 24, add Kalao (Everett *32*).
» 77, » 4, Hartert now calls this bird *Baza suberistata suberistata* (Nov. Zool. 1898, 47).
» 79, » 11 from below, add Djampea and Kalao (Everett *g 2*).
» 90, » 5 from below, add Kalao (Everett *d 3*).
» 91, » 33, add the Osprey has been observed nesting in India by Hume and others, according to Blandford. (Faun. Br. Ind. B. III, 1895 p. 315.)
» 95, » 25, for *Ninox lugubris affinis* read *Ninox scutulata affinis*.
» 115, » 19, for D'Aubert. read D'Aubent.
» 117, » 11, add Tagulandang and Biarro —? var. (Nat. Coll.).
» 118, » 17, 18, 20, for *o 1* read *t 1* and for *n 1* read *s 1*.
» 187, » 31, correct the name into *Cuculus canorus* L., without brackets.
» 188, » 7, first reference, for Tr. Z. S. read Tr. L. S.
» 191, » 21, query summer, as Platen's collecting in Mindanao was continued into the winter months.
» 217, » 14, from below, add Djampea and Kalao (Everett *w 8*, p. 176).
» 218, » 16, for *c 2* read *c 5*.
» 219, » 12, for Wellesly read Wellesley.
» 233, » 25, for *Ramphastidae* read *Rhamphastidae*.
» 239, » 13 from below, after Elliot insert Monogr. Bucerotidae.
» 248, » 16, for Cox & Hamilt. ib. read Cox and Hamilt. Pr. L. Soc. N. S. W.
» 257, title, affix an * to *Meropogon forsteni* Bp.
» 263, » 27, add Saleyer (Weber).
» 265, » 15 from below, for Kalao read Saleyer.
» 269, » 6, for Handb. read Handl.
» 285, » 14 from below, for 1885 read 1883.
» 288, » 6 from below, add Banggai (Nat Coll.).
» 294, » 6 from below, add Saleyer and Djampea (Everett *d 23*).
» 300, title, affix an * to *Monachalcyon princeps* Rchb.
» 305, » affix an * to *Cittura sangirensis* Sharpe.
» 322, » affix an * to *Lyncornis macropterus* Bp.
» 328, line 5, for Gld., HL, read Gld., Hb.
» 329, title, before 104. *Chaetura celebensis* cancel the *.
» 335, line 6, add Kalao (Everett *13*).
» 337, » 19, add Saleyer (Everett *15*).
» 350, » 5, title, put Bp. in brackets.
» 360, » 28, add Karkellang, Talaut (Nat. Coll.).
» 389, » 15 from below, add Saleyer (Everett *14*).
» 393, » 11 from below, for *Collurincla* read *Colluricincla*.
» 400, » 18, for *S. clio* read *P. clio*.
» 407, » 6, the name *Lanius jeracopsis* is spelt *Lanius jeracopis* by de Filippi.
» 416, » 14, add Sula (Wallace).

Page 421, line 23, add Togian (Meyer *d 3*).
» 437, » 4, from below, for Luwn read Luwu.
» 440, » 22, for *carbonaria* read *carbonarius*.
» 445, title, affix an * to *Dicaeum talautense* M.&Wg.
» 459, line 14, add Dongala, West Celebes (Doherty *o 1*).
» 459, » 18, erase f. 2 ♀ — this figure representing a North Celebes female (fide W. Blasius).
» 497, » 18, 19 put the names Wall., W. Blas., and Hombr. & Jacq. in brackets.
» 504, » 8 from below, title, for *Trichosloma celebensis* (Strickl.) read *Trichostoma celebense* Strickl.
» 505, » 6 for *Brachyteryx* read *Brachypteryx*.
» 513, last line, for Nat Coll. *a 25* read *a 26*.
» 525, line 6 from below, for W. Taczanowski read L. Taczanowski.
» 550, » 9, for *Munia molucca propinqua* Hart. read *Munia molucca propinqua* (Sharpe).
» 551, line 21, alter the formula *Munia molucca>propinqua* into *Munia molucca typica>*.
» 561, » 28, add Saleyer and Djampea (Everett *15*).
» 564, » 14, for *erythroprhys* read *erythrophrys*.
» 576, » 10, cancel the inverted commas in the name "La Pérouse".
» 605, » 24, for f. 2197 read f. 1297).
» 606, title, affix an * to *Ptilopus subgularis* M.&Wg.
» 616, » 14, add Djampea (Everett *20*.).
» 638, » 10, add Peling and Banggai (Nat. Coll.).
» 638, » 25, add Talaut—Lirung (Nat. Coll.).
» 671, last line, for *Tagegallus* read *Talegallus*.
» 676, line 18, for *bensteini* read *bernsteini*.
» 712, » 2 from below, read Tawaya, West Celebes, not West Tawaya, Celebes.
» 765, » 3 from below, add Togian (Meyer).
» 773, » 19 from below, read Petrop., not Petrov.
» 813, » 14, add Togian (Meyer *b 13*).
» 827, last line, add Sula (Wallace).
» 843, line 4, from below, read t. 153, instead of t. 155.
» 850, » 4, for *goisaki* read *goisagi*.
» 857, » 6 from below, add Karkellang, Talaut (Nat. Coll.).
» 884, » 1, for B. Kerguelen 1877 read 1879.
Plate XXVI read *teismanni*.

INTRODUCTION.

When we first planned a treatise on the Birds of Celebes, we soon found that it would be quite impossible to restrict ourselves to the mainland, as this is everywhere surrounded by larger or smaller islands which are so connected with it by their Avifaunas that they could not be left out; at the same time it proved impossible to define a natural zoological frontier between certain of these islands and the adjacent ones. Our frontispiece-map shows the limits we decided upon, viz. the inclusion of the Talaut Islands in the north, the Sula Islands in the east, and the Djampea Group in the south, though at each of these points elements from, respectively, the Philippines, the Moluccas, and the Lesser Sunda Islands are very marked. The boundary so chosen adjoins to the north the southern limit of the Philippines, as defined by Tweeddale, Worcester and Bourns, and others; to the east it coincides with Salvadori's western border, as drawn in his "Ornitologia della Papuasia e delle Molluche"; to the west it follows the eastern boundary of Borneo, as adopted in Everett's "List of the Birds of the Bornean Group", and by other writers; to the south it takes in all the islands between Celebes and the Lesser Sundas. The book may thus be said to fill up an ornithological gap, and the bounds as chosen appear also to be the most natural, except possibly (?) in the case of the Djampea Group. Moreover, the Avifauna of the adjacent groups often gives a clue to the derivation of non-Celebesian forms in Celebes; it would, therefore, be inadvisable to leave them out.

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1. TRAVEL AND LITERATURE.

The naturalists and collectors who have done work among the birds of this area first deserve attention, and to the following short biographical notes concerning them we append a list of the publications on the Birds of Celebes and the neighbouring islands, based more or less directly on these travellers' results. We are afraid that our lists are not complete, either in regard to its including all the names of ornithological collectors, or all items of literature. As to the latter we have restricted ourselves, with a few exceptions, to the period after the publication of Walden's "List of the Birds known to inhabit the Island of Celebes" in the year 1872, and several papers and books, which we have not enumerated in our list, though they contain something on Celebesian Birds, will be found in the synonymy of the species, if they have not been unhappily entirely overlooked.

1793. Labillardière (Jacques Julien Houton de) 1755—1834. Frenchman. Naturalist. Accompanied Dentrecasteaux' expedition in search of la Pérouse (see: Relation du voyage par le C^en^. Labillardière; an VIII [1800] vol. II, p. 298). The ships spent 18 days in passing through the strait between Buton and Muna, and parties landed upon both islands. There is no doubt that the "Pie de la Nouvelle Calédonie"(!), *Streptocitta albicollis* (Vieill.), was then obtained, as possibly also *Garrula typica* Bp. Labillardière mentions some Parrots in these islands. Besides the above, he published many works and papers on botany, etc.

1821. Reinwardt (Caspar Georg Carl) 1773—1854. German. Naturalist. Sojourned from 1816—1822 in the East Indian Archipelago, visited about 1820 the Island of Saleyer, spent a few months in 1821 in North Celebes (see: Reinwardt's Reis naar het oostelijk gedeelte van den indischen Archipel in het jaar 1821 by W. H. de Vriese, Amst. 1858, pp. 503—538, Gorontalo; pp. 539—603, the Minahassa; with plates, 7 concerning Celebes, and the published Catalogues of the Leyden Museum). His ornithological collections are in the Leyden Museum, — see the list of Birds collected (125 species) in the work quoted (pp. 237—239) and the mention of 633 specimens of birds etc. sent home (p. 245). On p. 592 some birds of the Minahassa are recorded. As to ornithological papers he only wrote: "Uber die Art und den Ursprung der essbaren Vogelnester auf Java" (1838), but we do not know where this has been published. *Bava reinwardti*, occurring on islands south of Celebes and elsewhere, was named after him.

1828. Müller (Salomon). German (born at Heidelberg). Naturalist. Sojourned in the East Indian Archipelago from 1826—1837 and visited among other places South Celebes and the Island of Buton, see: Reizen en onderzoekingen in den Indischen Archipel, 1828—1836, vol. II, 1857, pp. 4—19 (on the birds of South Celebes, pp. 7—8, 64, 69—71; of Buton, pp. 12, 15, 65, 69). This work is a new and enlarged edition of a part of the "Verhandelingen over de natuurlijke geschiedenis der Nederlandsche overzeesche bezittingen, door de leden der natuurkundige Commissie en andere schrijvers", uitgegeven door C. J. Temminck, 1839—1844, fol. His ornithological collections — about 8000 specimens — are in the Leyden Museum (see: Schlegel's Catalogues; Veth: Overzicht van hetgeen gedaan is voor de Kennis der Fauna van Ned. Ind. 1879, p. 89, etc.). *Tanygnathus muelleri* from Celebes was named after him. We have nowhere been able to find the dates of birth and death of this meritorious naturalist.

1828. Quoy (Jean René Constant) and **Gaimard** (Joseph Paul) 1790—1869 and 1796—1858. Frenchmen. Naturalists. The latter took part in the expedition of the "Uranie" and "Physicienne" (1817—1820), both in that of the "Astrolabe", 1826—1829 (see: Voyage de la corvette l'Astrolabe, Paris 1830—1834, Histoire du voyage, 1833, V, 428 by Dumont d'Urville, and Zoologie, 1830, I, 165, where 10 new species of birds from Celebes are described, by Quoy and Gaimard). They only visited the Minahassa for about 5 days in the year 1828. Temminck (Coup-d'oeil gén. s. l. poss. néerl. dans l'Inde arch. 1849, III, 105—106) said about this trip: "La relâche de la corvette française *l'Astrolabe* à la factorerie de Menado, et l'excursion d'une couple de jours faite par les naturalistes français au lac de Tondano, n'ont offert, à l'une comme à l'autre expédition scientifique, qu'une recolte peu nombreuse de plantes, ainsi que la capture d'un petit nombre d'animaux. Toutefois, le naturaliste a découvert dans ces acquisitions, à peu-près autant d'espèces nouvelles à faire connaître, qu'il s'est trouvé d'objets rassemblés, presque sans choix préalable; on a été non moins surpris des résultats qu'elles ont offerts à la science." Both have written many important works on Natural History, etc.

1841. Forsten (Eltio Alegondus) 1811—1843. Dutchman. Naturalist. Was elected (1836) a member of the "Natuurkundige Commissie" in the Netherlands' Indies and sojourned in North Celebes from 1841. He could not do much, however, in consequence of bad health, and died on the 2nd of January 1843 in Amboina. Nevertheless Temminck was justified in saying (Coup-d'oeil gén. s. l. poss. néerl. dans l'Inde arch. 1849, III, 106): "Les perquisitions et les travaux auxquels il lui fut possible de se livrer, nous ont valu des additions fort intéressantes à la connaissance très-superficielle qu'on avait pu acquérir jusqu'ici de cette contrée." His ornithological collections are in Leyden (see Schlegel's Catalogues, etc.). *Meropogon forsteni*, *Halcyon forsteni*, *Pitta forsteni* and *Carpophaga forsteni* from Celebes were named after him.

c. 1844. Léclancher (Charles René Auguste) 1804—1885. Frenchman. Surgeon on several warships from 1828—1844. He visited among other places Borneo and Celebes and brought home extensive collections to the Paris Museum. When with the "Favorite" from 1841—1844 he stayed at Manado in North Celebes and got two species of birds till then unknown, one of which was named after him *Dicaeum leclancheri* (see Rev. Zool. 1845, p. 93). During a former expedition of the same ship from 1830—1832 Eydoux was the doctor on board, and in 1839 he, with Gervais, described the birds then collected in the zoological part of the work on the voyage. The "Favorite" was also out from 1838—1839 with Léclancher on board, but neither this expedition, nor the one of 1841—1844, have been described, so far as we are aware.

1856. Wallace (Alfred Russel. Born 1823. Englishman. Naturalist. Amazon 1848—52, in the East Indian Archipelago 1854—62, where especially he was most successful in every respect, none of the former nor of the later naturalists there having attained anything to equal his results. He was in South Celebes from September to November 1856, and July to November 1857, in North Celebes from June to September 1859, and his Assistant, Charles Allen, collected in the Sula Islands. As is generally known, Mr. Wallace has written specially on the Avifauna of Celebes in his various important works. His separate ornithological papers concerning the Celebesian Area are: On the Ornithology of Northern Celebes, Ibis, 1860, 140; List of Birds from the Sula Islands, P. Z. S., 1862, 333; and Note on *Astur griseiceps*, Ibis, 1861, 181; but he treated of different genera and families monographically in which the Celebes birds play a great part, e. g.: On the Parrots of the Malay Region, P. Z. S., 1864; On the habits and the distribution of the genus *Pitta*, Ibis, 1861; On the Pigeons of the Malay Archipelago, Ibis, 1865; Catalogue of the Birds of Prey of the Malay Archipelago, Ibis, 1868. His ornithological collections are for the greater part in the British Museum as the "Catalogues of Birds" show, but there are to be found in many other museums and private collections specimens from his rich harvest, amounting to 8050 specimens, as he himself mentions in the preface of his "Malay Archipelago". *Prioniturus wallacei*, *Microstictus wallacei*, *Macropteryx wallacei*, *Osmotreron wallacei* and *Chalcophaps wallacei* from Celebes, as well as *Ceyx wallacei* from Sula were named after him.

c. 1856. Riedel (Johann Gerardus Friedrich). Dutchman. Born 1832 at Tondano, North Celebes, where his father was a missionary; educated in Europe. A discourse with Alexander von Humboldt in Berlin[1]) and later Mr. Wallace's presence in Celebes appear to have had much influence in awakening his interests in Natural Science. From 1853—1883 he was in the Civil Service in the East Indian Archipelago (1853—1863 in the Minahassa, 1863—1875 in Gorontalo — both in North Celebes —, 1875—1878 in Billiton, 1878—1880 in Timor, 1880—1883 in Amboina). Many papers from his pen on North Celebes are to be found in Dutch periodicals, but his chief work is: "De sluik-en kroesharige Rassen tusschen Selebes en Papua", with many plates (1886). He made extensive ornithological and other collections everywhere, which he presented to several European Museums. His birds from Celebes are among other places at Brunswick (see: Z. f. d. ges. Orn. 1886, 81[2]), Darmstadt (see: Abh. Naturw. Ver. Bremen V, 35, 1876, and 464, 1877), Dresden (see: our work), Karlsruhe (see: J. f. O. 1883, 129), Leyden (see: Schlegel's Catalogues, etc.), Paris (to which he presented many consignments from 1864—1872), St. Petersburg (see: Z. f. d. ges. Orn. 1886, 193[2]). *Phyllergates riedeli* and *Ardetta riedeli* from Celebes were named after him. Dr. Riedel has been living in Holland since 1883.

c. 1860. Duivenbode (Lodewijk Diederik Hendrik Alexander van Renesse van) 1832 or 1833—1881 or 1882. Dutchman (half-caste of Ternate). Planter and merchant at Manado. Son of Maarten Dirk van Renesse van Duivenbode, whom Mr. Wallace in his "Malay Archipelago" (II, p. 2) calls the King of Ternate. He sent out native hunters to make large collections of birds in the Minahassa and the neighbouring islands and presented them in part to Museums (such as the Leyden) and sold others; consequently lots of birds from "Manado" were in the European market between 1870—1880 (see, for instance, J. f. O. 1883, p. 129), and those in many collections may be traced to this source. They

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[1]) Alexander von Humboldt asked Mr. Riedel among other things, why there are no large mammals to be found in Celebes, a question involving the whole problem which makes this island so interesting.

[2]) This collection is not from the Minahassa, as Prof. W. Blasius writes, but from Gorontalo, as we know from Dr. Riedel himself. Gorontalo does not belong to the Minahassa.

bear, however, no exact locality and date and were often mixed up with birds from other parts of the East Indian Archipelago. He appears to have been induced to collect birds from the visit of Mr. Wallace to the Minahassa in the year 1859. *Eudrepanis duivenbodei* from Sangi was named after him.

1863. Rosenberg (Karl Benjamin Hermann von) 1817—1888. German. Lived, with an interval of two years, from 1840—1871 in the East Indian Archipelago, first as soldier, then draughtsman, next in the Civil Service, finally as naturalist to the government. He travelled in North and Central Celebes, from April 1863 to August 1864 and wrote concerning it: "Reistochten in de Afdeeling Gorontalo" (Amst. 1865), containing a few ornithological notes; the chapters on Celebes in his "Malayischen Archipel" (Leipsic 1878—1879) with more extensive remarks on the Avifauna (p. 270—279); and "Ein Jäger-Eldorado" (Zool. Garten 1881, 164). His determinations are, however, not throughout trustworthy, as he was more of a sportsman than of a naturalist. He also sent some hunters to the Sangi Islands in the year 1864. During his long stay in the Archipelago he made extensive ornithological collections, which now are in Darmstadt (see: Abh. Natw. Ver. Bremen, 1876, V, 35), Leyden (see Schlegel's Catalogues, etc.) and in some other Museums (e. g. Lübeck, see: J. f. O. 1877, 359; Dresden through von Schierbrand). *Strix rosenbergi* and *Gymnocrex rosenbergi* from Celebes were named after him.

1864. Bernstein (Heinrich Agathon) 1828—1865. German. Naturalist. Sojourned in the East Indian Achipelago from 1855—1865, from 1860 onwards as naturalist to the Government, and died near New Guinea. His extensive ornithological collections are in the Leyden Museum. Though he did not visit the Celebesian Area personally, except for a short stay at Macassar, he sent some of his native collectors to the Sula Islands in the year 1864 (see Schlegel's Catalogues, etc.). Bernstein's admirable ornithological papers do not concern Celebes directly. Van Musschenbroek published the diary of his last voyage to New Guinea (1864—1865) in the Bijdr. taal-, land- en volkenk. Ned. Ind. (4) VII, 1, 1883, containing much valuable information as to this lamented naturalist. *Megapodius bernsteini* from Sula was named after him.

1864. Hoedt (Dirk Samuel). Dutchman (half-caste of Amboina); secretary to the government; a passionate amateur naturalist; was nominated successor to Bernstein. He collected on Sula Besi and Sula Mangoli (1864) and on Great Sangi and Siao (1865) and forwarded his ornithological collections to the Leyden Museum (see: Schlegel's Catalogues, etc.). He died some time after 1879, but we have not been able to ascertain the year.

1865. Bickmore (Albert S.). Born 1839. American. Naturalist. In the East Indian Archipelago from 1865—1866 (see: Travels in the East Indian Archipelago, London 1868, transl. into German. 1869, and Dutch, 1873) and sojourned a short time in South Celebes (June 1865) and in North Celebes (December 1865 till January 1866). He published a list of birds collected there in the Proc. Boston Soc. Nat. Hist. as he remarks in his book, but we have not been able to find it in this Journal nor elsewhere. His ornithological collections will be in an American Museum. He now is Curator of the department of Public Instruction in the American Museum of Natural History in New York.

1870. Meyer (Adolf Bernhard). Born 1840. German. Naturalist. Travelled from 1870—1873 in the East Indian Archipelago, having been induced to go out to this part of the globe in the hope that its innumerable islands would afford the possibility of studying the variation of species in the Darwinian sense, for the publication of the "Origin of Species"

had influenced his University studies (1862—70), and he selected Celebes to begin with in consequence of Wallace's brilliant speculations on the anomalous condition of its fauna, and on the scientific problems awaiting solution there. He sojourned for over a year in Celebes: November 1870, Macassar; November—July, Minahassa and the neighbouring islands; July—September, Gorontalo, Togian and Central Celebes; September—November, South Celebes; January 1873, Macassar, Gorontalo, Kema; August 1873, Macassar. His ornithological collections from there are in Dresden, Berlin, London (British Museum: Walden Collection), etc.; they amounted to about 4000 specimens. Lord Walden treated of some of them in the Trans. Zool. Soc. vol. VIII, 1872; in the Ann. & Mag. Nat. Hist. vol. VIII 1871, IX 1872, XIV 1874; Meyer himself among other places (see "Literature") in the J. f. O. 1873, 404, where he made known that he had discovered 14 new species, and 25 which had not yet been recorded from Celebes; Rowley's Orn. Misc. 1877 & 1878; Ibis 1879 (field notes); and Abbildungen von Vogelskeletten 1879—1897. *Trichoglossus meyeri, Cyrtostomus frenatus meyeri* from Celebes, and *Halcyon meyeri* from Togian were named after him. He has translated some of Wallace's works into German and has been in charge of the Dresden Museum since 1874.

1870. Conrad (Paul). German. Captain of a trading vessel. He collected 5 species of birds at Macassar, South Celebes, in 1870, which are probably in the Bremen Museum (see: Verh. Zool.-bot. Ges. Wien 1873, 341).

1873. Fischer (Georg). German. Army Surgeon in the Dutch Indies. Collected in Celebes and Borneo and presented his ornithological collection of 1066 specimens from the Minahassa and Sangi to the Darmstadt Museum (see: Abh. Natw. Ver. Bremen V, 1876, p. 35, and t. c. 1878, p. 538). *Ptilopus fischeri* from Celebes was named after him. In 1880—1881 he was stationed at Ternate (see: Bull. Ac. Imp. des Sc. St. Pétersb. 1884 XI, p. 109).

1873. Beccari (Odoardo). Born 1843. Italian. Naturalist. Sojourned in the East Indian Archipelago from 1865—1868 (Borneo), from 1871—1876 (Moluccas, Celebes, New Guinea), from 1878—1879 (Sumatra), and as a scientific collector takes almost equal rank with Wallace. In 1873—1874 he visited the South-eastern Peninsula of Celebes, as well as the Minahassa and Macassar, and Count Salvadori has described his ornithological collections from there, now in the Genoa Museum (see: Ann. Mus. Civ. di Stor. Nat. di Gen. 1875, VII, 641). *Aethopyga beccarii* and *Turnix beccarii* from Celebes were named after him. He lives at Radda in Chianti near Florence.

1874. Bruijn (Antonius Augustus). Dutchman. He was an officer in the Dutch Navy, but settled on Ternate as son-in-law of the great merchant M. D. van Renesse van Duivenbode (mentioned above p. 4), whose business he carried on after his death. He sent out hunters with many of his ships and sold the bird-skins collected chiefly in Paris to plumassiers, but a large and highly valuable collection was presented by him to the Genoa Museum, containing among others a series from North Celebes and Sangi (see: Ann. Mus. Civ. Gen. 1875, VII, p. 641; ib. 1876, IX, p. 50). He died about the year 1880.

1875. Musschenbroek (Samuel Cornelius Jan Willem van) 1827—1883. Dutchman. Naturalist. In the Civil Service of the Dutch Indies from 1855—1877, including a two-years' furlough in Europe. He was Resident of the Province of Manado from 1875—1876. Here he collected ornithologically, as indeed he did in all branches of Natural History wherever he was stationed (Java, Ternate), sending his collections to the Museums of the Netherlands. He presented (1879) part of his North Celebesian birds to the Dresden Museum, others to Leyden (see: Notes of the Leyden Museum 1879, I, p. 50). He published some remarks on

the birds of North Celebes (Nat. Tijdschr. Ned. Ind. 1877, XXXVI, p. 376), and amongst his other works we may mention here his large map of the Minahassa (1878, $\frac{1}{100\,000}$) and that of the Gulf of Tomini and the lands adjoining (1879). As to his sojourn in the Minahassa, see also Rowley's Orn. Misc. 1878, III, p. 115. As a gentleman of high scientific attainments he offered great help to all naturalists visiting the East Indian Archipelago. *Surniculus musschenbroeki* from Batjan, now also known from Celebes, was named after him.

1875. Murray (John). Born 1841. Scotsman (Canada). Naturalist on the "Challenger" under whose superintendence the ornithological collections were formed, and of whose note-book, and of further notes, Mr. Sclater made use in his Report (see: "The Voyage of H. M. S. Challenger" 1873—1876, Zoology vol. II, part VIII, 1880). There is, however, only one species recorded belonging to our area, viz. a Lory from Melangis[1]), one of the Nanusa Islands (l. c. p. 115) to the north of Celebes. Specimens are in the British Museum. This bird was afterwards named *Eos challengeri*. Dr. Murray lives in Edinburgh as Director of the Scottish Marine Station for Scientific Research and is a member of the Fishery Board for Scotland.

1875. Bültzingslöwen (Wulf von). Born 1847. German. Sportsman. He travelled in the Minahassa in the year 1875 and brought together there a small collection of birds, which he presented to the Lübeck Museum (see: J. f. O. 1877, 359). Lives near Berlin.

1876. Faber (F. von). Dutchman. In the Civil Service of the Dutch Indies. He collected bird-skins in the Minahassa where he stayed at Amurang in the year 1876, and presented collections among others to the Dresden and Berlin Museums (as to the latter, see J. f. O. 1877, 217, and 1883, 121). Subsequently (1881) he collected ornithologically in Sumatra also. Died after 1886.

1876. Teijsmann (Johannes Elias). 1808—1882. Dutchman (of German origin). Naturalist. Lived at Buitenzorg in Java, from 1830 till his death, as Botanist and as Honorary Inspector of the Plantations. He made an official voyage in 1876 to the Moluccas and visited Sula Besi (see Nat. Tijdschr. Ned. Ind. 1877, XXXVII, p. 88); in 1877 another (besides various journeys in the Archipelago not mentioned here) to South Celebes and Saleyer (l. c. 1879, XXXVIII, p. 54), and on these occasions he collected birds among other objects. In Celebes he procured (t. c. p. 121) "893 specimens of skins of mammals, birds, etc. in 254 species". His reports also contain some ornithological notes. He visited Macassar, Pankadjene, Tjamba, Maros, Bonthain and Loka in South Celebes and Saleyer Island, but a full description of his valuable ornithological collection sent to the Leyden Museum was never given. *Rhipidura teijsmanni*, *Pachycephala teijsmanni* and *Cyrtostomus teijsmanni* were named after him (s. Notes Leyden Museum 1893, XV, pp. 167, 170, 179). In the year 1860 he had also visited the Minahassa on a short trip together with Prof. de Vriese, who died soon afterwards. (See l. c. 1861, XXIII, pp. 343—369.)

1878. Platen (Carl Constantin). Born 1843. German. Naturalist. Was a physician at Amoy, then collected, chiefly ornithologically, with a short interval in Europe in the year 1879, in 1878 in South Celebes, 1884 in Malacca, Borneo, the Moluccas and Waigiou, 1884—1886 in the Minahassa, North Celebes, 1886—1887 on Great Sangi, 1887—1892 in the Philippines, 1892—94 on Batjan. The greater part of his collections were sold to the Brunswick Museum and to Mr. Nehrkorn's Museum at Riddagshausen near Brunswick;

[1]) We write Melangis, instead of Meangis, as the former name is on the best Dutch maps.

other specimens to different museums and collections in Germany and abroad. Dr. Platen himself wrote about his trips in Celebes and Sangi in the "Gefiederten Welt" 1879, pp. 358, 378; 1887, 193, 264. His birds from Celebes and Sangi were carefully described by Prof. W. Blasius in the Z. ges. Orn. 1885, 201 (S. Celebes, 1878); Ornis 1892, IV, 527 (Sangi, 1886); and Festschr. Vers. Naturf. Braunschw. 1897, p. 277 (N. Celebes, 1884—1886). *Aramidopsis plateni*, and *Cyrtostomus plateni* from Celebes were named after him, and *Criniger platenae* after Mrs. Platen, who has always accompanied her husband. He lives at Barth (Prussia).

c. 1880. **Laglaize** (Léon). Frenchman. Collecting Naturalist. Made extensive expeditions in the East Indian Archipelago and sojourned about 1880 in Celebes and Sangi; his ornithological collections from there are in the Paris and some other museums.

1882. **Ribbe** (Carl) and **Kühn** (Heinrich). Born 1861 and 1860. Germans. Collecting naturalists. They made an expedition together in the East Indian Archipelago from 1882—1885, and visited South and East Celebes in 1882—1883. North and West Celebes (on a short trip) in 1885; the island of Banggai and East Celebes for the second time were visited by Mr. Kühn alone in 1884—1885. Part of their ornithological collections from Celebes came to the Dresden Museum (see Sitzb. Ges. Isis, Dresden, 1884, Abh. 1, pp. 16, 48); for a general report on this voyage and on a second to the Bismarck Archipelago and Solomon Islands (1892—1896) by R. alone, see: Deutsche geogr. Blätter 1895, vol. 18, p. 372. Concerning Celebes Mr. Ribbe has published: "Ein Sammeltag am Wasserfall von Maros" (see Krancher's entomolog. Jahrb. 1893). He is living near Dresden; Mr. Kühn at Tual in the Kei Islands as owner of a steam saw-mill.

1883. **Guillemard** (Francis Henry Hill). Born 1852. Englishman. Naturalist. Visited North and South Celebes, 1883, during the "Cruise of the Marchesa to Kamtschatka and New Guinea" (1886, p. 153—215: Chapter on Celebes, where there are some notes on birds) and described his ornithological collections in the Proc. Zool. Soc. of London 1885, 512. He collected 108 species in Celebes, 3 of which had not been recorded before from there, though from elsewhere. These are mostly in the Tring Museum. Dr. Guillemard has also travelled in Lapland and in Africa, and is now living in England at Trumpington near Cambridge.

1885. **Hickson** (Sydney John). Born 1859. Englishman. Naturalist. Made scientific researches in North Celebes, Sangi and Talaut in 1885 to 1886 and gave some notes on the birds there (see: "A Naturalist in North Celebes", 1889, Appendix B, p. 360). His ornithological collections, which are, however, small, are in the Cambridge Museum. He now is Professor of Zoology at the Owens College, Manchester.

1888. **Weber** (Max Carl Wilhelm). Born 1852. German. Naturalist. Professor of Zoology at Amsterdam. During an exploring expedition in the East Indian Archipelago (1888—1889) he visited South and Central Celebes and the Island of Saleyer, and procured 97 species of birds in 234 specimens in Celebes (of which, however, only 2 species of wide distribution were as yet unknown from the island) and 14 species in 22 specimens in Saleyer. These collections are partly in the Leyden Museum, partly in the Zoological Museum of the University of Amsterdam. (See: "Zoologische Ergebnisse einer Reise in Niederländisch Ost-Indien", 1894, III, p. 269.)

1890. **Radde** (Gustav Ferdinand Richard). Born 1831. German. Naturalist. Accompanied two Russian Grand-dukes on a voyage to the East and visited the Island of

Buton and South-east Celebes in 1890. He has not published a report on the ornithological collections made here, unless it be in the work brought out by the Grand-dukes in Russian. A chapter of this work, from the pen of Dr. Radde, on Buton and South Celebes appeared in German in the journal "Globus" 1896, vol. 69, p. 151, wherein are some ornithological notes (s. pp. 172, 189), but the determinations are not trustworthy, and have, therefore, not been quoted in this book. Dr. Radde is Director of the Museum of Tiflis, where, or elsewhere in Russia, this collection may now be.

1892. Cursham (Charles W.). Dutchman (half-caste of Celebes). Merchant at Manado, North Celebes, who had collected birds there before 1892, which may be in some museum. Was engaged by Dr. Meyer and the Hon. W. Rothschild to form another collection and sent out native hunters from 1892—1896 to some parts of the Minahassa and the small neighbouring islands, and to the Sangi, Talaut and Banggai Groups (see: J. f. O. 1894, 237, and Abh. Ber. Mus. Dresden 1894/5 Nr. 4, Nr. 9; 1896/7 Nr. 2). In our work specimens from this source are marked: "native collectors" or "native hunters" ("nat. coll.", "nat. hunt.") and some of these skins have passed into other museums also.

1893. Sarasin (Paul and Fritz). Born 1856 and 1859. Swiss. Naturalists. The cousins Sarasin spent the years 1884—1886 in Ceylon and published the results of their investigations in the great work entitled: "Ergebnisse naturwissenschaftlicher Forschungen auf Ceylon" (1887—1893). From 1893—1896 they were in Celebes, viz. 1893—1894 in North Celebes, 1895 in central parts, 1895—1896 in the South (see: Zeitschr. Ges. Erdkunde Berlin 1894, XXIX, 351; 1895, XXX, 226, 311; 1896, XXXI, 21; and Verh. Ges. Erdkunde Berlin 1896, 337; with 5 maps). No naturalists before them have made such a thorough and many-sided exploration of the Island, and contributions of the highest importance are to be expected from their pen, for as yet they have only begun to publish some of their results. They collected in nearly every branch of Natural History and Ethnography, and we had the privilege of receiving their ornithological specimens in 9 different consignments during the time we were writing this book (see: J. f. O. 1894, 153; Abh. Ber. Mus. Dresden 1894/95, Nr. 4 and Nr. 8; 1896/97, Nr. 1), which has reached a much higher standard through their welcome aid, as may be seen on almost every page. We are, therefore, deeply indebted to Dr. P. & Dr. F. Sarasin. They obtained 207 species on the mainland of Celebes, 10 of which proved to be new to science and 12 others not yet known from Celebes. Their ornithological collections are for the most part in the Museum at Basel, where they live; they also presented some valuable specimens to the Dresden Museum. *Myza sarasinorum*, *Zosterops sarasinorum* and *Cryptolopha sarasinorum* were named after them.

1894. Kükenthal (Willy). Born 1861. German. Naturalist. When on his exploring expedition into the East Indian Archipelago from 1893—1894 spent a few weeks (in June and July 1894) in North Celebes and collected some birds there, which are now in the Senckenberg Museum at Frankfort. Dr. Kükenthal is Professor of Zoology at Jena.

1895. Everett (Alfred Hart. Born 1848. Englishman. Naturalist. Has collected birds, etc., beginning about 1870, in the East Indian Archipelago, viz. in Borneo (see his "List of the Birds of the Bornean Group of Islands": J. Str. Br. R. As. Soc. 1889, Nr. XX), the Philippines (see Ibis 1872, and Proc. Zool. Soc. 1877—1879), Natuna, Savu, Lombok, Timor, etc. (see Novit. Zool. 1893 and 1896), and visited South Celebes and the islands to the south in 1895 (see Novit. Zool. 1896, pp. 69, 148, 256; 1897, 170). His ornithological collections are chiefly in the British and Tring Museums, but many of his duplicates are to be found elsewhere, for instance, in the Dresden Museum. *Androphilus everetti* from South Celebes,

Pachycephala everetti and *Monarcha everetti* from the Island of Djampea were named after him. He has been during most of this time in the Sarawak Government Service, and now resides in Labuan, when not engaged in zoological collecting.

1895. Hose (Charles and Ernest). Born 1863 and 1872. Englishman. Visited the Minahassa, on a collecting trip in 1895. Charles, the elder brother, had already explored the mountainous parts of North Borneo and made extensive collections there; he has written about the mammals and birds of Borneo (1893). He is in the service of the Rajah of Sarawak, as Resident of the Province of Baram. *Dicaeum hosei* from Celebes was named after him. Ernest Hose also lives in Sarawak, when not engaged in collecting work.

1896. Doherty (William). American from Cincinnati. Naturalist. He has travelled extensively for many years in Europe, Persia, India and the East Indian Archipelago and visited South Celebes in 1887 and 1891, South and West Celebes (Palos Bay) in 1896, Talaut in 1892 and Sula in 1898. His ornithological collections are chiefly in the Tring Museum (see: Nov. Zool. 1896, 153). *Pitta dohertyi* from Sula was named after him, this species, however, could not be treated of in our book, as it was not described until after we had finished. He is highly distinguished as a linguist and entomologist and has written a great deal on Lepidoptera from India. He is still travelling in the East.

1897. Waterstradt (Johannes). Born 1869. Dane. Collecting naturalist. Has made extensive expeditions in Ceylon, Malacca and the East Indian Archipelago (chiefly Borneo) since 1888 and sent his Bornean hunters to the Talaut Islands in 1897. The ornithological collections of this expedition are in the Tring Museum (see: Nov. Zool. 1898, 88). He is still collecting, and is settled for the moment in Labuan.

Special List of Literature on the Birds of Celebes.[1])

1850. Gould J. The Birds of Asia. 1850—1883. 7 vols. folio (completed by R. B. Sharpe).
1857. Schlegel H. Handleiding tot de beoefening der dierkunde. Vol. I 1857. 530 pages. 8 plates in folio.
1860. Wallace A. R. On the ornithology of Northern Celebes. Ibis p. 140—7.
1862. Schlegel H. Muséum d'Histoire Naturelle des Pays-Bas. Revue méthodique et critique des collections. 1862—1880. 7 vols. and 1 vol. Index by F. A. Jentink.
1862. Wallace A. R. List of Birds from the Sula Islands (east of Celebes), with descriptions of the New Species. P. Z. S. p. 333—46. Plates XXXVIII—XL.
1863. Schlegel H. De Vogels van Nederlandsch Indië (Pitta, Ijsvogels, Valkvogels). 1863—1866. 3 parts 4°. 185 pages, 50 plates.
1864. Wallace A. R. Note on Astur griseiceps, Schlegel. Ibis p. 184, plate V.
1865. Finsch O. Neu-Guinea und seine Bewohner. 185 pages. (On p. 154—85 list of Birds including Celebes.)
1866. Schlegel H. Observations Zoologiques I. Ned. Tijdschr. Dierk. III p. 181—213.
1868. Bickmore A. S. Travels in the East Indian Archipelago.
1868. Sharpe R. B. A monograph of the Alcedinidae. 1868—1871. 4°. LXXXII + 304 pages, 120 plates.
1869. Wallace A. R. The Malay Archipelago. 2 vols. XXIV + 1002 pages. (German edition by A. B. Meyer, in the same year.)
1871. Meyer A. B. Brief über Merops Forsteni von Celebes. J. f. O. p. 231—2 (translated in Gould's Birds of Asia vol. I pl. 39 1873).
1871. Walden A. On a new species of Trichoglossus (T. Meyeri) from Celebes. Ann. Mag. Nat. Hist. (4) VIII p. 281—2.
1872. Cabanis J. [Note on Oriolus formosus n. sp.] J. f. O. p. 392—3.
1872. Walden A. Description of a supposed new species of Cuckoo from Celebes. Ann. Mag. Nat. Hist. (4) IX p. 305—6.
1872. Walden A. On some supposed new species of Birds from Celebes and the Togian Islands. Ann. Mag. Nat. Hist. (4) IX p. 398—401.

1872. Walden A. A List of the Birds known to inhabit the Island of Celebes. Tr. Z. S. VIII p. 23—108, Plates III—X. 4to.
1872. Walden A. Appendix to a List of Birds known to inhabit the Island of Celebes. Tr. Z. S. VIII p. 109—98, Plates XI—XIII.
1873. Cabanis J. [Note on Gerygone flaveola n. sp.] J. f. O. p. 157—8.
1873. Finsch O. und P. Conrad. Ueber eine Vogelsammlung aus Ostasien. Verh. Zool.-bot. Ges. Wien p. 341—61 (5 species from Celebes).
1873. Meyer A. B. Notiz über die Vögel von Celébes. J. f. O. p. 404—5.
1873. Pelzeln A. v. [Liste von Vögeln grösstentheils aus Celebes.] Verh. Zool.-bot. Ges. Wien p. 10 of sep. copy.
1873. Sharpe R. B. On three new species of Birds. P. Z. S. p. 625—6 (1 new species from Celebes).
1874. Walden A. Descriptions of some new species of Birds. Ann. Mag. Nat. Hist. (4) XIV p. 156—8 (1 new species from Togian).

[1]) Where not otherwise specialized the book is octavo.

1874. Sharpe, Seebohm, Sclater, Gadow, Hartert, Grant, Hargitt, Salvadori, Salvin, Saunders: Catalogue of the Birds in the British Museum. 27 volumes. 1874—1898.

1875. Gould J. The Birds of New Guinea and the adjacent Papuan Islands. 1875—1888. 5 vols. folio (completed by R. B. Sharpe.

1875. Gurney J. H. Notes on a "Catalogue of the Accipitres in the British Museum". Ibis p. 87 et seq. (These notes continue till 1882 and contain remarks on many of the Birds of Prey of Celebes.)

1875. Meyer A. B. [Ueber Coryllis.] Gef. Welt IV p. 229—30.

1875. Meyer A. B. Ornithologische Mittheilungen I. Mitth. Zool. Mus. Dresden vol. I p. 19. 4to.

1875. Murray J. Voyage of H. M. S. Challenger. Zoology vol. II part VIII p. 115. 4to.

1875. Pelzeln A. v. Africa-Indien. Verh. Zool.-bot. Ges. Wien p. 33—62.

1875. Salvadori T. Intorno a due collezioni di uccelli di Celebes inviate al Museo civico di Genova dal Dr. O. Beccari e dal Sig. A. A. Bruijn. Note. Ann. Mus. Civ. di Stor. Nat. di Genova VII p. 641—81, Tav. XVIII.

1876. Brüggemann F. Beiträge zur Ornithologie von Celebes und Sangir. Abh. Naturw. Ver. Bremen V p. 35—102, Taf. III—IV.

1876. Koch G. v. Verzeichniss einer Sammlung von Vogelbälgen aus Celebes und Sanghir, welche vom Grossherz. Zoologischen Museum zu Darmstadt im Tausche oder gegen Baarzahlung zu erhalten sind.

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1876. Salvadori T. Intorno a due piccole collezioni di Uccelli, l'una di Pettà (Isole Sanghir) e l' altra di Tifore e di Batang ketcil, inviate dal Signor A. A. Bruijn al Museo Civico di Genova, nota. Ann. Mus. Civ. Genova IX p. 50—65.

1876. Salvadori T. [Letter on Celebes Birds.] Ibis p. 385—6.

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1876. Wallace A. R. The Geographical Distribution of Animals. 2 vols. XXXII + 1108 pag. (German edition by A. B. Meyer, in the same year.)

1877. Brüggemann F. Nachträgliche Notizen zur Ornithologie von Celebes. Abh. Naturw. Ver. Bremen V p. 464—6.

1877. Lenz H. Mittheilungen über malayische Vögel. J. f. O. p. 359—82.

1877. van Musschenbroek S. C. J. W. Jets over de Fauna van Noord-Celebes en zijne naaste omgeving. Nat. T. Ned. Ind. XXXVI p. 376—84.

1877. Reichenow A. [Note on Birds from Celebes.] J. f. O. p. 217—8.

1877. Rowley G. D. [and A. B. Meyer]. Broderipus formosus (Cab.). Orn. Misc. II p. 227—9, plate LVI. 4to.

1877. Rowley G. D. [and A. B. Meyer]. On a few species belonging to the genus Loriculus. Orn. Misc. II p. 231—54, plates LVII—LX. 4to.

1877. Rowley G. D. [and A. B. Meyer]. On the Genus *Pitta*. Orn. Misc. II p. 259—69, 321—3, plates LXII, LXIV—V. 4to.

1877. Salvadori T. Intorno alle specie di Nettarinie della Papuasia, delle Molucche e del gruppo di Celebes. Note. Atti d. R. Acad. Sc. Torino XII p. 299—321.

1877. Teijsmann J. E. [Report on a journey to the Moluccas with the mention of some birds from Sula Besi.] Nat. T. Ned. Ind. XXXVII p. 75—148.

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1878. Rowley G. D. [and A. B. Meyer]. On the genus Cittura. Orn. Misc. III, p. 131—43, plates XCIX—CII. 4to.
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1879. Schlegel H. On Strix inexpectata. Notes Leyden Mus. I p. 50—2.
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1880. Meyer A. B. De Vogels van Celebes. Een Handboek voor de Ingezetenen van het Eiland. Prospectus in Dutch and Malay, 4 pages, with plate (5 sp. of Kingfishers fig.). 4to. (Never published on account of insufficient subscriptions.)
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1880. Wallace A. R. Island Life: or, the phenomena and causes of Insular Faunas and Floras. XVII + 526 pages.
1881. Blasius W. Ueber eine Sendung von Vögeln aus Nord-Celebes. Braunschweigische Anzeigen Nr. 247 (newspaper!) and Gef. Welt p. 534.
1881. Meyer A. B. [Letter on Gymnophaps poecilorrhoa and Ptilopus Fischeri.] Ibis p. 169—70.
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1884. Dresser H. E. A monograph of the Meropidae. 1884—1886. XX + 144 pages, 34 plates. Folio.

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1892. Büttikofer J. A Review of the Genus Rhipidura. Notes Leyden Mus. XV p. 65—110 (2 new species p. 79 and 80).
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2. SEASONS AND WINDS IN THE EAST INDIAN ARCHIPELAGO.

See Maps III and IV.

The red colour on the maps denotes "fine season", the blue colour "rainy season", while purple distinguishes districts where it would be incorrect to term the period either wet or fine. The arrows fly with the wind. The short arrows distributed over the Archipelago show the persistence of the wind in the given direction (those grouped 5 mm apart denoting 50 per cent of the winds as coming more or less directly from the quarter indicated, those 4 mm apart denoting 60 per cent, and so on). The long arrows, chiefly outside the Archipelago, demonstrate the prevailing direction of the wind during the six months concerned, without reference to percentage.

It should be observed that our sketch-maps are more or less arbitrary and hypothetical, for data have not been accurately recorded from all parts, and others are hidden in papers in periodicals or in special works, and were not consulted, as lying too far from the aims of this book. We have been obliged to satisfy ourselves with an approximately correct picture of the winds and rains of the Archipelago, and this remark refers both to the arrows on our maps and to the colours. The general results and general points of view of our reasoning will not be greatly affected, even if some one should prove that there are faults here and there in our maps, which we are very ready to concede.

Among the many causes which effect the dispersal and the distribution of birds (cf. A. R. Wallace, Geogr. Distr. Anim. vol. I, chap. III, 1876), winds and seasons play an important part — the winds directly by carrying birds involuntarily to new lands, or in offering barriers to their wandering across certain zones; the seasons indirectly by their influence upon the abundance or scarcity of food, which forms the strongest of several motives for migration and local movements. In temperate and cold climes the alternation of the seasons, summer and winter, is, as it were, accompanied by a flow and ebb of vital energy in the vegetable kingdom expressed in the sprouting of foliage and the fall of the leaf of deciduous trees, and, at the approach of the cold season, insects, such as feed upon leaves and flowers, etc., hibernate or perish with the disappearance of their food, seeds and grain are buried or hidden under snow, molluscs and

batrachians hibernate; consequently, most insectivorous, granivorous and other birds betake themselves at this season to warmer latitudes, the majority invading the countries and islands of the tropics, where specimens often fall to the gun or blow-pipe of the collector, sometimes to be named as new species or subspecies by learned ornithologists at home. Amongst the endemic birds of tropical countries, such as the East Indian Islands, periodic wanderings across the sea are very rare (though not unknown amongst certain Pigeons); the birds do not as a rule shift their quarters in an extensive manner, for they have not far to go to find the needed food, since one side of an island often has its dry season when the other has its wet one, and the highlands in general an entirely different climate from that of the districts near the sea-shore or the plains. Birds, therefore, need not cross the sea to find new feeding-grounds; it is probable however that local movements, depending upon the ripening of certain fruits or blossoming of flowers (see, for instance in the text, Meyer's observations on some small Parrots in Celebes, pp. 122, 150, 159) are common, and the food-supply seems to be regulated by the season. The seasons are determined in the East Indies by the monsoons, the monsoons themselves by the position of the sun over the greater masses of land.

Monsoons of the East Indian Archipelago. — In consequence of the superior power of the sun about the equator, the heated atmosphere there rises, and an indraught of the cooler air from the north and the south flows in to supply its place, taking the form of N.E. and S.E., instead of due North and South, winds, owing to the rotation of the earth. These are the Trade-winds, which blow with a general regularity from year's end to year's end over most of the Pacific and over parts of the other great Oceans. The return of the rising equatorial air through higher strata towards the north and south, its meeting in the upper atmosphere with high N.E. and S.E. Trade-winds blowing from the Poles, their stopping one another, piling up and descending to the globe about lat. 30°—35° N. and S., giving rise to a high barometer and zones of calms (cf. Maury. Phys. Geogr. Sea, 14th ed. 1869 p. 80), the starting from these belts of the true Trade-winds and of low winds returning towards the Poles, are questions upon which the meteorologist may be consulted, but which need not further concern the weather-chart of the Archipelago. Here, there are four principal winds, two north of the equator and two south of it, which blow alternately throughout the year generally speaking without much interruption, except at the periods of the shifting of the winds, the N.E. and S.E., which blow each for about half a year, when they are displaced by other winds, the true Monsoons.

The South-west Monsoon. — When the sun in the Northern Hemisphere draws towards the Tropic of Cancer (our summer), the plains and table-lands of Asia become greatly heated[1]), and the N.E. Trade-wind, instead of continuing

[1]) "L'été de Pekin, qui est sous le quarantième degré de latitude, donne une moyenne de chaleurs égale à celle du Caire (30° lat.), et son hiver, une moyenne de froids égale de celle d'Upsal (60° lat.)" David, N. Arch. du Mus. 2e sér., 1885, VIII, 5.

to blow towards the parts of the Indian Ocean and islands about the equator, now no longer the hottest quarter, stops, and, turning back, commences to move towards the heated Continent as the S.W. Monsoon. This wind is general from about April to October in the Indian Ocean and the East Indian Archipelago north of the equator, sometimes extending as far east as the Marianne Islands and as far north as the south of Japan.

The South-east Monsoon. — During the time that the sun continues north of the equator and the South-west Monsoon is blowing, the S.E. Trade-wind in general has free course in the Southern Tropics, and from April to October is the wind of the East Indian Archipelago south of the equator, where it is commonly spoken of as the South-east Monsoon. The general direction of it and of the S.W. Monsoon of the Northern East Indies is shown on Map III.

The North-east Monsoon. — When the sun, at the autumnal equinox, passes into the southern hemisphere, the N.E. Trade-wind reasserts itself in the parts where it has had to give way to the S.W. Monsoon, and, displacing that wind, it blows from some time in October, to April. It is then the prevailing wind of the Archipelago north of the equator.

The North-west Monsoon. — At this time of the year, in the zone of calms about the equator between the N.E. and S.E. Trade-winds, a westerly monsoon, unaccountable to meteorologists at the time of Maury's celebrated work (1869), sets off and blows in a narrow, curved belt across nearly the whole width of the great oceans; much, one may suppose, as the return current flows back towards the buttresses of the bridge under which a swift river passes. Out of this belt there arises the N.W. Monsoon of Australia and the East Indies south of the equator. Corresponding with the S.W. Monsoon of the north of the equator, the N.W. Monsoon evidently is originated by the heating of the interior of Australia and New Guinea during the southern summer, and it is the prevailing wind throughout the Archipelago from the equator southwards during the period October to April. See Map IV.

The Rains: north of the equator. — Between April and October the S W. Monsoon, arising in the Indian Ocean about the equator or to the south of it near Sumatra, reaches the northern half of that island saturated with moisture and produces the rainy season there and along the west coast of the Malay Peninsula. The mountain-ranges running through the middle of that peninsula probably hold back the clouds, for, as the wind passes over the east coast, it is the fine season there, though there are occasional showers. In the Gulf of Siam the wind again commences to take up moisture; here, during the cruise of H. M. S. "Saracen" between 1855—58 a rough sea was experienced at this time of year, and, on the opposite coast "strong breezes with much rain and occasionally a fresh gale" (Direct. Ind. Arch. 1870 p. 17). Cambodia and the neighbouring parts of Siam have then their wet season. Further east the wind, passing over the middle of Sumatra and gathering vapour afresh in the south part of the

China Sea, brings the season of most rain to Borneo north of the equator, though the climate of that country is moist at all times of the year. The Sooloo Islands and the southern and western parts of the Philippines have now their rainy season. See Map III.

During the other half-year, October to April, the N.E. Monsoon is operative and reverses the work of the S.W. Monsoon. Laden with moisture taken up in the Pacific it deposits much of it on the northern and eastern parts of the Philippines, and, on arriving in Borneo north of the equator, does not bring with it so much rain as the S.W. Monsoon. In the Siamese Peninsula, Annam, facing the wind, now has plentiful rains, but on the opposite side Siam and Cambodia have their finest time of year: "at this time the sky is frequently unclouded for a week together", but the wind again becomes saturated in passing over the Gulf of Siam, and on the opposite coast along the eastern shore of the Malay Peninsula "the weather is wet and stormy".

The Rains: south of the equator. — In the parts of the Archipelago lying south of the equator the S.E. Trade-wind — here called the S.E. Monsoon — is the prevailing wind from April till October. Blowing from out of the arid deserts of Australia, it leaves the north coast of that country hot and dry, and has not time to take up much vapour before it reaches Timor and the chain of islands stretching between there and Java. Consequently these islands have now their dry season, and the vegetation of Timor — which country is probably the driest of all — is said by Wallace to have an aspect strikingly similar to the Australian. Before reaching the west end of Java the S.E. Monsoon, having passed over a wide stretch of ocean, has gathered moisture, and this part of the island now receives ample quantities of rain, though not in such abundance as is the case there during the returning N.W. Monsoon, which is the bad season, and the vegetation here is consequently most luxuriant. The same holds good even in a still greater degree for the west coast of Sumatra south of the equator, where there is still less difference between the two seasons. During this Monsoon it is also the fine season in South Borneo and in almost the whole of Celebes; but further east this is now no longer the case. The winds that reach the shores of the Gulf of Tomaiki in East Celebes, the southern coasts of Buru and Ceram, the Islands of Kei and Aru, the S. W. Coast of New Guinea, etc., pass from the South Pacific Ocean either through the Torres Straits or over the Cape York Peninsula across the Gulf of Carpentaria; thus, there are no broad lands in the way to receive their moisture until they reach the above-mentioned territories, which now have their rainy season. The high mountain-chains of New Guinea and the ranges which intersect the islands of Ceram and Buru serve to retain the clouds brought up by this Monsoon, and here again occurs the phenomenon of the rainy season on the south side of an island and the fine season on the north.

These conditions are reversed during the counter Monsoon, the N.W. Monsoon, which predominates from October to April in the Archipelago south of the

equator, and the lands, which had their dry season before, now get their wet one, and those, which then had their rainy season, now have their fine one. Though easy to be understood, this alternation of the seasons is often not a little striking. See Map IV.

Professor van der Stok of Batavia recognises 4 different types of Monsoons in the East India Archipelago, about which he has most obligingly sent us (in lit.) the following particulars.

"There are various types of Monsoons in the Indian Archipelago:

"First, the perfectly regular, the S. E. Trade-wind, or the S. E. Monsoon blowing out of Australia, which prevails in the southern parts of the Archipelago from April till October, characterized by dry weather (instances: Java, Bima in the Lesser Sunda Islands, Macassar, S. Celebes, and Banjermassin, S. Borneo); while from October to April the heavily saturated West Monsoon is in force.

"A second type is found, as your map[1] also shows accurately, in South and Middle Sumatra, especially on the west coast, and in the middle portion of Borneo, where all through the year a tolerably equal quantity of rain descends (instances: Padang, Siboga, Sintang, Singapore). For these conditions also your map is suitable.

"It is otherwise with the third type, of which examples in North Sumatra and North Borneo are recorded. Here it is not possible to divide the year into two halves in such a manner that the one contains the dry, the other the wet season. (See below p. *29* under Borneo.)

"Finally a fourth type is found in the eastern parts of the Archipelago where, as in Amboina, Saparua, etc., the Monsoon-periods — at least on the south side of the Island — are exactly reversed [as compared with the first type], as your map also shows. As a whole Celebes also lies under the southern Monsoon-division, for in North Celebes there is still to be found only a trace of the February minimum whereby North Sumatra and North Borneo are characterized".

Change of climate at different altitudes. It is probably always the case that the highlands of tropical islands have a very different climate from the coasts and plains. In April, 1871, when the fine season had begun at Manado, Meyer could not start for the mountains of the Minahassa, as the rainy season was still going on there. The following table shows this:

	Average of years	April mm	May mm	Juue mm	July mm
Masarang (highlands)	15	256	249	228	135
Manado (coast)	17	205	167	179	125

In Java where meteorology has been much more thoroughly studied than elsewhere in the Archipelago, Dr. J. J. de Hollander (Handl. Land- en

[1]) An original MS. map, since revised and modified.

Volkenk. Ned. Oost-Ind. 1882, 4th ed. vol. I pp. 178—181) describes four different climates peculiar to different altitudes — climates having not only differences of temperature, but also of winds and rains. As the existence of such have great influence upon bird-life we translate his remarks:

"The climatic conditions of Java are very varied, and especially dependent upon the altitude, as well as upon the Monsoons. In respect of this the surface of Java may be divided into four zones or belts: the First, or Hot Zone extending from the sea-level up to 2000 feet; the Second or Temperate Zone from 2000 to 4500 feet; the Third or Cool Zone from 4500 to 7500 feet; and the Fourth or Cold Zone from 7500 to 10 000 feet and upwards.

"In the First or Hot Zone the mean temperature is 29·7° C. (85·5° F., 23·8° R.) on the strand and 24·2° C. (75·5° F., 19·3° R.) on the upper boundary. At Batavia the greatest heat is experienced in April, the least in January; the nights and mornings are, however, coolest from June to August. In this Zone the atmosphere is very damp. This dampness naturally increases as one descends from a higher level to the strand, so that the atmosphere at Batavia contains a mean amount of 84 per cent of vapour, in other words, a cubic metre of air holds in suspension 20·25 grammes of water-vapour, whereas at the sea-level the air would be completely saturated with 26·39 grammes of vapour to the cubic metre. The damp is greatest in the months of January and February, and least in August. Near the sea-shore the air is filled with pernicious vapours developed in great quantities by the heat from the morasses, where many plant and animal remains are always rotting, . . . these exhalations, however, do not appear to rise to a height of more than 900 ft. The Monsoons operate very regularly. The rainy Monsoon prevails continuously from November to March, the dry Monsoon from May to September or October; the shifting of the winds takes place in April and October or November. The most rain falls in December, January, February and March; and, although at this time brighter and rainless days sometimes occur, the sky is usually heavily clouded over, and the rain comes down in copious streams, sometimes for days in succession, causing great floods. . . . In the East Monsoon the dryness is most marked in July and August, when — save for the daily alternating land- and sea-breeze — hardly any wind is perceptible. The moisture in the atmosphere is then deposited as heavy dew, to be taken up again with the warmth of the sun in the morning, forming itself in the upper air into clouds which are driven landwards by the sea-breeze (felt up to 2500 ft. above sea-level and become heaped up in the Second Zone. They sometimes disburden themselves in thunderstorms in the afternoon, especially in mountainous districts, such as Buitenzorg, where storms accompanied with heavy showers are of almost daily occurrence.

"In the Second or Temperate Zone the mean temperature is 23·6° C. (74·5° F., 18·9° R. at the lower and 18·7° C. (65·7° F., 15° R.) at the upper boundary, with a very marked difference between the warmth of the day and of the night,

especially on the table-lands. The warmth of the day itself is also subject to more or less variation, according as the moisture out of the First Zone rises sooner or later and in greater or less quantity, which, forming into clouds, intercepts the rays of the sun. Owing to the lesser heat and to the ground also being less damp, less vapour rises here than in the First Zone and consequently the atmosphere in general contains less moisture, the mean quantity of vapour being 15·7 grammes to the cubic metre, while 21·15 grm. at the lower and 16·88 grm. at the upper boundary are necessary for saturation. The degree of moisture also varies much in different localities; it is much greater over the wet rice-fields ('sawahs') and dense woods than over stretches of grass or 'alang-alang', or over plantations of shrubs (tea, coffee). Also the masses of mist driven up from lower territories by the sea-breeze produce great differences. These mists condense here more quickly than in the warmer temperature of the First Zone, and often very heavy storms and showers suddenly result. As to this division it should be remarked that in the west part of Java the atmosphere is much damper than in the eastern portions of the island. The West Monsoon in the highest parts of this Zone is already felt in less force, and consequently the difference between the seasons (the wet and the dry) is here much less marked than in the lower districts, and even when the West Monsoon is in full force in the First Zone, the East Monsoon (the Trade-wind) often blows here for days in succession.

"In the Third or Cool Zone the mean temperature is 18·7° C. (65·7° F., 14·9° R.) at the lower and 13° C. (55·4° F., 10·4° R.) at the upper boundary. The difference of temperature between day and night is here much less marked than in the First and Second Zones; the plateau of Mt. Diëng (6300 ft.) presents an exception to this rule, the difference here being so great that the dew on bright nights sometimes freezes into rime. In this Zone the air, which, in consequence of the diminished warmth cannot carry so great a quantity of water, is entirely saturated with water-vapour (16·88 grm. to the cubic metre at the lower and 11·60 grm. at the upper boundary). The mists rising from the lower regions condense here to such an extent that this Zone might literally be called the Zone of Clouds. They sometimes begin to form as early as nine o'clock in the morning, especially on declivities covered with forest; from 11 or 12 till 2 or 3 o'clock everything is covered with thick fog, which discharges itself — often simultaneously in different places — in storms of thunder and rain, after which alone the sun makes its way again through the clouds. But when the clouds are not broken up in this manner, so thick a fog covers everything for the rest of the day that it is impossible to distinguish an object at twenty-five paces, and it is not till after sun-down that the fog settles on the earth as dew. This, however, is more particularly applicable to the lower parts of this Zone, where the clouds gather most thickly; they seldom ascend to the upper parts, and then in less quantity, in consequence of which the showers there are rarer and less heavy. The influence of the West Monsoon is here almost entirely

imperceptible. The S.E. wind in general blows continuously, though, when the rainy season is going on in the lower regions, it may be replaced for a few days only by the West wind or by complete calm, the latter being the condition which nearly always reigns at night. The rain also is not heavier or more continuous here during the time of the West Monsoon than in the other period, but falls in tolerably equal quantity almost daily throughout the year.

"In the Fourth or Cold Zone (7500 to 10000 ft. and upwards) the mean temperature is 13° C. (55·4° F., 10·4° R.) at the lower boundary, and 8° C. (46·4° F., 6·4°R.) at a height of 10000 ft. above the sea-level. The difference in warmth of day and night is usually not very great; this is to be ascribed to the comparatively small extent of solid ground for the sun to play upon. On the highest mountain-tops, in places where there is no shelter from bushes and other objects, the temperature sometimes descends to the freezing-point, so that water, removed from the ground which contains warmth, receives a coating of ice in the open air and the grass is covered with rime. The moisture of the atmosphere is much less here than in the lower Zones, not exceeding 11·60 grm. at the lower limit and 8·70 grm. at 10000 ft. The air is consequently more rarified, purer, more transparent and fine; sound does not travel well, and breathing is more difficult. The few mists that rise up so high fail to form into clouds; rain is consequently very rare, and then only occurs as a fine drizzle. During great calms, however, it happens that the mists from the lower districts ascend right up into this Zone and then, becoming at once solidified by the ice-cold atmosphere, fall as hail. An East wind prevails uninterruptedly on these heights, though usually falling to a calm at night. Only very rarely, when the West wind is blowing strongly in the lower regions and is driven up the declivities of the mountains, it makes itself felt in the undermost parts of this Zone, bringing mists and fogs with it. At 10000 ft. a West wind is unknown. Obviously there can be no question of a rainy season in this Zone."

Although we have not particulars of the climatic variation at different altitudes in other parts of the Archipelago, it is not to be expected that the high mountains south of the equator will present any great differences from those of Java; those found north of the equator will be affected by other winds.

It is now proposed to examine the different parts of the Archipelago in greater detail.

Celebes. — The greater part of the country, being south of the equator, is under the influence of the Monsoons of the southern hemisphere. Over the Northern Peninsula, which lies just north of the equator, the S.E. Monsoon of April to October seems to be deflected by the S.W. Monsoon of the north of the equator, and from October to April the N.E. Trade-wind of the north similarly deflected by the N.W. Monsoon of the south; in consequence of this fairly due South and North winds respectively figure rather prominently here

on Dr. van der Stok's monthly charts[1]). The fine season over most of the island is during the S.E. Monsoon between April and the beginning of November, the rainy season from November till March, when North-west or North winds are predominant. To this rule there are many exceptions, sometimes due to location, sometimes to shelter from the high mountains.

Touching the Minahassa, Graafland writes (De Minahassa 1867 I, 1): "The changing of the Monsoons here takes place almost imperceptibly. One passes over from the East to the West Monsoon without noticing it otherwise than by the more or less plentiful showers and thunderstorms; and even this is not regular. There are years in which the West Monsoon brings so little rain that poor rice-harvests are the sensible result, while there are again other years when too much rain causes the rotting of the crop. The West or rainy season is calculated to be from the middle of October to the middle of April, but this is not at all certain". Dr. Riedel writes (in lit.) that during the N.W. Monsoon the sea is rough on the north coast of the Peninsula, which faces the wind, while on the south coast the wind is less heavy and blows out to sea. The plantations are harvested everywhere at the same time, and the rice is sown in October—November. There is, however, as Dr. van der Stok's tables show, a marked difference in rainfall between the north and south coasts of the Peninsula; when the N.W. Monsoon is blowing[1]) Manado and Kwandang on the north receive two or three times as much rain as Kema and Gorontalo some 20 miles distant on the south. The interior of the country is mountainous, and, as is clear from Dr. de Hollander's remarks on Java, the N.W. Monsoon is a superficial, somewhat shallow wind, and it is doubtless held back and deprived of its moisture to a great extent by the hills. During the N.W. Monsoon the shipping is carried on at Kema, while during the S.E. Monsoon everything in this way is done at the more important settlement of Manado. Meyer arrived at Manado in November, 1870, having been misinformed by Mr. Wallace that October is the beginning of the fine season for this region. Travellers should go there in April and the following months, though on the south coast of the Minahassa, at Kema for instance, the weather is much better and even fine in the rainy season. September is the driest month of the year.

The western portion of the N. Peninsula seems to be exposed at most times of the year to N. and N.W. and S.W. winds blowing out of the Celebes Sea, and Tontoli at the N.W. angle of the Peninsula cannot be said to have a rainy season, but has a tolerably equal rainfall throughout the year.

The following tables, extracted from the "Regenwaarnemingen in Nederlandsch-Indië", 1895, show the differences in rainfall and rainy days at different places in the N. Peninsula:

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[1]) See: van der Stok: Wind and Weather, Currents, Tides and Tidal Streams in the East Indian Archipelago (Batavia, 1897. Broad folio).

[2]) The "Directory for the Indian Archipelago" 1870 p. 22, states that on that part of the island situated N. of the equator the N.E. Monsoon in October replaces the S.W., wrongly adding that it makes the fine season.

Average monthly rainfall and number of rainy days in the North Peninsula.

	Situation	Altitude in metres	Number of years	Rain	January	February	March	April	May	June	July	August	September	October	November	December	Total
Manado	N. Coast	4	17	mm	*478*	*337*	*271*	205	167	179	125	121	82	125	*205*	*418*	2713
				Rainy days	*22*	*18*	*17*	15	15	16	10	12	8	11	*16*	*21*	181
Masarang. . . .	Interior	900	15	mm	*235*	*215*	*224*	*256*	*249*	*228*	135	121	108	182	*230*	*265*	2448
				Rainy days	*19*	*16*	*16*	*19*	*19*	*18*	13	12	8	14	*17*	*17*	188
Kema	S. Coast	—	15	mm	*145*	*139*	*149*	*160*	*124*	*156*	89	88	60	75	*160*	*150*	1495
				Rainy days	*12*	*11*	*11*	*14*	*10*	*13*	9	9	5	7	*13*	*11*	125
Kele-Londej . .	Interior	892	8	mm	*278*	152	*268*	*362*	*287*	*244*	194	194	107	185	*283*	*223*	2777
				Rainy days	*23*	16	*21*	*23*	*22*	*22*	18	19	10	15	*19*	*19*	227
Kwandang . . .	N. Coast	—	15	mm	*234*	*247*	*181*	*167*	*198*	*191*	127	144	81	*170*	*263*	*280*	2283
				Rainy days	*13*	*12*	*10*	*10*	*13*	*11*	8	9	6	*10*	*13*	*14*	129
Gorontalo . . .	S. Coast	—	15	mm	103	86	95	*138*	106	*145*	88	118	49	70	117	*119*	1234
				Rainy days	9	7	8	*10*	10	*11*	8	9	4	6	9	*11*	102
Limbotto	near S. Coast	—	15	mm	*137*	97	132	*179*	*129*	101	88	90	47	79	*141*	*188*	1408
				Rainy days	*10*	8	9	*12*	*11*	9	7	9	4	8	*12*	*13*	112
Tontoli	N. W. Coast	2	15	mm	*263*	*200*	*178*	130	*197*	*310*	*243*	*251*	*185*	*226*	*177*	*246*	2606
				Rainy days	*14*	*12*	*11*	10	*12*	*17*	*13*	*15*	*11*	*16*	*12*	*14*	157

In the South Peninsula the rainy and dry seasons are generally much more strongly contrasted than in N. Celebes. On the west side of this Peninsula the N.W. Monsoon brings great quantities of wet and the S.E. Monsoon for some months very fine weather. On the opposite east coast the converse of this is the rule. This is well shown by the rainfall at Balang Nipa which lies on the east coast of the Peninsula in about the same latitude as Macassar some 60 miles distant on the west coast: May, June and July are among the fine months at Macassar, while great quantities of rain fall at this time at Balang Nipa; but December, January, February and March are fine months at Balang Nipa, during which Macassar receives deluges of rain. Bonthain on the south coast of this Peninsula is sheltered from the N.W. Monsoon by the great Bonthain mass of mountains, and its seasons correspond with those of Balang Nipa, except that much less rain falls. Dr. van der Stok has most obligingly sent us tables showing the direction of the winds at Bonthain in the years 1886, 1887 and 1888. These are chiefly westerly from December to April, veering from S.W. to W.N.W. and generally changing a point or two in the course of each day; from May till the end of November the general direction is east, N.E. to S.S.E., with similar changes during the course of the day.

The following are the tables in the "Regenwaarnemingen in Ned. Ind." for the South Peninsula of Celebes (see next page).

One of the only two injurious winds known in the Dutch East Indies is found on the west coast of Celebes between Maros and Mandar and called the "Barubu". It blows yearly during the months of July, August and the beginning of September from the E. N. E. and extends about a geographical mile seawards. It causes a difficulty in breathing, dries up the lips and the throat, bringing about inflammation of the eyes and often long-lasting fevers (de Hollander, 1882, I, 86). The botanist Teijsmann experienced this wind in the South Peninsula at Pankadjene, Tjamba (6th September) and Bantimurang (26th September). He describes it as a wind which covers everything with fine dust, as very unpleasant, and at sea often very dangerous (N. T. Ned. Ind. 1879, 60, 78). A similar obnoxious wind is the "Anging bolo" of Bima, Sumbawa.

The temperature of Celebes is not high, seldom exceeding 32° C. (26° R., 90° F.). The tables show that August and September are the driest months at nearly all spots where the rainfall has been observed. On the whole, as a glance at our maps III and IV will show, Celebes has the same seasons as the islands lying south of the equator, as indeed should be the case from its geographical position; but at a few spots both in North and South Celebes traces of the minimum of rainfall in February, which is characteristic of N. Borneo and N. Sumatra, may be noticed.

Sangi. — The rainy season seems to set in after October. Dr. Platen, writing from Great Sangi in January, 1887. speaks of having been confined to the house for weeks by ceaseless rain falling in the N. W. Monsoon. (Gefied. Welt, 1887, 263).

Average monthly rainfall and number of rainy days in the South Peninsula.

	Situation	Altitude in metres	Number of years	Rain	January	February	March	April	May	June	July	August	September	October	November	December	Total
Segeri	near W. Coast	3	15	mm	*719*	*163*	*398*	244	216	137	93	28	53	125	*387*	*730*	3593
				Rainy days	*23*	*18*	*16*	15	13	10	7	3	3	7	*15*	*21*	151
Pankadjene	near W. Coast	3	17	mm	*876*	*548*	*420*	235	174	165	80	22	35	110	*328*	*760*	3753
				Rainy days	*23*	*21*	*17*	14	11	9	6	3	3	7	*16*	*22*	152
Tjamba	Interior	300	15	mm	*516*	*348*	*261*	207	177	168	121	53	31	82	220	*378*	2565
				Rainy days	*21*	*18*	*17*	16	16	14	10	5	3	7	11	*20*	161
Macassar	W. Coast	2	17	mm	*744*	*544*	*422*	130	101	120	51	13	18	47	189	*663*	3042
				Rainy days	*25*	*21*	*19*	12	9	9	6	3	2	5	12	*23*	146
Alloe	S. Coast	3	14	mm	*457*	*402*	*242*	95	90	97	50	12	12	54	165	*452*	2137
				Rainy days	*17*	*16*	*13*	8	8	8	4	2	1	3	10	*18*	108
Bonthain	S. Coast	1	15	mm	*145*	97	110	125	*170*	*187*	*159*	53	31	41	75	93	1286
				Rainy days	*14*	11	12	12	*14*	*14*	*10*	6	2	4	8	13	120
Saleyer	Saleyer Id., W. Coast	2	15	mm	*239*	120	159	198	161	167	80	10	16	31	148	*240*	1572
				Rainy days	*12*	10	10	13	11	11	6	2	1	3	8	*13*	100
Kadjang	E. Coast	8	15	mm	147	163	168	*281*	*541*	*395*	*312*	76	46	51	98	175	2453
				Rainy days	14	14	13	*16*	*19*	*17*	*14*	5	3	4	6	13	138
Bikeroe	Interior	245	14	mm	*321*	*276*	*306*	*301*	*444*	*407*	*372*	122	58	60	186	*249*	3102
				Rainy days	*17*	*18*	*18*	*16*	*20*	*18*	*16*	9	4	5	11	*18*	170
Balang Nipa	E. Coast	3	17	mm	129	118	130	*299*	*461*	*441*	*382*	134	52	105	81	119	2451
				Rainy days	12	11	12	*17*	*20*	*20*	*17*	11	5	6	7	13	151

Sooloo Archipelago and Celebes Sea. — According to the Sailing Directory, easterly winds are experienced here from October till May; from May onwards westerly winds accompanied by "rains, squalls and tempests", especially in July and August (p. 22). From van der Stok's charts the direction of the more prevalent winds is seen to be southerly from June till October, and northerly or north-easterly from November till April.

Philippine Islands. — The windward shores of the islands are in general the wet ones; thus, on the north and east coasts the most abundant rainfall takes place in the half-year from October till March when the N. E. Trade-wind is in force, while the territories to the South and West, which lie exposed to the S. W. Monsoon, have their rainy season during the other half-year. At Manila the winds vary much in the course of each day, owing to land- and sea-breezes. In July, August and September S. W. winds prevail, in November and December N. E. winds, becoming more S. E. in March and April. The town, being on the west coast, has its rainy season during the summer months of the northern hemisphere (cf. Obs. meteor. de Manila de la Comp. de Jésus, 1870—73, 1876). The following observations were obtained by Meyer from Iloilo on the Island of Panay. The S. W. Monsoon commences in June, exceptionally in May, but it does not then blow uninterruptedly. The rain falls in varying quantities, being sometimes heavy, at other times not so; and it may last — though this is the exception — for a month continuously; fourteen days in succession may be taken as the rule, judging from four or five occasions when this was experienced. June—September generally afford disturbed weather; most of August fine. The N. E. Monsoon commences about the middle of October, and there is occasional rain from October to December, in January only very little; from the end of January till March it is dry. In April and May, when the Monsoons are changing, there are occasional thunderstorms.

In Palawan the Monsoons are liable to much interruption, and there appears to be no rainy season in particular (Sail. Direct. 1870 p. 23).

Borneo. — "Owing to the great extent of alluvial ground with which Borneo is nearly everywhere surrounded, to the numerous water-courses irrigating the land in every direction, and to the vapours arising from the dense forest with which most parts of the island are covered the atmosphere is always damp." Land- and sea-breezes are felt far inland. The temperature is more moderate than might be expected; at Pontianak in the west almost on the equator, at sunrise 24·5° C. (19·5° R., 76° F.), at midday not more than 33·3° C. (26·7° R., 92° F.), mean 27·8° C. (22·2° R., 82° F.). As the island is divided by the equator, the northern and southern halves are subjected to the influence of different monsoons.

South of the equator the character of the season is well determined by the particular monsoon in force. The S. E. Monsoon prevails, roughly speaking, in the time of our summer, and the finest months of the year, as is shown by the reports sent in to Dr. van der Stok from six stations in Central and S. E. Borneo,

are July, August and September. June is also a fine month, though somewhat more rain falls than in October, when the returning N. W. Monsoon, the true rainy wind, can hardly have commenced to blow home. The wettest months of the year are from November to March, inclusive, when the N. W. Monsoon is in force. It has been stated that while Borneo south of the equator is having its rainy season under this wind, the parts of the island north of the equator, over which the N. E. Monsoon is blowing, are fine; but this is not altogether true. The great western projection of the island upon which Sarawak (near its north coast), Sinkawang (west coast), Pontianak (south coast) are situated, receives its heaviest amount of wet at the same time as South Borneo. This is also the case at Sintang far inland a little north of the equator. The N. E. Trade-wind does not blow in force right down to the equator, and, when the N. W. Monsoon is going on in the islands south of the equator, an indraught of the deflected N. E. wind must needs take place. In the South China Sea in the islands of Bintang, etc. this deflected wind is felt for half the year as a prevailing North wind (see, p. *32*), and, no doubt, as such, or even as a N. W. wind, it passes over Borneo a little north of the equator, bringing with it great quantities of moisture from the China Sea.

In Northern Borneo the seasons vary much according to locality. Dr. de Hollander speaks of the S. W. (April—October) as the rainy monsoon, and the N. E. October—April as the fine one, and so also the Sailing Directory of the Indian Archipelago; but there is much to take exception at in these statements. In an article on the climate of British North Borneo by Mr. Robert H. Scott (Journ. R. Met. Soc. 1889, pp. 206—219), to which Dr. van der Stok has kindly called our attention, it is stated that "the true wet season occurs at Sandakan (on the N. E. coast) in the N. E. Monsoon, and includes the months of November, December and January, and generally part of October or February or both . . . The true dry season immediately follows this true wet season, and includes March and April, and generally the whole of May and part of February . . . This true dry season is followed by a period of moderate rainfall, commencing generally about June. The first month or six weeks of this period almost deserves to be called a second wet season, and the rest of the period up to the commencement of the true wet season might be described as the second dry season". With these variations, the actual figures taken at Sandakan and Kudat show that by far the larger half of the total rainfall is deposited during the N. E. Monsoon, which is not to be wondered at, seeing that these places then present a windward shore to the Monsoon passing over the Sooloo Sea.

At Labuan, the average for 11 years shows that the first four months of the year — the closing ones of the N. E. Monsoon — are the driest.

The following tables are taken from those of Dr. van der Stok (Regenwaarnemingen in Ned. Ind. 1895, 416, 417), and Scott, *l. c.* (the inches of the latter converted to mm.

Average monthly rainfall in Borneo.

Locality	Situation	Nr. of years	January	February	March	April	May	June	July	August	September	October	November	December	Total
South of the equator															
Muareh Teweh	114°43′ E × 0°55′ S	12	*287*	*295*	*312*	*321*	*249*	207	148	161	159	223	*313*	*296*	2971
Buntok	114°30′ E × 1°15′ S	15	*308*	*272*	*345*	*311*	*263*	163	108	123	118	186	*331*	*354*	2882
Amuntai	115°10′ E × 2°15′ S	17	*310*	*287*	*363*	*225*	*210*	154	113	85	79	124	*250*	*325*	2525
Barabei	115°16′ E × 2°17′ S	16	*275*	*305*	*300*	*258*	*241*	205	111	127	88	160	*289*	*350*	2709
Pengaron	115°15′ E × 3°15′ S	17	*334*	*289*	*345*	*217*	*242*	178	111	109	80	149	*242*	*327*	2623
Banjermassing	114°35′ E × 3°19′ S	17	*315*	*303*	*313*	*221*	173	170	112	113	87	144	*221*	*315*	2487
Pontianak	109°20′ E × 0°1′ S	17	*262*	179	250	230	218	234	171	237	206	*447*	*398*	*369*	3231
North of the equator															
Sinkawang	109°00′ E × 0°55′ N	16	*379*	211	212	233	213	204	166	*301*	195	*432*	*438*	*494*	3478
Sintang	111°32′ E × 0°7′ N	17	*347*	283	*343*	*314*	292	272	229	*327*	261	*403*	*362*	*364*	3797
Kuching, Sarawak	110°8′ E × 1°28′ N	5	*690*	*610*	256	255	231	222	121	225	198	252	*345*	*653*	4058
Labuan	115°20′ E × 5°30′ N	11	221	132	184	213	*376*	*353*	*302*	*385*	*275*	*371*	*355*	*352*	3519
Limbnak	117°5′ E × 7°15′ N	1	*285*	79	*610*	188	218	138	183	*562*	117	*457*	*361*	*450*	3648
Kudat	116°52′ E × 6°54′ N	3	*407*	212	*326*	58	111	176	174	143	126	*242*	*364*	*603*	2942
Sandakan	118°12′ E × 5°49′ N	10	*496*	*235*	194	109	143	*221*	145	188	*258*	*244*	*398*	*514*	3145

As a general conclusion it may be stated that Borneo south of the equator has its fine season during the months of our summer and its wet one in those of our winter. A little north of the equator the conditions are much the same, the differences being that the rainfall is more copious, and that the wet and fine seasons commence a little earlier in the year. August, when the S.W. Monsoon of Asia is in full force, appears to be a very wet month here, as it is also at Labuan, Mempakol, Gaya on the N.W. coast of the island, and at Bangnay Island off the north point of Borneo. On the N.W. coast the figures from four stations show a strongly marked minimum rainfall in February; the fine period appears to last for about three months only, January—April. On the North and N.E. coast the true wet season takes place in the N.E. Monsoon and the true dry season about the period of the shifting of the winds, February—May.

Sumatra. — Dr. van der Stok shows that very varying conditions prevail upon the different coasts of this great island.

In the Malacca Straits land- and sea-breezes are general, neutralizing the effect of the Monsoons. The wettest months along this part of the coast of Sumatra are from October to December, the rains being apparently brought up by the N.E. Monsoon out of the China Sea and the Straits. The dry months are February and March, and also June and July, there being here, as in North Borneo, a second rainy and fine period.

At the northern end of Sumatra the S.W. Monsoon is much more marked, being felt from May till October, and bringing the rains with it from the Indian Ocean. February and March, when the E. Monsoon is blowing, are the finest months.

Along the N.W. coast down to the equator it is hard to speak of any rainy — or one might better say of any fine — season. South of the equator down to the Straits of Sunda the wettest months are from September to December, and the driest May to August, with a reduced rainfall in February.

In South and S.E. Sumatra the Monsoons are well marked, the dry season being produced by the S.E. Monsoon from April or May till September, the wet accompanying the northerly and westerly winds which prevail from November to March.

The Bintang, Lingga, Karimon, Timbulan, Anambas, Natuna, and Serasan Islands: groups of small islands in the South China Sea between Malacca and Bangka and Borneo. — These islands receive the rains of both Monsoons and are very wet almost the whole year, the greatest number of fine days occurring in January, February and March. The climate is not considered unhealthy.

Banka, Billiton and the Straits of Karimata and Gaspar. — Here the climatic conditions are very changeable, varying on the land at different altitudes. The greatest amount of wet is brought up by the N.W. Monsoon in November, December and January; there is a minimum of rainfall in February, but the driest months are July, August and September. In Banka the temperature on the coast is given as 21°—24° C. (17°—19° R., 70°—75° F.) during the night

and morning, rising sometimes to 32°—35° C. at midday. In the interior it is less hot, the nights being even cold and damp. In Billiton the damp atmosphere is sometimes very oppressive, although the temperature in the morning and evening is 22°—23.5° C., and rarely more than 29° C. at midday; the nights very cool (de Hollander, t. c, 812, 828; van der Stok, Wind and Weather).

Java. — The chief meteorologic conditions of this island as recorded by de Hollander have been already given (pp. *22—24*). Bad weather is encountered during the N.W. Monsoon (October to April); the fine season accompanies the S. E. Monsoon in the months of our summer. On the south coast much wet is also brought up by the S.E. Monsoon from the Indian Ocean, particularly towards the western parts of this coast, but the true rainy season here as elsewhere is during the N.W. Monsoon. It has been said that bad weather marks the shifting of the Monsoons; there set in "wild storms from the W. and N.W."; "storms of wind and rain beneath a clouded sky alternate with severe gales and heavy winds" (Jansen in Maury's Phys. Geogr. Sea, 14th ed., 380); but the extensive observations of van der Stok lead him to the opposite conclusion — that "the condition of the sea is at its best when the Monsoons turn, i. e. in March, April, and November" (op. cit. p. 57).

The Lesser Sunda Islands (Bali, Lombok, Sumbawa, Flores, Sumba, Timor, Rotti, Timorlaut, and the intermediate smaller islands). — The wet and the dry seasons are here very strongly contrasted, especially in Timor. In this island hardly a drop of rain falls during the five months June—October, while an abundance comes down in December, January and February. The rivers are said to be then overstreaming, but during the S. E. Monsoon many are dried up, and the thermometer then rises to 52° C. in the sun and 35° C. in the shade. A similar drought in summer is found at least on the north coast of the other islands (Bali, Sumbawa). Flores is subject to manifold and sudden changes in the atmosphere, making it very unhealthy. An injurious wind, the "Anging bolo", occurs, as mentioned above (p. *27*), in Sumbawa where the climate is considered unhealthy. The Lesser Sunda Islands as a whole receive far less rain than Java, Celebes or the Moluccas, and only about one-half or one-third the amount of that which falls in Borneo, and ornithologists should not neglect to make studies of possible climatic variation among allied species of birds in these regions, such as have been made on certain birds in North America by Allen (see, below p. *58*). It may be that the climate has had something to do with "Wallace's Line" as far as it goes (see, below pp. *81—89*), for not all animals and plants can exist indifferently in a wet climate like that of Borneo and a dry one like that of the Lesser Sundas. A general similarity between Timor and Australia has been noticed, and it should not be forgotten that the S.E. Monsoon, which is productive of the drought in the Lesser Sundas blows out of the arid deserts of Australia, and it may bring many things directly with it, just as the returning N.W. Monsoon may carry to Australia any thing that is capable of sustaining a voyage through the air.

The Halmahera Group. These islands lying under or near the equator are chiefly under the influence of northerly winds from December to April and southerly ones from June to October, and as they are therefore not sheltered by any great land-masses they receive much rain with both winds. According to Dr. van der Stok there is "a principal maximum in June and July and a secondary maximum in January", but the rainfall seems to be chiefly determined by the position of the place concerned — whether it lies on the windward or lee shore of the island with sheltering hills behind. The climate is stated to be healthy. In Ternate the thermometer seldom rises higher than 30° C. (23.5° R., 85° F.); in Halmahera the mean temperature on the coast is about 30° C. at midday and 23° C. at night.

Buru and Ceram. — In consequence of the high mountain-chains which intersect these islands from west to east, a wall is presented to the alternating N. W. and S. E. Monsoons, so that, when the former is blowing, the northern or windward sides of the islands have their rainy season, while the southern sides, being sheltered by the mountains, are fine. This wind dominates from December to March. From May or June till October, when the S. E. Monsoon is blowing, the previous state of things is reversed; the southern parts now get their rainy and the northern their fine season.

In the "Jahresb. des Ver. f. Erdk. zu Dresden", 1892, 159, 160, Mr. C. Ribbe writes: "The climate of Ceram is one of the heathiest and most agreeable experienced by me in the Indies; from my tables of the temperature I find that the greatest degree of heat at Illu was 32½° C. in the shade, the lowest 20° C. . . . By shifting quarters according to the time of year, it is possible to live in a perpetual spring, for the great heat, as also the wearisome rainy season can be avoided: you build your hut now on the south and then on the north coast of the island. . . . It would not be safe, however, to conclude that these weather conditions recur from year to year with mechanical regularity; on the other hand frequent exceptions to the rule take place, from which the travelling naturalist may have to suffer severely".

The rainfall has been studied at two places in Ceram — at Wahaai on the north coast and at Amahei nearly opposite on the south coast, spots which are separated by mountains from 6000—10,000 feet high. The following monthly averages for 15 years show the contrast in the seasons at the two spots.

	Jan.	Febr.	Mch.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
Wahaai .	*280*	*176*	*293*	*234*	140	106	113	94	93	107	110	*212*	2258
Amahei .	127	101	121	191	*271*	*424*	*537*	*538*	*241*	174	101	109	2938

The figures for February on the one hand and for July and August on the other are particularly instructive. The respective Monsoons are then especially well developed.

Amboina and Saparua. These islands lying under the shelter of the south

coast of Ceram, have their rainy season during the months of our summer, when the S. E. Monsoon is blowing, and a great abundance of rain then falls. The north coast of Amboina receives less rain than the south, but the seasons are not so strongly contrasted as in Ceram.

Banda Islands. "The East Monsoon brings rain and storm with it." April, May and June are the wettest months, and August to November somewhat the driest.

Kei Islands. — The fine season seems to be restricted to three months of the year, viz. August, September and October.

Aru Islands. — A plentiful and generally even amount of rain fell here during the year 1890. Dr. de Hollander writes: "In the West Monsoon, which lasts from the beginning of December to April, the day-temperature is very high, but the nights, when a heavy dew usually falls, are on the contrary cold and raw; during the East Monsoon from the middle of April till the middle of November the heat of the day is less oppressive and the nights less cold. The most rain falls at the turning of the Monsoons; at this time fever occasionally occurs."

New Guinea. — In Dutch New Guinea, as in other islands which are intersected by high mountains, the north coast has its fine season while the rainy season is on the south. Some observations at Doreh and Andei in the Geelvink Bay gave the prevailing winds as east — generally due east — from May to November, which is the dry season, and westerly during the other half-year — the rainy season. Stormy or violent winds were rare and occurred most frequently in the E. Monsoon (Meyer, Ausz. Neu Guinea Reise 1875, p. 20). Van der Stok records the winds at Mansinam, western shore of the Geelvink Bay, as N. E. from May to September, the drier period, and W. from November to April, with a maximum rainfall in February. De Hollander records the temperature as rising to as much as 35.5° C. (28.5° R., 96° F.) during the E. Monsoon.

On the west coast the "Sailing Directory of the East Indian Archipelago" states that the S. E. Monsoon blows from April to November, bringing great quantities of rain chiefly from June to September; the N. W. Monsoon prevails from October to May, when the weather is fine and calm.

Further down the north and north-east coast, some interesting figures, on a parallel with others already given, have been sent in from three settlements in Kaiser Wilhelms-Land: Finschhafen, Constantinhafen and Hatzfeldhafen. Finschhafen[1]) lies at the head of the Finisterre Peninsula, south of the lofty Finisterre Mts. which intersect the peninsula near its north coast: Constantinhafen is on the other side of the range at the head of Astrolabe Bay, and Hatzfeldhafen[1]) higher up the coast. Owing to its position, Finschhafen, together with the adjacent north coast of the Huon Gulf, presents a windward shore to the

[1]) Finschhafen and Hatzfeldhafen are now abandoned.

S. E. Monsoon of June—September, while Constantinhafen lies sheltered from wind and rain by the mountains, which also, with some other nearer hills, protect Hatzfeldhafen. During the N. W. Monsoon the case is reversed, Finschhafen is now sheltered by the Finisterre Mts., and the other two exposed to the wind. Consequently Finschhafen has its fine season with this, the N. W. Monsoon, and its rainy season with the S. E. Monsoon, while at Constantin- and Hatzfeldhafen exactly the opposite takes place. The total rainfall for the year being given as 100, the following shows the percentage of rain when the different Monsoons are in force:

	Finschhafen.	Constantinhafen.	Hatzfeldhafen.
Dec.—April 1886/87	17%	58%	62%
Dec.—April 1887/88	18%	69%	68%
June—Sept. 1886	58%	—	11%
June—Sept. 1887	62%	18%	17%

These results held good for the subsequent reports in 1888 and 1890. (Nachrichten über Kaiser Wilhelms-Land, 1888, 160).

In South-eastern New Guinea Capt. Moresby states that "the N.W. Monsoon blows from November till March, accompanied with occasional westerly gales, and with fine-weather intervals". D'Albertis says that a S.E. wind blows at Yule Island for 8 months and confirms Moresby's remarks in stating that the rainy months are November—February (N. G. 1880, I, 402). The same traveller found that heavy rains fall in the valley of the Fly River from December to April. In the dry and cooler season May—August the max. heat was 29.5° C., and during the hotter months rarely rose to 35° C.

Solomon Islands. — This group is subject to variable winds, violent squalls, and heavy rainfall. The N.E. Monsoon from the end of November to the end of March is considered to be the rainy season. Heavy gales from the west and north-west are not infrequent at this period. The S.E. Trade-wind from April to November seems to blow in fits and starts, interrupted by calms, variable winds, and often heavy squalls and much rain. The temperature varies little: 75° F. at night to 90°—95° F. at noon (Leeper, J. R. Met. Soc. 1885, 309—313).

Northern Australia. — Here the N.W. Monsoon brings the rains, and the S.E. Monsoon, blowing out of the interior, is of course very dry.

This rough sketch of the winds and rainfall in the East Indian Archipelago may, it is hoped, prove to be not without use in the study of the climatic variation of birds, of their local movements, their nidification and moulting. The winds and rains and temperature are also factors which should be taken into consideration in questions concerning the geographical distribution of birds.

The following publications have been consulted in preparing this chapter:

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We are also indebted to Dr. van der Stok of Batavia for examining an original draught of our maps III and IV and for kindly pointing out and describing an alteration which was neccessary. We had, too, the advantage of Prof. Neumayer's kind advice.

3. MIGRATION IN THE EAST INDIAN ARCHIPELAGO.

Migration in its simplest form. — As Mr. Whitlock points out in his recent critique on Gätke's theories (see: "The Migration of Birds" 1897), the first stage in the history of migration is probably seen in the daily journeys of certain species to their feeding grounds and their return to their roosting places in the evening. In England this may be particularly well observed in the Rooks and their comrades, the Jackdaws; they are very methodical in their daily visits to certain fields, though their movements are by no means governed with the regularity and punctuality of a pendulum. This sort of thing will of course be found in all animals, human or avian or other, which sleep in one spot and dine in another. One of the most striking cases which we have seen from the East Indies is that recorded by Dr. Hagen of the large Hornbill, *Cranorrhinus corrugatus*, in E. Sumatra. These ill-flying birds feed by the sea and return in the evening to their roosting places inland, making use of certain trees about every kilometer of their way as travellers' rests. "The resting places are fixed spots, and, if they are not scared, the birds may be expected with tolerable certainty every evening at the appointed time" (see: text p. 244).

Local movements. — A further development of the principal of migration is seen where species do not spend the hours of a day but remain some weeks or months in one locality, and then depart elsewhere. These movements are probably common in the tropics and depend upon the abundance of certain foods at these periods. Thus Meyer observed that the small Parrots, *Loriculus exilis* and *stigmatus*, *Trichoglossus ornatus* and *meyeri*, visited Manado in great numbers at March or, respectively, April and May, the cause being apparently the flowering or fruit-bearing of certain trees; and the Sarasins found *Munia pallida* abundant at Macassar during the rice-harvest June, July, but they personally did not see them afterwards as late as September. There is much to be learnt still about movements of this kind in Celebes, but it would be easy to multiply instances in the Indian countries and elsewhere. Dr. E. P. Ramsay (see: "Ornis" 1885) terms the movements of all Australian birds "nomadic", but there are also some species there which are as true migrants as those of the temperate parts of the northern hemisphere (see, below, p. 48).

Local movements are the more to be expected among the birds of Celebes and other parts of the Archipelago in consequence of the great differences in the season often to be found in spots a few miles apart. The east side of the Southern Peninsula, for instance, has its wet season when the west side has its dry one, and when the west coast is deluged with rain, the east coast has fine weather, though the two districts are only some 30—60 miles apart. In a similar manner the north and south coasts of Ceram are contrasted, and traces of the same condition are seen on the north and south coasts of the North Peninsula of Celebes. The climate of the mountains is also strongly contrasted with that of the plains. We have been at some pains to obtain particulars of the movements of the birds from gentlemen resident in the East Indies, but have not received any data suited to the requirements of the present work, except some notes from Mr. H. Veen of Kele Londej, a place situated at a height of about 3000 ft. in the Minahassa. Mr. Veen has observed in the case of a few species ("Sonsoliat", "Tegi", "Tangkuitj" = *Hypothymis puella*, "Keresow") that their movements are affected by the abundance or scarcity of food; they generally arrive in groups and start again after 3—4 weeks. He adds: "The blossoming and the ripening of the fruits goes on the whole year, according to the altitude, e. g. the Lansap *(Lansium domesticum)*; near the coast this fruit is ripe towards the end of December and in January; a little higher up in February and March; still higher from April to August. The Durian and the Mango are ripe near the coast as early as December and January, but at Langowan (in the hills in April—June. The Coffee-tree is in blossom in Kele Londej the whole year round, but at its fullest from November to February, and it begins partially to ripen in May. At Langowan this occurs about a fortnight earlier, and at Tondano a fortnight earlier still. Last year (1893) coffee was gathered every month, though in various quantities. And this though Kele Londej is only about 400 ft. higher than Langowan, and Langowan only about 200 ft. higher than Tondano".

Other phaenological observations from Celebes than these, except stray ones, have not reached us, though we possess such from Middle Luzon, which, however, would not afford a crucial test for Celebes.

Islet nomads. — A curious phase of migration is displayed by several Pigeons of the East Indian Archipelago. The species occurring in the Celebesian area and displaying the characteristic in question are *Caloenas nicobarica*, *Myristicivora bicolor*, *Carpophaga concinna* and *C. pickeringi*. These birds — at least the two first and better known species — are highly gregarious; they repair to breed on certain fixed islets and during the rest of the year seem to wander from one small island to another within their range, only occurring exceptionally on the neighbouring mainlands. In this manner the *Myristicivora* and the *Caloenas* have a range of three or four thousand miles, and that of *Carpophaga concinna* is also large. The Nutmeg Pigeon, *Myristicivora*, is often excessively numerous; we read of the lofty trees of a small island being simply covered with thousands

of these white birds, of their fairly swarming at times on other islets, of great flocks literally hanging in clusters on the trees of the little island of Manado tua. So, too, the Nicobar Pigeon, *Caloenas*, is described as swarming by thousands upon its almost inaccessible breeding islet of Batty Malve in the Nicobars. It is obvious at once that these small islets cannot and do not support such a population of Pigeons for long, consequently the birds are repeatedly on the move, flying over the sea in search of fresh feeding grounds. Instances of their being seen in the act of crossing the sea are given in the text (p. 629, 659). It appears that they visit their breeding islands seasonally, but everything has still to be learnt about the periodicity, if any, of their visits to the other islands of their ranges. The four Pigeons in question have no near affinity with one another; the Nicobar Pigeon is the sole representative of a subfamily; the other three have more or less near affinities with mainland species.

As is well known, certain sea-birds, such as the Gannets, Albatroses, and some Terns, resort to particular rocks or other islets to breed. In their case, as in that of the Pigeons, protection of their brood from animals destructive to their eggs and young may well have been the original motive for the adoption of these habits, yet with the Pigeons it remains strange that they avoid the mainland after their young have been safely reared. (For further remarks hereon, see pp. 616, 629, 659—661).

For the sake of the general reader, who may be apt to suppose that narrow straits of the sea offer no barrier to the geographical distribution of tropical species, it may be mentioned that, so far from this being the case, there is reason to believe that resident species never, or only very exceptionally, cross the sea; were it otherwise the species would not be found with such restricted ranges as is actually the case.

Migration proper in the East Indian Archipelago. — The following is a list of most of the more prominent migratory birds of Celebes. A few species, well known to be migrants, offered difficulties which have led to their being omitted, while a large number of other species have been left out because their migrations are as yet hidden in such obscurity that it would probably be misleading to attempt to trace them categorically. In the case of the species given it has often been impossible, in the absence of positive data, to avoid speculation in the use of the signs for summer and winter haunts, but it will generally be found that too little has been said, rather than too much.

○: signifies "summer visitor". (It would generally be safe to assume that the species breeds in the localities so marked, but in not one-half of them have the nest and eggs yet been discovered.)
×: signifies "winter visitor", or "passes through on migration".
†: signifies "rare", or "a straggler".

Localities	*Tachyspizias soloensis* (Horsf.)	*Accipiter virgatus gularis* (T. & S.)	*Butastur indicus* (Gm.)	*Ninox scutulata japonica* (T. & S.)	*Hierococcyx sparverioides* (Vig.)	*Cuculus canorus canoroides* (S. Müll.)	*Coccystes coromandus* (L.)	*Merops ornatus* Lath.	*Merops philippinus* L.	*Halcyon pileata* (Bodd.)	*Halcyon sancta* Vig. Horsf.	*Cypselus pacificus* (Lath.)	*Pitta cyanoptera* Temm.	*Hirundo rustica* L.	*Muscicapa griseosticta* (Swinh.)	*Lanius tigrinus* Drapiez	*Lanius lucionensis* L.	*Petrophila cyanus solitaria* (P. L. S. Müll.)	*Aëroccphalus orientalis* (Temm. Schl.)	*Locustella fasciolata* (G. R. Gray)	*Locustella ochotensis* (Midd.)	*Phylloscopus borealis* (Blas.	*Motacilla flava* L.	*Motacilla borrida melanope* (Pall.)	*Anthus gustavi* Swinh.	*Anthus cervinus* (Pall.)	*Sturnia violacea* (Bodd.)
Northern Europe .	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Centr. & S. Europe .	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	+	○	○	×	–
South-west Asia . .	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	○	○	×	–
Africa	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	×	○	×	–
Madagascar	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Siberia, West	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Siberia, Central . .	–	–	–	–	–	○	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Siberia, N.E.	–	–	–	–	○	○	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Arctic Regions . . .	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Bering Islands . . .	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Alaska	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Kamtschatka	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
S.E. Sib., Amurland	–	–	–	○	○	○	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Mongolia	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Manchuria	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Corea	–	–	○	○	–	–	–	–	–	○	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Japan	–	–	○	○	–	–	–	–	–	+	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
China, North	○	×	○	○	–	–	–	–	○	○	–	–	–	–	–	○	+	–	○	–	–	–	–	–	–	–	–
China, South	○	×	×	○	–	–	–	–	–	○	–	–	–	–	–	○	–	–	○	–	–	–	–	–	–	–	–
Formosa	–	–	×	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Philippines	×	×	○	×	×	×	×	×	○	×	×	○	–	–	–	×	–	×	×	×	×	×	×	×	×	×	×
Borneo	×	×	×	×	×	×	×	×	×	×	×	×	○	–	–	×	–	×	×	×	×	×	×	×	×	×	×
Talaut Islands .	×	–	×	×	×	–	–	×	×	×	×	×	×	–	–	×	–	×	×	×	×	×	×	×	×	×	×
Sangi Islands . .	×	–	×	×	–	–	–	×	×	×	×	×	×	–	–	×	–	×	×	×	×	×	×	×	×	×	×
Celebes, North .	×	×	×	×	×	×	×	×	×	×	×	×	×	–	–	×	†	×	×	×	×	×	×	×	×	×	×
Celebes, South .	–	–	–	×	–	×	–	×	×	×	×	×	×	–	–	×	–	×	×	×	×	×	×	×	×	×	×
Moluccas	–	–	×	×	–	×	–	×	×	×	×	×	×	–	–	×	†	×	×	×	×	×	×	×	×	×	×
Papuasia	–	–	×	–	–	×	–	○	–	–	×	×	×	–	–	×	–	×	×	×	×	×	×	×	×	×	×
India	–	–	–	–	○	○	○	–	○	×	×	×	×	–	–	×	†	×	×	×	×	×	×	×	×	×	×
Ceylon	–	–	–	–	–	–	×	–	×	+	×	×	×	–	–	×	†	×	×	×	×	×	×	×	×	×	×
Islands, B. of Bengal	×	–	–	–	–	×	–	–	×	×	×	×	×	–	–	×	×	×	×	×	×	×	×	×	×	×	×
Further India	†	–	×	–	–	×	○	–	○	×	×	×	×	–	–	×	×	×	×	×	×	×	×	×	×	×	×
Malay Peninsula . .	×	×	×	–	–	–	×	–	×	×	×	×	×	–	–	×	×	×	×	×	×	×	×	×	×	×	×
Sumatra	×	×	–	–	–	–	×	–	×	×	×	×	×	–	–	×	×	×	×	×	×	×	×	×	×	×	×
Java	×	×	×	–	×	–	×	–	×	×	×	×	×	–	–	×	×	×	×	×	×	×	×	×	×	×	×
Lesser Sunda Is. . .	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	×	×	×	×	×	×	×	×	×	×	×	×
Australia	–	–	–	–	–	×	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Polynesia	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
New Zealand	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
North America . . .	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Almost cosmopolitan, wintering in the South, breeding in the North																											

Localities	*Fulica atra* L.	*Glareola isabella* Vieill.	*Lobivanellus cinereus* Blyth	*Squatarola helvetica* (L.)	*Charadrius fulvus* Gm.	*Aegialitis cervina* J. Gd.	*Aegialitis geoffroyi* Wagl.	*Aegialitis mongola* Pall.	*Aegialitis curonica* (Gm.)	*Strepsilas interpres* L.	*Totanus glottis* L.	*Totanus calidris* L.	*Totanus glareola* L.	*Heteractitis brevipes* Vieill.	*Actitis hypoleucos* L.	*Terekia cinerea* (Güld.	*Tringa acuminata* (Horsf.)	*Tringa damascensis* (Horsf.)	*Tringa ruficollis* (Pall.)	*Phalaropus hyperboreus* L.	*Limicola platyrhyncha* (Temm.	*Gallinago megala* Swinh.	*Limosa novaezealandiae* (G. R. Gray)	*Numenius minutus* J. Gd.	*Numenius variegatus* Scop.	*Numenius cyanopus* Vieill.	*Ardetta exilipluma* Swinh.
Northern Europe .	○	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Centr. & S. Europe .	×○	–	–	×	×	–	†	×	×	×	×	○	○	×	×	†	†	†	–	–	–	–	–	–	–	–
South-west Asia . .	×○	–	–	×	×	–	†	×	×	×	×	○	○	×	×	×	×	×	–	–	–	–	–	–	–	–
Africa	–	×	–	×	×	–	–	×	×	×	×	×	×	×	×	×	×	×	–	–	–	–	–	–	–	–
Madagascar	–	–	–	×	×	–	–	×	×	×	×	×	×	×	×	×	×	×	–	–	–	–	–	–	–	–
Siberia, West	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Siberia, Central. . .	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Siberia, N.E.	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Arctic Regions . . .	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Bering Islands . . .	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Alaska	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Kamtschatka	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
S.E. Sib., Amurland	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Mongolia	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Manchuria	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Corea	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Japan	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–	–
China, North	×	○	–	×	×	○	†	×	×	×	×	×	×	×	×	×	×	×	–	–	–	–	–	–	–	–
China, South	×	–	–	×	×	×	–	×	×	×	×	×	×	×	×	×	×	×	–	–	–	–	–	–	–	–
Formosa	–	–	–	–	×	×	○	×	×	×	×	×	×	×	×	×	×	×	–	–	–	–	–	–	–	–
Philippines	–	–	–	–	×	×	×	×	×	×	×	×	×	×	×	×	×	×	–	–	–	–	–	–	–	–
Borneo	–	–	–	–	×	×	×	×	×	×	×	×	×	×	×	×	×	×	–	–	–	–	–	–	–	–
Talaut Islands. .	–	–	–	–	×	×	×	×	×	×	×	×	×	×	×	×	×	×	–	–	–	–	–	–	–	–
Sangi Islands . .	–	–	–	–	×	×	×	×	×	×	×	×	×	×	×	×	×	×	–	–	–	–	–	–	–	–
Celebes, North .	×	–	–	†	†	×	×	×	×	×	×	×	×	×	×	×	×	×	–	–	–	–	–	–	–	–
Celebes, South .	–	×	–	–	–	×	×	×	×	×	×	×	×	×	×	×	×	×	–	–	–	–	–	–	–	–
Moluccas.	×	–	–	–	×	×	×	×	×	×	×	×	×	×	×	×	×	×	–	–	–	–	–	–	–	–
Papuasia	–	–	–	–	×	×	×	×	×	×	×	×	×	×	×	×	×	×	–	–	–	–	–	–	–	–
India	×○	–	×	–	×	×	×	×	×	×	×	×	×	×	×	×	×	×	–	–	–	–	–	–	–	–
Ceylon	–	–	–	–	×	×	×	×	×	×	×	×	×	×	×	×	×	×	–	–	–	–	–	–	–	–
Islands, B. of Bengal	–	–	–	–	×	×	×	×	×	×	×	×	×	×	×	×	×	×	–	–	–	–	–	–	–	–
Further India	×○	–	×	–	×	×	×	×	×	×	×	×	×	×	×	×	×	×	–	–	–	–	–	–	–	–
Malay Peninsula . .	–	–	–	–	×	×	×	×	×	×	×	×	×	×	×	×	×	×	–	–	–	–	–	–	–	–
Sumatra	×	–	–	–	×	×	×	×	×	×	×	×	×	×	×	×	×	×	–	–	–	–	–	–	–	–
Java	×	–	–	–	×	×	×	×	×	×	×	×	×	×	×	×	×	×	–	–	–	–	–	–	–	–
Lesser Sunda Is. . .	–	–	–	–	–	×	×	×	×	×	×	×	×	×	×	×	×	×	–	–	–	–	–	–	–	–
Australia	–	–	–	–	–	×	×	×	×	×	×	×	×	×	×	×	×	×	–	–	–	–	–	–	–	–
Polynesia	–	–	–	–	×○	×	×	×	×	×	×	×	×	×	×	×	×	×	–	–	–	–	–	–	–	–
New Zealand	–	–	–	–	×○	×	×	×	×	×	×	×	×	×	×	×	×	×	–	–	–	–	–	–	–	–
North America . . .	–	–	–	–	–	×	×	×	×	×	×	×	×	×	×	×	×	×	–	–	–	–	–	–	–	–

During our studies it has become abundantly evident to us that ornithologists are not generally aware that migration goes on in the East Indies to the great extent it does. Naturalists travelling in the Archipelago have rarely had a word to say on this subject, for the reason that they themselves are continually on the move from place to place and are consequently unable to say whether the birds they see are visitors or stationary. Among the residents or travellers of longer standing it would be difficult to mention the names of more than two or three competent observers; of these Mr. Everett has as yet published nothing on migration to our knowledge beyond a few terse notes on individual species, but there are a number of interesting observations extant from the pen of Mr. Whitehead. We quote from this gentleman the following passages relating to the S. E. parts of Palawan: "When the great rush of birds from the far north takes place these plains have a much more lively aspect; hundreds of Wagtails, Pipits, Snipes, and other small Waders are continually flying up on your approach . . . Towards the middle of September, after we had collected all the resident species within our reach, the sea-coast, with its rocky points and estuaries, was by far the most attractive hunting-ground; for about that time the great winter migration from the north reaches the coasts and forests of Palawan. Most Waders passed between 5 and 6. P. M., all in one direction, S.W.; if a small flock settled and was disturbed, never did the birds return, but still hurried on their southward course. By continuing this line of flight they would touch Balabac, and then turn due south down to the coast of Borneo, where some remain for the winter, but most seem to travel further still. When the wind was blowing gales from the S.W., bringing up heavy clouds loaded with rain, then was the liveliest time for moving; on calm, or even moderate days, it was seldom worth while to visit the coast. All these great travellers were as fat as butter, and in no state for a bird-collector" (Ibis 1890 p. 40). Out of a total of 157 species in Palawan 49 are migrants.

Birds at sea. — Nearly all naturalists when at sea in these regions have been visited by birds of migratory species for a temporary rest on board ship. When sailing ships were common this was possibly a more usual occurrence than in these days of steamers. The following passage from F. J. F. Meyen's "Reise um die Erde", 1835 II, 195, is of interest. When crossing the China Sea between Macao, Canton River, and Manila, "besides the ordinary sea-birds a number of various small land-birds were seen, which, as we quickly perceived, were migrating and resting upon our ship. We obtained on this occasion the *Lanius phoenicurus* (Pall.) (= *L. lucionensis*), the *Hirundo domestica* Pall, and the *Motacilla flava*, all of them birds which spend the summer months in Southern Siberia . . . As it appeared all these birds were directing their course towards the Moluccas; the Swallows came along in such numbers that we caught eight of them in the evening. One day the head of a palm-tree drifted by our ship . . . Large birds were resting on this swimming island as it came towards us, and

a host of fishes swam in front of it, while innumerable crabs sat upon it and sunned themselves".

In the special articles on the species records of individuals captured or observed at sea are quoted, such are: *Tachyspizias soloensis* (China Sea, near the Pescadores, May); *Accipiter virgatus* (China Sea, near the Natuna Is., 14th November); *Merops philippinus* (Indian Ocean, November); *Halcyon sancta* (Pacific Ocean, 300 sea-miles S.E. of the Louisiade group); *Hirundo rustica* (several records from the seas between the Moluccas and S. China); *Acrocephalus orientalis* (40 miles N. of the Looehoo Islands); *Motacilla flava* (Indian Ocean and China Sea); *Tringa ruficollis* (China Sea, May 14th); *Hypotaenidia philippensis* (Pacific Ocean far at sea east of Australia); *Myristicivora bicolor* and *Caloenas nicobarica* (Seas of the East Indian Archipelago).

Routes. — The above tables tend to prove that each species has its own route or routes of migration; nevertheless the species allow of a certain amount of co-ordination, as follows.

From Northern Europe and Siberia to the East Indian Archipelago. — So far as species occurring in Celebes are concerned, migration reaches its highest development in the Arctic Chiffchaff, *Phylloscopus borealis* (J. H. Blas.) and the Siberian Pipit, *Anthus gustavi* Swinh. The former is known to breed as far west as Northern Norway (Collett), the latter as far as the Petchora (Seebohm and Harvie-Brown); they also breed in various parts of Siberia. In the winter there are no observations to show that individuals stop short of S.E. Asia and the East Indies; on the other hand they are observed to pass through China on migration, the Pipit holding to the countries washed by or near the Pacific Ocean and not visiting the Indian countries, while the Chiffchaff occurs both in the territories invaded by the Pipit and in Further India and the neighbouring islands as well. So far as can be judged the general direction of the two species in autumn is from west to east across Siberia and then south or south-south-east. They are in singular contradiction to Gätke's picturesque theory of an east to west flight at this season, and *Anthus gustavi* should be contrasted with *Anthus richardi* V., which is supposed to migrate in the opposite direction, and is often referred to for proof by Gätke.

From Northern Europe to Africa, and from Siberia to the East Indies or further. — Many species migrate thus, but, as a rule, appreciable racial differences may be seen in the western and eastern individuals, with intermediate forms from other localities between them. Such are: *Hirundo rustica*, *Cuculus canorus*, *Petrophila cyanus*, *Motacilla flava*, *Motacilla boarula*, *Anthus cervinus*. *Totanus calidris*. Other forms are commonly separated as distinct species in the West and East; such are *Charadrius pluvialis* and *fulvus*, *Acrocephalus turdoides* and *orientalis*. *Tringa minuta* and *ruficollis*, *Limosa lapponica* and *novaezealandiae*, *Numenius phaeopus* and *variegatus*. Others do not differ in the West and East, or at least no prominent racial differences in them have as yet been insisted upon; such

are: *Squatarola helvetica*, *Aegialitis curonica*, *Strepsilas interpres*, *Totanus glottis*, *T. glareola*, *Actitis hypoleucos*, *Terekia cinerea*, *Phalaropus hyperboreus*, etc. It may be that these last commingle more freely in their breeding grounds than the others, and have not yet adopted routes of migration of an equally unvarying character.

From China, or China and S. E. Siberia, to Further India, the Philippines and Sunda Islands as far as North Celebes. — A large number of visitors to Celebes are distributed in summer and winter, respectively, as above. Celebes appears to be reached by individuals which have travelled over the Philippines, and not by birds coming from Borneo and Java. This is shown by the fact that these species occur in the Northern Peninsula, but much more rarely, if at all, in other parts of Celebes. Migrants descending south through the Philippines and across the Celebes Sea are confronted by a lofty barrier 400 miles long formed by this peninsula, and the majority of individuals do not pass over it into South Celebes or into the Moluccas. If the migrants came from Borneo or Java they would reach the west and south coasts first, and their presence on the northern coast could only be accounted for as an aimless progression towards the north-east, of which there is no evidence. The simpler explanation may be assumed with much confidence to be the correct one. The winter visitors, therefore, from China and the North to the Northern Peninsula are: *Tachyspizias soloensis*, *Accipiter virgatus gularis*, *Hierococcyx sparverioides*, *Coccystes coromandus*, *Halcyon pileata*, *Pitta cyanoptera*, *Lanius lucionensis*[1]), *Petrophila cyanus solitaria*[1]), *Locustella ochotensis*, *Lobivanellus cinereus*, *Tringa damascensis*, *Ardetta eurhythma*.

There is no species occurring as a migrant in the Philippines which has been found in South Celebes and not in the North Peninsula, except *Limicola platyrhyncha*, which is as yet known from Celebes by one specimen only from the South-central part of the island.

Species with the above summer and winter distribution, but which pass on further into South Celebes, the Moluccas and Papuasia are: *Butastur indicus*, *Ninox scutulata japonica*, *Cuculus canorus canoroides*, *Acrocephalus orientalis*, *Gallinago megala*, *Numenius minutus*. To these should be added most of the Waders, and the two Wagtails, the Pipit, *Anthus cervinus*, the Arctic Chiffchaff, *Phylloscopus borealis*, etc., which, however, have a higher northern breeding range.

From S. E. Siberia and China to Further India and the Sunda Islands, avoiding the *Philippines*. — This route is pursued by *Lanius tigrinus*, in striking contrast to its compatriot *Lanius lucionensis*, which visits the Philippines in abundance, and the Indian countries and Southern Sunda Islands only sparingly (See pp. 405, 408—410). Most of the individuals of *Pitta cyanoptera* seem to take a route like that of *L. tigrinus*.

West-Pacific migration. — There are several species occurring in Celebes which in winter visit the countries in the more immediate neighbourhood of the Pacific, not crossing to the Malay Peninsula, Sumatra, Java and the islands in

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[1]) Has occurred in the Moluccas.

the Bay of Bengal. *Sturnia violacea*, for instance, is not known from the continent of Asia, but breeds in Japan, from where it seems to fly directly in autumn to the Philippines, Borneo, N. Celebes and the Moluccas. *Muscicapa griseosticta* and *Locustella fasciolata* breed in North China or N. E. Asia and occur in winter in the East Indies which are washed by the Pacific, as far as New Guinea and the Moluccas, respectively. *Heteractitis brevipes* wanders in winter down the West Pacific coasts from unknown breeding grounds in the high North as far south as Australia. A remarkable traveller across the Pacific is seen in *Limosa novaezealandiae*; this bird has been found breeding in Alaska and Arctic Siberia, and it visits New Zealand in great numbers in winter, the majority of individuals apparently flying directly across the Pacific without making use of the East Indies as a resting-place, for the number of examples recorded from there is comparatively very small (see p. 794). In the case of this species, as also in that of the Pacific Cuckoo, *Urodynamis taitiensis* (Sparrm.), it is perhaps erroneous to attempt to avoid the assumption of a "sense of direction". Still ocular remembrance of the sparsely scattered atolls and high islands of the Pacific on which the birds may land or pass over, together with the positions of the sun and stars at certain hours, and the direction of the roll of the waves should not be left out of account as a means by which they may alter and regulate their course over hundreds of miles of trackless ocean (see Möbius: "Ein Beitr. z. Frage üb. d. Orientirung der wandernden Vögel": Ausland 1882 p. 648).

Migration south of the equator. — Professor Newton remarks (D. B. 555): "If the relative proportion of land to water in the southern hemisphere were at all such as it is in the northern we should no doubt find the birds of southern continents beginning to press upon the tropical and equatorial regions of the globe at the season when they were thronged with emigrants from the north . . . but we know almost nothing of the migration of birds in the other hemisphere". In this comment — very true, apparently, in regard to the comparatively small amount of migration south of the equator — Prof. Newton has almost overlooked a great point of difference in northern and southern migration, namely that the birds of the South proceed towards the equator in the time of our summer and leave the tropics again for their breeding quarters about the time that the equatorial countries are invaded by the migrants from the North. The southern territories which call for consideration in this book (the East Indies and Australia) have furnished very few thorough-going migrants; it is certain that the number is very small compared with that of the northern hemisphere, but there is also a regrettable lack here of competent observers and of published observations. One or two passages relating to migration across the Torres Straits seem to show that among the islands here it is possible that a second Heligoland may be found some day. Remarks to this effect are made in Moseley's 'Naturalist on the "Challenger"', 1879, p. 364: "Most of the birds of Cape York are constantly migrating, and the resident official at Somerset told me that the constant change from month to month of

the birds seen about his place was most astonishing. The Torres Straits Islands serve as resting places for the birds crossing from New Guinea; Booby Island is evidently thus used, and the number of its land-birds is thus to be accounted for. This island corresponds thus in this respect with such an island as Heligoland. . . . It is the last place in the world, as viewed from the sea, with clouds of Boobies hovering over it, from which one would expect two new land-birds [a Dove and a Rail described by Gould] to hail. Our officers laughed at the notion of there being quails or anything to shoot upon it. . . . On August 13th, 1841, the officers of the 'Beagle' shot 145 quails, 18 pigeons, 12 rails of two species, and 3 pigeons ["doves" in Stokes' 'Discoveries in Australia' 1846 II, 330]." The contents of the game-book of the "Beagle" when among the islands of the Arafura Sea are large and interesting, though unscientific; an extract is given by Stokes, l. c. The transit of the Australian Bee-eater, *Merops ornatus*, across the Torres Straits has been remarked upon by two observers (see p. 250). This bird takes some weeks to travel from here to its breeding grounds in New South Wales.

Touching migration in Australia Mr. A. J. North (*in lit.* 7. VIII. 1894) has most obligingly furnished us with the following: "There is nothing published in the Proceedings of any society beyond a paper contributed by Dr. E. P. Ramsay to the Ornithological Congress held . . . in Vienna about twelve years ago . . . As there pointed out by Dr. Ramsay we have, comparatively speaking, but very few migratory birds in Australia, but a great number of nomadic species which shift from one point of the country to another, many of them appearing regularly every season in the spring to breed and returning north or west directly the cold weather sets in. From my notes which I have kept for the past twenty years I will give you the date or time of arrival and departure of the species asked for . . .

"*Chaetura caudacuta.* This bird arrives in New South Wales during the hottest months of the year. I have noted them as early as December, but they usually arrive in January and depart again about the middle of April. I have never seen them resting, they pass the whole of the day on the wing.

"*Cypselus pacificus.* Arrives and departs at the same time as the preceding species, with which it is more often than not seen in company. It is not, however, so numerous as *C. caudacuta.*

"*Eurystomus pacificus* and *Scythrops novaehollandiae.* These species arrive in Northern Queensland about the end of August, but their appearance is influenced greatly by the season; sometimes it is at the end of September, and in 1892 it was as late as the 12th of October when *Eurystomus* arrived. They leave again on the approach of cold weather about the end of April. In New South Wales *Eurystomus* arrives usually about the middle of September and departs again early in April. I saw young birds nearly fledged taken from their nesting place in the hollow limb of a tree near Newcastle on the 3rd of October, 1893; this was very early for New South Wales.

"*Halcyon sancta.* The main body of these birds arrive in N. S. W. during August and the early part of September, breed and depart again by the end of March; I have, however, noted straggling pairs during the intervening winter months. In Northern Queensland this bird is a resident species.

"*Circus assimilis* (*C. jardinii* Gould). This bird arrives in N. S. W. during the month of August and is frequently met with in the small clumps of pine (*Callitris*) growing out on the plains in the inland portions of the colony, and in which it is often found breeding during September and October. It takes its departure again about the end of January or middle of February."

The paper of Dr. E. P. Ramsay's referred to by Mr. North will be found in the "Ornis" 1885, pp. 581—584. The author remarks: "One thing with respect to our Australian fauna must be carefully borne in mind, strictly speaking we have no migration among our birds"; and again: "The term 'migratory' as understood by European naturalists, does not apply to any Australian species, the term I propose for these is 'nomadic'". Dr. Ramsay considers that Australian birds wander from place to place in quest of fresh feeding grounds and suitable breeding quarters; when they have reared their young, they retire to another part, sometimes only 10 or 20 miles away. "The *Hirundinidae*, our species of *Gallinago*, *Rhynchaea*, *Merops*, *Artamus* and some *Rallidae*, make the closest approach to a migration here as they sometimes wander from the north to the south of Australia". We know nothing about the endemic species of Australia, but, as regards others which occur in Celebes, Dr. Ramsay's statements are certainly more or less erroneous and misleading. Two to four natives of Australia occur only as migrants in Celebes, in the same manner as a number of natives of the northern hemisphere reach the island and proceed as far as Australia in the south. Evidences of remarkable migrations across the Torres Straits have been given above. Of birds breeding in Australia *Merops ornatus* (though a few probably stay out of the general migration on occasions) is known to be a migrant to Celebes and the Moluccas; *Glareola isabella* and *Halcyon sancta* are almost equally certainly such; the Australian form of *Eurystomus orientalis* has been recorded from Celebes and probably correctly, though we confess to an inability to distinguish the supposed races of this bird. *Circus assimilis* and *Scythrops novachollandiae* seem to be residents in Celebes, though it would be a matter for no surprise if their numbers ultimately proved to be affected by migration to and from Australia. Some of the greatest migrants of the North travel to Australia, among them being the following visitors to Celebes: *Cypselus pacificus*, *Squatarola helvetica*, *Charadrius fulvus*, *Aegialitis vereda*, *A. geoffroyi*, *A. mongola*, *Strepsilas interpres*, *Totanus glottis* and *glareola*, *Heteractitis brevipes*, *Actitis hypoleucos*, *Terekia cinerea*, *Tringa acuminata*, *Tringa ruficollis*, *Limosa novaezealandiae*, *Numenius minutus*, *N. variegatus* and *cyanopus*. There are also several other species about which particulars as to migration would be very welcome, such as *Turnix maculosa*; the Herons, *Herodias eulophotes*, *H. alba*, *H. garzetta*, *H. intermedia*, *Notophoyx novachollandiae*, *N. picata*

and *Nycticorax caledonicus*; and the Rails, *Hypotaenidia philippensis*, *Amaurornis cinerea* and *moluccana*. Dr. Ramsay's term "nomadic" for wandering Australian birds denotes an initiatory form of migration not of a regular half-yearly character, but, as is shown by the above species, a development of the migratory habits is sometimes found as high as in many species of the northern hemisphere.

The return-migration. — Birds do not appear always to return in spring by the route pursued in autumn, often, apparently, being rare or absent in one season in districts through which they pass in abundance in the other season.

Birds which stay behind in their winter quarters. — It seems to be a very common occurrence for a few individuals to stay throughout the year in the winter resorts of the species. Among Celebesian species which have been found in the island after their fellows have departed to their breeding localities in the North, or, respectively, the South, may be mentioned: *Merops ornatus*, *Motacilla flava*, *Charadrius fulvus*, *Aegialitis geoffroyi*, *A. mongola*, *A. curonica*, *Totanus glottis*, *T. glareola*, *Heteractitis brevipes*, *Tringa acuminata*, *T. ruficollis*, *Numenius variegatus*. To these *Motacilla boarula* and *Anthus gustavi* should probably be added; the first has been sent to us from Manado tua as late as May, the Pipit as late as May 26th. Other instances of migrants killed in the Moluccas and elsewhere at dates when the main body of their species is absent will be found in the text. During his travels in Polynesia Dr. Finsch found many Waders of several species on the Marshall and Gilbert atolls of the Central Pacific in the summer months; and similar observations will be found in "Stray Feathers" and elsewhere.

It is unprofitable to speculate on the cause of this violation of the general rule, as the possible explanations are many and the individual judgment is prone to select that which conforms best to its own prejudices. Several reasons may indeed work together in inducing these birds to stay behind. The following is likely to escape general observation, viz. the time of shedding the remiges varies in individuals[1]) and a bird with its powers of flight thus diminished at the spring migration might well hesitate at attempting the journey. Or an accident — a broken wing or leg — may delay an individual, and as observers know, one or more sympathetic companions will be likely to remain by the injured one with a devotion equal to that of man himself. In other cases, as, for instance, the individuals on the atolls in the middle of the Pacific, it may more plausibly be supposed that the birds had lost their way. At other times it looks as if the birds remain behind simply from choice. But, though in Natural History it is almost always impossible to assert that a certain this, and this only, is the true explanation, it is happily sometimes possible to show that some other is an untrue explanation. Thus, it has been asked in Baird,

[1]) See pp. 739, 744, 747, 761, 762, 765, 768, 772, 798.

Brewer and Ridgway's "Water Birds of North America" 1884 I, 123, whether those birds which spend the summer in the winter haunts of their species are not old, effete and barren individuals. This suggestion is negatived by the fact that among such visitors to Celebes five species have been known to breed in some part, or parts, of their winter range, viz. *Charadrius fulvus*, *Aegialitis geoffroyi*, *A. mongola*, *Strepsilas interpres* and *Limosa novaezealandiae*.

Causes of migration. — It may be tritely said that birds migrate in autumn to feed, in spring to breed! At the approach of winter most birds must of necessity proceed towards the tropics, or starve, owing to the disappearance of their food through death or hibernation, or through concealment under snow or ice. In spring the temperate and arctic regions produce an abundance of food and, it may be presumed, offer safer and easier conditions for the propagation of the species than is found in the tropics; the birds then repair to their native haunts. Naturalists, who seek for physiological conditions to account for the actions of the subject, may find a stimulus for the spring migration in the annual development of the reproductive systems, while the approaching autumnal moult of the remiges may sometimes serve as a warning to species that it is time to accomplish their flight towards the equator, for many of them leave long before the cold sets in. Waders killed in their winter quarters in the Celebesian area in the late autumn or winter months are generally found to be moulting some of their remiges. Possibly, however, the chief motive for the spring migration is to be found in the love of home so strongly developed in birds, for without this it is conceivable that they would attempt to establish themselves in the tropics for breeding purposes. Instances of the marvellous regularity with which individuals return to the old breeding haunt after a journey of hundreds, or more often thousands, of miles have excited the admiration of all field-observers. That the young birds also sometimes follow their parents to their birth-place is shown by a case given on p. 48 (text). But it seems to be the case — which is not so generally known — that birds display a very similar adhesiveness in the choice of their winter quarters. An instance of enormous numbers of Wagtails and Swallows returning two years in succession to roost in a coffee garden in Ceylon, as observed by Mr. S. Bligh, will be found on p. 537; and Davison states that a large number of migratory *Collocaliae*, which had taken to roosting upon a certain spot about a yard square against the roof of a shed in the Andamans, disappeared when the building was pulled down, only to come again and occupy the same spot on a new shed, which had been put up on the identical site (p. 332). There are no rookeries near Dresden, but every year about the beginning of November great numbers of Rooks and Jackdaws pass over the neighbourhood for many days in succession[1], and some spend the winter there.

[1] The flocks fly high, so that it is sometimes difficult to detect them with the naked eye. The mode of progress is very slow in a S. or S.W. direction, perhaps at the rate of 12 miles an hour, and conducted with much cawing and calling and circling in the air, as if none wish to have the responsibility of leading the way.

Two or three individuals often make their appearance in the daytime in the Bismarckplatz in the town each year, though they are not always driven there by cold and hunger, and they are most likely the same birds each season. There is an autumnal migration route of Wild Geese (*Anser segetum*) at Grossenhain near Dresden, the birds making their appearance during their transit to the South every year on the fish-ponds at this place, but only quite exceptionally on the fish-ponds at Moritzburg some 10 miles to the S.E. Mr. Schwarze of the Dresden Museum informs us that Kingfishers did not occur in summer at his native village in Saxony, but were to be found every winter, when the fish-pond was frozen over, at the inlet or trap where water was let in, and where there were plenty of small fish. The Grey Crow, *Corvus cornix* L., visits the Eastern counties of England in great numbers every autumn; these birds do not proceed far inland, being unknown in the Western counties; and such is almost equally the case in the Southern Midlands, for instance, in Northern Buckinghamshire. Yet these parts of England appear to be quite as capable of sustaining them as the Eastern counties. Mr. W. Eagle Clarke's "Digest of the Reports on Migration" should also be read in this connection.

If the birds remember their final and intermediate halting-places so well, it appears that they must find their way in migrating by means of such familiar land-marks and stations. It is well known that "homing" Pigeons are lost if turned out in a strange country, and these birds are trained for long flights by breaking the journey into a number of stages and thus gradually lengthening the familiar landscape. In the same way it can well be understood how such a bird as *Phylloscopus borealis*, which migrates from Norway across Siberia to the East Indies, may originally have been a native of East Siberia, but extended its breeding range for a mile or two at intervals, the advanced individuals flying back over the known track to their comrades in autumn; while the young generation gathered experience from the older travellers, and thus the ancient traditional route was increased in extent.

Nevertheless it should be pointed out that Professor Newton, who was one of the first to examine the "homing" faculty of Pigeons in the hope that it might afford a clue to explaining how migrating birds find their way, has since been led to abandon it, holding that ocular memory as the guiding medium is disproved by three facts; first, that migrating birds fly over the open sea, sometimes thus traversing as much as a thousand miles before they can reach land; secondly, that much migration is done in darkness at night, sometimes at high elevations; thirdly, that "among migrants the young and old always journey apart and most generally by different routes". These reasons may well be considered beyond all objection by many ornithologists, but by others not so. A bird may take its direction across the vast open expanses of the Pacific, as has been already remarked, by means of the familiar lay of the land at starting, the rise and setting of sun and stars, and, as Prof. Möbius has suggested, by the direction of the roll of the waves; also by ascending to a height of 10 000

feet (which seems to be within what has actually been observed — Dict. B. p. 563) a hill of 2000 feet could be seen at a distance of 190 English miles, and similar heights in the land the bird is leaving would disappear at this distance behind.[1]) This of course could only take place under suitable atmospheric conditions, but, should such conditions be thought impossible, it may be mentioned that Meyer when in Celebes was able from the top of Mt. Klabat (over 6000 feet) to see the islands of Maju and Tifore in the Molucca Straits, a distance of about 90 English miles, and the guide, the Hukum kadua of Ayermadidi, who had ascended the mountain four times, stated that Ternate could sometimes be seen, a distance of about 170 miles. The hills of Tifore are only 300—400 feet high, but the Peak of Ternate reaches 5300 feet. The effects of refraction may still further increase the length of view. It would be of interest to know whether the birds ever attempt their great journeys across the Pacific at night. As to nocturnal migration it should be remembered that nights are seldom of a "pitch" dark character, when we are not aware that birds[2]) are heard migrating, and it is not unreasonable to suppose that they keep in view the outlines of the country over which they wander. As to the young birds migrating alone, it may be that a small percentage of adults among them may have been overlooked by those who have made these statements; like many others we do not entirely trust the evidence. But if it be accepted, such cases seem to point to "inherited experience", the young bird recognising the right way by innate knowledge, in the same manner as a newly hatched chick knows that grains of rice are good to eat. If birds have a "sense of direction", why do they take such indirect routes to their destinations?

[1] Prof. Pattenhausen of the Royal Technical School in Dresden has most obligingly given us the following formula for making this computation: Granted the atmosphere as perfectly transparent and, further, that the rays of light travel directly onward from the surface of the sea, the equation is:

$$s = 3{\cdot}8\,(\sqrt{h} + \sqrt{h'})$$

when h = the height of the point of view in metres,
h' = the height of the object seen in metres,
and s = the radius of view in kilometres.

[2] Diurnal birds almost certainly have a long and clear range of vision, although it may not be fair to cite the Vulture, Kite, and Kestrel in proof. At night they seem to experience much the same difficulty as ourselves. Those who have practised netting along hedgerows with a beater on one side and a double-handed clap-net on the other are well aware that it is next to no use attempting to catch birds except on dark nights, and even then the great majority see the net against the sky and avoid it. But the manner in which a scared party flutter in some neighbouring hedge to which they have flown, is in part due to the difficulty they have in finding a perch in the dark, and shows that they do not see distinctly.

4. VARIATION.

The phases of Variation, or Modification of Structure and Plumage displayed among the birds of Celebes may be conveniently considered under the following headings:

1. Individual Variation; the differences peculiar to the individual.
2. Geographical Variation; as shown by local races, subspecies, or species.
3. Seasonal Changes; such as peculiar summer and winter plumages in birds.
4. Sexual Differences; the secondary sexual characters.
5. Changes depending upon Age; the development and decadence of the individual.

1. Individual Variation.

The assumption that no two individuals are ever exactly alike seems to be completely justified by facts. No one, probably, is so fully aware of this, as the zoologist, who is called upon to make the closest possible comparison of large series of individuals of the same race. In the course of writing the present book, for instance, which is chiefly based upon a study of the external coverings, and bills, legs and feet of Celebesian birds, with occasional reference to their skeletons — some thousands of specimens have been examined, yet to the best of our knowledge no two of them were exactly alike; moreover in the text several thousand measurements of parts will be found, yet we believe that hardly any two cases occur in which four terms (wing, tail, tarsus, bill are the same. There are some very close observers of Nature to whom a knowledge of this infinite diversity of form is perceptible; who, as children, are conscious of the peculiarities of individual Sparrows or the differences in blades of grass; others, and amongst them men of learning, have never had their eyes opened to the fact, and assert that exactly the opposite is the case. Thus the idea of a uniformity of the individuals of a species is encouraged by the latter, with its consequence, that species were evolved *per saltum*. This position is partly the result of a system of nomenclature which no longer meets the needs of our time. There are of course species — groups of individuals possessing some character (or characters) never so found in any other group, — but each individual has its own peculiarities, and an ideal system of nomenclature can only

be attained when each specimen is compared with the type — the first-described individual — of its species, and a formula representing the difference appended to the binomial name. Such a method is however impossible at present for practical reasons; there is no means of measuring the differences in question. Another reason why individual variation finds so little mention from those who have most experience of it is that for a long time a strong effort has been made to enforce the recognition of subspecies; the effect of this has been to give undue prominence to geographical variation and to divert attention from individual and other phases of variation, which form exceedingly difficult factors in the study of local races, and are for that very reason disregarded by careless or ignorant writers.

Range of individual variation. — Compared with some other animal forms, for instance, certain Beetles, individual variation in birds (other than domesticated races) keeps within somewhat narrow limits. The maximum as regards variation of plumage is seen in the male Ruff *(Machetes pugnax)*. The extinct Solitaire *(Pezophaps)* of Rodriguez was also extremely variable; its osteological remains show that "the variability of colour he (Leguat) had noticed in the females — some fair, some brown — was paralleled by the marvellous variability displayed by almost every bone of the skeleton" (Newton, D. B., 890). Other familiar examples of high individual variability among birds are furnished by the Honey Buzzard *(Pernis apivorus)*, the Common Partridge *(Perdix cinerea)*, and the Common Crossbill *(Loxia curvirostra)*. The minimum of individual variation is perhaps found among certain highly local species of Pigeons, such as those of the genera *Ptilopus* and *Osmotreron*; also many Sunbirds, Kingfishers, Parrots, etc., seem to be very stable in this respect. The differences separating many species of Pigeons are so small that it creates a feeling of surprise to find that large series of specimens do not present every sort of intermediate form and other modification. Under domestication, on the other hand, the Blue Rock Dove has displayed a most remarkable variability. A high degree of individual variability is sometimes found among species of birds in which the sexes are dissimilar (e. g. *Machetes*, *Macropygia*, *Gallus*), but the sexes are dissimilar also in *Ptilopus*, *Osmotreron*, the Sunbirds, and other stable forms, so that this factor evidently has no direct influence in the matter.

Some species vary much in the measurements of various parts of the body, but little in coloration (e. g. *Streptocitta*, *Amaurornis moluccana*); others vary much both in size of parts and in coloration (e. g. *Halcyon chloris*, *Xanthocnus flaricollis*). Highly specialized features are generally very variable: for instance, the long tails of *Streptocitta*, *Phoenicophaes* and *Fregata*, the long hind claws of *Centrococcyx* and *Hydralector*, the long bills of *Limosa* and *Numenius*, the long tarsus of *Himantopus*; but age also plays an important role in this connection.

Psychological differences of individuals. — Persons who have closely observed or have kept wild species in confinement have often noticed differences of

temperament in individuals; some are bold and fierce, others more gentle; some more clever, others more stupid; some trustful, others shy; and so on. A marked "individuality" in birds may sometimes be noticed in their choice of their feeding grounds and nesting spots.

Monstrosities. — Cases of exceptional individual variation, infraction of the rule of bilateral symmetry[1]) etc., have not fallen under our observation among Celebesian birds. There is a tame Duck with webless toes in the Sarasin Collection from North Celebes.

Albinism, Melanism, etc. — Among genera occurring in Celebes albinism, partial or complete, seems to be most frequent in the Coucals, *Centropus* and *Centrococcyx*. The Hornbill, *Cranorrhinus* sometimes displays white spots on the tail, but this may be a partial reversion to a form with a white band across the rectrices, as seen in some allied Hornbills. Cases of albinism are so common in the Heron, *Demiegretta sacra*, that this species may be rightly termed dimorphic. A further advance of albinism is seen in species which are now always white, such as certain Herons and Swans, for it seems certain that these birds were at one time coloured species.

According to the observations of Mr. K. G. Henke (see, besides, Z. ges. Orn. 1886 III, 268), albinism, when partial, does not conform to the rule of bilateral symmetry.

Partial melanism occurs in a highly variable degree in the large Talaut Oriole, *Oriolus melanisticus*, which appears to be developing into a species with a black upper surface. The Bittern, *Xanthocnus melaenus* (Salvad.) may ultimately prove to represent a case of frequent melanism in *X. flavicollis*. Permanently black species among Celebesian birds are *Ictinaetus malayensis* (when adult), *Surniculus musschenbroeki*, *Eudynamis* (males), *Rhabdotorrhinus exaratus* and *Cranorrhinus cassidix* (females), *Dicrurus*, *Corvus*, *Limnocorax*.

Examples of individual xanthochroism in *Trichoglossus ornatus* have been mentioned by Brüggemann, Meyer, and Guillemard among Celebesian birds (see text, p. 121). The species of *Cacatua* and *Myristicivora* are probably permanently xanthochroistic forms. The sulphur tint of the plumage of the former in life[2]) is due to the absence of the pigment fuscin, the colour parrot-green being caused by the yellow pigment psittaco-fulvin lying on the fuscin (see, Meyer, Sitzb. Ak. Wiss. Berlin 1882, 518); and the similar tint in the Nutmeg Pigeons is probably caused in the same manner, very possibly by the same pigment.

Dichromatism. — The phenomenon of dimorphism seems to be classifiable under Individual Variation, although there are cases where it appears to mark the commencement of the evolution of a new species. The best illustration of

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[1]) See below p. 68.

[2]) It fades through exposure to the light in course of time in skins and stuffed examples, leaving the plumage white.

dichromatism among Celebesian birds is afforded by the Heron, *Demiegretta sacra*; this bird is ordinarily slate-coloured, but a pure white form is very frequent, and in some parts of its range, as in the Andamans, white individuals number some 20 per cent of the species. The two forms are known to breed together, and pure white young ones, as well as the usual dark ones, are known from the nest; piebald specimens are also not uncommon. It may well be, as has been suggested by Dr. Stejneger, that *Demiegretta sacra* will in the end become a pure white species, like the allied Herons of the genus *Herodias*, one of *Ardea*, and *Bubulcus* (when not breeding). In other parts of the world three more Herons are known among which white individuals are of very frequent occurrence (see text, p. 822).

The genus *Spilornis* is supposed by some ornithologists to be dichromatic when young, but further proof of this is wanting (see p. 3). *Ardetta eurhythma* perhaps makes an approach to dichromatism, since the male is sometimes known to breed in its immature dress (the ordinary female dress), and a female is occasionally found in the male plumage. Other cases of dichromatism have not been found among Celebesian birds, and the phenomenon is indeed always rare in ornithology.

Modifications of the individual due to foreign violence, such as injuries to feathers and parts of the body, disease, effects of shelter and exposure, of food etc. cannot be discussed here, as leading too far. Only a remark or two. The heredity of oft-repeated external action on feathers is discussed below, pp. *73—79*. Remarkable effects may sometimes be produced by food, such as the conversion of Canaries or white Fowls into red ones by feeding them with Cayenne pepper. Isabelline-coloured Pigeons fed with crumbs coloured with Methyleosine were turned into birds of a permanent red tint, and green Australian Parrakeets (*Mellopsittacus*) supplied with millet coloured with Methylviolet were converted into blue birds, the yellow forehead becoming white or dirty white (Sauermann, Mitth. Ornith. Vereins Wien 1890, pp. 92—94). Parrots (*Sittace*) in Brasil are made to change colour into yellow by plucking out feathers and inoculating the wounds with a frog's or toad's blood or with the milky secretion from its skin; when the new feathers grow the colour is changed. The common Amazonian green Parrot *Chrysotis*, if fed with the fat of large Siluroid fishes, becomes beautifully variegated with red and yellow feathers. In Halmahera *Lorius garrulus* is said to be influenced in a similar manner. (After v. Martius and Wallace, communicated by Meyer: Sitzb. Ak. Wiss. Berlin 1882, 521.)

Thus we imagine that a bird flying to a neighbouring island and finding there another sort of food, may, if settled there, acquire some new character in coloration; e. g. *Loriculus stigmatus* flying over to Banggai becomes *sclateri ruber*, to Togian Island *quadricolor*, etc. etc., these forms only differing slightly. Such alterations may occur *per saltum* or at least quickly, not requiring generations. A fruit from Batavia planted at Manado does not always remain the same, as

is well known there; wood-ruff transplanted from the woods loses its aroma. Examples could be added by scores. Though we cannot explain these alterations mechanically, facts remain; so it is with insignificant variations in the colours of birds in new localities, if isolated. How easily colour may be influenced is shown by the following case of one of the *Musophagidae*, *Corythaix albocristatus*, first made known by Dr. Chenu (Encyclopédie D'Hist. Nat. Oiseaux 2me partie 1855 p. 55): "Une particularité remarquable, dont nous devons la communication à Jules et Édouard Verreaux, si bons observateurs, c'est que les douze ou quatorze pennes alaires, qui sont d'un si beau pourpre violâtre, perdent cette couleur chez les individus vivants, lorsqu'elles ont été mouillées par la pluie: si, dans cet état, on vient à les toucher ou à les frotter avec les doigts, ceux-ci se trouvent aussitôt rougis par la couleur pourprée qui a déteint sur eux; et, en séchant, ces mêmes plumes reprennent leur éclat primitif. Sur la dépouille de l'Oiseaux, aucun effect semblable ne se produit. Ce fait nous paraît unique dans la classe des Oiseaux."[1]) Though this be exceptional, no doubt chemical or mechanical alterations of colour occur elsewhere, be they dependent on food, light or other external influences, touching which we know next to nothing at present. Alteration of colour in individuals, gone astray to isolated localities, leads us to geographical variation, which should next be treated of.

2. Geographical Variation.

Although it is conceivable, and indeed likely, that a new species may sometimes owe its origin to dimorphism, a condition which may be ultimately due to the successful multiplication of a single case of exceptional individual variation, it is nevertheless far more certain that the great majority of the peculiar forms of Celebes and the neighbouring islands are what are termed geographical species or local races, which have developed their distinctive characters while geographically isolated from one another. In the Celebesian area there are about 150 species of this description now known, not to speak of a large number of partially formed races. The latter are in many respects the most interesting, as they show species in the first stages of their differentiation, and their study holds out the best hope of solving the problem of the origin of species — or at least of the majority of species. The differences seen are often very small, but of a very palpable description, as, for instance, the broader black border to the secondaries of *Eos histrio* in Sangi, the narrower border in Talaut; the darker grey of the head of *Phoenicophaes calorhynchus* in North Celebes, the lighter grey in the South, and so on. These differences may be due to an inherent tendency in the individuals in question to evolve

[1]) Compare Schlegel: J. f. O. 1858, 381; A. Bogdanow: C. R. Ac. Sc. Paris 1857 XLV, 311 and 1862 LIV, 660; Brehm Tierl. 3. ed. 1891 V, 138; Krukenberg: "Die Farbstoffe der Federn" in his Vergl.-Physiol. Stud. 5. Abt. 1881, 75.

in a certain direction (as a complete ceasing from all variation, even under unaltered conditions, is inconceivable in the course of the propagation of organic forms), or they may be caused by local influences. For some cases the former assumption appears unavoidable; for other cases there is satisfactory evidence of the effect of local influences, though the exact nature of these latter is almost always uncertain; as a rule, probably, both causes operate together, but it very rarely happens that an opinion either way is permissible at present. In illustration of independent development in the same direction it may be mentioned that the genus *Loriculus* has produced two species with very similar red crowns in Ceylon and in the Southern Philippines; and a corresponding distribution of markings is seen in the plumage in the two forms of Celebes (*L. stigmatus*) and Sooloo (*L. bonapartei*), which are not closely related to one another (see p. 163 et seq.). Local influences are sufficiently indicated when a number of species are found to vary in the same place in a corresponding manner; for instance, two phases of modification have been detected by Mr. Allen among North American birds and are recapitulated by Professor Newton (Dict. B. 1896, p. 1005) as follows: there is "a general increase of intensity toward the south and development of dark markings at the expense of the light intervening spaces. so that of brightly-coloured species southern individuals are the most brightly coloured, and some tints, which to the northward cannot be called brilliant, become vivid in a lower latitude. In respect of longitude Variation occurs with like regularity, the differences appearing to hold a direct relationship to the humidity of the climate. Thus on the dry plains of the middle and western parts of the continent birds have a pallid complexion, while on the Pacific slope they resume nearly the tints of the eastern form, though further to the northward, in the rainy belt that extends along the coast of British Columbia, they acquire a depth of colour far in excess of that which they display on the Atlantic border."[1]) In such cases the direct influence of climate upon the colours appears to be proved.

The following instances of correlated geographical variation are noticeable among the birds of the Celebesian Province.

Increase of size in the Sangi and Talaut Islands. — The local species or races of Sangi and Talaut having their nearest affinities with species on the mainland of Celebes are:

[1]) This quotation, which we have reprinted, is only from a résumé of Mr. Allen's original memoir: "On the Mammals and Winter Birds of East Florida" Bull. Mus. Comp. Zool. Cambridge, 1870—1, II, pp. 161—450, plates IV—VIII which should be consulted here, chiefly pp. 239 sq., where he says: "Causes of Climatic Varation. — ... The southward increase in depth of color and in iridescence in birds specifically identical coincides also with the general increase in brilliancy of color in birds, taken as a whole, in the lower latitudes as well as in insects and animals generally), the maximum being reached in the tropics. — The longitudinal Variation, or the westward increase in color, seems to be also coincident with the increased humidity to the westward, the darker representatives of any species occurring where the annual rainfall is greatest and the palest where it is least ..."

Sangi	Talaut
1. *Tanygnathus muelleri sangirensis* M.Wg.	1. *T. muelleri—sangirensis*
2. *Ceycopsis sangirensis* M.&Wg.	
3. *Cittura sangirensis* Sharpe	
4. *Hypothymis rowleyi*[1]) (Meyer)	
	2. *Dicaeum talautense* M.&Wg.
5. *Acmonorhynchus sangirensis* (Salv.)	
	3. *Hermotimia talautensis* M.&Wg.
6. *Anthreptes malaccensis chlorigaster* (Sh.)	
7. *Zosterops nehrkorni* W. Blas.	
8. *Calornis panayensis sangirensis* (Salv.)	4. *Calornis panayensis sangirensis* (Salv.)
9. *Osmotreron sangirensis* (Brügg.)	
10. *Ptilopus xanthorrhous* (Salv.)	5. *Ptilopus xanthorrhous* (Salv.)
11. *Macropygia albicapilla sangirensis* (S.)	
12. *Megapodius sangirensis* Schl.	6. *Megapodius sangirensis* Schl.

To the Talaut list the following species having their nearest affinities in the Philippines and elsewhere should be added: 7. *Tanygnathus talautensis* M.&Wg.; 8. *Zosterops babelo* M.&Wg.; 9. *Oriolus melanisticus* M.&Wg.; 10. *Carpophaga intermedia* M.&Wg.; and to the Sangi list should be added *Oriolus formosus* Cab., allied to Philippine and Sula forms.

There are about 17 species in Sangi with near affinities to forms on the mainland of Celebes, but which have developed more or less appreciable local differences. Of these 17, no fewer than 12 named in the above list have increased in size in Sangi, while two others, *Prioniturus platurus* and *Dicaeum sangirense*, are probably also a trifle larger than their relatives on the mainland. *Dicrurus leucops*, *Hermotimia sangirensis* and *Pitta caeruleitorques* have not increased in size, but they are at the same time not smaller than their Celebesian allies. In no case have Celebesian species decreased in size in Sangi.[2])

The imperfectly explored Talaut Islands are at present known to possess 8 peculiar species allied to forms belonging to Celebes or the Philippines, not counting 2 with Moluccan affinities; and to these eight should be added 4 Celebesian forms which Talaut possesses in common with Sangi. Ten of these twelve species display a marked increase of size in Talaut, and the other two show no reduction.

The converse supposition that the large forms of Sangi and Talaut represent the original size and that the races of Celebes and the Philippines are those which have undergone alteration, viz. reduction in size, is not plausible. The islands seem most obviously to have been colonised chiefly from the mainlands

[1]) Nearest affinities uncertain.

[2]) From the island of Siao belonging to the Sangi group a single very small specimen of an Owl like *Scops manadensis* has been described by Schlegel as *Scops siaoensis*. Its distinction is not admitted in this ork (see p. 104).

of Celebes and the Philippines, and not Celebes and the Philippines from them; their volcanic or coral character (see de Hollander, Land- en Volkenkunde Ned. Oost. Ind. 1884, II. 234) and the absence of heavy, ill-flying birds and of peculiar generic types speak for the recent upheaval and colonisation of these islands[1]. It might happen that a species or two on the mainlands subsequently became smaller, but there is no reason to assume that the twenty species which remained in Celebes and the Philippines all became small hereafter, while those which had peopled the islands all maintained the original sizes of the species. On the other hand there is reason to anticipate that the individuals of these twenty species which had emigrated to the new islands would undergo alteration of some kind or other, for the conditions of existence are not precisely the same there. It appears, therefore, quite safe to assume that Celebesian and Philippine birds develop as a rule into larger races in Sangi and Talaut[2].

As is usual in such cases it is not difficult to find more than one explanation why these things should be so, but not easy to decide which explanation is the true one. The most plausible suggestion is that the dangers are fewer and the struggle for partners perhaps more severe in Sangi and Talaut than on the mainland. Hawks and Falcons which prey upon birds seem to be very rare in these islands; so far not one bird-eater, strictly speaking, has been killed in them, for *Tachyspizias soloensis*, the most dangerous to small birds, is not only a migrant but feeds to a great extent on insects. Moreover there are no monkeys in Sangi and Talaut, and other enemies, which could be dangerous to breeding birds, their nestlings and eggs, are rarer than in Celebes and the Philippines. The chief competition therefore that goes on would appear to be among the birds themselves, and the largest and strongest will be more likely to secure nesting quarters and partners than the smaller and weaker[3].

Decrease in size in Sula. — Two Birds-of-prey and two Pigeons display a slight reduction in dimensions in the Sula Islands, viz. *Spilornis rufipectus*, *Accipiter sulaensis*, *Turacoena manadensis* and *Macropygia albicapilla*. Sula seems to resemble Celebes in its Birds-of-prey.

Differences in size in the North and South Peninsulas of Celebes. — As a rule the birds agree in their dimensions in these districts, but where there is a difference it seems to be in the direction of an increase in size in South Celebes. *Pachycephala meridionalis* and *Stoparola meridionalis* are much larger than the

[1] Prof. Hickson noticed evidences of recent slight elevation in Talaut (Nat. in N. Celebes 1859, 151, 157).

[2] The case affords a good illustration of our postulate, that colonists become more changed than stayers-at-home (see, p. 162).

[3] It may be added that many ornithologists are of opinion that the males of most species of birds are more numerous than the females, and Dr. Platen certainly collected many more males than females in the Sangi Islands (see W. Blasius, Ornis 1888, pp. 527—646); but it may well be that the superior plumage of the males leads to their being shot and skinned more frequently, and it is preferable not to introduce this doubtful element into the argument.

representative species, *P. septentrionalis* and *S. septentrionalis*, of the North; also *Carpophaga paulina* shows a slight increase in size in the South, and a very small increase is noticeable there in *Streptocitta albicollis* and in *Phoenicophaes calorhynchus*.

Similar geographical variations of coloration. — The Lories of the genus *Trichoglossus* range from Australia as far as Celebes and consist of two groups, *Trichoglossus* proper of Australia, the Lesser Sundas, Papuasia, the Moluccas and Celebes, and *Psitteuteles* of Australia, the Lesser Sunda Islands and Celebes. Count Salvadori (1891) recognises 16 species, all of which have a yellow (in two cases red) band across the base of the remiges, except in the Celebesian area, where there are three species, *T. ornatus* and *P. meyeri* in Celebes, and *P. flavoviridis* in Sula, which have no yellow band. We have, however, found small evidences of a yellow band in two or three immature specimens out of 17 examples of *T. ornatus* and in three young specimens and one female in a smaller series of *P. meyeri* — a significant indication that these species are derived from birds which possessed the band, such as are found inhabiting the countries to the east and south of Celebes to-day. Why the birds have lost the band in the Celebesian area it appears useless to speculate.

Pitta forsteni of Celebes wants the usual white wing-band.

The Serpent-harrier, *Spilornis rufipectus*, and the Sparrow-hawk, *Accipiter rhodogaster*, of Celebes, are represented in the Sula Islands by two closely allied, but slightly smaller forms (*S. rufipectus sulaensis* and *A. sulaensis*). Both of these have undergone a similar modification of the wing, viz. the bars on the under surface of the remiges have become narrower in Sula, or have increased in width in Celebes, as the case may be.

The Cuckoos of the genus *Eudynamis*, which range from the Himalayas to Australia, have pale bills, and the Kingfishers of the genus *Pelargopsis*, ranging from India to the Sula Islands, have red bills, except in Celebes, where both the Cuckoo and the Kingfisher have the bill black, while the bill of the latter is varied with black and red in the neighbouring Banggai Archipelago.

Out of the ten known geographical species of the Talaut Islands three display melanotic influences or, at least, a darkening of their tints; these are *Oriolus melanisticus*, *Dicaeum talautense*, and *Pitta inspeculata*. The Lory, *Eos histrio talautensis*, has, however, slightly less black on the wings than the *typical Eos histrio* of Sangi.

The above cases are included under the heading Geographical Variation, because their peculiarities of coloration seem most probably to be connected with some unknown local influences; there are in the Celebesian area, however, other cases of similar variation, the cause of which seems to be in no way connected with the locality. Such are *Pernis celebensis* and *Spizaetus lanceolatus* which are similar, adult to adult, and young to young, as are in the same way also *Spilospizias trinotatus* and *Accipiter rhodogaster;* while *Muscicapula westermanni*,

Lalage leucopygialis and *Graucalus bicolor* correspond in coloration to a considerable extent, male with male, and female with female. These cases call for consideration later on.

3. Seasonal Changes.

The modifications which birds undergo at certain periods of the year seem to depend sometimes upon climatic, sometimes upon sexual conditions. The breeding season however is regulated by climatic conditions, the young being brought forth at a period when food is abundant; consequently climate should be regarded as promoting all periodic variation. Climate alters the appearance of the surface of the earth — causes it to be clothed with a luxuriant vegetation or covered with snow and ice, now bringing forth an abundance, and then removing the supply of food — and organisms are modified to suit these conditions. In the tropics, as, for instance, in Celebes, where a contrasted summer and winter does not exist, but only a fine and a rainy season, strongly marked periodic changes in the plumage of the birds are rarely seen. More than 160 peculiar species are now known from the Celebesian area, and seasonal changes are not known to occur in a single one of them, though sexual differences are common enough. A few tropical or subtropical Herons (*Ardeola*. *Herodias*, *Bubulcus*), a *Cisticola*, and perhaps one or two others which are resident in Celebes differ when in nuptial and simple plumage, but, in order to see seasonal variation in full evidence, it is necessary to look to the northern temperate and arctic regions. Here, as is well known, most remarkable contrasts of summer and winter plumage are abundantly represented; as, for instance, the varied dress of the Ptarmigan (*Lagopus mutus*) in summer, its snow-white plumage in winter; the black under surface of the Golden Plover (*Charadrius*) in summer, the whitish of these parts in winter. Many northern forms visit Celebes in winter, often in an attire very different from that in which they breed in the North; amongst them may be mentioned the Eastern Golden Plover (*C. fulvus*), and the Grey Plover (*Squatarola*) which undergo a similar seasonal change; the Stints and Godwits which are suffused with rufous in summer; the Glossy Ibis (*Plegadis* which has the under parts chestnut in summer, earthy brown in winter; the Phalaropes; certain Terns (*Hydrochelidon*), etc. These changes are not of a sexual nature, as the sexes differ little or not at all in coloration, and both are subjected to the same seasonal changes; but in many — probably in most — cases where there are any secondary sexual differences these characters are intensified in the breeding season and new markings are sometimes added in the male sex (e. g. the ruff of *Machetes*, the black facial markings in some species of *Aegialitis*, the long tail-feathers of *Vidua*). It may, however, also happen that the sexes are less similar in the winter season than when breeding; this seems to be the case to a slight extent with *Anthus cervinus*.

The moult. — In the temperate and cold regions of the northern hemisphere it is generally admitted that a complete moult takes place in birds in autumn after the breeding season; many species moult again in spring, and some a third time in summer. The principal time for moulting in Celebes, Sangi, and Talaut seems to be from July to December, when the birds probably undergo a complete post-nuptial moult. It is questionable whether signs of a spring moult can be found; on the other hand some species may be found moulting during most months of the year. For instance, specimens in the Dresden Museum of *Heteractitis brevipes* are moulting in January, April, July, August, November; of *Actitis hypoleucos* in January, March, July, November.

Some of the Waders, autumn visitors from the North to Celebes (*Aegialitis geoffroyi*, *Heteractitis*), seem to moult first on the under parts, then the remiges, and finally on the upper surface. No regular order in moulting is pursued in the Black Sunbirds (*Hermotimia*), among which the transition from young to adult male dress can be particularly well observed. The characteristic metallic subgular stripe of the Celebesian species makes its appearance first, but the rest of the plumage is developed without any such regular sequence, and there is a specimen of *Hermotimia talautensis* in the Dresden Museum (C 15377) in almost complete adult dress except on the forehead and crown, while a second of the same species (C 13847) has the plumage of the adult on the forehead and most of the crown, but the young dress on most of the other parts. This proves that the transition from the young to the adult dress does not take place in perfect phylogenetic order; that is, the adult characters are not necessarily developed in the young male bird in exactly the same sequence as that in which they were acquired in the evolution of the race (see, also, immature male, pp. 469, 471).

Besides their feathers some birds are known to shed certain corneous appendages or coverings on their bills; for instance, the white Pelican of America has a horny knob on the culmen during the breeding season, but which falls off when that period is over; and the Puffin (*Fratercula*) moults the horny sheath of its bill and the outgrowths over the eyes (Newton, D. B., pp. 599, 600). It is possible that a similar moult of the ribbed plates at the base of the bill of the Celebesian Hornbill, *Cranorrhinus cassidix*, takes place. It is believed by the natives to add one rib-plate each year; and, though this notion is certainly wrong, it is possible that a shedding of the plates has been observed.

Change of coloration without a moult. — In a recent number of the "Auk" (1897, April) Dr. Chadbourne has furnished what seems to be the first really conclusive evidence that a change of colour may take place in the perfect feather, this being caused by a redistribution of the pigments already present in the shaft and barbs. The observations were made on the male Bobolink. *Dolichonyx oryzivorus* (L.), but there can be now no doubt that the principle is

general among birds. The difficulties of making observations are great, and no certain evidence has been adduced from Celebesian birds, but Prof. W. Blasius holds that *Centrococcyx bengalensis* when passing into adult dress is subjected to certain colour changes without moulting (see, also, p. 215 of our text).

The changes in colour of certain corneous or epidermal parts, such as the bills and legs of certain Herons (*Herodias*, *Bubulcus*) in the breeding and winter seasons, may perhaps be placed in the same category as changes of colour in the feathers without a moult (see p. 838).

4. Sexual differences.

In relation to sex it is convenient to gather birds into three groups:

1. Male more highly developed than the female. Examples: *Paradiseidae*, *Trochilidae*, *Cinnyridae*, many *Phasaniidae*, many *Anatidae*, etc., etc.

2. Sexes alike. Examples: *Pittidae*, *Artamidae*, many *Ploceidae*, many *Alcedinidae* and *Cuculidae*, most *Ardeidae* and *Laridae*, etc., etc.

3. Female more highly developed than the male. Examples: *Turnicidae*, *Phalaropus*, *Limosa*, *Hydralector*, *Centrococcyx*, *Rhynchaea*, *Eudromias*, *Casuarius*, *Dromaeus*, the *Crypturi* and others.

To these may be added doubtfully:

?4. Sexes developed on independent lines of evolution. *Eudynamis*, *Monachalcyon*, *Cittura*. The sexes either differ in coloration from the nest or after the first plumage; nevertheless there is some reason to think that the adult female represents an earlier stage in the evolution of the race, and that the species concerned should, therefore, be placed in the first group. Thus the female of the Black-billed Koel, *Eudynamis melanorhyncha*, resembles another Cuckoo, *Centrococcyx bengalensis*, when the latter is in first plumage; *Monachalcyon monachus*, especially the female, bears resemblance to *Halcyon hombroni* of the Philippines; the female of *Cittura cyanota* is more like both sexes of *C. sangirensis* than is the male.

It is not to be understood that these groups are always sharply characterized and easily distinguishable; on the other hand, gradual transitions from one group to another are found: from such contrasts of the sexes as are seen in *Paradisea*, *Gallus* and *Cinnyris* in which the male far surpasses the female in adornment, to *Tanygnathus* and *Zosterops* in which the female is hardly inferior to the male, to *Pitta* and *Myristicivora* in which there is nothing to the human eye to choose between the two sexes, to *Limosa* and *Phalaropus* in which the female becomes rather the finer bird, and so on to *Turnix* in which she is much superior to her partner. It also happens at times that the male is the more advanced in one respect and his mate in another; thus, among the Birds-of-prey the male generally has the more highly developed plumage, but the female is of larger size.

The psychological differences of the sexes. — The rule found among mammals — that the male is more active and wars and works for the sake of the female, while the female is more passive and gentle and devotes herself more to the care of the young — holds good also for large numbers of birds, but in many others the sexes seem to be much alike in temperament and to share duties, while in some species the rule is more or less completely subverted, the male undertaking the "female duties", and the female assuming the usual role of the male. The fact is important, as it shows that there are no mental peculiarities originally bound up with the primary fact of sex. It appears, moreover, that these psychological conditions often (but not always) accompany the three conditions of development of plumage and structure mentioned above; namely, when the male is more highly developed than the female, he is noisy, combative and extravagant of display in his courtship, while the female builds the nest or most of it, incubates the eggs, and takes the chief or sole care of the young; when the sexes are alike, the males are less quarrelsome in the breeding season, less demonstrative in their courtship, and share the work of incubating the eggs and rearing the young; when the female is the more highly developed, she is noisy, pugnacious with other females and courts the male, leaving him to do most or all of the work of hatching the eggs and caring for the young. Thus the highly coloured males of the *Trochilidae*, many *Anatidae* and *Gallinae* seem not to concern themselves for the brood to which the plain-looking female devotes herself most faithfully, whereas the large and handsome female *Turnix* roams about and calls and fights other females, leaving the smaller and plainer male to attend chiefly to the incubation of the eggs and the welfare of the chicks, though indeed she does most of the nest-building and assists a little in hatching the eggs (Krohn, Gefied. Welt, 1894, 190). The female of one of the Emus which is larger than the male and wears a slight top-knot has been observed in captivity not only to leave the entire work of incubation to the male, but apparently to use her utmost endeavours to destroy her young when hatched (Darwin, Descent of Man 1871, II, p. 205).

Among species the sexes of which are much alike in appearance and which share the duties of incubation may be mentioned the Tits, *Paridae*; many Warblers, *Sylviidae*; some Larks, *Alaudidae*; some Buntings, *Emberizidae*; certain Finches, *Fringillidae*; Woodpeckers, *Picidae*, and others; while in other cases the male feeds the brooding female and sometimes relieves her in sitting for a short time (cf. e. g. Naumann's Vögel Deutschlands, 1824, IV, 93 and in many other places). But it is by no means always the case that the finer one sex in birds is in comparison with the other, so much the more he (or she) will abandon the nest, eggs and young to the humbler consort, and that the more similar they are in appearance, the more evenly will they share duties. As instances to the contrary may be mentioned the male Ostrich, which, though the finer bird, broods on the eggs of his wives at night; the females of the Birds-of-prey, which are usually superior to the males in point of size (though not in coloration),

fulfil the usual maternal duties properly; the males of the Swallow, Goldfinch and Hoopoe which, though very like their mates, are said to take no share in the incubation of the eggs; while the male Reed Bunting and Blackcap, which are more highly developed than their mates, nevertheless help a little in hatching the eggs. There appears, therefore, to be no hard and fast law of correlation in the evolution of higher organic development and of mental functions of the "masculine" type; in other words, the structural differences and the psychological differences of the sexes seem to have been developed independently.

Theories in explanation of the development of secondary sexual characters. — Several have been advanced:

1. Darwin (Descent of Man, 1871, pp. 38—238, Birds) accounts for the superiority of the male by reason of the choice by the female of the male which pleases her best (sexual selection), and

2. partly by the survival of the fittest in combat.

3. Wallace (Darwinism, 1889, 289, et seq.) believes that the secondary sexual differences have risen to a higher development in one sex owing to a prepotency of vitality or growth-power, and some evidence is adduced tending to make it plausible that the accessory plumes of the males are developed over centres of high muscular or nervous activity.

4. Wallace (t. c. p. 277, Darwin, t. c. p. 166) adds the complementary theory that the need for protective coloration in the brooding female has prevented her by natural selection from acquiring many of the bright colours and showy ornaments of the male.

5. Stolzmann (P. Z. S. 1885, 421, et seq.) bases a theory on the assumption that among birds the males are more numerous than the females. Any development of colour or markings which is disadvantageous to the males, by rendering them more conspicuous and more easily destructible to foes (whether predaceous animals or males of their own species), will be advantageous for the species, because the superfluous males are parasites devouring food which would be useful to the breeding birds, persecutors of the brooding females, destroyers of the eggs, etc. It is argued that natural selection will favour the preservation of those females which produce male offspring handicapped with such peculiarities of structure, plumage, temperament, etc., as are likely to bring about the destruction of these males.

6. Beddard (Animal Coloration, 1892, p. 282 *et antea*) finds that "the secondary sexual characters of animals are dependent upon the germ glands themselves; and that the sexual diversity of animals is also associated with differences of disposition and habit".

Touching Darwin's theories it is obvious that natural selection in the "law of battle" affords a simple explanation of the development of certain offensive and defensive organs, greater size, strength, activity and courage.

Mr. Wallace's theory of the development of protective coloration in the

female is also easily to be understood on the ground of the elimination of the disadvantageously coloured birds of this sex, yet the explanation does not seem to apply to the majority of cases, in many of which the female is like the male, and in others she is only a little less bright or wants some special marking and appears then to represent a lower stage in the history of the race, as the immature male is often like her. Many males assist in incubation. The female of the Cuckoo, *Eudynamis*, which lays its eggs in Crows' nests does not appear to be protectively coloured, but the male, being black, might be thought to be so.

Darwin's theory of sexual selection has been much contested of late years. The author cites cases of certain female birds in captivity mating by preference with certain males and avoiding others; though allowance must perhaps be made for this in nature, there is now a strong opinion in favour of the view of a passive role being generally played by the female, the male expelling his rivals and making the female yield to him.

There is much to be said for Mr. Wallace's view of an excess of vitality or growth-force in the male as the cause of the development of superfluous decorative plumes, etc., though a localization of such growths in the skin "over centres of high nervous or muscular activity" is not tenable. For instance, the second primary of the male *Macrodipteryx*, an African Nightjar, is developed into an enormous racket-feather capable of erection; three long racket-feathers sprout from each side of the head of the male of the Paradise-bird, *Parotia*, one very long one in *Pteridophora*, etc., etc. As the principal muscular and nervous centres are not different in birds, such a great diversity in the location of the accessory growths could not arise from this cause. Why does the male *Paradisea* have its ornamentation chiefly on the side of the breast, and another Bird of Paradise, *Lophorhina*, on the occipital region and jugulum?

Mr. Wallace's theory appears to include "the normal development of colour due to the complex chemical and structural changes ever going on in the organism" (Darwinism, p. 288), for the sex which possesses the most growth-force will be the first to undergo these necessary modifications. It is probable that a great number of sexual differences owe their origin to this developmental law. (See *Loriculus*, *antea* p. 57).

Mr. Stolzmann portrays the two sexes as naturally inimical to one another's well-being. The males above a certain number are useless parasites, they diminish the food-supply and persecute the females; ill-fed females produce an excess of male offspring, and the female for her own preservation produces males which are disastrously equipped for the struggle for existence. We are unable to grasp the argument, if indeed it is a valid one, for it appears to us that the handicapped males will be the first to perish, and the males which will perpetuate the species will be the sons of females which produce the best-equipped offspring. Their qualities being inherited, these males will somewhat counteract the tendency on the part of certain females to produce inferior males, and the latter females will be less likely to survive than their sisters. As their inferior

male offspring will not be allowed to perpetuate itself it would appear that such females will have to breed with the finer males and their harmful effect on that sex will be done away with in course of generations. because the male qualities are transmitted in part to the female offspring as well as to the male.

Mr. Beddard's opinion that sexual dimorphism is mainly dependent upon the reproductive organs is based upon such rare cases as that of a hermaphrodite Chaffinch (p. 262) in which one side of the bird was found to be like the male in coloration, the other side like the female, with the generative systems correspondingly divided[1]). As bearing upon the same matter may be cited the circumstance that old females which have lost their fertilily sometimes assume the male dress.[2]) Such facts appear to be very instructive, perhaps proving that the sexual glands themselves through nervous influences determine the coloration of the integument, intricate questions, which we are not prepared to discuss here. But when Mr. Beddard suggests that the differences in disposition and habit of very many males and females are dependent upon the sexual germ glands themselves he appears to be contradicted by reasons given *antea*, p. *65*.

Exceptional cases. An examination of exceptions often throws more light upon a matter than is afforded by the contemplation of the rule. The female of the Coucal, *Centrococcyx bengalensis*, is much larger and stronger than the male, though of similar coloration; it utters remarkable cries and is not known to take any share in incubating the eggs; the male is small, silent, and it broods on the eggs. Moreover the male possesses only one testicle, the left one being entirely wanting. The conditions have been fully described by their discoverer, Bernstein, in the Natuurk. Tijdschr. van Ned. Ind. 1860, pp. 27—49, pl. I; and mentioned J. f. O. 1859, 185; 1860, 269. (See also, *subtus*, pp. 219, 220). Apparently both Darwin, Wallace, and Beddard might claim this case as supporting their different theories. Darwin, though he seems to have overlooked the fact, anticipated the possibility of such a condition: "If we might assume that the males . . . have lost some of that ardour which is usual to their sex, so that they no longer search eagerly for the females . . . then it is not improbable that the females would have been led to court the males, instead of being courted by them" (Descent, p. 207). For Wallace's view it might be claimed that the structural deficiency of the male points to a lower status of vitality, sufficient to account for its smaller size and quiet habits. In accordance

[1] The Chaffinch quoted by Prof. Beddard was described by Prof. Weber (Zool. Anzeiger 1890, 508). Compare Prof. Cabanis' descriptions of such differently coloured halves in *Pyrrhula vulgaris* and *Colaptes mexicanus* (J. f. O. 1874, 344); of v. Rosenberg's of a Chaffinch with two anterior halves of the body, the one in coloration a male, the other a female M. O. Ver. Wien 1884 VIII, 87 & plate, and of Kleinschmidt's of a bilateral-asymmetrically coloured specimen of the Common Kingfisher (Abh. u. Ber. Zool. Mus. Dresden 1898/9 Nr. 2 p. 73, plate III. Also the remarks of Prof. Brandt on *Arrhenoidia lateralis* (Z. wiss. Zool. 1889 XLVIII, 107) should be consulted. Lorenz asserted that he had seen a similar case in *Tetrao tetrix* (see: Tichomirow: "On Hermaphroditism in Birds" — written in Russian — 1887 p. 21 note), but we doubt this.

[2] "Hahnenfedrigkeit". Comp. Meyer: Auer-, Rackel- und Birkwild 1887 p. 33, and Abh. Ber. Mus. Dresden 1894/5 Nr. 3, as well as Brandt's paper quoted in note 1.

with Beddard's theory, the reduction in size and the quiet disposition of the male bird should be due to the partial atrophy of the male organs. Beddard's theory here seems to contain the most probable explanation, and it would be well to make observations on other *Centropodinae*. It still remains to be demonstrated how such an aberration has arisen, which is perhaps comparable to the development of only the left ovary[1] in the female of all birds.

In the case of *Turnix nigricollis*, in which the male does most of the work of incubating the eggs, the large and strikingly coloured female is supposed from observations by Mr. Krohn (Gefied. Welt, 1894, 190) to be given to polyandry. Darwin cites Jerdon's remark that the females are "much more commonly met with than the males". It is difficult to reconcile this statement with the former supposition, but these cases are mentioned here as showing that the contrast in size, habits, etc., may sometimes, as in *Centrococcyx*, be accompanied, and perhaps determined, by a deficiency of reproductive energy or capacity, or sometimes, as perhaps in *Turnix*, by an excess of reproductive power.

In addition to the 6 theories of the origin of secondary sexual characters mentioned above at least two more can be indicated.

7. Secondary sexual characters as "recognition markings". Mr. Wallace (Darwinism, 1889, p. 217 et seq., and in other works) seems to have been the first to define conspicuous markings and patches of colour as useful means by which individuals of a species may at once recognise others of their own kind. He applies his theory to species and further on (p. 284) to the sexes.

8. Development of accessory sexual characters owing to external violence or excessive physiological employment of the parts in question. Use promotes the development of a part in the individual, disuse its atrophy. In the next section of this chapter reason is also given for the opinion that mutilations of feathers — and hence of other parts — if repeated for generations are inherited.

In the present case out of 8 theories of the origin of secondary sexual characters it may well be that 6 have been actually operative in Nature, working alone or more likely in different combinations and degrees. These causes are:

1. The differences of the reproductive organs (Theory 6).
2. Higher development owing to a prepotency of growth-force (Theory 3).
3. Survival of the fittest in combat (Theory 2).
4. The stimulation of parts to a higher development by use and external violence or irritation (Theory 8).
5. Development of recognition-characters by natural selection and preferential mating of males and females which can distinguish one another (Theory 7).
6.[2]) Protective coloration for the sex which broods on the eggs (Theory 4).

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[1]) A rudimentary right ovary is usually present (Gadow, Vög. in Bronn's Kl. u. Ord. 1891. p. 842.

[2]) As to Darwin's theory of sexual selection authors are disagreed.

5. Changes depending upon Age.

The modifications of plumage and structure displayed during the life-time of the individual, the phenomena of its development and decadence, may fitly be placed at the end of this chapter, as one form or other of the four preceding phases of variation — sexual, seasonal, geographical, and (if perpetually recurrent) individual variation — is often repeated during the growth of the young towards maturity.

Classification of the developmental phases. — Charles Darwin (Descent of Man, p. 187) gives six "classes of cases or rules under which the differences and resemblances, between the plumage of the young and the old, of both sexes or of one sex alone, may be grouped". Keeler Evol. Col. Feath. 1893, p. 213) adds two classes more. All eight of them have representatives among Celebesian birds, and they allow of re-grouping according to the phase of variation which exerts a predominant influence in each case.

Sexual influences predominate in four classes:

1. Male more highly developed than female: young like female (*Loriculus*, *Cinnyris*, etc.).
2. Female more highly developed than male: young like male (*Turnix*).
3. Male like female: young like the parents (Many *Psittaci*, *Columbae*, etc.).
4. Male unlike[1] female: young male like adult male, young female like adult female (*Monachalcyon*, *Cittura*)[2].

The influence of seasonal variation appears to be prepotent for the following:

5. Male like female: young like the adults in winter plumage (*Bubulcus*), or like them in summer plumage (*Alca*), or intermediate between summer and winter plumage (*Charadrius*).

The influence of some previous condition in the history of the race (hereditary geographical or individual modification) is sometimes satisfactorily, more often doubtfully, displayed under the following conditions:

6. Male like female: young different from both (*Munia*, *Larus*, *Ardea*, etc.).
7. Male unlike female: young different from both (*Siphia*, *Chalcophaps*, *Eudynamis*,[3] etc.).
8. Male unlike female: young ones different, and differing sexually from one another (*Graucalus bicolor*).

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[1] Probably a higher development: see *antea*, p. 64.

[2] The condition — male unlike female: young male like female, young female like male — is not known.

[3] In *Eudynamis* the coloration of the young is supposed to be protective (see Whitehead, Ibis 1888, p. 410; and Expl. Kina Balu 1893, p. 145).

9. Male unlike female: young female like adult female, young male peculiar (*Microstictus* partly; *Dryobates* and *Xenopicus*: Keeler, p. 224).

It seems to be a very true remark of Darwin's that these several classes graduate into one another.

Ancestral characters. — At the present time much interest turns on the difficult question of the manifestation of the past history of the race occasionally to be read in the plumage of the young or in the less highly developed sex. Among Celebesian birds the following are some of the more interesting and undeniable examples of ancestral indications in the young.

The Kingfishers of the Oriental genus *Pelargopsis* have the lower back and rump blue, except in the Celebesian area, where *Pelargopsis melanorhyncha* and *P. dichrorhyncha* have these parts buff. The young of *P. melanorhyncha* is known to have the parts in question blue — proof that the species was once so coloured (pp. 269, 270 of text).

The Lories of the subgenera *Trichoglossus* typical and *Psitteuteles* have a yellow (or red) band across the under side of the wing, except in *Trichoglossus ornatus* and *Psitteuteles meyeri* of Celebes, and *P. flavoviridis* of Sula, which have the wing uniform below. Traces of yellow, where the band should be, are often seen in young individuals (occasionally in an apparently adult female) of *P. meyeri*, and now and then in the young of *T. ornatus*, proving that these two species once possessed the wing-band (p. 126 of text).

The Stork, *Dissoura episcopus*, has no contour-feathers, but only down, on the sides of the head and on the neck, though it is not to be doubted that it once had these parts feathered. The young has the sides of the head feathered, and some feathers of blackish brown are produced on the neck, but they soon fall out. These feathers indicate what the species was like at some period of the past (pp. 807, 808 of text).

The Parrots of the genus *Prioniturus* have the two middle tail-feathers furnished with long projecting rackets. Young birds before the first moult display attenuated projecting ends or half-formed rackets (see pl. V, figs. 1, 2), showing, according to the argument pursued below, p. *74*, an earlier stage in the formation of these growths.

The Tree Duck, *Dendrocygna guttata*, has round white spots on the flanks; in the young these spots take the form of stripes similar to those of *D. arcuata* at all ages; a proof that the round spots are a recent development (p. 872). The Blackbird, *Merula celebensis*, when young is spotted like a Thrush (see pl. XXXV).

The little slate-and-vinous Hawks, *Accipiter rhodogaster* and *sulaensis* and *Spilospizias trinotatus* are totally different when young, resembling Kestrels (*Tinnunculus*); and the Pigeon, *Chalcophaps*, in first plumage has no resemblance to the adult (an unusual circumstance among Pigeons), but has the coloration of the Pigeon-genus *Macropygia*. It appears hardly possible to doubt that these are ancestral indications (pp. 25, 26, 650, 652 of text).

The Kingfisher *Melidora* of New Guinea, a curious form with a hooked bill, is held by Sharpe to be the lowest type of the family, and *Cittura* of Celebes and Sangi has the nearest affinities with it, but wants the maxillary hook. When quite young *Cittura* has this hook (p. 307). Though not a feather-character, this point is of equal significance.

It has been already remarked that, when the two sexes are not alike, one (usually the female) seems to show a lower development than the other. It is probable that such females preserve more ancestral features than the males, which have acquired more new features than have the females; yet direct proof of this is hard to find. Among Celebesian birds, a female of *Psitteuteles meyeri* displays, as mentioned above, a trace of the yellow ancestral wing-band; and the rackets of the females of *Prioniturus* are seldom so long as in the males. Indirect proof of the phylogenetic value of the female plumage is furnished when the young of both sexes are like the mother, for such facts as those given above render it pretty certain that the young tend to display ancestral characters. It sometimes happens that the mother and young of one species resemble the adults of both sexes of another species less highly developed than the male of the first.

These considerations place in the hands of the student of geographical distribution an important and (to ourselves) new means of proof in tracing the land of origin of particular species or genera — provided that our supposition be admitted that emigrants, cut off from their native country, are more likely to get altered than the stayers-at-home.[1]) In this manner it has proved possible to trace the genus *Loriculus* (of which over 20 geographical species are known between India and New Guinea) as having originated in Asia, and to construct a genealogical tree of two main branches showing the descent of the species from the Asiatic *L. vernalis* or its ancestor, this species being supposed to have extended its range in process of time across the Archipelago, undergoing some new modification with each change of habitat, viz. with each new isolation. The more eastern forms now throw back by their females and young to more western forms, and in this manner the two branches of the genus finally converge upon a form like *L. vernalis*. The case is fully discussed, pp. 160—169 of text, Map VI.

On similar grounds it is possible to trace the origin of the Blue-and-rufous Flycatcher of Kalao Island to Celebes. The sexes are slightly different, and the male of *Siphia kalaoensis* is the most specialized member of its group; its female is like the male from Djampea Island, *S. djampeana*; the female from Djampea is like the male from Saleyer Island and Celebes, *S. banyumas*, which is thus indicated as having emigrated first to Djampea and later from there to Kalao.

In the same manner the blue back of the young of *Pelargopsis melanorhyncha*

[1]) For proof see variation in Sangi and Talant, *antea*, p. 58.

of Celebes may be held to prove the derivation of that species from the blue-backed forms of the Oriental Region, and the indications of a wing-band in the young *Trichoglossus* and *Psitteuteles* of Celebes to demonstrate their descent from the banded species of the Australian Region.

In applying this argument one is apt, however, to stumble on such difficulties as the following. Müller's Green Parrot, *Tanygnathus muelleri*, of the Celebesian area occasionally displays blue on the head when young, suggesting its derivation from the blue-headed *T. luconensis* of the Philippines. But the young *T. luconensis* has the head green, which might be taken as an indication of its descent from the green-headed *T. muelleri*. Is *T. muelleri* descended from *T. luconensis*, and *T. luconensis* from a pre-existing green-headed Parrot, or is the coloration of the head of the young simply due to some chemical condition imposed upon it by the respective parents?

Mr. Keeler (Evolution Colors Birds 1893, p. 178) has suggested, without producing any real proof, that a different colour at the basis of a feather may have a phylogenetic value and denote what the colour of the bird at this spot was at some period of the past. On the contrary our own observations have persuaded us that a different basal colour sometimes shows what colour the feather is going to become. The adult male of the eastern form of the Blue Rock Thrush, *Petrophila cyanus*, has the breast and abdomen chestnut; the immature bird has the feathers of these parts terminally fringed with whitish, next to which is a subterminal bar of dusky, below this usually a little blue, and then a large area above the extreme base chestnut — the colour which the bird will become. Also the jugulum, head and upper parts of the adult are blue, but in the young this blue occupies the basal part of the feathers. Not the base, but the tip of the feather may sometimes have a phylogenetic worth. Evidence of this is shown by the buff-backed Kingfisher of Celebes, *Pelargopsis melanorhyncha*, the young of which by its pale blue back throws back to the other members of the genus, all of which (except another Celebesian form) have blue backs. Now the blue in the young *P. melanorhyncha* is confined to the tips of the feathers; below this they are buff, though there is usually also a faint buff fringe round each feather. In the young of this species the tendency to change into a form with a buff back does not set in in force until the tips of the feathers have already been developed; these tips present the point wherein it agrees with the rest of the genus — apparently therefore a character of long standing, while the buff at the base betrays the character which will soon be assumed.

Hereditary effects of shelter and exposure. — It is proposed here to show some evidence drawn from Celebesian birds that modifications of shape or colour of feathers as caused by the ever-repeated action of mechanical attrition, or by the action of light, are ultimately transmitted to offspring.

The racket-tail-feathers of *Prioniturus*. The two middle tail-feathers are

prolonged much beyond the others, and in adult birds the overreaching portion of these two rectrices is converted into a bare shaft tipped with a spatule of ordinary web (see pl. VI, figs. 1, 4, pl. V, fig. 5). The question of the formation of these racket-feathers has been broached by several writers, especially by Prof. W. Blasius (Ztschr. ges. Orn. 1885, pp. 212—219, figs.). Dr. Finsch remarked (Papag. 1868, II, 401) that the bareness of the shafts was manifestly due to the attrition of the barbs of the feathers; Meyer showed (Ibis 1879, 49) that this view, as of a direct mutilation of the individual, is incorrect, since many specimens were shot by him in which the racket-feathers were growing, and the bare rachis lay upon the surface of the other feathers protected from foreign contact. Prof. W. Blasius has expressed the opinion that the shafts do not grow out naked from the first, but become bare later, owing perhaps to a physiological casting-off of the webs.

The specimens in the Dresden Museum prove that the webs are neither rubbed off, nor bitten off as in the case of the Motmots (see Salvin, P. Z. S. 1873, p. 433). Two specimens figured on plate VI, figs. 2, 3, display the growing racket as found underneath the upper tail-coverts (here removed to show the conditions); the shaft is already webless even where it is still enclosed in the corneous husk or follicle out of which the young feather has grown, and where it could of course be neither rubbed nor bitten. On removing a third younger sprouting racket (♂ ad. *P. platurus*) by the root and taking off the epidermal husk (pl. V, fig. 4), it was found that the web (rami) is present on either side of the shaft, but some of the rami appear not to be attached at all but to run, soldered together, parallel to the shaft almost to its root; other rami have become individually broken off or have fallen off from the shaft, and it was easy to see that, as the feather grew longer, all would have fallen from the shaft. In a growing racket with the shaft 35 mm cut out of the tail of an adult male bird it was not possible to detect any signs of barbs with certainty. Plate VI, fig. 3 displays 44 mm of a growing shaft (♂ ad. *P. flavicans*), which would reach a length of 67 mm (judging from the length of the other perfect racket); this shaft was found to be bare down to its point of attachment by the side of the oil-gland; near the base alone some corneous matter of uncertain determination, but perhaps feather-material, was adhering to it.

These investigations tend to prove that no web at all is produced with long-shafted rackets, but rackets of a lower stage of development have imperfect or unattached webs which fall off before the racket is fully exposed.

The inquiry as to how the middle tail-feathers originally began to be lengthened and narrowed and finally formed into long rackets may be answered by a hypothesis which, if it is a correct explanation of the facts, may be not without weight in its bearings upon theories of heredity.

It is easy to obtain a practical demonstration as to how racket-feathers may be formed by holding a feather by the barrel and scraping the webs with a knife; a bare stem with a spatule at the tip then quickly forms itself, the

yielding pliancy of the tip making it difficult to remove the web from this point without cutting off the end of the feather altogether. In Nature any feather of sufficient stiffness, prolonged so as to stand out beyond the other feathers, will be liable to such a process as this, attrition against the twigs of trees, the walls of their nesting holes etc., supplying the place of the knife. Assumed that the two middle tail-feathers of *Prioniturus* were originally a little longer than the rest[1]), the ends, if sufficiently prolonged, are liable to attrition; and a narrowing of the tips, such as is now seen in the young birds (pl. V, fig. 1), will result. The friction at the ends of the feathers causes irritation to the roots; an increased supply of blood ensues there, with the result of an increased size of these feathers. These longer feathers are more liable to attrition, and half-formed rackets (pl. V, fig. 3) take shape; the increased irritation and consequent lengthening of the feather results in the production of other stages (pl. V, fig. 4), up to the most advanced development of the present time (pl. VI, fig. 1). Yet the striking features shown in the plates were not obtained in one generation, as has been proved; on the other hand this appears to have been a process of ages, more and more advanced results being obtained in successive generations and transmitted by heredity. The simplest stages of this formation are displayed by young birds in first plumage which in respect of the tail probably resemble the first ancestors of the genus (pl. V, fig. 1); the second moult, when the webs are often quite absent on the shafts of the rackets, which are about half the full length in old birds, seems to show a later period in the history of the race; while the highest development of these feathers, as seen in old birds (especially males) of the present day, is probably the most recent stage in the evolution of the genus.

The following are the arguments in proof that these rackets are the inherited effects of attrition:

1. It has been shown that such can easily be formed artificially by scraping, the size of the spatule depending upon the stiffness of the feather.

2. Where the shafts are not exposed to attrition they are not bare. It is only on the projecting part of the middle tail-feathers that the shafts are bare; and as far as the ends of the lateral feathers, by which the middle ones are protected from attrition, they are fully webbed. If the bareness were due to something else, it might be expected that the naked shaft would not in every species[2]) arise just at this point of the tail, but sometimes much higher up, or sometimes much lower down[3]).

3. Rackets do not occur on unexposed feathers sheltered from attrition.

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[1]) A very common condition in birds.

[2]) We have examined *P. luconensis*, *cyaneiceps*, *suluensis*, *discurus*, *flavicans*, *platurus*, and the plate of *verticalis*.

[3]) Genera in which the racket-feathers are longer and consequently heavier (e. g. *Bhringa*) usually have larger spatules and the attenuation of the webs on the shaft continued towards the base of the tail — a result of friction upon the other feathers.

4. Rackets are present in birds having no affinity with one another, and in the most varied positions on the wing, tail, or head, where a sufficiently stiff feather projects so as to be liable to attrition. Thus they are found on projecting feathers on the sides of the head in the Paradise-bird, *Parotia*, on the projecting second primary of the Nightjar, *Macrodipteryx*, on the overreaching tail-feathers of *Prioniturus*, of the Indian Drongos, *Bhringa* and *Dissemurus* (the web of the racket on the outside only), of the Kingfishers of the genus *Tanysiptera*, etc.

5. Remains of the web are often to be found on the shaft of the racket (pl. V, fig. 5).

6. There appears to be no other means of accounting for the origin of these racket-feathers. They are not sexual characters, nor is it conceivable that they are useful and hence developed by natural selection. The theory of "recognition markings" fails, because they are not present in the young and because they are present and very similar in different species living in the same localities (e. g. *Prioniturus platurus* and *flavicans*).

7. The Motmots of America have the curious habit of forming rackets artificially on the lengthened middle tail-feathers by biting or tearing off the web behind the tip. The result appears now to be partially inherited, since a very pronounced narrowing of the web here is seen in young birds (see Salvin, P. Z. S. 1873, pp. 431, 432 with figures). The habit of tearing away the web also appears to be inherited, for young birds reared by hand began to tear away the webs of the middle tail-feathers when these had reached their full length (see Cherrie, Auk 1892, 323).

As an argument against the loss of the webs through attrition during the individual development, it has been pointed out that when a narrow fringe of web is found on one side of the shaft, it is almost always on the outside that this occurs, where it is said that it would be most likely to get rubbed (Meyer and W. Blasius, ll. cc.). Due weight should, however, be given to the following considerations: first, birds rarely spread out their tails except in flight, and in the position of rest one middle tail-feather lies over the other so that little of the latter is seen, and the inner web of the one racket would receive a good deal of the pressure and friction put upon the outer web of the other; and second, the webs on the inside would be liable to get crossed, interlocked, sawed and broken by one another.

The attenuated tail-feathers of *Merops*. The two middle tail-feathers of all the species of Bee-eaters of the genus *Merops* are prolonged beyond the others when the bird is adult; the tip is not furnished with a spatule as in *Prioniturus*, but attenuated for its terminal projecting portion and for a little distance on the non-projecting part (see plate VIII, fig. 1). These attenuated ends are not formed by attrition at the sides during the lifetime of the individual, as is shown by young feathers sprouting out of the follicles thus perfectly developed (see pl. VIII, figs. 2, 3). Yet the argument for attrition continued during gene-

rations without number applies equally well here. The habits of *Merops* are very different from those of *Prioniturus*; the Parrot breeds in holes in trees, but the Bee-eater forms a burrow, like the hole of a mouse or rat, for a depth of one to three metres in a bank of sand or earth. The friction caused by the sand, against which the terminal portion of the feather is chiefly brushed, seems sufficient to account for this peculiar shape. If a feather of ordinary shape be taken, and rubbed and drawn between two sheets of sand-paper, a ragged similitude of a *Merops*-rectrix may be obtained.[1])

Other cases. If once the theory that the racket-tail-feathers of *Prioniturus* are the inherited results of attrition is admitted, a principle is arrived at by which a host of other cases are capable of explanation. Among feather-formations may be mentioned: the bifid tips of the remiges of *Merops* and *Hirundo*, explicable by the habit of these birds of supporting themselves on their wings when commencing their nests (for *Merops*, see p. 252, note , the oscillation of the body forcing the webs apart at the tips of the feathers and so forming a little notch, just as is done by rubbing the tip of a feather on blotting-paper or by knocking the tip gently with the finger; the stiff. tapering tails of Woodpeckers and *Nasiterna*, stimulated to strong growth and worn down to shape by the habit of using them as a prop in climbing; the curiously attenuated first primaries of many Hornbills and Pigeons, so shaped by the friction caused in flight to these reduced quills which lie under the other remiges, against which they vibrate and by which they are rubbed; the narrowing of the outer webs of the lateral tail-feathers of all birds and the gradual increase in width of these webs from one feather to another until on the two middle feathers they are of approximately equal width, the middle feathers being protected by the lateral ones from the friction of objects against which the tail is repeatedly getting brushed, the lateral feathers being exposed to this attrition, — most of all the outermost pair in which the outer web is narrowest. Also in the narrowing of the outer webs of the remiges, though feathers of this shape are apparently essential to flight, mechanical attrition, caused by the rush of air in flight, may have worked together with natural selection in determining their shape. The friction may have acted as a stimulus to the lengthening of these feathers which are far larger and stronger than contour-feathers. Other parts may be modified in the same manner as feathers by the inherited effects of wear and tear: such as the bills of *Anastomus*, *Esacus* and *Demiegretta*, worn away so as no more to close properly by the rough shells and crustaceans upon which the birds feed; the bill of adult Hornbills not meeting for a space where the bird lays hold of objects in climbing and feeding and even swings from them on occasion suspended by its bill (see, Legge, B. Ceylon 1880, p. 274); the skin of the head of the Cock, drawn out into a comb and with the formative feather-

[1]) See also Meyer's remarks on and figures of the two lengthened middle tail-feathers of *Paradisea minor* etc. in Abh. Ber. Mus. Dresden 1898/9 Nr. 2 p. 44 plate II.

papillae destroyed by the beaks of antagonists; the face of the adult Rook from which the feathers fall at the base of the bill as a result of dirt and wear for generations; the head and face of the adult Moleo, naked owing to ages of attrition from the sand in which it burrows; and so on. Examples drawn from man and other animals could be given. The principle is of importance, as a cause of, or directive stimulus to, variation; it should therefore not be accepted without criticism. For some cases the principle of natural selection affords an explanation (e. g. the remiges), but for others the argument furnished thereby can hardly be made to commend itself to impartial judgment (e. g. the rectrices), and for others again this principle appears to fail completely (e. g. the rackets of *Prioniturus*, the comb of the Cock[1]).

Effect of light. In course of time most colours in mounted specimens and skins of birds fade with exposure to the light. Among Celebesian birds the effect is particularly well seen in the buff of the Nutmeg Pigeons and the wash of salmon-colour on the under parts of the Moleo, which soon fade in exposed skins, leaving the respective parts white. Nor does light seem to be operative solely upon the dead.

Where the wing rests upon the body. — In nearly all birds a change of colour takes place on the under side of the remiges where they rest upon the body with the wing closed, so that this part differs from the distal ends and more external parts of these feathers. Sometimes merely a slight change of gloss is seen, but all stages of difference may be found from this up to the most marked contrasts. Among Celebesian birds some of the most striking examples are: the Cuckoo-shrike, *Graucalus bicolor*, with the remiges white below where they rest upon the body, black on the other portions; the Parrots, *Prioniturus Loriculus*, with the remiges below verditer-blue against the body and partly where they cover one another, black elsewhere; the Roller, *Coracias temmincki* — remiges blue against the body, black changing with the light to bronze on the free parts[2]); the Flycatcher, *Zeocephus*, with the said parts ferruginous and blackish respectively; and so on. A tendency to blackness is generally seen on the distal ends and external portions of these feathers.

Where the tail-feathers are concealed by the upper tail-coverts. — A change of colour in the shafts and webs of the rectrices is generally seen on their concealed bases, very commonly a tendency to paleness or white, suggesting a loss of pigment. The most striking examples occurring in Celebes are the Cuckoo-shrike, *Graucalus bicolor*; the two Nutmeg Pigeons, *Myristicivora bicolor* and *luctuosa*; the Pratincole, *Glareola isabella* (as also *G. orientalis*). In these birds all that part of the tail which is concealed by the upper tail-coverts is white, and all

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[1]) As shown by Stolzmann (P. Z. S. 1885, 430) this may bring disaster to the wearer of it, but the author attempts to explain this by natural selection.

[2]) On the upper surface of the remiges these colours are reversed, being blue above where they are bronze below, and bronze above where they are blue below, but the lines of demarcation do not exactly coincide.

the terminal exposed part is black, the division of the colours being sharply conterminable with the tips of the longest upper tail-coverts.

The concealed bases of the contour-feathers. — Here again a difference of pigmentation or of gloss, or of both, is seen, the bases being usually of paler or duller hues than the tips. Thus the bases of the contour-feathers in *Corvus enca* are white, the terminal portions glossy black; in the Parrot, *Aprosmictus sulaensis*, the bases are grey or greenish, the exposed terminal portions bright blue on the mantle; and so on.

Apart from the phylogenetic value of the different parts of a feather, there is convincing evidence that light must be cited as an important agent affecting the distribution of the pigments of a feather, either through physiological stimulation, or direct action, or both. No better test case could be found than the male of the Celebesian Cuckoo-shrike, *Graucalus bicolor*. Seen from above with its wings closed it is a black bird, for, though the rump and upper tail-coverts are white, these parts are then probably concealed by the wings. The under surface is white. The wings and tail are black; yet that part of the tail which lies hidden beneath the upper tail-coverts is white, and so is the wing below where it rests upon the sides of the body; also the black contour-feathers of the upper parts are white on their concealed bases. It may be said that wherever the feathers are exposed to the sun they are black; where they are in shadow or concealment they are white. It is preferable to attempt no explanation of these facts here, but it seems permissible to suggest that the case is similar to that of *Prioniturus*, the difference being that the inherited effects of attrition are assigned as the cause of the formation of the racket-feathers of the Parrot, whereas the action of light is regarded as having in the course of generations in some way brought about the distribution of the pigments in *Graucalus*.

Direct evidence of the action of sunlight upon plumage is afforded by the following statement. As Dr. Russ writes: "The Goldfinch when kept caged in a dark place often becomes black, and even in a light room the bright colours after moulting often appear fainter and more impure, but this can be prevented if the Goldfinch is placed as much as possible in the open air and sun" (Einheim. Stubenvög. 1873, II, 265).

The soft, glossless plumage of nocturnal birds, viz. Goatsuckers and Owls, also calls for consideration in this connection, as well as examples already suggested, and innumerable other ones in which the action of light, or the want of it, appears less obvious.

5. GEOGRAPHICAL DISTRIBUTION.

In the intermediate seas between the Euro-asiatic and the Australian continents there is stretched out the largest and most numerously membered archipelago of the earth, with a fauna and flora derived partly from the West and partly from the East. Where do we now find the frontier of these two faunas and floras, which contrast so strongly with one another in their extreme forms; or do they pass into one another so insensibly that a sharply defined frontier cannot be traced? It would be very premature to attempt a sketch of the geological history of this region of the earth in view of the quite insufficient knowledge available concerning the living and, especially, concerning the extinct fauna and flora of the Archipelago, for we are acquainted with only a small fragment of the latter (the extinct); we must content ourselves with an attempt to answer the above interesting question with the aid of the rather better established data of the present time[1]), and, in accordance with the character of our book,

[1]) The status of geological knowledge as to Celebes is very defective as yet, though some valuable work has been done recently and more is to be expected from Drs. P. & F. Sarasin. In this state of things we have found it preferable to abstain entirely from discussing the past history of the island, but give some of its literature, where references to further geological, palaeontological and mineralogical papers are to be found:

1883. K. Martin: Wiss. Aufg., welche der geologischen Erforschung des Indischen Archipels gestellt sind. Lecture. Leyden, Brill. Id.: Die wichtigsten Daten unserer geologischen Kenntniss vom Niederl. Ost-ind. Arch.: Bijdr. taal- land- en volkenk. van Ned. Ind., uitg. ter gelegenheid van het 6. intern. Congres der Orientalisten te Leiden. Land- en volkenkunde. 1883, 17 Celebes p. 23 with summary of literature.

1888. C. M. Kan: Bodengesteldheid der eilanden en diepte der Zeeën van den ind. Arch.: Tdschr. Ned. aardr. Gen. (2 V Versl., 202. Kaart IV.

1890. K. Martin: Die Kei Inseln und ihr Verhältniss zur australisch-asiatischen Grenzlinie, zugleich ein Beitrag zur Geologie von Timor und Celebes: Tdschr. Ned. aardr. Gen. (2 VII, 241. Id.: Zur Geologie von Celebes: l. c. 1891 VIII, 180.

1890. A. Wichmann: Bericht über eine ... Reise etc. II. Celebes. l. c. (2 VII, 921 Tab. II; 1892 IX, 258. Id.: Die Binnenseen von Celebes: Petermann's Mitth. 1893, 215 Taf. 16. Id.: Petrogr. Studien über den Ind. Arch. I. Leucitgesteine von der Insel Celebes: Nat. Tschr. Ned. Ind. LIII, 315, with plate. 1895 II. Zur Geol. der Insel Saleyer: l. c. LIV, 236 pl. V.

1894. W. F. van Vliet jr.: De verticale ligging en de geologische bouw van Celebes: Tdschr. gesch., land en volkenk. 9. Jaarg., 257 (with summary of literature).

1895. I. W. Retgens: ... Gesteenten van Celebes: Jaarb. Mijnwezen in Ned. Oost-Ind. 24 Jaarg., 124.

1896. Encyclopaedie van Ned. Indië by van der Lith and others I, 317 (s. a.). A general report on the geological formation of Celebes.

1896. K. Martin: Zur Frage nach der Entstehung des ost- und westindischen Archipels: Geogr. Zeitschr. II, 376.

It is nearly the same with the flora of the Archipelago. Though relatively much is already known, we are very far from a thorough knowledge, which would enable us to draw trustworthy conclusions. We, therefore, likewise abstain from touching these questions, which are discussed in the works of Grisebach Vegetation der Erde 1872. Ges. Abh. u. kl. Schr. zur Pflanzengeographie 1880. Engler Versuch einer Entwicklungsgeschichte der Pflanzenwelt, insbesondere der Florengebiete seit der Tertiärperiode 1882, Drude Die

restrict ourselves to the ornithological facts at our disposal, taking the Avifauna of Celebes as the basis for this purpose. Conclusions which may be drawn from ornithological facts alone must, however, be weighed very carefully, as birds have their own modes of dispersal. We shall then see in how far these conclusions differ from those arrived at by other means.

Wallace's line.

As is generally known Mr. Wallace drew a line to the west of Celebes by which the Archipelago was divided into two widely differing halves. This division was welcomed with much approbation on account of the fascinating speculations of its inventor, though these speculations were more suggestive than substantially founded upon and backed by facts, some of which were not taken into consideration, and others were not available with our defective knowledge of 20 or 30 years ago, nor indeed are they available to-day.

Mr. Wallace has, however, in the course of his later studies modified his views in some respects. At first, as in the "Malay Archipelago" (1869) and in the "Geographical Distribution of Animals" (1876) — not to mention earlier writings[1]) — the line passes between Bali and Lombok, through the Macassar Strait west of Celebes, turning to the east between Mindanao and Halmahera; while he adds in "Island Life" (1880, 431) "that the present land of Celebes has never (in Tertiary times) been united to the Asiatic continent, but has received its population of Asiatic forms by migration across narrow straits and intervening islands". He draws in the latter work (p. 434) the following conclusion: "We have in this island a fragment of the great eastern continent which has preserved to us, perhaps from Miocene times, some remnants of its ancient animal forms"; and (p. 509): "I now look upon Celebes as an outlying portion of the great Asiatic continent of Miocene times, which either by submergence or some other cause had lost the greater portion of its animal inhabitants and since then has remained more or less completely isolated from every other land. It has thus preserved a fragment of a very ancient fauna along with a number of later types which have reached it from surrounding islands by the ordinary means of dispersal". He further says in his "Australasia" (ed. by Dr. Guillemard 1894, p. 287): "The peculiarities of the animal life of Celebes may be best explained by supposing it to be an outlying portion of that Miocene continent, which became detached from it, and has since never been actually joined to any Asiatic or Australian land. It has thus preserved to us some descendants of ancient types, and these have become intermingled with such immigrants from both east and west as were enabled to establish

Florenreiche der Erde, Petermann's Erg. Heft Nr. 74 1884, Atlas der Pflanzenverbreitung 1887, Handbuch der Pflanzengeographie 1890, Warburg (Die Flora des asiatischen Monsungebietes: Verh. Ges. Deutscher Naturf. Allg. Theil 1890, especially concerning South Celebes), etc.

[1]) These earlier writings are to be found in the Ibis 1859, 450; J. of the Proc. Linn. Soc., Zool., 1860, IV, 172; P. Z. S. 1863, 481; J. R. Geogr. Soc., 1863, XXXIII, 217; Edinburgh Philos. Journ., new ser., 1864, XIX, Nr. 1, etc.

themselves in competition with the ancient inhabitants. To the naturalist, therefore, Celebes is an island of extreme interest. It cannot be said to belong either to the eastern or the western divisions of the archipelago, but to stand almost exactly midway between them; the relic of a more ancient land, and dating from a period perhaps anterior to the separate existence of any of the islands."

If we now glance over the scientific literature on "Wallace's line", as Huxley baptised it (P. Z. S. 1868, 313), it should be understood that we do not pretend to give an exhaustive extract, but only quote such writings as have been within easy reach or which have appeared sufficiently characteristic. There are also heaps of other books and papers in which Wallace's line is mentioned.

E. Blyth, in 1871 (Nature III, 428), recognizes the line. He has a Celebesian Sub-region of the Melanesian Region and it comprises: Celebes, Lombok, Sumbawa, Flores, Wetter, Timor and Sandalwood Island.

J. Pijnappel, in 1872 ("Enkele aanmerkingen op Wallace's Insulinde": Bijdr. taal, l. en vk. Ned. Ind. 3. ser. VII, 159), made some serious objections and is of opinion, that as Geography, Anthropology, Ethnography and Botany are opposed to the line, Zoology alone cannot uphold it: the less so, as it sometimes requires the most hazardous hypotheses as to geological convulsions, upheavals and submergences in order to explain the occurrence of a single mammal.

A. v. Pelzeln in a paper entitled "Africa-Indien", published 1875 (see: Verh. z.-b. Ges. Wien p. 33), adopted the line; he considered Celebes as belonging to the Australian Region and enunciated as peculiar bird-genera (p. 48): *Monachalcyon*, *Cittura*, *Ceycopsis*, *Artamides*, *Gazzola*, *Streptocitta*, *Scissirostrum*, *Enodes*, *Basileornis*, *Prioniturus* and *Megacephalon*. He takes as identical (p. 47) *Scops manadensis* from Celebes and Madagascar, and *Ortygometra flavirostris* from Celebes and Africa, and mentions eighteen species which are common to the Ethiopian and the Indo-Malayan Region. In 1876 he confirmed his general conclusion in a paper on the Malayan mammalia (see: Festschr. z.-b. Ges. p. 53).

P. J. Veth, in 1875, gave a lecture on the line before the International Geographical Congress in Paris ("Observations sur les lignes de Wallace": C. R. Congr. Int. des sc. géogr. à Paris, 1878, 305), and treated the matter with the acumen usual to him. He said that it rests on an inadequate basis hydrographically, that the flora was not taken into consideration, that Wallace only referred to mammals, birds, some insects and land-shells instead of to the whole fauna; that it is, therefore, zoologically insufficiently proved, and that it is not evinced by the facts of anthropology (see, also, l. c., p. 276 and Veth's translation of Wallace's paper: "Over de physische Geogr. van den Ind. Arch.", with notes. Zalt-Bommel. 1865).

J. A. Allen, 1878 ("The Geographical Distribution of the Mammalia considered in relation to the principal ontological regions of the earth and the laws that govern the distribution of animal life": Bull. of the U. S. Geol. and Geogr.

Survey, vol. IV, 363—377), is one of the few earlier zoologists who do not recognise Wallace's line. His Indian Region, being part of the Indo-African Realm, has for its eastern frontier a line drawn west of the Moluccas and Aru. He says (p. 358): "I fail to see any good reason for assigning Celebes and all the smaller Sunda Islands to the Papuan Province, as Mr. Wallace and others have done, but abundant evidence that such is not their real affinity." And p. 364: "The Australian Realm will be here restricted so as so embrace none of the islands situated to the westward of the Moluccas."[1]) His Insular or Malayan Province forms part of the Indian Region; it includes all the Sunda Islands, the Philippines and Celebes. His Papuan Province (p. 367) takes in the Molucca and Aru Islands to the west, but he considers the Molucca Group (p. 364) to be a transitional link between the Indo-African and the Australian Realm, faunistically more loosely allied to the latter than to the former.

K. Semper, 1880, in his work: "Die natürlichen Existenzbedingungen der Thiere" (II, 136), discussed the problem fully. Though he found that facts do not speak everywhere in favour of Wallace's line, he was nevertheless inclined to adopt it in a general way; he explained the differences of the faunas to the east and west not, however, by former land-connections, but by the sea-currents transporting the animals, a hypothesis which, as far as we are aware, has not been accepted elsewhere.

O. Krümmel, in 1882, published (see: Ztschr. wiss. Geogr. III, 1, Taf. I) an important map: "Tiefenkarte des australasiatischen Mittelmeeres", on which he drew the line, but remarked (p. 2) that the depths of the Macassar Straits are quite insufficiently known and (p. 3) that in the Straits of Lombok only one sounding very near the coast of Bali, which was broken off at 50 fathoms, serves as a basis for the assertion that a deep gap in the chain of islands exists here! He further mentioned (p. 5) that there are no soundings whatever known from the three large gulfs of Celebes.

K. Martin, in a lecture on the "Wissenschaftlichen Aufgaben, welche der geologischen Erforschung des Indischen Archipels gestellt sind", held in Leyden in the year 1883, considered the line entirely erroneous. In his opinion (p. 28) the continental frontier between Asia and Australia is approximately identical with the chain of volcanoes in the Archipelago. The same author says in a paper: "Die wichtigsten Daten unserer geologischen Kenntniss vom niederländisch Ost-indischen Archipel" (see: Bijdr. taal-, land- en volkenkunde Ned. Ind. uitg. ter gelegenheid van het 6. intern. Congress der Orientalisten te Leiden, Land- en Volkenkunde. 1883, 27): "As far as our knowledge of to-day goes, Wallace's line is geologically unjustifiable. . . . Nothing hinders us from drawing

[1]) Previously (Bull. Mus. Comp. Zool. Cambridge, 1870—71, II, p. 381) Mr. Allen had uttered the following opinion: "The Australian Realm embracing Australia, New Zealand, New Guinea and their dependent islands, including those to the eastward [?] as far as Timor and Celebes, is zoologically as distinct . . ." This is not at all clear to us, but as this prominent writer later (see above) was quite intelligible, it is not necessary to discuss his former intimation.

the frontier to the north-west of Timor; the sea-depths would allow it just as well, and in this case at least a separation of geognostically different regions would be attained." (A. Wichmann, however, appears to reckon Timor, etc., to the former Asiatic continent, see: Samml. des geol. Reichs-Mus. in Leiden. I. Ser. Bd. II. p. 201, 1887.)

O. Drude, 1884 ("Die Florenreiche der Erde": Erg. Heft Nr. 74 zu Petermann's Mitth. p. 62[b]), acknowledges the line as a floristic frontier, to which opinion he still adheres in 1890 ("Handbuch der Pflanzengeographie", p. 150 and Map I; see also: "Atlas der Pflanzenverbreitung" Berghaus' Phys. Atlas. 5, No. 1, 1887).

A. Heilprin, 1887 ("The Geographical and Geological Distribution of Animals" p. 107, and map), adopts an Austro-malaysian Transition Region, which is bounded to the west by Wallace's line, to the east and south by New Guinea and Australia, to the north by Mindanao.

W. Marshall, 1887 ("Atlas der Tierverbreitung": Berghaus' Phys. Atlas. VI. Abth. p. I[a], Map III), simply adopts the line.

C. M. Kan, in a paper published in 1888 on the "Bodengesteldheid der eilanden en diepte der Zeeën van den ind. Archip." (see: T. Ned. Aard. Gen. 2. ser. vol. V. Meer uitgebreide art. p. 219, with map IV) does not recognize the line for reasons indicated in the title of his paper.

A. Reichenow, in 1888 ("Die Begrenzung zoogeographischer Regionen vom ornithologischen Standpunkt": Zool. Jahrb. Abt. f. Syst. III, 699), recognizes an Eastern Zone with an Eastern Temperate Region, an Ethiopian Region and a Malayan Region as far as Wallace's line (see also map XXVI), and a Southern Zone which extends to the west up to Wallace's line; he, therefore takes Celebes as non-Oriental.

R. Schuiling, in a special dissertation: "De grenslijn van Wallace eene continentale grens", 1888 (T. Ned. Aard. Gen. 2. ser. V, p. 523), came to the conclusion (p. 548), that Geology, Zoology and Oceanography teach: "Celebes belongs to Asia".

F. A. Jentink, in 1889 (l. c. VI, 244), showed (p. 246), that we are very far from such an adequate knowledge of the mammals of Bali and Lombok as to justify Wallace's affirmation (Island Life 1880 p. 4): "Bali and Lombok differ far more from each other in their birds and quadrupeds than do England and Japan." neither was Wallace justified in basing an argument on 16 land-mammals as the ascertained number from Celebes, because as early as 1878 21 were already known and this large island has not been at all thoroughly investigated yet. In 1888 there were already 26 land-mammals and 19 bats extant from there, a number which is probably still far from the true total. There was therefore no good reason whatever for drawing important conclusions with such scanty knowledge.[1])

[1] We can only point to Mr. Whitehead's recent discoveries of mammals on the high mountains of the Philippines see: Ann. Mag. N. H. 1895, 6. ser. vol. XVI, 160), in the conviction that such an experienced

E. Reclus, 1889 (Nouv. Géogr. univ., vol. XIV, 209) sticks to the line and says: "De tous les côtés elle [Celebes] apparait isolée; c'est une terre dont l'isolement complet est un fait géologique datant des ages les plus reculés"(!).

E. v. Martens published in 1889 his "Tagebuch-Notizen" from Banda, Timor and Flores (see: Z. d. Ges. f. Erdk. zu Berlin, vol. 24, p. 83) and concludes (p. 104) that Timor, Celebes, the Philippines, and the islands east of Java represent the region of intermixture of the eastern and western animal worlds and may just as well belong to neither as to both. "Nearly every zoological genus presents a different frontier, a sharply defined common frontier does not exist in nature, nor here."

O. Warburg remarked in 1890 ("Die Flora des asiatischen Monsungebietes": Verh. Ges. Deutsch. Naturf. Bremen, Allg. Theil, p. 15 of sep. copy) that important as Wallace's line is for understanding the evolution of the floras in detail, the character as a whole was not altered by the separation; the greatest part of the present flora would have already transmigrated before the separation, thus certainly long before Miocene times.

K. Martin in a paper of 1890: "Die Kei-Inseln und ihr Verhältniss zur Australisch-Asiatischen Grenzlinie" (Tdschr. Kon. Ned. Aardr. Gen. 2. ser. VII, 273) says: "To the west of Great Key and to the north-west of Timor lies a natural and geognostically well-founded line of separation between the islands dismembered from the Asiatic and Australian continents." He adds, however, that it is not to be expected that on the continental borders the present faunistic and floristic character of single islands should have a direct connection with the geological line of separation or be congruent with it, because peripheric parts of the continental masses are at times connected or separated.

E. L. Trouessart, in 1890 ("La Géographie Zoologique", pp. 89, 131, 243 and map p. 9), simply accepts Wallace's line.

E. v. Martens showed in 1891 ("Landschnecken des Indischen Arch.": Weber's Zool. Erg. II, 263) that the land-shells do not allow of a sharp line being drawn between Celebes and Borneo, though they differ considerably, for North Celebes cannot be separated from the Philippines, and the differences between Java on the one side, and Flores and Timor on the other, are less conspicuous. The region to the east of Celebes does not offer any uniformity with this island and cannot be regarded as constituting a unit with it.

P. L. Sclater, who, as is well known, first divided the earth into six ornithological regions now widely adopted for animals in general ("On the general Geographical Distribution of the Members of the Class Aves": J. Proc. Linn. Soc. 1858 II, 130—145)[1]) in 1891 recognised the line ("On Recent Advances in our knowledge of the Geographical Distribution of birds": Ibis, p. 515), though he gave Celebes a special heading (p. 530) and says (p. 533) that Celebes is "a

collector as he would gain a similar harvest on the high mountains of Celebes, which rise to nearly 10 000 feet, and from where next to nothing is as yet known.

[1]) See, also, his lecture on "The Geogr. Distribution of Mammals" Sc. Lect. f. the people (6. 1874 p. 80.

debatable land between the Oriental and Australian Regions, but more properly attributable to the former".

W. H. Flower & R. Lydekker, in 1891 (Introd. to the Study of Mammals p. 102), regard Celebes as the typical representative of the Austro-Malayan transitional region or sub-region, but they do not define it and do not recur to Wallace's line (except on p. 97).

P. A. van der Lith, 1893, gave (Nederl. Ost-Indië, 2. ed. I, 11) a sketch of the facts and views concerning the line, but was inclined not to adopt it. A very readable résumé is to be found in J. F. van Bemmelen's book: "Uit Indië", 1895, p. 146 et seq.

E. Haeckel in 1893 ("Zur Phylogenie der australischen Fauna" in Semon's Zool. Forschungsreisen, I p. V) adopts the line without entering critically into this difficult and complicated question, though he presents us with the following astonishing affirmation: "An keinem anderen Punkte unserer Erde stehen zwei benachbarte Thiergebiete in so auffallendem Gegensatze, als auf der schmalen Grenze zwischen der indo-malayischen und austral-malayischen Region. Überschreiten wir die schmale Meerenge am Südende dieser Grenze, die tiefe Lombok Strasse, so treten wir mit einem Male aus der Gegenwart in das mesozoische Zeitalter [!]. Obgleich die beiden Nachbar-Inseln Bali und Lombok nur wenige Meilen entfernt und im Allgemeinen denselben klimatischen Bedingungen unterworfen sind, erscheint dennoch die charakteristische Landesfauna derselben gänzlich verschieden; und noch mehr gilt das, wenn wir die Mangkassar Strasse überschreiten und von dem indischen Borneo nach dem australischen Celebes übersetzen. Der durchgreifende Gegensatz ihrer Vogel- und Säugethier-Welt ist so gross, dass er zu den schlagendsten chorologischen Argumenten des Transformismus gerechnet werden muss." (!)

W. Haacke, 1893, simply adopts the line (Schöpfung der Thierwelt" p. 238).

A. Newton, also in 1893, ("A Dictionary of Birds", p. 317—363, and Map facing p. 1, likewise accepts the line. Concerning Celebes he says: "To the Papuan Region may be assigned, though with doubt, the wonderful island of Celebes, presenting perhaps more anomalies than any other in the world, and yet anomalies which, by the use of strictly scientific inference (as Mr. Wallace has shewn us), may possibly tell a story that sounds so romantic and yet will satisfy those who judge it more severely".

R. B. Sharpe, likewise in 1893 ("On the Zoo-Geographical Areas of the World, illustrating the Distribution of Birds": Natural Science III, 100 and map), applies the Wallace-line as western frontier to his Australian Region; he recognizes a Celebean Sub-Region, which, with the exception of the Sula Islands, coincides with our Celebesian area, and a Moluccan Sub-Region, comprising everything between Lombok, a line east of Celebes, New Guinea and Aru to the east, and Australia to the south.

F. H. H. Guillemard, when editing Mr. Wallace's "Australasia" in 1894, likewise appears to have neglected literature when he says (p. 347 — a passage

not in the first edition of 1879, p. 419, and we are not aware whether it is in subsequent ones): "We thus have the Sunda Chain divided distinctly and definitely into an Asiatic and an Australian portion, the dividing line coinciding with the deep-sea channel existing between Bali and Lombok. This boundary is now universally known as 'Wallace's line'".

M. Weber, 1894, in his important paper: "Die Süsswasser-Fische des Indischen Archipels, nebst Bemerkungen über den Ursprung der Fauna von Celebes" (Zool. Ergebnisse III, 468) came to the result that Celebes has no Australian, but a highly impoverished Indian character in its fish-fauna, and remarked as to the general problem (p. 473): "The unhappy line of Wallace, which he himself has not formally retained for Celebes, has worked its way deeply into the brains of numerous zoologists as something fascinatingly simple. Text-books which touch upon zoogeography and get rid of the subject in a few words maintain their hold on this classical frontier. And thus the Australian Fauna of Celebes lives notwithstanding various protests." Prof. Weber concludes (p. 476): "The original line of Wallace separates groups of islands, of which the western (Borneo, Sumatra and Java) received, on account of their size, but chiefly in consequence of their longer connection with the Indian continent, a rich Oriental fauna and, therefore, have developed specific forms of Indian character. Of the eastern, Celebes was first separated from the Indian continent and remained cut off. In consequence, it retained single older forms, which developed independently. — Consisting in earlier times of single smaller islands, its fauna has remained poor."

F. E. Beddard, in 1895 ("A Text-Book of Zoogeography"), recognises Wallace's line (p. 103 and frontispiece-map) as a frontier between the Oriental and the Australian Regions (p. 103 and 113), though (p. 113) he says that Celebes "probably" belongs to the latter, but (p. 106) treats of it under the heading of the Malayan Sub-region of the former.

R. Lydekker in 1896 ("A Geographical History of Mammals", p. 45 and map), adopts Heilprin's Transition Region (see above) as an Austro-Malayan Region and as one of four Regions of the Notogaeic Realm (p. 27): "Poverty, and an admixture of Australian and Malayan types, with a very marked preponderance of the latter, are the leading features in its mammalian fauna". He says, however, that from the living mammalian fauna one might be inclined to place the whole area within the limits of the Oriental Region. He evidently hesitates in giving Celebes a fixed position, the more so as "there is absolutely no palaeontological evidence to help us in regard to past history".

C. Hedley ("Mollusca of the Oriental region": Journ. of Malacol. IV, 53) showed, 1895, that the line between Bali and Lombok has no value for the Mollusca, as the land-shells of these two islands do not differ essentially.

Likewise E. v. Martens showed in 1896 (Sb. Ges. natf. Freunde zu Berlin p. 157), that of 10 land-shells from Lombok 3 are geographically neutral, 4 are

assigned to the great Sunda Islands, 3 to the eastern islands, that, therefore, no sharp frontier exists for land-shells between Bali and Lombok.

The same eminent conchologist said in 1897 ("Süss- und Brackwasser-Mol. des Indischen Archipels": Weber's Zool. Ergebnisse IV, 298): "The frontier between Bali and Lombok is for the fresh-water Mollusca quite imaginary, as long as we know next to nothing of the species living on these islands;" and he proved further (p. 297) that the fresh-water Mollusca from South Celebes are most closely allied to those of Java and Flores, those of North Celebes most closely to those of the Philippines, which is not consistent with Wallace's line, but with the geographical position.

A. Supan, 1896 "Grundzüge der physischen Erdkunde", p. 557, and Maps XIX, XX sticks to the "celebrated" line.

W. Kükenthal, in 1896 (Abh. Senckenb. Naturf. Ges. XXII, 130), abnegates Wallace's line.

W. L. Sclater, 1896, treating of the Mammals of his Celebesian Subregion "The Geography of Mammals": Geogr. Journ. VIII, 388 with Maps), finds that the Australian element in the mammalian fauna of Celebes does not in any way require the supposition of an ancient land-connection with that Region, but that the greater amount of Oriental forms suggests such a former connection with Asia; he, therefore, annexes the Celebesian Subregion to the Oriental and not to the Australian Region. In the beginning of this important paper (l. c. 1894, III, p. 97, with Map, and IV, p. 35, with Map) Mr. Sclater draws Wallace's line to the east of Celebes and between Bali and Lombok (see, also, l. c. VIII, p. 378) and takes this as the frontier between the Australian and the Oriental Region, reckoning the Sula Islands to the former, Celebes to the latter, as "on the whole the evidence of the mammals, at any rate, serves to connect it more closely with the Oriental Region" (see l. c. IV p. 36).

F. J. Niermeyer, finally, in 1897 ("De Geschiedenis van de lijn van Wallace": Tijdschr. Kon. Ned. Aard. Gen. 2. ser. XIV, 758), has given a very readable historical sketch. He rightly censures zoologists, botanists, and geographers for often writing on the problem without having consulted Wallace himself, or the manifold literature extant on this subject, and still advocating a frontier which specialists have long since abandoned. He shows in detail how Wallace himself has altered his opinion from 1860 to 1863, 1869, 1876, and 1880, and what Weber's merits are in promoting knowledge on this question.

On going over these different opinions on Wallace's line it will be seen that they are fairly equally divided, though they must be weighed and not counted, many writers on the general subject not plunging deeply into the problem, but uncritically following the authority of this eminent naturalist. One must also take into account that errors, when once they have crept into books, disappear from them with great difficulty. On the other hand also, some

specialists of the highest standing acquiesce in the line, partly disregarding the circumstance that Wallace himself has to a certain degree altered his views; whereas others of the same rank encounter insuperable obstacles in adopting such a frontier between the Oriental and Australian Regions. There can be no doubt that in our present state of knowledge it is premature to define the problem for solution, however interesting and suggestive it may be, and that it is, therefore, waste of time to speculate on it with the help of an up-and-down system for the islands and continents, just as required. It is characteristic of an inadequate hypothesis that it is always in need of a new one which should sustain it, and as geology and palaeontology are as yet powerless to guide us, we must restrict ourselves to zoology, though we know that here also our knowledge is defective in a high degree. Let us see, however, what the ornithology of Celebes in its present state teaches, and whether our results agree at least with those arrived at by others.

What are the characteristic elements of the Celebesian Avifauna and where did they originate? This is the only question we put, and which we will try to answer — always bearing in mind that our ornithological knowledge of Celebes, especially of the centre and high mountains, is imperfect —, leaving all further speculations to the naturalist of the future.

The following table of the Geographical Distribution of the species treated of in this book will facilitate the answer to our question. It will be observed that the Celebesian Area is flanked to the left by the Nearctic, Ethiopian, Palaearctic and Oriental Regions, to the right by the Australian and Neotropical Regions, the generally adopted Sclaterian division having been accepted for convenience's sake, though we are aware that that of Prof. Newton (D. B. 1893, p. 315 *et seq.*) is an improvement upon it. (His main divisions are the New Zealand, Australian, Neotropical, Holarctic, Ethiopian and Indian Regions; uniting under the Holarctic the Nearctic and Palaearctic, and separating the former Australasian Region into an Australian and a New Zealand Region.) The affinities of the Celebesian Avifauna make it preferable to break up the Oriental Region into several parts, inserting between them Japan — a section of the Palaearctic Region, as follows: Indian Province, Chinese Province, Japan, the Malay Peninsula, Sumatra, Java, and Borneo. For similar reasons we have divided the Australian Region into Papuasia, Australia, Polynesia, and New Zealand. As to the middle parts of the East Indian Archipelago we advocate, as will be seen later on, the recognition of a broad Transition-Zone, comprising four areas — a Philippine, a Celebesian, a Lesser Sundan, and a Moluccan, — although the three first display a preponderance of Asiatic elements, while the Moluccas correspond naturally to their geographical position between Sula and Papuasia.

GEOGRAPHICAL DISTRIBUTION OF THE

Number	Name of species	Page in the text	Nearctic Region	Ethiopian Region	Palaearctic Region	Indian Province	Chinese Province	Japan	Malay Peninsula	Sumatra	Java	Borneo	Philippine Islands	Lesser Sunda Islands
1	Spilornis rufipectus J. Gd. (typical) . .	2	—	—	—	—	—	—	—	—	—	—	—	—
	— rufipectus sulaensis (Schl.) . . .	4	—	—	—	—	—	—	—	—	—	—	—	—
	— rufipectus<sulaensis	5	—	—	—	—	—	—	—	—	—	—	—	—
2	Circus assimilis Jard. Selby	7	—	—	—	—	—	—	—	—	—	—	—	—
3	Astur griseiceps Schl..	9	—	—	—	—	—	—	—	—	—	—	—	—
4	Astur trivirgatus (Temm.) (typical . .	11	—	—	—	*	*	—	—	*	*	*	*	—
	— trivirgatus rufitinctus (McClell.)	12	—	—	—	*	—	—	*	—	—	—	—	—
5	? Astur tenuirostris Brügg.	13	—	—	—	—	—	—	—	—	—	—	—	—
6	Urospizias torquatus (Temm.).	15	—	—	—	—	—	—	—	—	*?	—	—	*
7	Tachyspizias soloensis (Horsf.)	17	—	—	—	*	*	—	*	*	*	*	*	—
8	Spilospizias trinotatus (Bp.) (typical) . .	21	—	—	—	—	—	—	—	—	—	—	—	—
	— trinotatus haesitandus Hart. . .	23	—	—	—	—	—	—	—	—	—	—	—	—
9	Accipiter rhodogaster (Schl.)	25	—	—	—	—	—	—	—	—	—	—	—	—
10	Accipiter sulaensis (Schl.)	26	—	—	—	—	—	—	—	—	—	—	—	—
11	Accipiter virgatus (Temm.) (typical) . .	27	—	—	—	*	—	—	*	*	*	—	—	—
	— virgatus affinis (Hdgs.)	28	—	—	—	*	*	—	—	—	—	—	—	—
	— virgatus manilensis (Meyen) . .	28	—	—	—	—	—	—	—	—	—	—	*	—
	— virgatus gularis (Temm. Schl.) .	28	—	—	*	—	*	*	*	*	*	*	*	*
	— virgatus rufotibialis (Sharpe) . .	29	—	—	—	—	—	—	—	—	—	*	—	—
12	Spizaetus lanceolatus Temm. Schl.. .	32	—	—	—	—	—	—	—	—	—	—	—	—
13	Lophotriorchis kieneri (G. Sparre) . .	35	—	—	—	*	—	—	*	*	*	*	*	*
14	Ictinaetus malayensis (Reinw.)	38	—	—	—	*	—	—	*	*	*	*	—	—
15	Haliaetus leucogaster (Gm.)	40	—	—	—	*	*	—	*	*	*	*	*	*
16	Polioaetus humilis (Müll. Schl.) (typical)	43	—	—	—	*	—	—	*	—	—	*	—	—
	— humilis major n. subsp.	44	—	—	—	*	—	—	—	—	—	—	—	—
	— humilis—major	44	—	—	—	*	—	—	—	—	—	—	—	—
17	Butastur indicus (Gm.)	45	—	—	*	*	*	*	*	—	*	*	*	—
18	Butastur liventer (Temm.)	49	—	—	—	*	*	—	—	—	*	*?	—	*
19	Haliastur indus (Bodd.)	51	—	—	—	*	—	—	*	*	*	*	*	*
20	Milvus migrans (Bodd.) (typical) . . .	60	—	*	*	*	—	—	—	—	—	—	—	—
	— migrans melanotis (Temm. Schl.)	60	—	—	*	*	—	*	—	—	—	*	—	—
	— migrans govinda (Sykes). . . .	60	—	—	—	*	—	—	—	—	—	—	—	—
	— — affinis (J. Gd.) & m.—affinis.	60	—	—	—	*	*	—	*	*	—	—	—	*
21	Elanus hypoleucus J. Gd.	62	—	—	—	—	—	—	—	*	*	*	*	—
22	Pernis celebensis (Wall.).	65	—	—	—	—	—	—	—	—	—	—	—	—
23	Pernis sp.	72	—	—	—	—	—	—	—	—	—	—	—	—
24	Baza celebensis Schl.	73	—	—	—	—	—	—	—	—	—	—	—	—
25	Baza reinwardti Müll. Schl.	75	—	—	—	—	—	—	—	—	—	—	—	*
26	Tinnunculus moluccensis orient. n. subsp.	79	—	—	—	—	—	—	—	—	—	—	—	—
	— moluccensis occidentalis M. & Wg.	79	—	—	—	—	—	—	—	—	*	*	—	*
	— molucc. orientalis—occidentalis .	79	—	—	—	—	—	—	—	—	—	—	—	—
27	Falco severus papuanus M. & Wg. . . .	84	—	—	—	—	—	—	—	—	—	—	—	—

SPECIES OF THE CELEBESIAN AREA.

Celebesian Area																						
		Celebes																				
Talaut Islands	Sangi Islands	North Peninsula	West Celebes	East Peninsula	Togian Islands	Central Celebes	South Peninsula	S. E. Peninsula (and Buton)	Saleyer Island	Djampea Group	Peling Group	Sula Islands	Moluccas	Papuasia	Australia	Polynesia	New Zealand	Neotropical Region	Name of species
—	*?	*	—	*	*	*	*	*	*	—	—	—	—	—	—	—	—	—	Spilornis rufipectus (typ.)
—	—	—	—	—	—	—	—	—	—	—	—	*	—	—	—	—	—	—	— rufipectus sulaensis.
—	—	—	—	—	—	—	—	—	—	—	*	—	—	—	—	—	—	—	— — <sulaensis.
—	—	*	—	—	—	*	*	—	—	—	—	—	—	—	*	—	—	—	Circus assimilis.
—	—	*	*	—	—	*	*	—	—	—	—	—	—	—	—	—	—	—	Astur griseiceps.
—	—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Astur trivirgatus.
—	—	*?	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	— — rufitinctus.
—	—	—	—	—	—	—	—	—	—	*	—	—	—	*	*	—	—	—	? Astur temnirostris.
*	*	*	*	—	—	—	—	—	—	—	—	*	*	*	—	—	—	—	Urospizias torquatus.
—	—	*	*	—	—	—	*	—	—	—	—	—	—	—	—	—	—	—	Tachyspizias soloensis.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Spilospizias trinotat. (typ.).
—	—	*	*	—	—	—	*	—	—	—	—	—	—	—	—	—	—	—	— — haesitandus.
—	—	—	—	—	—	—	—	—	—	—	*	*	—	—	—	—	—	—	Accipiter rhodogaster.
—	—	—	—	—	—	—	—	—	—	—	—	*	—	—	—	—	—	—	Accipiter sulaensis.
—	—	—	—	—	—	—	—	—	—	*	—	—	—	—	—	—	—	—	Accipiter virgatus (typ.).
—	—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	— virgatus affinis.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	— virgatus manilensis.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	— virgatus gularis.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	— virgatus rufotibialis.
—	—	*	—	—	—	*	*	—	—	—	—	*	—	—	—	—	—	—	Spizaetus lanceolatus.
—	—	*	—	—	—	—	*	—	—	—	—	*?	*?	—	—	—	—	—	Lophotriorchis kieneri.
—	—	*	—	*	—	—	*	—	*	—	*	—	*	*	*	*?	*?	—	Haliaetus leucogaster.
—	—	*	—	—	—	—	*	—	—	—	*	—	—	—	—	—	—	—	Polioaetus humilis (typ.).
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	— humilis major n. subsp.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	— humilis—major.
*	*	*	—	—	—	—	—	—	—	—	—	—	*	*	—	—	—	—	Butastur indicus.
—	—	—	—	—	—	*	*	—	—	—	—	—	*?	—	—	—	—	—	Butastur liventer.
*	*	*	—	—	*	—	*	—	—	—	*	*	*	*	*	—	—	—	Haliastur indus.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Milvus migrans (typical).
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	— migrans melanotis.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	— migrans govinda.
—	—	*	—	—	—	—	*	—	—	—	—	—	—	—	*	—	—	—	— migrans affinis, etc.
—	—	*	—	—	—	*	*	—	—	*	—	—	—	—	—	—	—	—	Elanus hypoleucus.
—	—	*	—	—	—	—	*	—	—	—	*	—	—	—	—	—	—	—	Pernis celebensis.
—	—	—	—	—	—	—	—	—	*	—	—	—	—	—	—	—	—	—	Pernis sp.
—	—	*	—	—	—	*	*	—	—	—	*	*	—	—	—	—	—	—	Baza celebensis.
—	—	—	—	—	—	—	—	—	—	*	—	—	*	*	—	—	—	—	Baza reinwardti.
—	—	—	—	—	—	—	—	—	—	—	—	—	*	—	—	—	—	—	Timunculus mol. orient.
—	—	*	—	—	—	—	*	—	—	*	—	—	—	*?	—	—	—	—	— moluccensis occident.
—	—	—	—	—	—	—	—	—	—	—	*	—	*	—	—	—	—	—	— — orient.—occident.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	*	—	—	—	—	Falco severus papuanus.

Number	Name of species	Page in the text	Nearctic Region	Ethiopian Region	Palaearctic Region	Indian Province	Chinese Province	Japan	Malay Peninsula	Sumatra	Java	Borneo	Philippine Islands	Lesser Sunda Islands
27	Falco severus indicus n. subsp.	81	—	—	—	*	—	—	—	—	—	—	—	—
	— severus papuanus—indicus	84	—	—	—	—	—	—	*	—	*	*	*	—
28	Falco peregrinus (Gerini) (typical)	85	*?	*	*	*	—	—	—	*	*	*	*	*
	— peregrinus melanogenys (J. Gd.)	86	—	—	—	—	*?	—	—	*	*	*	*	*
	— peregrinus ernesti (Sharpe)	86	—	—	—	—	—	—	—	—	—	*	*	—
	— peregrinus anatum (Bp)	87	*	—	*?	—	—	—	—	—	—	—	—	—
	— peregrinus pealei Ridgw.	87	*	—	—	—	—	—	—	—	—	—	—	—
29	Pandion haliaetus (L.) (typical)	89	—	*	*	*	*	—	—	—	*	*	*	—
	— haliaetus leucocephalus (J. Gd.)	89	—	—	—	—	—	—	—	—	—	*	*	—
	— haliaetus carolinensis Gm.	90	*	—	—	—	—	—	—	—	—	—	—	—
30	Ninox ochracea (Schl.)	94	—	—	—	—	—	—	—	—	—	—	—	—
31	Ninox scutulata (Raffl.) (typical)	95	—	—	—	*	—	—	*	*	*	*	—	—
	— scutulata lugubris (Tickell)	95	—	—	—	*	—	—	—	—	—	—	—	—
	— scutulata affinis (Tytler)	95	—	—	—	*	—	—	—	—	—	—	—	—
	— scutulata japonica (Temm. Schl.	95	—	—	*	—	*	*	—	—	—	*	*	*
32	Cephaloptynx punctulata (Q. G.	100	—	—	—	—	—	—	—	—	—	—	—	—
33	Scops manadensis (Q. G.) (typical)	103	—	—	—	—	—	—	—	—	—	—	—	—
	— manadensis albiventris (Sharpe)	105	—	—	—	—	—	—	—	—	—	—	—	*
	— manadensis rutilus (Pucher.)	105	—	*	—	—	—	—	—	—	—	—	—	—
	— manadensis capnodes (Gurney)	105	—	*	—	—	—	—	—	—	—	—	—	—
	— manadensis magicus (S. Müll.)	105	—	—	—	—	—	—	—	—	—	—	—	—
	— manadensis leucospilus (Gray)	106	—	—	—	—	—	—	—	—	—	—	—	—
	? — manadensis morotensis (Sharpe)	106	—	—	—	—	—	—	—	—	—	—	—	—
	— manadensis brookii (Sharpe)	107	—	—	—	—	—	—	—	—	—	*	—	—
	— manadensis sibutuensis (Sharpe)	107	—	—	—	—	—	—	—	—	—	—	*	—
34	Strix flammea rosenbergi (Schl.)	109	—	—	—	[1]	—	—	—	—	—	—	—	—
	— flammea L. (typical)[1]	111												
35	Strix inexpectata Schl.	112	—	—	—	—	—	—	—	—	—	—	—	—
36	Strix candida Tick.	112	—	—	—	*	*	—	—	—	—	—	*	—
37	Eos histrio (St. Müll.) (typical)	115	—	—	—	—	—	—	—	—	—	—	—	—
	— histrio talautensis M. & Wg.	117	—	—	—	—	—	—	—	—	—	—	—	—
	— histrio challengeri (Salvad.)	118	—	—	—	—	—	—	—	—	—	—	—	—
38	Trichoglossus ornatus (L.)	120	—	—	—	—	—	—	—	—	—	—	—	—
39	Trichoglossus forsteni Bp. (typical)	123	—	—	—	—	—	—	—	—	—	—	—	*
	— forsteni djampeanus Hart.	124	—	—	—	—	—	—	—	—	—	—	—	—
40	Trichoglossus meyeri Tweedd. (typical)	124	—	—	—	—	—	—	—	—	—	—	—	—
	— meyeri bonthainensis (A. B. M.)	125	—	—	—	—	—	—	—	—	—	—	—	—
41	Trichoglossus flavoviridis Wall.	127	—	—	—	—	—	—	—	—	—	—	—	—
42	Cacatua sulphurea (Gm.) (typical)	128	—	—	—	—	—	—	—	—	—	—	—	—
	— sulphurea djampeana Hart.	130	—	—	—	—	—	—	—	—	—	—	—	—
	— sulphurea parvula (Bp.)	130	—	—	—	—	—	—	—	—	—	—	—	*
43	Prioniturus platurus (Vieill.)	133	—	—	—	—	—	—	—	—	—	—	—	—
44	Prioniturus flavicans Cass.	138	—	—	—	—	—	—	—	—	—	—	—	—
45	Tanygnathus muelleri (Müll. Schl.) (typ.	140	—	—	—	—	—	—	—	—	—	—	—	—

[1] Distribution not clearly defined.

Celebesian Area																			
		Celebes																	
Talaut Islands	Sangi Islands	North Peninsula	West Celebes	East Peninsula	Togian Islands	Central Celebes	South Peninsula	S. E. Peninsula (and Buton)	Saleyer Island	Djampea Group	Peling Group	Sula Islands	Moluccas	Papuasia	Australia	Polynesia	New Zealand	Neotropical Region	Name of species
—	—	—	—	—	—	—	—	—	—	—	—	—			—	—	—	—	Falco severus indicus.
—	—	*	—	—	—	—	*	—	—	—	—	—	*		—	—	—	—	— — papuan.—indicus.
—	—	*?	—	—	—	—	—	—	—	—	—	—	*	—	—	—	—	—	Falco peregrinus (typ.).
—	—	*	—	—	—	—	—	—	—	—	—	—	—	*	*	*	—	—	— — melanogenys.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	*	—	—	— — ernesti.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	*	— — anatum.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	— — pealei.
—	*	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Pandion haliaetus (typ.).
*	*	*	—	—	—	—	—	—	—	*	*	—	*	*	*	*	*	—	— — leucocephalus.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	*	— — carolinensis.
—	—	*	—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Ninox ochracea.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Ninox scutulata (typical).
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	— — lugubris.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	— — affinis.
*	*	*	—	—	—	—	*	—	—	*	—	*	*	—	—	—	—	—	— — japonica.
—	—	*	—	—	—	—	*	—	—	—	—	—	—	—	—	—	—	—	Cephaloptynx punctulata.
—	*	*	—	—	—	—	*	*	—	—	—	—	—	—	—	—	—	—	Scops manadensis (typ.).
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	— — albiventris.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	— — rutilus.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	— — capnodes.
—	—	—	—	—	—	—	—	—	—	—	—	—	*	—	—	—	—	—	— — magicus.
—	—	—	—	—	—	—	—	—	—	—	—	—	*	—	—	—	—	—	— — leucospilus.
—	—	—	—	—	—	—	—	—	—	—	—	—	*	—	—	—	—	—	?— — morotensis.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	— — brookii.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	— — sibutuensis.
—	*	*	—	—	—	—	*	—	—	—	—	—	—	—	—	—	—	—	Strix flammea rosenbergi.
—	—	—	—	—	—	—	—	—	—	*	—	—							— flammea (typical) [1].
—	—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Strix inexpectata.
—	—	—	—	—	—	*	—	—	—	—	—	—	—	—	*	*	—	—	Strix candida.
—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Eos histrio (typical).
*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	— histrio talautensis.
* [2]	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	— histrio challengeri.
—	—	*	*	*	*	—	*	*	—	—	*	—	—	—	—	—	—	—	Trichoglossus ornatus.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Trich. forsteni (typical).
—	—	—	—	—	—	—	—	—	—	*	—	—	—	—	—	—	—	—	— forsteni djampeanus.
—	—	*	—	—	—	*	—	—	—	—	—	—	—	—	—	—	—	—	Trich. meyeri (typical).
—	—	—	—	—	—	—	*	—	—	—	—	—	—	—	—	—	—	—	— meyeri bonthainensis.
—	—	—	—	—	—	—	—	—	—	—	—	*	—	—	—	—	—	—	Trich. flavoviridis.
—	—	*	*	—	—	*	*	*	—	—	—	—	—	—	—	—	—	—	Cacatua sulphurea (typ.).
—	—	—	—	—	—	—	—	—	—	*	—	—	—	—	—	—	—	—	— sulphurea djampeana
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	— sulphurea parvula.
*	*	*	—	—	*	—	*	*	—	—	*	—	*?	—	—	—	—	—	Prioniturus platurus.
—	*?	*	—	—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	Prioniturus flavicans.
—	—	*	—	*	*	*	*	*	—	—	*	*	—	—	—	—	—	—	Tanygnath. muelleri (typ.).

[2]) Lit. Nanusa Islands.

Number	Name of species	Page in the text	Nearctic Region	Ethiopian Region	Palaearctic Region	Indian Province	Chinese Province	Japan	Malay Peninsula	Sumatra	Java	Borneo	Philippine Islands	Lesser Sunda Islands
45	Tanygnathus muelleri sangirensis M.&Wg.	142	—	—	—	—	—	—	—	—	—	—	—	—
	— muelleri—sangirensis.	142	—	—	—	—	—	—	—	—	—	—	—	—
46	? Tanygnathus luconensis (L.).	144	—	—	—	—	—	—	—	—	—	—	*	—
47	Tanygnathus talautensis M. & Wg. . .	145	—	—	—	—	—	—	—	—	—	—	—	—
48	Tanygnath. megalorhynchus (Bodd.) (typ.)	146	—	—	—	—	—	—	—	—	—	—	—	—
	— megalorhynchus sumbensis (Meyer)	148	—	—	—	—	—	—	—	—	—	—	—	*
	— megalorhynchus — sumbensis . .	148	—	—	—	—	—	—	—	—	—	—	—	—
49	Loriculus exilis Schl.	149	—	—	—	—	—	—	—	—	—	—	—	—
50	Loriculus catamene Schl.	151	—	—	—	—	—	—	—	—	—	—	—	—
51	Loriculus sclateri Wall. (typical) . . .	153	—	—	—	—	—	—	—	—	—	—	—	—
	— sclateri ruber M. & Wg.	154	—	—	—	—	—	—	—	—	—	—	—	—
52	Loriculus quadricolor Tweedd.	157	—	—	—	—	—	—	—	—	—	—	—	—
53	Loriculus stigmatus (Müll. Schl.) . .	158	—	—	—	—	—	—	—	—	—	—	—	—
54	Aprosmictus sulaensis (Rchw.)	170	—	—	—	—	—	—	—	—	—	—	—	—
55	Iyngipicus temminckii (Malh.)	173	—	—	—	—	—	—	—	—	—	—	—	—
56	Microstictus fulvus (Q. G.)	175	—	—	—	—	—	—	—	—	—	—	—	—
57	Microstictus wallacei (Tweedd.) . . .	179	—	—	—	—	—	—	—	—	—	—	—	—
58	Hierococcyx crassirostris (Tweedd. . .	182	—	—	—	—	—	—	—	—	—	—	—	—
59	Hierococcyx sparverioides (Vig.). . . .	184	—	—	*	*	*	—	*	—	*	*	*	—
60	Hierococcyx fugax (Horsf.)	185	—	—	*	—	*	*	*	*	*	*	*	—
61	Cuculus canorus (L.) (typical).	187	—	*	*	*	—	—	—	—	—	—	—	—
	— canorus canoroides (S. Müll.) .	188	—	—	*?	*	*	*	*	—	*	*	*	*
62	? Cuculus saturatus Hdgs..	191	—	—	*?	*	*	*?	—	*?	*?	*	*?	*?
63	Chrysococcyx malayanus (Raffl.) . . .	194	—	—	—	—	—	—	*	*	—	*	*	*
64	Chrysococcyx basalis (Horsf.)	195	—	—	—	—	—	—	*	—	*	—	—	*
65	Cacomantis virescens (Brügg.)	196	—	—	—	—	—	—	—	—	—	—	—	—
66	Cacomantis merulinus (Scop.)	199	—	—	—	*	*	—	*	—	*	*	*	*
67	Coccystes coromandus (L.)	201	—	—	—	*	*	—	*	*	*	*	*	—
68	Surniculus musschenbroeki A. B. M. . .	203	—	—	—	—	—	—	—	—	—	—	—	—
69	Eudynamis melanorhyncha S. Müll. . .	205	—	—	—	—	—	—	—	—	—	—	—	—
70	Eudynamis mindanensis (L.) (typical). .	210	—	—	—	—	—	—	—	—	—	—	*	—
	— mindanensis sangirensis (W. Blas.)	211	—	—	—	—	—	—	—	—	—	—	—	—
71	Centrococcyx bengalensis (Gm.)	213	—	—	—	*	*	—	*	*	*	*	*	*
72	Pyrrhocentor celebensis (Q. G.) (typical)	221	—	—	—	—	—	—	—	—	—	—	—	—
	— celebensis rufescens M. & Wg.) .	223	—	—	—	—	—	—	—	—	—	—	—	—
73	Phoenicophaes calorhynch. (Temm.) (typ.)	226	—	—	—	—	—	—	—	—	—	—	—	—
	— calorhynchus meridionalis M. & Wg.	227	—	—	—	—	—	—	—	—	—	—	—	—
74	Scythrops novaehollandiae Lath. . . .	231	—	—	—	—	—	—	—	—	—	—	—	*
75	Rhabdotorrhinus exaratus (Temm.) . .	235	—	—	—	—	—	—	—	—	—	—	—	—
76	Cranorrhinus cassidix (Temm.	239	—	—	—	—	—	—	—	—	—	—	—	—
77	Merops ornatus Lath..	248	—	—	—	—	—	—	—	—	*?	*?	—	*
78	Merops philippinus L.	253	—	—	—	*	*	—	*	*	*	*	*	*
79	Meropogon forsteni Bp.	257	—	—	—	—	—	—	—	—	—	—	—	—
80	Alcedo ispida L.	262	—	*	*	*	*	*	*	—	*	*	*	*

Celebesian Area																			
		Celebes																	
Talant Islands	Sangi Islands	North Peninsula	West Celebes	East Peninsula	Togian Islands	Central Celebes	South Peninsula	S. E. Peninsula (and Buton)	Saleyer Island	Djampea Group	Peling Group	Sula Islands	Moluccas	Papuasia	Australia	Polynesia	New Zealand	Neotropical Region	Name of species
—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Tanygn. muell. sangirensis.
*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	-- muelleri—sangirensis.
—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	?Tanygnath. luconensis.
*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Tanygnath. talautensis.
*	*	*	—	—	—	—	—	—	—	—	—	—	*	*	—	—	—	—	T. megalorhynchus (typ.).
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	— — sumbensis.
—	—	—	—	—	—	—	—	—	—	*	—	—	—	—	—	—	—	—	— megalorh.—sumb.
—	—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Loriculus exilis.
—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Loriculus catamene.
—	—	*?	—	—	—	—	—	—	—	—	—	*	—	—	—	—	—	—	Loriculus sclateri.
—	—	—	—	—	—	—	—	—	—	—	*	—	—	—	—	—	—	—	— sclateri ruber.
—	—	—	—	—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	Loriculus quadricolor.
—	—	*	*	*	—	*	*	—	—	—	—	—	—	—	—	—	—	—	Loriculus stigmatus.
—	—	—	—	—	—	—	—	—	—	—	*	*	—	—	—	—	—	—	Aprosmictus sulaensis.
—	—	*	—	—	—	—	*	—	—	—	—	—	—	—	—	—	—	—	Iyngipicus temmincki.
—	—	*	—	—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	Microstictus fulvus.
—	—	—	*	*	—	*	*	*?	—	—	—	—	—	—	—	—	—	—	Microstictus wallacei.
—	—	*	—	—	—	*	*	—	—	—	—	—	—	—	—	—	—	—	Hierococcyx crassirostris.
—	—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Hierococc. sparverioides.
—	—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Hierococc. fugax.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Cuculus canorus (typ.).
*	*	*	—	—	—	—	*	—	*	*	—	*	*	*	*	*	—	—	— canorus canoroides.
—	—	*?	—	—	—	—	*?	—	—	—	—	—	*?	*?	*?	*?	—	—	? Cuculus saturatus.
—	—	—	—	—	—	*	*	—	—	—	—	—	—	*	*	—	—	—	Chrysococcyx malayanus.
—	—	—	—	—	—	—	*	—	—	—	—	—	—	*	*	—	—	—	Chrysococcyx basalis.
—	—	*	*	*	—	*	*	—	—	—	*	—	—	—	—	—	—	—	Cacomantis virescens.
—	—	—	*	—	*?	—	*	—	—	—	—	—	—	—	—	—	—	—	Cacomantis merulinus.
—	—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Coccystes coromandus.
—	—	*	—	—	—	—	*	—	—	—	—	—	*	—	—	—	—	—	Surnicul. musschenbroeki.
—	—	*	*	*	*	—	*	—	—	—	*	*	—	—	—	—	—	—	Eudynam. melanorhyncha.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Eud. mindanensis (typical).
*	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	— — sangirensis.
*	*	*	—	*	—	*	*	*	—	*	—	—	*	—	—	—	—	—	Centrococcyx bengalensis
—	—	*	—	—	*	—	*?	—	—	—	—	—	—	—	—	—	—	—	Pyrrhocentor celeb. (typ.).
—	—	—	*	*	—	—	*	—	—	—	—	—	—	—	—	—	—	—	— celebensis rufescens.
—	—	*	—	*	*	—	—	*	—	—	—	—	—	—	—	—	—	—	Phoenicoph. calorh. (typ.).
—	—	—	*	—	—	*	*	—	—	—	—	—	—	—	—	—	—	—	— — meridionalis.
*	—	*	—	—	—	—	*	—	—	—	—	—	*	*	*	—	—	—	Scythrops novaeholland.
—	—	*	*	*	—	*	*	—	—	—	—	—	—	—	—	—	—	—	Rhabdotorrhinus exarat.
—	—	*	—	*	*	*	*	—	—	—	—	—	—	—	—	—	—	—	Cranorrhinus cassidix.
*	*	*	*	—	*	—	—	—	—	—	*	*	*	*	*	—	—	—	Merops ornatus.
—	—	*	—	—	—	*	*	—	—	—	—	—	—	—	—	—	—	—	Merops philippinus.
—	—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Meropogon forsteni.
*	*	*	—	—	—	—	—	—	*	—	—	—	*	—	—	—	—	—	Alcedo ispida.

Number	Name of species	Page in the text	Nearctic Region	Ethiopian Region	Palaearctic Region	Indian Province	Chinese Province	Japan	Malay Peninsula	Sumatra	Java	Borneo	Philippine Islands	Lesser Sunda Islands
81	Alcedo moluccana (Less.)	264	—	—	—	—	—	—	—	—	—	—	—	—
82	Alcedo meninting Horsf.	266	—	—	—	*	*	—	*	*	*	*	*	*
83	Pelargopsis melanorhyncha (Temm.)	269	—	—	—	—	—	—	—	—	—	—	—	—
84	Pelargopsis dichrorhyncha M. & Wg.	271	—	—	—	—	—	—	—	—	—	—	—	—
85	Ceyx wallacei Sharpe	272	—	—	—	—	—	—	—	—	—	—	—	—
86	Ceycopsis fallax (Schl.)	275	—	—	—	—	—	—	—	—	—	—	—	—
87	Ceycopsis sangirensis M. & Wg.	278	—	—	—	—	—	—	—	—	—	—	—	—
88	Halcyon coromanda rufa (Wall.)	280	—	—	—	—	—	—	—	—	—	—	—	—
89	Halcyon pileata (Bodd.)	283	—	—	*	*	*	*	*	*	—	*	*	—
90	Halcyon sancta Vig. Horsf.	287	—	—	—	—	—	—	—	*	*	*	—	*
91	Halcyon chloris (Bodd.) (typical)[1]	292												
92	Monachalcyon monachus (Bp.) (typical)	297	—	—	—	—	—	—	—	—	—	—	—	—
	— monachus intermedius Hart.	298	—	—	—	—	—	—	—	—	—	—	—	—
93	Monachalcyon capucinus M. & Wg.	299	—	—	—	—	—	—	—	—	—	—	—	—
94	Monachalcyon princeps Rchb.	300	—	—	—	—	—	—	—	—	—	—	—	—
95	Cittura cyanotis (Temm.)	303	—	—	—	—	—	—	—	—	—	—	—	—
96	Cittura sangirensis Sharpe	305	—	—	—	—	—	—	—	—	—	—	—	—
97	Coracias temmincki (Vieill.)	309	—	—	—	—	—	—	—	—	—	—	—	—
98	Eurystomus orientalis (L.)	312	—	—	*	*	*	—	*	*	*	*	—	*
99	Caprimulgus macrurus Horsf. (typical)	317	—	—	—	—	—	—	*	*	*	*	*	*
	— macrurus albonotatus (Tick.)	318	—	—	—	*	—	—	—	—	—	—	—	—
	— macrurus—albonotatus	318	—	—	—	*	*	—	—	—	—	—	—	—
100	Caprimulgus celebensis Grant	320	—	—	—	—	—	—	—	—	—	—	—	—
101	Caprimulgus affinis Horsf.	321	—	—	—	—	—	—	—	*	*	*	—	*
102	Lyncornis macropterus Bp.	322	—	—	—	—	—	—	—	—	—	—	—	—
103	Cypselus pacificus (Lath.)	327	—	—	*	*	*	*	*	—	—	—	—	—
104	Chaetura celebensis (Scl.)	329	—	—	—	—	—	—	—	—	—	—	*	—
105	Collocalia fuciphaga (Thunb.)	331	—	—	—	*	*	—	*	*	*	*	—	*
106	Collocalia esculenta (L.)	334	—	—	—	—	—	—	—	—	—	—	—	—
107	Collocalia francica (Gm.)	335	—	*	—	*	—	—	*	—	—	—	*	—
108	Macropteryx wallacei (J. Gd.)	336	—	—	—	—	—	—	—	—	—	—	—	—
109	Pitta celebensis Müll. Schl.	340	—	—	—	—	—	—	—	—	—	—	—	—
110	Pitta palliceps Brügg.	344	—	—	—	—	—	—	—	—	—	—	—	—
111	Pitta caeruleitorques Salvad.	345	—	—	—	—	—	—	—	—	—	—	—	—
112	Pitta inspeculata M. & Wg.	346	—	—	—	—	—	—	—	—	—	—	—	—
113	Pitta forsteni Bp.	350	—	—	—	—	—	—	—	—	—	—	—	—
114	Pitta sangirana (Schl.)	351	—	—	—	—	—	—	—	—	?	—	—?	—
115	Pitta cyanoptera Temm.	352	—	—	*	*	*		*	*	*	*	*	—
116	Pitta irena Temm.	354	—	—	—	—	—	—	—	—	—	—	—	*
117	Pitta virginalis Hart.	355	—	—	—	—	—	—	—	—	—	—	—	—
118	Hirundo rustica L. (races)[1]	357												
119	Hirundo javanica Sparrm.	358	—	—	—	*	—	—	*	*	*	*	*	*
120	Muscicapa griseosticta (Swinh.)	363	—	—	—	—	*	—	—	—	—	—	*	—

[1] Distribution of races not capable of exact definition.

Celebesian Area																									
		Celebes																							
Talaut Islands	Sangi Islands	North Peninsula	West Celebes	East Peninsula	Togian Islands	Central Celebes	South Peninsula	S. E. Peninsula (and Buton)	Saleyer Island	Djampea Group	Peling Group	Sula Islands	Moluccas	Papuasia	Australia	Polynesia	New Zealand	Neotropical Region	Name of species
—	*	*	—	*	—	—	*	—	*	*	*	*	*	*	—	—	—	—	Alcedo moluccana.
—	*	*	—	*	*	*	—	*	—	—	—	—	—	—	—	—	—	—	Alcedo meninting.
—	—	*	*	—	*	*	—	*	—	—	—	*	—	—	—	—	—	—	Pelargops. melanorhyncha
—	*	—	—	—	—	—	*	—	—	—	*	*	—	—	—	—	—	—	Pelargops. dichrorhyncha.
—	*	*	*	—	*	—	*	—	—	—	*	*	—	—	—	—	—	—	Ceyx wallacei.
—	—	*	—	—	—	—	*	—	—	—	*	*	—	—	—	—	—	—	Ceycopsis fallax.
—	—	*	—	—	*	—	*	—	—	—	*	*	—	—	—	—	—	—	Ceycopsis sangirensis.
—	—	*	—	—	*	—	*	—	—	—	*	*	—	—	—	—	—	—	Halcyon coromanda rufa.
—	—	*	—	—	*	—	*	—	—	—	*	*	*	*	*	*	—	—	Halcyon pileata.
—	—	*	—	*	*	—	*	*	*	*	*	*	—	—	—	—	—	—	Halcyon sancta.
—	—	*	—	—	—	—	*	—	—	—	—	—	—	—	—	—	—	—	Halcyon chloris (typ.)[1].
—	—	*	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Monachalc. monach. (typ.).
—	—	—	—	*	—	—	*	—	—	—	—	—	—	—	—	—	—	—	— — intermedius.
—	—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Monachalcyon capucinus.
—	—	*	*	*	—	—	—	*	—	—	—	—	—	—	—	—	—	—	Monachalcyon princeps.
—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Cittura cyanotis.
—	—	*	—	*	—	—	*	*	—	—	—	—	—	—	—	—	—	—	Cittura sangirensis.
—	*	*	—	—	—	—	*	—	—	*	*	*	*	*	*	—	*	—	Coracias temmincki.
—	—	—	—	—	—	—	—	—	*	*	—	—	*	*	*	—	—	—	Eurystomus orientalis.
—	—	—	—	—	—	—	—	—	—	—	—	—	*	*	*	—	—	—	Caprimulg.macrurus(typ.).
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	— — albonotatus.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	— macrurus—albonotat.
—	—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Caprimulgus celebensis.
—	—	—	*	—	—	—	*	—	—	—	—	—	—	—	—	—	—	—	Caprimulgus affinis.
—	—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Lyncornis macropterus.
—	—	*	—	—	—	—	—	—	—	—	—	—	—	*	*	—	—	—	Cypselus pacificus.
—	—	*	—	—	—	—	*	—	—	—	—	—	*	*	—	—	—	—	Chaetura celebensis.
—	—	—	—	—	—	—	*	—	—	*	*	—	*	*	*	*	—	—	Collocalia fuciphaga.
—	—	—	—	—	—	—	*	—	—	*	*	—	*	*	*	—	—	—	Collocalia esculenta.
—	—	—	—	—	—	—	—	—	—	*	—	—	*	*	*	*	—	—	Collocalia francica.
—	—	*	—	*	*	*	*	—	*	—	*	*	—	—	—	—	—	—	Macropteryx wallacei.
—	—	*	*	*	*	—	*	—	—	—	—	—	—	—	—	—	—	—	Pitta celebensis.
—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Pitta palliceps.
*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Pitta caeruleitorques.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Pitta inspeculata.
—	*	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Pitta forsteni.
—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Pitta sangirana.
—	—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Pitta cyanoptera.
—	*	—	—	—	—	—	—	—	—	—	—	*	*	—	—	—	—	—	Pitta irena.
—	—	—	—	—	—	—	—	—	—	*	—	—	—	—	—	—	—	—	Pitta virginalis.
*	*	*	—	*	*	—	*	—	—	—	—	—	—	—	—	—	—	—	Hirundo rustica L. races)[1].
*	*	*	—	*	*	—	*	—	—	—	—	*	*	*	*	—	—	—	Hirundo javanica.
*	—	*	—	—	—	—	*	—	—	—	—	—	*	*	—	—	—	—	Muscicapa griseosticta.

Number	Name of species	Page in the text	Nearctic Region	Ethiopian Region	Palaearctic Region	Indian Province	Chinese Province	Japan	Malay Peninsula	Sumatra	Java	Borneo	Philippine Islands	Lesser Sunda Islands
121	Muscicapula westermanni Sharpe. . .	365	—	—	—	*	—	—	—	—	*	*	*	*
122	Muscicapula hyperythra (Blyth) . . .	366	—	—	—	*	—	—	*	*	*	*	—	*
123	Siphia banyumas (Horsf.)	368	—	—	—	—	—	—	*?	*?	*	*?	*?	—
124	Siphia djampeana Hart.	371	—	—	—	—	—	—	—	—	—	—	—	—
125	Siphia kalaoensis Hart.	371	—	—	—	—	—	—	—	—	—	—	—	—
126	Siphia rufigula (Wall.).	372	—	—	—	—	—	—	—	—	—	—	—	—
127	Siphia bonthaina Hart.	373	—	—	—	—	—	—	—	—	—	—	—	—
128	Stoparola septentrionalis Bütt. . . .	374	—	—	—	—	—	—	—	—	—	—	—	—
129	Stoparola meridionalis Bütt.	375	—	—	—	—	—	—	—	—	—	—	—	—
130	Hypothymis puella (Wall.).	376	—	—	—	—	—	—	—	—	—	—	—	—
131	Hypothymis rowleyi (A.B.M.	378	—	—	—	—	—	—	—	—	—	—	—	—
132	Rhipidura celebensis Bütt.	379	—	—	—	—	—	—	—	—	—	—	—	—
133	Rhipidura teijsmanni Bütt.	380	—	—	—	—	—	—	—	—	—	—	—	—
134	Zeocephus talautensis M.&Wg. . . .	382	—	—	—	—	—	—	—	—	—	—	—	—
135	Monarcha commutatus Brügg.	383	—	—	—	—	—	—	—	—	—	—	—	—
136	Monarcha inornatus (Garn.)	384	—	—	—	—	—	—	—	—	—	—	—	*
137	Monarcha everetti Hart..	385	—	—	—	—	—	—	—	—	—	—	—	—
138	Myiagra rufigula Wall.	386	—	—	—	—	—	—	—	—	—	—	—	*
139	Culicicapa helianthea (Wall.)	387	—	—	—	—	—	—	—	—	—	—	*	—
140	Gerygone flaveola Cab.	388	—	—	—	—	—	—	—	—	—	—	—	—
141	Pratincola caprata (L.).	390	—	—	*	*	—	—	—	—	*	*?	*	*
142	Pachycephala sulfuriventer (Tweedd.).	391	—	—	—	—	—	—	—	—	—	—	—	—
143	Pachycephala meridionalis Bütt. . .	396	—	—	—	—	—	—	—	—	—	—	—	—
144	Pachycephala teijsmanni Bütt. . . .	396	—	—	—	—	—	—	—	—	—	—	—	—
145	Pachycephala orpheus Jard.	397	—	—	—	—	—	—	—	—	—	—	—	*
146	Pachycephala griseonota G.R.Gray. .	398	—	—	—	—	—	—	—	—	—	—	—	—
147	Pachycephala clio Wall.	399	—	—	—	—	—	—	—	—	—	—	—	—
148	Pachycephala everetti Hart.	400	—	—	—	—	—	—	—	—	—	—	—	—
149	Pachycephala bonthaina M.&Wg. . . .	401	—	—	—	—	—	—	—	—	—	—	—	—
150	Pachycephala bonensis M.&Wg. . . .	401	—	—	—	—	—	—	—	—	—	—	—	—
151	Colluricincla sangirensis (Oust.). . .	402	—	—	—	—	—	—	—	—	—	—	—	—
152	Lanius tigrinus Drapiez	403	—	—	*	*	*	*	*	*	*	*	*	—
153	Lanius lucionensis L.	406	—	—	*	*	*	—	*	*	—	*	*	*
154	Graucalus bicolor (Temm.).	411	—	—	—	—	—	—	—	—	—	—	—	—
155	Graucalus leucopygius Bp.	413	—	—	—	—	—	—	—	—	—	—	—	—
156	Graucalus temminckii (S. Müll.). . . .	415	—	—	—	—	—	—	—	—	—	—	—	—
157	Graucalus schistaceus Sharpe). . . .	416	—	—	—	—	—	—	—	—	—	—	—	—
158	Graucalus melanops (Lath.)	417	—	—	—	—	—	—	—	—	—	—	—	*
159	Edoliisoma morio (S. Müll.) (typical) .	419	—	—	—	—	—	—	—	—	—	—	—	—
	— morio septentrionalis M.&Wg. .	420	—	—	—	—	—	—	—	—	—	—	—	—
	— morio—septentrionalis M.&Wg. .	421	—	—	—	—	—	—	—	—	—	—	—	—
160	Edoliisoma salvadorii Sharpe	422	—	—	—	—	—	—	—	—	—	—	—	—
161	Edoliisoma talautense M. & Wg. . . .	423	—	—	—	—	—	—	—	—	—	—	—	—
162	Edoliisoma emancipata Hart..	424	—	—	—	—	—	—	—	—	—	—	—	—
163	Edoliisoma obiense Salvad.	424	—	—	—	—	—	—	—	—	—	—	—	—
164	Lalage leucopygialis Tweedd.	425	—	—	—	—	—	—	—	—	—	—	—	—

Celebesian Area																			
		Celebes																	
Talaut Islands	Sangi Islands	North Peninsula	West Celebes	East Peninsula	Togian Islands	Central Celebes	South Peninsula	S. E. Peninsula (and Buton)	Saleyer Island	Djampea Group	Peling Group	Sula Islands	Moluccas	Papuasia	Australia	Polynesia	New Zealand	Neotropical Region	Name of species
—	—	—	—	—	—	—	*	—	—	—	—	—	—	—	—	—	—	—	Muscicapula westermanni.
—	—	*	—	—	—	—	*	—	—	—	—	—	—	—	—	—	—	—	Muscicapula hyperythra.
—	—	*	*	—	—	*	*	—	*	—	—	—	—	—	—	—	—	—	Siphia banyumas.
—	—	—	—	—	—	—	—	—	—	*	—	—	—	—	—	—	—	—	Siphia djampeana.
—	—	—	—	—	—	—	—	—	—	*	—	—	—	—	—	—	—	—	Siphia kalaoensis.
—	—	*	—	—	—	*	*	—	—	—	—	—	—	—	—	—	—	—	Siphia rufigula.
—	—	—	—	—	—	—	*	—	—	—	—	—	—	—	—	—	—	—	Siphia bonthaina.
—	—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Stoparola septentrionalis.
—	—	—	—	—	—	—	*	—	—	—	—	—	—	—	—	—	—	—	Stoparola meridionalis.
—	—	*	*	*	*	*	*	*	—	—	*	*	—	—	—	—	—	—	Hypothymis puella.
—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Hypothymis rowleyi.
—	—	—	—	—	—	—	*?	—	—	*	—	—	—	—	—	—	—	—	Rhipidura celebensis.
—	—	—	—	—	—	—	*	—	—	—	—	—	—	—	—	—	—	—	Rhipidura teijsmanni.
*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Zeocephus talautensis.
—	*	*?	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Monarcha commutatus.
*	—	—	—	—	—	—	—	—	—	*	*	*	*	*	—	—	—	—	Monarcha inornatus.
—	—	—	—	—	—	—	—	—	—	*	—	—	—	—	—	—	—	—	Monarcha everetti.
—	—	—	—	—	—	—	—	—	—	*	—	—	—	—	—	—	—	—	Myiagra rufigula.
—	—	*	—	—	—	—	*	—	*	—	*	—	—	—	—	—	—	—	Culicicapa helianthea.
—	—	—	*	—	—	*	*	*	*	—	—	—	—	—	—	—	—	—	Gerygone flaveola.
—	—	*	*	—	—	*	*	—	*	—	—	—	—	—	—	—	—	—	Pratincola caprata.
—	—	*	—	—	—	*	—	—	—	—	—	—	—	—	—	—	—	—	Pachycephala sulfurivent.
—	—	—	—	—	—	—	*	—	—	—	—	—	—	—	—	—	—	—	Pachycephala meridional.
—	—	—	—	—	—	—	*?	—	*	—	—	—	—	—	—	—	—	—	Pachycephala teijsmanni.
—	—	—	—	—	—	—	—	—	*	—	—	—	—	—	—	—	—	—	Pachycephala orpheus.
—	—	—	—	—	—	—	—	—	—	—	—	*	*	—	—	—	—	—	Pachycephala griseonota.
—	—	—	—	—	—	—	—	—	—	—	*	*	*	—	—	—	—	—	Pachycephala clio.
—	—	—	—	—	—	—	—	—	—	*	—	—	—	—	—	—	—	—	Pachycephala everetti.
—	—	—	—	—	—	—	*	—	—	—	—	—	—	—	—	—	—	—	Pachycephala bonthaina.
—	—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Pachycephala bonensis.
—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Colluricincla sangirensis.
—	—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Lanius tigrinus.
*	*	*	—	—	—	—	—	—	—	—	—	—	*	—	—	—	—	—	Lanius lucionensis.
—	—	*	*	*	*	—	—	*	—	—	—	—	—	—	—	—	—	—	Graucalus bicolor.
—	*?	*	*	*	*	—	*	—	—	—	—	—	—	—	—	—	—	—	Graucalus leucopygius.
—	—	*	—	*	—	—	—	—	—	—	—	*	—	—	—	—	—	—	Graucalus temmincki.
—	—	—	—	—	—	—	—	—	—	—	*	*	—	—	—	—	—	—	Graucalus schistaceus.
—	—	—	—	—	—	—	—	—	—	—	*	*	*	*	*	—	*	—	Graucalus melanops.
—	—	—	—	—	—	*	*	—	—	—	—	—	—	—	—	—	—	—	Edoliisoma morio (typ.).
—	—	*	—	—	*?	—	—	—	—	—	—	—	—	—	—	—	—	—	— morio septentrionalis.
—	—	—	*	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	— morio—septentrion.
—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Edoliisoma salvadorii.
*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Edoliisoma talautense.
—	—	—	—	—	—	—	—	—	—	*	—	—	—	—	—	—	—	—	Edoliisoma emancipata.
—	—	—	—	—	—	—	—	—	—	—	*	*	*	—	—	—	—	—	Edoliisoma obiense.
—	—	*	*	*	—	—	*	*	—	—	*	*	—	—	—	—	—	—	Lalage leucopygialis.

Number	Name of species	Page in the text	Nearctic Region	Ethiopian Region	Palaearctic Region	Indian Province	Chinese Province	Japan	Malay Peninsula	Sumatra	Java	Borneo	Philippine Islands	Lesser Sunda Islands
165	Lalage timorensis (S. Müll.)	428	—	—	—	—	—	—	—	—	—	∗?	—	∗
166	Artamus leucogaster (Val.)	430	—	—	—	∗	—	—	—	∗	∗	∗	∗	∗
167	Artamus monachus Bp.	434	—	—	—	—	—	—	—	—	—	—	—	—
168	Dicrurus leucops Wall. (typical)	436	—	—	—	—	—	—	—	—	—	—	—	—
	— leucops—axillaris	437	—	—	—	—	—	—	—	—	—	—	—	—
	— leucops axillaris (Salvad.)	438	—	—	—	—	—	—	—	—	—	—	—	—
169	Dicrurus pectoralis Wall.	439	—	—	—	—	—	—	—	—	—	—	—	—
170	Dicaeum celebicum S. Müll.	441	—	—	—	—	—	—	—	—	—	—	—	—
171	Dicaeum sulaense Sharpe	443	—	—	—	—	—	—	—	—	—	—	—	—
172	Dicaeum sangirense Salvad.	444	—	—	—	—	—	—	—	—	—	—	—	—
173	Dicaeum talautense M. & Wg.	445	—	—	—	—	—	—	—	—	—	—	—	—
174	Dicaeum splendidum Bütt.	446	—	—	—	—	—	—	—	—	—	—	—	—
175	Dicaeum nehrkorni W. Blas.	447	—	—	—	—	—	—	—	—	—	—	—	—
176	Dicaeum hosei Sharpe	448	—	—	—	—	—	—	—	—	—	—	—	—
177	Acmonorhynchus aureolimbatus (Wall.)	449	—	—	—	—	—	—	—	—	—	—	—	—
178	Acmonorhynchus sangirensis (Salvad.)	451	—	—	—	—	—	—	—	—	—	—	—	—
179	Aethopyga flavostriata (Wall.)	453	—	—	—	—	—	—	—	—	—	—	—	—
180	Endrepanis duivenbodei (Schl.)	456	—	—	—	—	—	—	—	—	—	—	—	—
181	Cyrtostomus frenatus (S. Müll.) (typical)	458	—	—	—	—	—	—	—	—	—	—	—	—
	— frenatus saleyerensis Hart.	458	—	—	—	—	—	—	—	—	—	—	—	—
	— frenatus>saleyerensis	458	—	—	—	—	—	—	—	—	—	—	—	—
	— frenatus<saleyerensis	459	—	—	—	—	—	—	—	—	—	—	—	—
	— frenatus dissentiens (Hart.)	460	—	—	—	—	—	—	—	—	—	—	—	—
182	Cyrtostomus teijsmanni (Bütt.)	462	—	—	—	—	—	—	—	—	—	—	—	—
183	Hermotimia auriceps (G. R. Gray)	464	—	—	—	—	—	—	—	—	—	—	—	—
184	Hermotimia porphyrolaema (Wall.) (typ.)	465	—	—	—	—	—	—	—	—	—	—	—	—
	— porphyrolaema scapulata M. & Wg.	466	—	—	—	—	—	—	—	—	—	—	—	—
185	Hermotimia grayi (Wall.)	467	—	—	—	—	—	—	—	—	—	—	—	—
186	Hermotimia sangirensis (A. B. M.)	469	—	—	—	—	—	—	—	—	—	—	—	—
187	Hermotimia talautensis M. & Wg.	470	—	—	—	—	—	—	—	—	—	—	—	—
188	Anthreptes malaccensis (Scop.) (typical)	472	—	—	—	∗	—	—	∗	∗	∗	∗	—	∗?
	— malaccensis celebensis (Shell.)	475	—	—	—	—	—	—	—	—	—	—	—	—
	— malaccensis chlorigaster (Sharpe)	477	—	—	—	—	—	—	—	—	—	—	∗	—
189	Myzomela chloroptera Tweedd.	478	—	—	—	—	—	—	—	—	—	—	—	—
190	Melilestes celebensis M. & Wg. (typical)	481	—	—	—	—	—	—	—	—	—	—	—	—
	— celebensis meridionalis M. & Wg.	482	—	—	—	—	—	—	—	—	—	—	—	—
191	Myza sarasinorum M. & Wg.	483	—	—	—	—	—	—	—	—	—	—	—	—
192	Zosterops squamiceps (Hart.)	485	—	—	—	—	—	—	—	—	—	—	—	—
193	Zosterops intermedia (Wall.)	486	—	—	—	—	—	—	—	—	—	—	—	∗
194	Zosterops atrifrons Wall.	487	—	—	—	—	—	—	—	—	—	—	—	—
195	Zosterops subatrifrons M. & Wg.	490	—	—	—	—	—	—	—	—	—	—	—	—
196	Zosterops nehrkorni W. Blas.	490	—	—	—	—	—	—	—	—	—	—	—	—
197	Zosterops sarasinorum M. & Wg.	491	—	—	—	—	—	—	—	—	—	—	—	—
198	Zosterops anomala M. & Wg.	494	—	—	—	—	—	—	—	—	—	—	—	—
199	Zosterops babelo M. & Wg.	495	—	—	—	—	—	—	—	—	—	—	—	—
200	Iole aurea (Tweedd.)	496	—	—	—	—	—	—	—	—	—	—	—	—

Celebesian Area															Moluccas	Papuasia	Australia	Polynesia	New Zealand	Neotropical Region	Name of species
		Celebes																			
Talaut Islands	Sangi Islands	North Peninsula	West Celebes	East Peninsula	Togian Islands	Central Celebes	South Peninsula	S. E. Peninsula (and Buton)	Saleyer Island	Djampea Group	Peling Group	Sula Islands									
—	—	*?	—	—	—	—	*	—	*	*	—	—			*	*	*	—	—	—	Lalage timorensis.
—	—	*	—	*	*	—	*	—	*	*	*	*			—	—	—	—	—	—	Artamus leucogaster.
—	*	*	*	—	—	*	*	*	*	—	*	—			—	—	—	—	—	—	Artamus monachus.
—	—	—	—	—	—	—	—	—	—	—	—	—			—	—	—	—	—	—	Dicrurus leucops (typ.).
—	—	—	—	—	—	—	—	—	—	—	—	—			—	—	—	—	—	—	— leucops—axillaris.
—	—	—	—	—	—	—	—	—	—	—	—	—			—	—	—	—	—	—	— leucops axillaris.
—	—	*	*	—	*	—	*	—	—	—	*	*			*	—	—	—	—	—	Dicrurus pectoralis.
—	—	—	—	—	—	—	—	—	—	—	*	*			—	—	—	—	—	—	Dicaeum celebicum.
—	*	—	—	—	—	—	—	—	—	—	—	—			—	—	—	—	—	—	Dicaeum sulaense.
*	—	—	—	—	—	—	*?	—	*	*	—	—			—	—	—	—	—	—	Dicaeum sangirense.
—	—	*	—	—	—	—	*	—	—	—	—	—			—	—	—	—	—	—	Dicaeum talautense.
—	—	*	—	—	—	—	*	*	—	—	—	—			—	—	—	—	—	—	Dicaeum splendidum.
—	—	—	—	—	—	—	—	—	—	—	—	—			—	—	—	—	—	—	Dicaeum nehrkorni.
—	—	*	*	*	*	*	*	*	—	—	—	—			—	—	—	—	—	—	Dicaeum hosei.
—	—	*	*	*	*	*	*	*	—	—	—	—			—	—	—	—	—	—	Acmonorh. aureolimbatus.
—	—	*	*	*	*	*	*	*	—	—	—	—			—	—	—	—	—	—	Acmonorh. sangirensis.
—	—	*	*	*	*	—	*	*	—	—	—	—			—	—	—	—	—	—	Aethopyga flavostriata.
—	—	—	—	—	—	—	—	—	—	—	—	—			—	—	—	—	—	—	Eudrepanis duivenbodei.
—	—	—	—	—	—	—	—	—	*	—	*	*			*	*	*	—	—	—	Cyrtostomus frenatus(typ.)
—	—	*	*	*	*	—	*	*	—	—	—	—			—	—	—	—	—	—	— frenatus saleyerensis.
—	—	—	—	—	—	—	*	—	—	—	—	—			—	—	—	—	—	—	— — >saleyerensis.
—	—	—	—	—	—	—	*	—	—	—	—	—			—	—	—	—	—	—	— — <saleyerensis.
—	—	—	—	—	—	—	*?	—	—	*	—	—			—	—	—	—	—	—	— frenatus dissentiens.
—	—	—	—	*	—	—	—	—	—	—	—	—			—	—	—	—	—	—	Cyrtostomus teijsmanni.
—	—	—	*	—	—	*	*	*	—	—	*	*			*	*	—	—	—	—	Hermotimia auriceps.
—	—	—	—	*	*?	—	—	*?	—	—	—	—			—	—	—	—	—	—	H. porphyrolaema (typ.).
—	—	—	—	—	—	—	—	—	—	—	—	—			—	—	—	—	—	—	— — scapulata.
—	*	*	—	—	—	—	—	—	—	—	—	—			—	—	—	—	—	—	Hermotimia grayi.
*	—	—	—	—	—	—	—	—	—	—	—	—			—	—	—	—	—	—	Hermotimia sangirensis.
—	—	—	—	—	—	—	—	—	—	—	—	—			—	—	—	—	—	—	Hermotimia talautensis.
—	—	*	*	*	*	—	*	*	—	—	*	*			—	—	—	—	—	—	Anthrept.malaccens.(typ.).
—	*	—	—	—	—	—	—	—	—	—	—	—			—	—	—	—	—	—	— — celebensis.
—	—	*	*	—	—	—	*	—	*	*	—	—			—	—	—	—	—	—	— — chlorigaster.
—	—	*	—	—	—	—	—	—	—	—	—	—			—	—	—	—	—	—	Myzomela chloroptera.
—	—	*	—	—	—	—	*	—	—	—	—	—			—	—	—	—	—	—	Melilestes celebensis(typ.).
—	—	—	—	—	—	—	—	—	—	—	—	—			—	—	—	—	—	—	— — meridionalis.
—	—	*	—	—	—	—	—	—	—	—	—	—			—	—	—	—	—	—	Myza sarasinorum.
—	—	—	—	—	—	—	*	—	—	—	—	—			—	—	—	—	—	—	Zosterops squamiceps.
—	—	—	*	—	—	*	*	—	*	*	—	—			*	—	—	—	—	—	Zosterops intermedia
—	—	—	*	—	—	*	—	—	—	—	—	—			—	—	—	—	—	—	Zosterops atrifrons.
—	—	—	—	—	—	—	—	—	—	—	*	*			—	—	—	—	—	—	Zosterops subatrifrons.
—	*	—	—	—	—	—	—	—	—	—	—	—			—	—	—	—	—	—	Zosterops nehrkorni.
—	—	*	—	—	—	—	*	—	—	—	—	—			—	—	—	—	—	—	Zosterops sarasinorum.
—	—	—	—	—	—	*	*	*?	—	—	—	—			—	—	—	—	—	—	Zosterops anomala.
*	—	—	—	—	*	—	—	—	—	—	—	—			—	—	—	—	—	—	Zosterops babelo.
—	—	—	—	—	—	—	—	—	—	—	—	—			—	—	—	—	—	—	Iole aurea.

Number	Name of species	Page in the text	Nearctic Region	Ethiopian Region	Palaearctic Region	Indian Province	Chinese Province	Japan	Malay Peninsula	Sumatra	Java	Borneo	Philippine Islands	Lesser Sunda Islands
201	Iole longirostris (Wall.	497	—	—	—	—	—	—	—	—	—	—	—	—
202	Iole platenae (W. Blas.)	498	—	—	—	—	—	—	—	—	—	—	—	—
203	Malia grata Schl. typical	499	—	—	—	—	—	—	—	—	—	—	—	—
	grata recondita (M. & Wg.)	500	—	—	—	—	—	—	—	—	—	—	—	—
204	Androphilus castaneus (Bütt.)	502	—	—	—	—	—	—	—	—	—	—	—	—
205	Cataponera turdoides Hart.	503	—	—	—	—	—	—	—	—	—	—	—	—
206	Trichostoma celebensis (Strickl.)	504	—	—	—	—	—	—	—	—	—	—	—	—
207	Trichostoma finschi Tweedd.	506	—	—	—	—	—	—	—	—	—	—	—	—
208	Malacopteron affine (Blyth)	508	—	—	—	—	—	—	*	*	*	*	—	—
209	Geocichla erythronota Scl.	509	—	—	—	—	—	—	—	—	—	—	—	—
210	Merula celebensis Bütt.	510	—	—	—	—	—	—	—	—	—	—	—	—
211	Petrophila cyanus (L.) typical	512	—	*	*	*	*	—	—	—	—	—	—	—
	— cyanus solitaria (P. L. S. Müll.)	512	—	—	*	*	*	*	*	—	*	*	*	—
212	Cisticola cursitans (Frkl.)	515	—	*	*	*	*	*	*	*	*	—	*	*
213	Cisticola exilis (Vig. Horsf.)	517	—	—	—	*	*	—	*	—	*	—	*	*
214	Phyllergates riedeli M. & Wg.	519	—	—	—	—	—	—	—	—	—	—	—	—
215	Acrocephalus orientalis (Temm. Schl.)	521	—	—	*	*	*	*	*	*	*	*	*	*
216	Locustella fasciolata (G. R. Gray)	524	—	—	*	—	*	*	—	—	—	—	*	—
217	Locustella ochotensis Midd.	526	—	—	*	—	*	*	—	—	—	*	*	—
218	Phylloscopus borealis (Blas.)	527	*	—	*	*	*	*	*	*	—	*	*	*
219	Cryptolopha sarasinorum M. & Wg.	530	—	—	—	—	—	—	—	—	—	—	—	—
220	Motacilla flava L.	531	*	*	*	*	*	—	*	*	*	*	*	*
221	Motacilla boarula L. (typical)	534	—	*	*	—	—	—	—	—	—	—	—	—
	— boarula melanope (Pall.)	535	—	—	*	*	*	*	*	*	*	*	*	*
222	Anthus gustavi Swinh.	538	—	—	*	—	*	—	—	—	—	*	*	*
223	Anthus cervinus (Pall.)	540	*	*	*	*	*	—	—	—	—	*	*	—
224	Munia oryzivora (L.)	542	—	*	—	*	*	*	*	*	*	*	*	*
225	Munia formosana Swinh. (typical)	544	—	—	—	—	*	—	—	—	—	—	*	—
	— formosana jagori (Marts.)	541	—	—	—	—	—	—	—	—	—	—	*	—
	— formosana brunneiceps (Wald.)	544	—	—	—	—	—	—	—	—	—	*	—	—
226	Munia pallida Wall.	546	—	—	—	—	—	—	—	—	—	—	—	*
227	Munia subcastanea Hart.	548	—	—	—	—	—	—	—	—	—	—	—	—
228	Munia punctulata nisoria (Temm.)[1]	548	—	—	—	—	—	—	*	*	*	—	—	*
229	Munia molucca (L.) typical	549	—	—	—	—	—	—	—	—	—	—	—	—
	— molucca propinqua Sharpe	550	—	—	—	—	—	—	—	—	—	—	—	*
	— molucca—propinqua	550	—	—	—	—	—	—	—	—	—	—	—	—
	— molucca<propinqua	551	—	—	—	—	—	—	—	—	—	—	—	—
	— molucca typica>	551	—	—	—	—	—	—	—	—	—	—	—	—
	— molucca kangeanensis (Vordm.)[2]	551	—	—	—	—	—	—	—	—	—	—	—	—
230	Passer montanus (L.)	553	—	*	*	*	*	*	*	*	*	—	*	—
231	Calornis panayensis (Scop.) (typical)	555	—	—	—	—	—	—	—	—	—	—	*	—
	— panayensis chalybea (Horsf.)	556	—	—	—	—	—	—	*	*	*	*	—	—
	— panayensis affinis (Hay	556	—	—	—	*	—	—	—	—	—	—	—	—
	— panayensis chalybea—affinis	556	—	—	—	*	—	—	—	—	—	—	—	—
	— panayensis tytleri (Hume)	557	—	—	—	*	—	—	—	—	—	—	—	—

[1] Five races recognised by Sharpe. [2] Kangeang.

Celebesian Area																			
		Celebes																	
Talaut Islands	Sangi Islands	North Peninsula	West Celebes	East Peninsula	Togian Islands	Central Celebes	South Peninsula	S. E. Peninsula (and Buton)	Saleyer Island	Djampea Group	Peling Group	Sula Islands	Moluccas	Papuasia	Australia	Polynesia	New Zealand	Neotropical Region	Name of species
—	—	—	—	—	—	—	—	—	—	—	*	*	—	—	—	—	—	—	Iole longirostris.
—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Iole platenae.
—	—	—	—	—	—	—	*	—	*?	—	—	—	—	—	—	—	—	—	Malia grata (typical).
—	—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	— grata recondita.
—	—	*	—	—	—	—	*	—	—	—	—	—	—	—	—	—	—	—	Androphilus castaneus.
—	—	—	—	—	—	—	*	—	—	—	—	—	—	—	—	—	—	—	Cataponera turdoides.
—	—	*	*	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Trichostoma celebensis.
—	—	—	*	—	—	—	*	—	—	—	—	—	—	—	—	—	—	—	Trichostoma finschi.
—	—	—	—	*	—	—	*	—	—	—	—	—	—	—	—	—	—	—	Malacopteron affine.
—	—	*	*	—	—	—	*	—	—	—	—	—	—	—	—	—	—	—	Geocichla erythronota.
—	—	—	—	—	—	—	*	—	—	—	—	—	—	—	—	—	—	—	Merula celebensis.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Petrophila cyanus (typ.).
*	*	*	—	—	—	—	—	—	—	—	—	—	*	—	—	—	—	—	— cyanus solitaria.
—	—	—	—	—	—	*	*	—	—	—	*	—	—	—	—	—	—	—	Cisticola cursitans.
—	—	*	*	—	*	*	*	*	—	—	*	—	*	*	*	—	—	—	Cisticola exilis.
—	—	*	—	—	—	*	*	—	—	—	—	—	—	—	—	—	—	—	Phyllergates riedeli.
—	—	*	—	—	—	—	*	—	—	—	—	—	*	—	—	—	—	—	Acrocephalus orientalis.
*	*	—	—	—	—	—	—	—	—	—	—	—	*	—	—	—	—	—	Locustella fasciolata.
—	—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Locustella ochotensis.
*	*	*	—	—	—	—	*	—	*	*	—	*	*	—	—	—	—	—	Phylloscopus borealis.
—	—	—	—	—	—	—	*	—	—	—	—	—	—	—	—	—	—	—	Cryptolopha sarasinorum.
*	—	*	—	*	—	—	*	—	*	*	—	—	*	—	—	—	—	—	Motacilla flava.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Motacilla boarula (typ.).
—	—	*	—	—	—	—	*	—	—	—	—	—	*	*	—	—	—	—	— boarula melanope.
—	—	*	—	—	—	—	—	—	—	*	—	—	*	—	—	—	—	—	Anthus gustavi.
—	—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Anthus cervinus.
—	—	*	—	—	—	—	*	—	—	—	—	—	—	—	—	—	—	—	Munia oryzivora.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Munia formosana (typical).
—	—	—	—	—	—	—	—	—	—	—	—	—	*	—	—	—	—	—	— — jagori.
—	—	*	*	—	*	*	*	—	—	—	—	—	—	—	—	—	—	—	— — brunneiceps.
—	—	—	—	—	—	—	*	—	—	—	—	—	—	—	—	—	—	—	Munia pallida.
—	—	—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Munia subcastanea.
—	—	—	—	—	—	*	*	—	—	—	—	—	—	*	—	—	—	—	Mun. punctulata nisoria [1].
—	—	—	—	—	—	—	—	—	—	—	—	—	*	*	—	—	—	—	Munia molucca (typ.).
—	—	—	—	—	—	—	—	—	—	—	—	—	—	*	—	—	—	—	— — propinqua.
—	*	*	—	—	—	*	*	—	—	—	*	*	—	—	—	—	—	—	— molucca—propinqua.
—	—	—	—	—	—	—	—	—	*	*	—	—	—	—	—	—	—	—	— — <propinqua.
*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	— molucca typica>.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	— — kangeanensis [2].
—	—	—	—	—	—	—	*	—	—	—	—	—	—	—	—	—	—	—	Passer montanus.
—	—	*	—	—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	Calornis panayensis (typ.).
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	— panayensis chalybea.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	— — affinis.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	— — chalybea—affinis.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	— — tytleri.

Number	Name of species	Page in the text	Nearctic Region	Ethiopian Region	Palaearctic Region	Indian Province	Chinese Province	Japan	Malay Peninsula	Sumatra	Java	Borneo	Philippine Islands	Lesser Sunda Islands
231	Calornis panayensis sangirensis (Salvad.)	557	—	—	—	—	—	—	—	—	—	—	—	—
	— panayensis—sangirensis	557	—	—	—	—	—	—	—	—	—	—	—	—
	— panayensis altirostris (Salvad.)[1]	558	—	—	—	—	—	—	—	—	—	—	—	—
	— panayensis enganensis (Salvad.)[2]	558	—	—	—	—	—	—	—	—	—	—	—	—
232	Calornis minor Bp.	561	—	—	—	—	—	—	—	—	—	—	—	*
233	Calornis sulaensis Sharpe.	561	—	—	—	—	—	—	—	—	—	—	—	—
234	Calornis metallica (Temm.)	562	—	—	—	—	—	—	—	—	—	—	—	—
235	Enodes erythrophrys (Temm.)	564	—	—	—	—	—	—	—	—	—	—	—	—
236	Acridotheres cinereus Bp.	566	—	—	—	—	—	—	—	—	—	—	—	—
237	Scissirostrum dubium (Lath.).	567	—	—	—	—	—	—	—	—	—	—	—	—
238	Sturnia violacea (Bodd.).	570	—	—	—	—	—	*	—	—	—	*	*	—
239	Basileornis celebensis G.R.Gray . . .	572	—	—	—	—	—	—	—	—	—	—	—	—
240	Basileornis galeatus A.B.M.	574	—	—	—	—	—	—	—	—	—	—	—	—
241	Streptocitta albicollis (Vieill.)	575	—	—	—	—	—	—	—	—	—	—	—	—
242	Streptocitta torquata (Temm.)	577	—	—	—	—	—	—	—	—	—	—	—	—
243	Charitornis albertinae Schl.	579	—	—	—	—	—	—	—	—	—	—	—	—
244	Corvus enca (Horsf.) (Celebesian races)	581												
245	Gazzola typica Bp.	584	—	—	—	—	—	—	—	—	—	—	—	—
246	Oriolus celebensis Tweedd. (typical) .	585	—	—	—	—	—	—	—	—	—	—	—	—
	— celebensis meridionalis Hart.. .	586	—	—	—	—	—	—	—	—	—	—	—	—
	— celebensis—meridionalis	586	—	—	—	—	—	—	—	—	—	—	—	—
247	Oriolus frontalis Wall.	589	—	—	—	—	—	—	—	—	—	—	—	—
248	Oriolus boneratensis M.&Wg.	589	—	—	—	—	—	—	—	—	—	—	—	—
249	Oriolus formosus Cab.	590	—	—	—	—	—	—	—	—	—	—	—	—
250	Oriolus melanisticus M.&Wg.	593	—	—	—	—	—	—	—	—	—	—	—	—
251	Osmotreron wallacei Salvad. (typical)	595	—	—	—	—	—	—	—	—	—	—	—	—
	— wallacei pallidior Hart.	597	—	—	—	—	—	—	—	—	—	—	—	—
252	Osmotreron sangirensis Brügg.) . . .	598	—	—	—	—	—	—	—	—	—	—	—	—
253	Osmotreron vernans (L).	599	—	—	—	*	*	—	*	*	*	*	*	*
254	Ptilopus fischeri (Brügg.)	602	—	—	—	—	—	—	—	—	—	—	—	—
255	Ptilopus meridionalis M.&Wg.	604	—	—	—	—	—	—	—	—	—	—	—	—
256	Ptilopus gularis (Q.G.)	605	—	—	—	—	—	—	—	—	—	—	—	—
257	Ptilopus subgularis M.&Wg.	606	—	—	—	—	—	—	—	—	—	—	—	—
258	Ptilopus melanocephalus (Forst.) . . .	607	—	—	—	—	—	—	—	—	*	—	—	*
259	Ptilopus melanospilus (Salvad.). . . .	608	—	—	—	—	—	—	—	—	—	—	—	—
260	Ptilopus chrysorrhous (Salvad.). . . .	610	—	—	—	—	—	—	—	—	—	—	—	—
261	Ptilopus xanthorrhous (Salvad.) . . .	611	—	—	—	—	—	—	—	—	—	—	—	—
262	Ptilopus temmincki (Des Murs & Prév.)	613	—	—	—	—	—	—	—	—	—	—	*	—
263	Carpophaga concinna Wall.[3]	615	—	—	—	—	—	—	—	—	—	—	—	*
264	Carpophaga paulina Bp.)	617	—	—	—	—	—	—	—	—	—	—	—	—
265	Carpophaga pulchella Tweedd.. . . .	619	—	—	—	—	—	—	—	—	—	—	—	—
266	Carpophaga intermedia M.&Wg. . . .	619	—	—	—	—	—	—	—	—	—	—	—	—
267	Carpophaga rosacea (Temm.	620	—	—	—	—	—	—	—	—	—	—	—	*
268	Carpophaga pickeringi Cass.[3]	621	—	—	—	—	—	—	—	—	—	*	*	—

[1] Nias. [2] Engano. [3] Islet nomad.

Celebesian Area																			
		Celebes																	
Talaut Islands	Sangi Islands	North Peninsula	West Celebes	East Peninsula	Togian Islands	Central Celebes	South Peninsula	S. E. Peninsula and Buton	Saleyer Island	Djampea Group	Peling Group	Sula Islands	Moluccas	Papuasia	Australia	Polynesia	New Zealand	Neotropical Region	Name of species
*	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Calornis panayens. sangir.
—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	— panayensis - sangir.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	— -- altirostris.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	— — enganensis.
—	—	—	—	—	—	—	*	—	*	*	—	—	—	—	—	—	—	—	Calornis minor.
—	—	—	—	*	—	—	—	—	—	—	*	*	—	—	—	—	—	—	Calornis sulaensis.
—	—	—	—	—	—	—	—	—	—	—	—	*	*	*	*	—	—	—	Calornis metallica.
—	—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Enodes erythrophrys.
—	—	—	—	—	—	—	*	—	—	—	—	—	—	—	—	—	—	—	Acridotheres cinereus.
—	—	*	*	*	*	—	*	—	—	—	*	—	—	—	—	—	—	—	Scissirostrum dubium.
—	—	*	—	—	—	—	—	—	—	—	—	—	*	—	—	—	—	—	Sturnia violacea.
—	—	*	—	*	—	—	*	—	—	—	—	—	—	—	—	—	—	—	Basileornis celebensis.
—	—	—	—	—	—	—	—	—	—	—	*	*	—	—	—	—	—	—	Basileornis galeatus.
—	—	—	—	—	—	—	*	*	—	—	—	—	—	—	—	—	—	—	Streptocitta albicollis.
—	—	*	*	*	*	*	—	—	—	—	—	—	—	—	—	—	—	—	Streptocitta torquata.
—	—	—	—	—	—	—	—	—	—	—	—	*	—	—	—	—	—	—	Charitornis albertinae.
—	—	*	—	*	*	—	*	*	—	—	—	*							Corvus enca (Cel. races).
—	—	—	—	—	—	—	*	—	—	—	—	—	—	—	—	—	—	—	Gazzola typica.
—	—	*	*	—	*	—	—	*?	—	—	—	—	—	—	—	—	—	—	Oriolus celebensis (typ.).
—	—	—	—	—	—	*	*	—	—	—	—	—	—	—	—	—	—	—	— — meridionalis.
—	—	—	—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	— celebensis—meridion.
—	—	—	—	—	—	—	—	—	—	—	*	*	—	—	—	—	—	—	Oriolus frontalis.
—	—	—	—	—	—	—	—	—	—	*	—	—	—	—	—	—	—	—	Oriolus boneratensis.
—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Oriolus formosus.
*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Oriolus melanisticus.
—	—	*	*	*	*	—	*	—	*	—	*	*	—	—	—	—	—	—	Osmotreron wallacei (typ.).
—	—	—	—	—	—	—	—	—	—	*	—	—	—	—	—	—	—	—	— wallacei pallidior.
—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Osmotreron sangirensis.
—	—	*	*	*	—	*	*	—	—	—	—	—	—	—	—	—	—	—	Osmotreron vernans.
—	—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Ptilopus fischeri.
—	—	—	—	—	—	—	*	—	—	—	—	—	—	—	—	—	—	—	Ptilopus meridionalis.
—	—	*	*	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Ptilopus gularis.
—	—	—	—	—	—	—	—	—	—	—	*	—	—	—	—	—	—	—	Ptilopus subgularis.
—	—	—	—	—	—	—	—	—	*	*	—	—	—	—	—	—	—	—	Ptilopus melanocephalus.
—	—	*	*	*	*	—	*	*	—	—	—	—	—	—	—	—	—	—	Ptilopus melanospilus.
—	—	—	—	—	—	—	—	—	—	—	*	*	*	—	—	—	—	—	Ptilopus chrysorrhous.
*	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Ptilopus xanthorrhous.
—	—	*	—	—	—	—	*	—	—	—	—	—	—	—	—	—	—	—	Ptilopus temmincki.
*	*	—	—	—	—	—	—	—	—	—	—	—	*	*	—	—	—	—	Carpophaga concinna.
—	—	*	*	*	—	*	*	—	—	—	*	*	—	—	—	—	—	—	Carpophaga paulina.
—	—	—	—	—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	Carpophaga pulchella.
*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Carpophaga intermedia.
—	—	*	—	—	—	—	*	—	—	*	—	—	*	*	—	—	—	—	Carpophaga rosacea.
*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Carpophaga pickeringi.

Number	Name of species	Page in the text	Nearctic Region	Ethiopian Region	Palaearctic Region	Indian Province	Chinese Province	Japan	Malay Peninsula	Sumatra	Java	Borneo	Philippine Islands	Lesser Sunda Islands
269	Carpophaga radiata (Q. G.	622	—	—	—	—	—	—	—	—	—	—	—	—
270	Carpophaga forsteni Bp.	623	—	—	—	—	—	—	—	—	—	—	—	—
271	Carpophaga poecilorrhoa Brügg.	625	—	—	—	—	—	—	—	—	—	—	—	—
272	Myristicivora bicolor Scop.)[1]	627	—	—	—	*	*	—	*	—	*	*	*	*
273	Myristicivora luctuosa (Temm.)	631	—	—	—	—	—	—	—	—	—	—	—	—
274	Columba albigularis Bp.)	633	—	—	—	—	—	—	—	—	—	—	—	—
275	Turacoena manadensis (Q. G.)	635	—	—	—	—	—	—	—	—	—	—	—	—
276	Macropygia albicapilla Bp. (typical)	637	—	—	—	—	—	—	—	—	—	—	—	—
	— albicapilla sangirensis (Salvad.).	638	—	—	—	—	—	—	—	—	—	—	—	—
	— albicapilla—sangirensis	638	—	—	—	—	—	—	—	—	—	—	—	—
277	Macropygia macassariensis (Wall.)	641	—	—	—	—	—	—	—	—	—	—	—	—
278	Turtur tigrinus (Temm. Kn.)	643	—	—	—	*	*	—	*	*	*	*	*	*
279	Geopelia striata L.)	646	—	*	—	*	*	—	*	*	*	*	*	*
280	Chalcophaps indica (L.)	649	—	—	—	*	*	—	*	*	*	*	*	*
281	Chalcophaps stephani Rchb.	653	—	—	—	—	—	—	—	—	—	—	—	—
282	Phlogoenas tristigmata Bp.	654	—	—	—	—	—	—	—	—	—	—	—	—
283	Phlogoenas bimaculata Salvad.	656	—	—	—	—	—	—	—	—	—	—	—	—
284	Calocnas nicobarica (L.)[1]	657	—	—	—	*	—	—	—	*	*	*	*	—
285	Excalfactoria chinensis (L.)[2]	663	—	—	—	*	*	—	*	*	*	*	*	—
286	Gallus ferrugineus (Gm.)	667	—	—	—	*	*	—	*	*	*	—	*	*
287	Megapodius cumingi Dillw.	671	—	—	—	—	—	—	—	—	—	*	*	—
288	Megapodius sangirensis Schl.	675	—	—	—	—	—	—	—	—	—	—	—	—
289	Megapodius bernsteini Schl.	676	—	—	—	—	—	—	—	—	—	—	—	—
290	Megapodius duperreyi Less. Garn.	677	—	—	—	—	—	—	—	—	—	—	—	*
291	Megacephalon maleo (Hartl.)	678	—	—	—	—	—	—	—	—	—	—	—	—
292	Turnix rufilatus Wall.	686	—	—	—	—	—	—	—	—	—	—	—	—
293	Turnix maculosa (Temm.)	687	—	—	—	—	—	—	—	—	—	—	—	—
294	Gymnocrex rosenbergi (Schl.)	689	—	—	—	—	—	—	—	—	—	—	—	—
295	Aramidopsis plateni (W. Blas.)	690	—	—	—	—	—	—	—	—	—	—	—	—
296	Hypotaenidia striata (L.)	692	—	—	—	*	*	—	*	*	*	*	*	—
297	Hypotaenidia philippensis (L.)[4]	694	—	—	—	—	—	—	—	—	—	*	*	*
298	Hypotaenidia celebensis (Q. G.)	697	—	—	—	—	—	—	—	—	—	—	—	—
299	Hypotaenidia sulcirostris (Wall.)	698	—	—	—	—	—	—	—	—	—	—	—	—
300	Rallina minahassa Wall.	699	—	—	—	—	—	—	—	—	—	—	—	—
301	Porzana fusca (L.)	701	—	—	—	*	*	*	*	*	*	*	*	—
302	Limnocorax niger Gm.)	703	—	*	—	—	—	—	—	—	—	—	—	—
303	Amaurornis cinerea (Vieill.)	705	—	—	—	—	—	—	*	*	*	*	*	*
304	Amaurornis phoenicura (Forst.)	708	—	—	—	*	*	—	*	*	*	*	*	*
305	Amaurornis moluccana (Wall.)	711	—	—	—	—	—	—	—	—	—	—	—	—
306	Amaurornis isabellina (Schl.)	712	—	—	—	—	—	—	—	—	—	—	—	—
307	Gallinula frontata Wall.	713	—	—	—	—	—	—	—	—	—	*	—	*
308	Gallinula chloropus (L.)	715	—	*	*	*	*	*	—	*	*	*	*	—
309	Porphyrio calvus Vieill.	717	—	—	—	—	—	—	—	—	*	*	—	—

[1] Islet nomad. [2] Introd. into Mauritius and ? Bourbon. [3] Introduced. [4] Mauritius.

Celebesian Area																									
		Celebes																							
Talaut Islands	Sangi Islands	North Peninsula	West Celebes	East Peninsula	Togian Islands	Central Celebes	South Peninsula	S. E. Peninsula (and Buton)	Saleyer Island	Djampea Group	Peling Group	Sula Islands	Moluccas	Papuasia	Australia	Polynesia	New Zealand	Neotropical Region	Name of species
—	—	✶	—	—	—	—	✶	—	—	—	—	—	✶	✶	—	—	—	—	Carpophaga radiata.
—	—	✶	—	—	—	✶	✶	—	—	—	—	—	—	✶	—	—	—	—	Carpophaga forsteni.
—	—	✶	—	—	—	—	✶	—	—	—	—	—	—	✶	—	—	—	—	Carpophaga poecilorrhoa.
—	✶	✶	—	—	—	—	✶	—	—	✶	—	—	✶	✶	—	—	—	—	Myristicivora bicolor[1]).
—	—	✶	✶	✶	—	✶	✶	—	—	—	✶	✶	✶	✶	—	—	—	—	Myristicivora luctuosa.
—	—	✶	✶	—	✶	✶	✶	✶	—	—	✶	✶	✶	—	—	—	—	—	Columba albigularis.
—	—	✶	—	—	✶	✶	✶	—	—	—	✶	✶	—	—	—	—	—	—	Turacoena manadensis.
—	—	✶	—	—	—	—	✶	—	—	—	—	—	—	—	—	—	—	—	Macropygia albicap. (typ.).
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	— — — sangirensis.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	— albicapilla—sangir.
—	—	✶	✶	—	—	—	✶	—	✶	✶	—	—	✶	✶	—	—	—	—	Macrop. macassariensis.
—	—	✶	✶	—	—	✶	✶	—	—	—	—	—	✶	✶	—	—	—	—	Turtur tigrinus.
—	—	✶	—	—	—	—	✶	—	✶	—	—	—	✶	—	—	—	—	—	Geopelia striata.
—	—	✶	✶	✶	✶	—	✶	—	—	—	✶	✶	✶	✶	—	—	—	—	Chalcophaps indica.
—	—	✶	✶	—	—	—	✶	—	—	—	—	—	✶	✶	—	—	—	—	Chalcophaps stephani.
—	—	✶	—	—	—	—	✶	—	—	—	—	—	—	—	—	—	—	—	Phlogoenas tristigmata.
—	—	✶	—	—	—	—	✶	—	—	—	—	—	—	—	—	—	—	—	Phlogoenas bimaculata.
—	—	✶	—	—	—	—	✶	—	—	—	—	—	✶	✶	—	—	—	—	Caloenas nicobarica[1]).
—	✶[3])	✶	—	—	—	—	—	—	✶	✶	—	—	—	—	—	—	—	—	Megacephalon maleo.
—	—	✶	✶	—	—	—	✶	✶	—	—	—	—	✶	✶	✶	—	—	—	Excalfactoria chinensis[2]).
—	—	✶	✶	—	✶	✶	✶	✶	—	—	—	—	✶	—	✶	—	—	—	Gallus ferrugineus.
—	✶	✶	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Megapodius cumingi.
—	✶	✶	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Megapodius sangirensis.
—	—	✶	—	—	—	—	✶	—	—	—	—	✶	—	—	—	—	—	—	Megapodius bernsteini.
—	—	✶	—	—	—	—	✶	—	✶	✶	—	—	—	✶	✶	—	—	—	Megapodius duperreyi.
—	—	✶	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Megacephalon maleo.
—	—	✶	✶	—	—	—	✶	✶	—	—	—	—	—	—	—	—	—	—	Turnix rufilatus.
—	—	—	✶	—	—	—	—	✶	—	—	—	—	—	✶	✶	—	—	—	Turnix maculosa.
—	—	✶	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Gymnocrex rosenbergi.
—	—	✶	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Aramidopsis plateni.
—	—	✶	—	—	—	—	✶	✶	—	—	—	—	✶	✶	✶	✶	✶	—	Hypotaenidia striata.
—	—	✶	✶	—	—	—	✶	✶	—	—	—	—	—	—	—	—	—	—	Hypotaenidia philippens.[4])
—	—	—	—	—	—	—	—	—	—	—	—	✶	—	—	—	—	—	—	Hypotaenidia celebensis.
—	—	—	✶	—	—	—	—	—	—	—	—	✶	—	—	—	—	—	—	Hypotaenidia sulcirostris.
—	—	✶	—	—	—	—	✶	—	—	—	—	—	—	—	—	—	—	—	Rallina minahassa.
—	—	✶	—	—	—	—	✶	—	—	—	—	—	—	—	—	—	—	—	Porzana fusca.
—	—	✶	—	—	—	—	✶	—	—	—	—	—	—	—	—	—	—	—	Limnocorax niger.
✶	✶	✶	—	—	—	—	✶	—	✶	✶	—	—	✶	✶	✶	✶	—	—	Amaurornis cinerea.
✶	✶	✶	✶	—	—	—	✶	✶	✶	—	—	—	✶	✶	✶	—	—	—	Amaurornis phoenicura.
—	✶	—	✶	—	—	—	—	—	—	—	—	—	✶	✶	✶	—	—	—	Amaurornis moluccana.
—	—	✶	—	—	—	—	✶	—	—	—	—	—	✶	✶	—	—	—	—	Amaurornis isabellina.
—	—	✶	—	—	—	—	✶	—	—	—	—	—	—	—	—	—	—	—	Gallinula frontata.
—	—	✶	—	—	—	—	✶	—	—	—	—	—	✶	✶	—	—	—	—	Gallinula chloropus.
—	—	✶	—	—	—	—	✶	—	—	—	—	—	✶	✶	✶	✶	✶	—	Porphyrio calvus.

Number	Name of species	Page in the text	Nearctic Region	Ethiopian Region	Palaearctic Region	Indian Province	Chinese Province	Japan	Malay Peninsula	Sumatra	Java	Borneo	Philippine Islands	Lesser Sunda Islands
310	Porphyrio pulverulentus Temm.	721	—	—	—	—	—	—	—	—	—	—	*	—
311	Fulica atra L.	722	—	*	*	*	*	*	—	*	*	*?	*	—
312	Hydralector gallinaceus (Temm.)	725	—	—	—	—	—	—	—	—	—	*	—	—
313	Glareola isabella Vieill.[1]	728	—	—	—	—	—	—	—	—	*	*	—	*
314	Esacus magnirostris (Vieill.)	733	—	—	—	*	—	—	—	*	*	*	*	—
315	Lobivanellus cinereus (Blyth)	735	—	—	*	*	*	*	—	—	—	—	—	—
316	? Squatarola helvetica (L.)	736	*	*	*	*	*	*	*	—	*	*	*	*
317	Charadrius fulvus Gm.	738	*	*	*	*	*	*	*	*	*	*	*	*
318	Aegialitis vereda J. Gd.	741	—	—	*	*	*	—	—	—	*	—	*	—
319	Aegialitis geoffroyi (Wagl.)	743	—	*	*	*	*	*	*	*	*	*	*	*
320	Aegialitis mongola (Pall.)	746	*	*	*	*	*	*	*	*	*	*	*	—
321	Aegialitis curonica (Gm.)	749	*?	*	*	*	*	*	*	—	*	*	*	*
322	Aegialitis peroni (Schl.)	752	—	—	—	—	—	—	—	—	*	*	*	*
323	Strepsilas interpres (L.)	755	*	*	*	*	*	*	*	*	*	*	*	*
324	Himantopus leucocephalus J. Gd.	757	—	—	—	—	—	—	—	—	*	*	*	*
325	Totanus glottis (L.)	759	*	*	*	*	*	*	*	*	*	*	*	*
326	Totanus calidris (L.)	761	—	*	*	*	*	*	*	*	*	*	*	—
327	Totanus glareola (L.)	764	—	*	*	*	*	*	—	*	*	*	*	*
328	Heteractitis brevipes (Vieill.)	766	—	—	*	—	*	*	—	—	—	*	*	*
329	Actitis hypoleucos (L.)	770	—	*	*	*	*	*	*	*	*	*	*	*
330	Terekia cinerea (Güld.)	773	—	*	*	*	*	*	*	*	*	*	*	—
331	Tringa acuminata (Horsf.)	776	*	—	*	*	*	*	—	—	*	—	*	—
332	Tringa damascensis (Horsf.)	778	—	—	*	*	*	*	*	—	*	*	*	—
333	Tringa ruficollis Pall.	780	—	—	*	*?	*	*	*	—	*	*	*	*
334	? Calidris arenaria (L.)	782	*	*	*	*	*	*	—	—	*	*	—	—
335	Phalaropus hyperboreus (L.)	785	*	*	*	*	*	*	—	—	—	—	—	—
336	Limicola platyrhyncha (Temm.)	787	—	*	*	*	*	*	*	—	*	—	*	—
337	Gallinago megala Swinh.	789	—	—	*	—	*	*	—	—	—	*	*	—
338	Limosa novaezealandiae (G. R. Gray)	792	*	—	*	—	*	*	*	—	*	*	*	*
339	Numenius minutus J. Gd.	795	—	—	*	—	*	*	—	—	*	—	—	—
340	Numenius variegatus (Scop.)	797	—	—	*	—	*	*	—	*	*	*	*	*
341	? Numenius arquatus (L.)	799	—	—	*	*	*	*	*	*	*	*	*	—
342	Numenius cyanopus Vieill.	800	*	—	*	—	*	*	—	—	—	*	*	*
343	Plegadis falcinellus (L.)	803	*	*	*	*	*	—	—	*	*	*	—	—
344	Dissoura episcopus (Bodd.)	806	—	—	—	*	—	—	*	*	*	*	*	*
345	Platalea sp.	809												
346	Phoyx manilensis (Meyen)	811	—	—	—	*	*	—	*	*	*	*	*	—
347	Ardea sumatrana Raffl.	811	—	—	—	*	*	—	*	*	*	*	*	*
348	Notophoyx picata (J. Gd.)	816	—	—	—	—	—	—	—	—	—	—	—	—
349	Notophoyx novaehollandiae (Lath.)	817	—	—	—	—	—	—	—	—	*?	—	—	*
350	Demiegretta sacra Gm.	819	—	—	—	*	*	*	*	*	*	*	*	*
351	Herodias eulophotes Swinh.	824	—	—	—	*	*	*	—	—	—	—	—	—
352	Herodias garzetta (L.)	826	—	*	*	*	*	*	*	*	*	*	*	—
353	Herodias alba (L.)[2]	829	—	*	*	*	*	*	—	—	*	*	—	*

[1] Add Billiton. [2] Varies geographically.

Celebesian Area																			
		Celebes																	
Talaut Islands	Sangi Islands	North Peninsula	West Celebes	East Peninsula	Togian Islands	Central Celebes	South Peninsula	S. E. Peninsula and Buton	Saleyer Island	Djampea Group	Peling Group	Sula Islands	Moluccas	Papuasia	Australia	Polynesia	New Zealand	Neotropical Region	Name of species
*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Porphyrio pulverulentus.
—	—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Fulica atra.
—	—	*	—	—	—	—	*	—	—	—	—	—	*?	*	*?	—	—	—	Hydralector gallinaceus.
—	—	*	—	—	—	—	*	—	—	—	*	—	*	*	*	—	—	—	Glareola isabella[1]).
—	—	*	—	—	—	—	—	—	—	*	—	*	*	*	*	*	—	—	Esacus magnirostris.
—	—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Lobivanellus cinereus.
—	—	*?	—	—	—	—	—	—	—	—	—	—	*	*	*	—	—	*	? Squatarola helvetica.
*	—	*	—	—	*	*	—	—	*	—	—	—	*	*	*	*	*	—	Charadrius fulvus.
*	—	*	—	—	—	—	*	—	—	—	—	—	*	*	*	—	—	—	Aegialitis vereda.
*	*	*	—	—	—	—	*	—	—	—	*	—	*	*	*	*	—	—	Aegialitis geoffroyi.
—	—	*	—	—	—	—	—	*	—	—	—	—	*	*	*	—	—	—	Aegialitis mongola.
—	—	*	—	—	—	—	*	—	—	—	—	—	—	—	—	—	—	—	Aegialitis curonica.
—	—	*	—	—	—	—	*	—	—	—	—	—	—	—	—	—	—	—	Aegialitis peroni.
—	—	*	—	—	—	—	—	*	*	—	—	—	*	*	*	*	*	*	Strepsilas interpres.
—	—	*	—	—	—	*	*	—	*	—	—	—	*	*	*	—	*	—	Himantopus leucocephal.
—	—	*	—	—	—	*	*	*	*	—	—	—	*	*	*	—	—	—	Totanus glottis.
—	—	*	—	—	—	*	—	—	*	—	—	—	—	—	—	—	—	—	Totanus calidris.
*	—	*	—	—	*	—	*	—	—	—	—	—	*	—	—	—	—	—	Totanus glareola.
*	*	*	—	—	—	*	—	—	—	—	—	—	*	*	*	—	—	—	Heteractitis brevipes.
*	*	*	—	—	*	*	*	—	*	—	—	—	*	*	*	*	—	—	Actitis hypoleucos.
—	—	*	—	—	—	*	—	—	—	—	—	—	*	—	*	—	—	—	Terekia cinerea.
—	—	*	—	—	—	—	—	—	—	—	—	—	*	*	*	*	*	—	Tringa acuminata.
—	—	*	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Tringa damascensis.
—	*	*	—	—	—	—	—	—	*	—	—	—	*	*	*	*	—	—	Tringa ruficollis.
—	—	*?	—	—	—	—	—	—	—	—	—	—	—	—	—	*	—	*	? Calidris arenaria.
—	—	*	—	—	—	—	—	—	—	—	—	—	*	*	—	—	—	—	Phalaropus hyperboreus.
—	—	—	—	—	—	*	—	—	—	—	—	—	*	—	—	—	—	—	Limicola platyrhyncha.
—	—	*	—	—	—	—	*	—	*	—	—	—	*	—	—	*	—	—	Gallinago megala.
*	—	*	—	—	—	—	—	—	—	—	—	—	*	*	*	*	*	—	Limosa novaezealandiae.
—	—	*	—	—	—	—	—	—	—	—	—	—	*	*	*	—	—	—	Numenius minutus.
*	*	*	—	—	—	—	*	*	—	—	—	*	*	*	*	*	—	—	Numenius variegatus.
—	—	*?	—	—	—	—	—	—	—	—	—	—	*	—	—	—	—	—	? Numenius arquatus.
—	—	*	—	—	—	—	—	—	—	—	—	—	*	*	*	—	*	—	Numenius cyanopus.
—	—	*	—	—	—	—	*	—	—	—	—	—	—	*	*	—	—	—	Plegadis falcinellus.
—	—	*	—	—	*	*	—	—	—	—	—	—	—	—	—	—	—	—	Dissoura episcopus.
—	—	*	—	—	—	—	—	—	—	—	—	—							Platalea sp.
—	—	*	—	*	*	*	*	—	—	—	—	—	—	—	—	—	—	—	Phoyx manilensis.
—	*	*	—	—	—	—	—	—	—	—	—	—	*	*	*	—	—	—	Ardea sumatrana.
—	—	*	—	—	—	—	*	—	—	—	—	—	*	*	*	—	—	—	Notophoyx picata.
—	—	*	—	—	—	—	—	—	—	—	—	—	*	*	*	*	*	—	Notoph. novaehollandiae.
*	*	*	—	—	—	—	—	*	—	—	—	—	*	*	*	*	*	—	Demiegretta sacra.
—	—	*	—	—	—	—	—	—	—	—	—	—	—	*?	*?	—	—	—	Herodias eulophotes.
*	*	*	—	—	*	—	*	—	—	—	—	*	*	*	*	—	—	—	Herodias garzetta.
*	—	*	—	—	—	—	—	—	—	—	—	*	*	*	*	—	*?	—	Herodias alba[2].

Number	Name of species	Page in the text	Nearctic Region	Ethiopian Region	Palaearctic Region	Indian Province	Chinese Province	Japan	Malay Peninsula	Sumatra	Java	Borneo	Philippine Islands	Lesser Sunda Islands
354	Herodias intermedia (Wagl.)	832	—	*	—	*	*	*	—	*	*	*	*	*
355	Bubulcus coromandus (Bodd.)	835	—	*	*	*	*	*	*	*	*	*	*	*
356	Ardeola speciosa (Horsf.)	838	—	—	—	—	—	—	—	—	*	*	—	*
357	Nycticorax caledonicus (Gm.)	841	—	—	—	—	—	—	—	—	—	*	—	*
358	Nycticorax manilensis Vig.	843	—	—	—	—	—	—	—	—	—	*	*	—
359	Nycticorax griseus (L.)	845	*	*	*	*	*	*	—	*	*	*	*	*
360	Gorsachius kutteri (Cab.)	848	—	—	—	—	—	—	—	—	—	*	*	—
361	Butorides javanica (Horsf.)[1]	851	—	*	*	*	*	*	*	*	*	*	*	*
362	Ardetta sinensis (Gm.)[2]	854	—	—	*	*	*	*	*	*	*	*	*	*
363	Ardetta eurhythma Swinh.	856	—	—	*	—	*	*	—	—	*	*	—	—
364	Ardetta cinnamomea (Gm.)	859	—	—	—	*	*	—	*	*	*	*	*	*
365	Xanthocnus flavicollis (Lath.)[3]	861												
366	Xanthocnus melaenus (Salvad.)	863	—	—	—	—	—	—	—	—	—	—	—	—
367	Nettopus pulchellus J. Gd.	865	—	—	—	—	—	—	—	—	—	—	—	—
368	Nettopus coromandelianus (Gm.)	866	—	—	—	*	*	—	*	*	*	*	*	—
369	Dendrocygna arcuata (Horsf.)	868	—	—	—	—	—	—	—	—	*	*	*	*
370	Dendrocygna guttata Schl.	870	—	—	—	—	—	—	—	—	—	—	*	—
371	Anas superciliosa Gm.	872	—	—	—	—	—	—	—	*?	*	—	—	*
372	Nettion gibberifrons (S. Müll.)	874	—	—	—	—	—	—	—	—	*	—	—	*
373	Querquedula circia (L.)	879	—	*	*	*	*	*	—	*	*	*	*	—
374	Nyroca fuligula (L.)	881	—	*	*	*	*	*	—	—	—	*	*	—
375	Fregata minor (Gm.)[4]	883												
376	Plotus melanogaster (Penn.)[5]	886	—	—	—	*	*	—	*	*	*	*	*	—
377	Phalacrocorax melanoleucus (Vieill.)	888	—	—	—	—	—	—	—	—	—	—	—	*
378	Phalacrocorax sulcirostris Brdt.	890	—	—	—	—	—	—	—	—	—	*	—	*
379	Sula leucogaster (Bodd.)[6]	892												
380	Hydrochelidon leucoptera (Meisn. Sch.)	893	—	*	*	*	*	—	—	—	*	*	*	—
381	Hydrochelidon hybrida (Pall.)	895	—	*	*	*	*	—	—	—	*	*	*	—
382	Sterna media Horsf.	897	—	*	*	*	—	—	*	*	*	—	—	—
383	Sterna bergii Lcht.	899	—	*	—	*	*	*	—	*	*	*	*	*
384	Sterna sinensis Gm.	901	—	—	*	*	*	*	*	*	*	*	*	*?
385	Sterna melanauchen Temm.[7]	903	—	—	—	*	*	—	*	*	—	*	—	*
386	Sterna anaestheta Scop.	906	*	*	—	*	*	*	*	*	*	*	*	*
387	Anous stolidus (L.)[8]	908												
388	Stercorarius sp.	910												
389	Puffinus cuneatus Salv.	911	—	—	—	—	—	—	—	—	—	—	—	—
390	Puffinus leucomelas (Temm.)	913	—	—	—	—	*	*	—	—	—	*	*	—
391	Diomedea sp.	914												
392	Podiceps tricolor (G. R. Gray)	915	—	—	—	—	—	—	—	—	—	—	—	*
393	Podiceps gularis J. Gd.	917	—	—	—	—	—	—	—	—	*	*?	—	—

[1] With racial differences. [2] Add Seychelles. [3] Racial differences not perfectly understood. [4] Indian and Pacific Oceans.

Celebesian Area																									
		Celebes																							
Talaut Islands	Sangi Islands	North Peninsula	West Celebes	East Peninsula	Togian Islands	Central Celebes	South Peninsula	S. E. Peninsula (and Buton)	Saleyer Island	Djampea Group	Peling Group	Sula Islands	Moluccas	Papuasia	Australia	Polynesia	New Zealand	Neotropical Region	Name of species
—	—	✱	—	—	—	—	✱	—	—	—	—	—	✱	✱	✱	—	—	—	Herodias intermedia.
—	✱	✱	—	—	—	—	✱	—	✱	—	—	—	✱	—	—	—	—	—	Bubulcus coromandus.
—	—	✱	—	—	—	—	✱	✱	—	—	—	—	—	—	—	—	—	—	Ardeola speciosa.
—	✱	✱	—	—	—	—	—	—	—	✱	✱	—	✱	✱	✱	✱	✱	—	Nycticorax caledonicus.
—	—	✱	—	—	—	—	—	—	—	—	—	—	—	—	—	✱	—	—	Nycticorax manilensis.
—	—	✱	—	—	—	—	—	—	—	—	—	—	—	—	—	✱	—	—	Nycticorax griseus.
—	—	✱	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Gorsachius kutteri.
—	—	✱	—	—	—	—	✱	✱	✱	—	—	—	✱	✱	✱	✱	—	—	Butorides javanica [1]).
—	✱	✱	—	—	—	—	—	—	—	—	—	—	✱	✱	✱	✱	—	—	Ardetta sinensis [2]).
—	—	✱	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Ardetta eurhythma.
—	—	✱	—	—	—	—	✱	—	—	—	—	—	—	—	—	—	—	—	Ardetta cinnamomea.
—	✱	✱	—	—	—	—	✱	—	—	—	—	—	—	—	—	—	—	—	Xanthocnus flavicollis [3]).
—	✱	—	—	—	—	—	—	—	—	—	—	—	✱	—	—	—	—	—	Xanthocnus melaenus.
—	—	✱	—	—	—	—	—	—	—	—	—	—	✱	✱	✱	—	—	—	Nettopus pulchellus.
—	—	✱	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Nettop. coromandelianus.
—	✱	✱	—	✱	—	✱	✱	—	—	—	—	—	✱?	✱	✱	✱	—	—	Dendrocycna arcuata.
—	—	✱	—	—	—	—	—	—	—	—	—	—	✱	✱	—	—	—	—	Dendrocycna guttata.
—	—	✱	—	—	—	✱	✱	—	—	—	—	—	✱	✱	✱	✱	✱	—	Anas superciliosa.
—	—	✱	—	—	—	✱	✱	—	✱	—	—	—	—	✱	✱	✱	✱	—	Nettion gibberifrons.
—	—	✱	—	—	—	—	—	—	—	—	—	—	✱	—	—	—	—	—	Querquedula circia.
—	—	✱	—	—	—	—	—	—	—	—	—	—	—	—	—	✱	—	—	Nyroca fuligula.
—	—	✱	—	—	—	—	✱	—	—	—	—	—	—	—	—	—	—	—	Fregata minor.
—	—	✱	—	—	—	—	✱	—	—	—	—	—	—	—	—	—	—	—	Plotus melanogaster.
—	—	✱	—	—	—	—	—	—	—	✱	—	—	✱	✱	✱	✱	✱?	—	Phalacroc. melanoleucus.
—	—	✱	—	—	—	—	—	—	—	—	—	—	✱	✱	✱	—	—	—	Phalacroc. sulcirostris.
—	✱	✱	—	—	—	—	✱	—	—	—	—	—	—	—	—	—	—	—	Sula leucogaster.
—	✱	✱	—	—	—	—	✱	—	—	—	—	—	✱?	—	✱	—	✱	—	Hydrochelidon leucoptera
—	—	✱	—	—	✱	—	✱	—	—	—	—	—	✱	✱	✱	—	—	—	Hydrochelidon hybrida.
—	—	✱	—	—	✱	—	✱	—	—	—	—	—	—	✱	✱	—	—	—	Sterna media.
✱	—	✱	—	—	—	—	✱	—	—	—	—	—	✱	✱	✱	✱	—	—	Sterna bergii.
—	—	✱	—	—	—	—	—	—	—	—	—	—	—	✱	✱	—	—	—	Sterna sinensis.
—	—	✱	—	—	—	—	—	—	—	—	—	—	✱	✱	✱	✱	—	—	Sterna melanauchen.
—	✱	—	—	—	—	—	✱	—	✱	—	—	—	✱	✱	✱	✱	—	—	Sterna anaestheta.
—	✱	✱	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Anous stolidus.
—	—	✱	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Stercorarius sp.
—	—	✱	—	—	—	—	—	—	—	—	—	—	—	—	—	✱	—	—	Puffinus cuneatus.
—	—	✱	—	—	—	—	—	—	—	—	—	—	✱	✱	✱	—	—	—	Puffinus leucomelas.
—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	Diomedea sp.
—	—	✱	—	—	—	—	—	—	—	—	—	—	✱	✱	—	—	—	—	Podiceps tricolor.
✱	✱	—	—	—	—	—	—	—	—	—	—	—	—	✱	✱	—	—	—	Podiceps gularis.

[5]) Add Madagascar. [6]) The tropical and subtropical seas of the globe. [7]) Islands of the Indian Ocean. [8]) Tropical seas.

The Island of Celebes is now known to possess 15 peculiar genera of birds, some of which, indeed, range into other parts of the Celebesian area. These forms are of unequal values, that is to say some of them are very distinct from genera existing in other parts of the world, while others hardly possess any structural difference to warrant their distinction. We have, therefore, divided the Celebesian genera into three classes, according to their taxonomic value.

The following four are I. Class genera:

Megacephalon	*Cittura*
Streptocitta	*Scissirostrum.*

The Moleo, *Megacephalon*, has affinities with *Talegallus* and *Aepypodius* of New Guinea.

Streptocitta, a bird very similar in appearance to a Magpie, seems to occupy an intermediate position between the *Sturnidae* and *Corvidae*. It is probably most nearly allied to *Basileornis*, a Celebesian genus occurring on the mainland and known also by distinct species from Banggai and Ceram; the latter genus seems to have its nearest affinities with *Melanopyrrhus* of New Guinea. Hence *Streptocitta* does not seem to be of Oriental origin, but of Australasian (pp. 576, 573 of text).

Cittura, a low type of Kingfisher, has certain affinities with the still more primitive *Melidora* of New Guinea, but its direct descent from such a form is improbable, and its land of origin is hidden in doubt (p. 307 of text).

Scissirostrum, a Grosbeak-like Starling, has been variously treated by systematists, and in our opinion it has as near affinities with the Oriental *Acridotheres* as with anything, but its curious beak undoubtedly entitles it to an isolated position among the *Sturnidae* (p. 569 of text).

The following are II. Class genera:

Rhabdotorrhinus	*Malia*
Meropogon	*Cataponera*
Ceycopsis	*Enodes*
Myza	*Aramidopsis.*

The small Hornbill, *Rhabdotorrhinus*, is apparently most nearly related to the Philippine genus, *Penelopides* (p. 237 of text).

Forsten's Bee-eater, *Meropogon*, finds its nearest allies in *Nyctiornis* of the Oriental Region — not including the Philippines (pp. 259, 260 of text).

The little Kingfisher, *Ceycopsis*, seems to be intermediate between the red-backed section of *Ceyx* which ranges from India to the Philippines, and the blue-backed section of that genus found from the Philippines to the Solomon Islands, but it differs from both in possessing a minute inner toe, which is quite obliterated in all members of the genus *Ceyx*. We believe that indications may be found showing that the red-backed section of *Ceyx* is more ancient than the blue (pp. 274, 277 of text).

The Honey-sucker, *Myza*, belongs to the purely Australasian family of the *Meliphagidae*, a family which cannot, however, be sharply distinguished from the *Nectariniidae* of the Ethiopian, Oriental and Australian Regions. The nearest affinities of *Myza* are doubtful (p. 483 of text).

The Bulbul, *Malia*, appears to belong to Oates' *Crateropodinae*, a subfamily of the *Timeliidae*. The geographical limits of the group have not been defined, but it is very strongly represented in the Oriental Region and very sparingly in Papuasia. The nearest affinities of *Malia* are uncertain (p. 501 of text).

Cataponera, a Babbler, is related to genera of the Oriental Region (p. 504 of text).

Enodes, an aberrant Starling, is somewhat intermediate between the Indo-Australian *Calornis* and the Oriental *Acridotheres* (p. 565 of text).

Platen's Rail, *Aramidopsis*, is most closely allied to *Aramides* of South America (p. 691 of text).

The remaining three genera are what we have termed III. Class and are not of higher taxonomic value than 10 strongly characterized species They are:

Spilospizias *Churitornis* *Gazzola.*

The ten species estimated to be of equal value with III. Class genera are:

1. *Microstictus fulvus* (Q. G.) or *wallacei* (Tw.)
2. *Hierococcyx crassirostris* (Tweedd.)
3. *Cranorrhinus cassidix* (Temm.)
4. *Monachalcyon monachus* (Bp.), or *princeps* R.
5. *Pachycephala bonensis* M. & Wg.
6. *Melilestes celebensis* M. & Wg.
7. *Carpophaga poecilorrhoa* Brügg.
8. *Phlogoenas tristigmata* Bp.
9. *Gymnocrex rosenbergi* (Schl.)
10. *Amaurornis isabellina* (Schl.)

The above ten, equal to III. Class genera, we propose to term I. Class species. Their differences from their nearest allies (not counting local forms of them in the Celebesian area itself) are about as great as those between *Corvus monedula* L. and *Corvus corone* L., or *Buteo vulgaris* Leach and *Aquila chrysaetus* (L.).

Then follow 22 II. Class species, differing as markedly from their nearest allies outside Celebes as, for instance, *Turdus musicus* L. from *Turdus merula* L. They are:

1. *Astur griseiceps* Schl.
2. *Accipiter rhodogaster* (Schl.)
3. *Trichoglossus ornatus* (L.)
4. — *meyeri* (Tweedd.)
5. *Prioniturus platurus* (Vieill.)
6. *Loriculus exilis* Schl.
7. — *stigmatus* (Müll. Schl.)
8. *Iyngipicus temminckii* (Malh.)
9. *Phoenicophaes calorhynchus* Temm.
10. *Coracias temminckii* (Vieill.)
11. *Hypothymis puella* (Wall.)
12. *Graucalus bicolor* (Temm.)
13. — *temminckii* (S. Müll.)
14. *Dicaeum nehrkorni* W. Blas.
15. *Acmonorhynchus aureolimbatus* (Wall.)
16. *Zosterops squamiceps* (Hart.)

17. *Zosterops anomala* M. & Wg.
18. *Trichostoma celebense* Strickl.
19. *Basileornis celebensis* G. R. Gray
20. *Ptilopus fischeri* Brügg.
21. — *gularis* (Q. G.)
22. *Carpophaga forsteni* Bp.

There are about 45 species in Celebes which may be relegated to the III. Class, differing from one another about as much as *Corvus corone* L. from *Corvus cornix* L., and for the most part geographical species. They need not be tabulated again here, but in the following table these III. Class species have been taken as the unit in computing the relationship of the avifauna of Celebes with those of the neighbouring countries. We have adopted the following scale:

One III. Class species, or V. (!) Class genus	=	1
One II. Class species, or IV. Class genus	=	2
One I. Class species, or III. Class genus	=	4
One . . . . . II. Class genus	=	8
One . . . . . I. Class genus	=	16

Species of lower value than the III. Class, and first class subspecies are valued at ·50; less pronounced races at ·25. We have not troubled to make finer estimations than these last[1]).

In attaching a value in this manner to species or genera, room for error due to the "personal equation" must be allowed for, but the method is obviously better than the usual addition and substraction of genera and species as if they were, respectively, units of equal worth. It is very evident, for instance, that *Megacephalon* suggests much more about ancient Celebes than does *Gazzola*, but it is another question whether the value of the former (four times as great as the latter) is correctly estimated.

[1]) Besides the peculiar species of Celebes and the neighbouring islands, there are about 200 other Celebesian species which are either migratory or extend their range beyond the bounds of the area. They may be tabulated as follows, with the premonition that there is great uncertainty as to whether some species should be termed migratory or not:

Species occurring both in the Oriental and Australasian Regions (often migratory)	c. 60
Asiatic migrants	c. 64
Australian migrants	c. 5
Asiatic non-migrants	c. 38
Australian non-migrants	c. 34

It is sufficiently obvious that these species have nothing to say about the former distribution of land and water in the East Indies, and they should not be taken into consideration in questions of Geographical Distribution.

Estimated value of the affinities of the peculiar species of Celebes.[1]

Doubtful	Indo-Australian	Oriental	Bornean	Javan	Philippine	Name of species	Lesser Sundan	Moluccan	Papuasian	Australian	Australasian
—	—	—	1	—	—	1. *Spiloruis rufipectus* J. Gd.	—	—	—	—	—
—	2	—	—	—	—	2. *Astur griseiceps* Schl.	—	—	—	—	—
4	—	—	—	—	—	3. *Spilospizias trinotatus* (Bp.)	—	—	—	—	—
2	—	—	—	—	—	4. *Accipiter rhodogaster* (Schl.)	—	—	—	—	—
—	—	—	—	—	1	5. *Spizaetus lanceolatus* (Bp.)	—	—	—	—	—
—	—	1	—	—	—	6. *Pernis celebensis* (Schl.)	—	—	—	—	—
—	—	—	·5	—	·5	7. *Baza celebensis* Schl.	—	—	—	—	—
—	1	—	—	—	—	8. *Ninox ochracea* (Schl.)	—	—	—	—	—
—	—	—	—	—	—	9. *Cephaloptynx punctulata* (Q. G.)	—	—	1	—	—
—	·5	—	—	—	—	10. *Scops manadensis* (Q. G.) (typical)	—	—	—	—	—
1	—	—	—	—	—	11. *Strix inexpectata* (Schl.)	—	—	—	—	—
—	—	—	—	—	—	12. *Trichoglossus ornatus* (L.)	—	1	1	—	—
—	—	—	—	—	—	13. *Trichoglossus meyeri* Tweedd.	2	—	—	—	—
—	—	—	—	—	—	14. *Cacatua sulphurea* (Gm.) (typical)	·5	—	—	—	—
—	—	—	—	—	2	15. *Prioniturus platurus* (Vieill.)	—	—	—	—	—
—	—	—	—	—	1	16. *Prioniturus flavicans* Cass.	—	—	—	—	—
—	—	—	—	—	1	17. *Tanygnathus muelleri* (Müll. Schl.)	—	—	—	—	—
—	—	—	—	—	—	18. *Loriculus exilis* Schl.	2	—	—	—	—
—	2	—	—	—	—	19. *Loriculus stigmatus* (Müll. Schl.)	—	—	—	—	—
—	—	—	—	—	2	20. *Iyngipicus temmincki* (Malh.)	—	—	—	—	—
—	—	—	—	—	4	21. *Microstictus fulvus* (Q. G.)	—	—	—	—	—
—	—	4	—	—	—	22. *Hierococcyx crassirostris* Tweedd.	—	—	—	—	—
—	—	—	—	—	—	23. *Cacomantis virescens* (Brügg.)	—	·5	—	—	—
—	1	—	—	—	—	24. *Eudynamis melanorhyncha* S. Müll.	—	—	—	—	—
—	—	—	—	1[2]	—	25. *Pyrrhocentor celebensis* (Q. G.)	—	—	—	—	—
—	—	—	—	2	—	26. *Phoenicophaes calorhynchus* Temm.	—	—	—	—	—
—	—	—	—	—	8	27. *Rhabdotorrhinus exaratus* (Temm.)	—	—	—	—	—
—	—	—	—	—	4	28. *Cranorrhinus cassidix* (Temm.)	—	—	—	—	—
—	—	8	—	—	—	29. *Meropogon forsteni* Bp.	—	—	—	—	—
—	—	—	·5	—	·5	30. *Pelargopsis melanorhyncha* Temm.	—	—	—	—	—
—	8	—	—	—	—	31. *Ceycopsis fallax* (Schl.)	—	—	—	—	—
—	—	·5	—	—	—	32. *Halcyon coromanda rufa* (Wall.)	—	—	—	—	—
—	—	—	—	—	2	33. *Monachalcyon monachus* (Bp.)	2	—	—	—	—
—	—	—	—	—	·5	34. *Monachalcyon princeps* Rchb.	·5	—	—	—	—
16	—	—	—	—	—	35. *Cittura cyanotis* (Temm.)[3]	—	—	—	—	—

[1] Species occurring on the mainland, sometimes ranging into the islands of the area. Where two or more geographical races are found in the Celebesian area, the first described only is reckoned.

[2] Literally Kangean. [3] Probably Australasian.

Doubtful	Indo-Australian	Oriental	Borneau	Javan	Philippine	Name of species	Lesser Sundan	Moluccan	Papuasian	Australian	Australasian
—	—	2	—	—	—	36. *Coracias temmincki* (Vieill.)[1]	—	—	—	—	—
—	—	—	—	—	1	37. *Lyncornis macropterus* Bp.	—	—	—	—	—
—	—	—	—	—	1	38. *Caprimulgus celebensis* Grant	—	—	—	—	—
—	—	1	—	—	—	39. *Macropteryx wallacei* (A. Gd.)	—	—	—	—	—
—	—	—	—	—	·5	40. *Pitta celebensis* Müll. Schl.	—	·25	·25	—	—
—	—	—	·25	—	·25	41. *Pitta forsteni* Bp.	—	—	·5	—	—
—	—	—	—	—	1	42. *Siphia rufigula* (Wall.	—	—	—	—	—
—	—	1	—	—	—	43. *Stoparola septentrionalis* Bütt.	—	—	—	—	—
—	—	2	—	—	—	44. *Hypothymis puella* (Wall.)	—	—	—	—	—
—	—	—	—	—	—	45. *Rhipidura teijsmanni* Bütt.	—	—	—	1	—
—	—	—	·5	—	·5	46. *Gerygone flaveola* Cab.	—	—	—	—	—
—	—	—	—	—	1	47. *Pachycephala sulfuriventer* (Tweedd.)	—	—	—	—	—
—	4	—	—	—	—	48. *Pachycephala bonensis* M. & Wg.	—	—	—	—	—
—	2	—	—	—	—	49. *Graucalus bicolor* (Temm.)	—	—	—	—	—
—	1	—	—	—	—	50. *Graucalus leucopygius* Bp.	—	—	—	—	—
—	—	—	—	—	—	51. *Graucalus temmincki* (S. Müll.)	—	—	2	—	—
—	—	—	—	—	—	52. *Edoliisoma morio* (S. Müll.)	—	—	1	—	—
—	—	1	—	—	—	53. *Lalage leucopygialis* Tweedd.	—	—	—	—	—
—	—	—	—	—	—	54. *Artamus monachus* Bp.	—	—	1	—	—
—	·5	—	—	—	—	55. *Dicrurus leucops* Wall.	—	—	—	—	—
—	—	—	1	—	—	56. *Dicaeum celebicum* S. Müll.	—	—	—	—	—
—	—	1	—	—	—	57. *Dicaeum nehrkorni* W. Blas.	—	—	1	—	—
—	—	1	—	—	—	58. *Dicaeum hosei* Sharpe	—	—	—	—	—
—	—	—	—	—	—	59. *Acmonorhynchus aureolimbatus* (Wall.)	2	—	—	—	—
—	—	1	—	—	—	60. *Aethopyga flavostriata* (Wall.)	—	—	—	—	—
—	—	—	—	—	—	61. *Cyrtostomus frenatus* (S. Müll.) (loc. races)	—	—	—	—	·5
—	—	—	—	—	—	62. *Hermotimia porphyrolaema* (Wall.)	—	1	—	—	—
—	—	·5	—	—	—	63. *Anthreptes malace. celebensis* (Shelley)	—	—	—	—	—
—	—	—	—	—	—	64. *Myzomela chloroptera* Tweedd.	—	—	—	1	—
—	—	—	—	—	—	65. *Melilestes celebensis* M. & Wg.	—	—	4	—	—
—	—	—	—	—	—	66. *Myza sarasinorum* M. & Wg.	—	—	—	—	S
—	—	—	1	1	—	67. *Zosterops squamiceps* (Hart.)	—	—	—	—	—
—	—	—	—	—	—	68. *Zosterops atrifrons* Wall.	—	—	1	—	—
—	—	—	—	—	—	69. *Zosterops sarasinorum* M. & Wg.	·5	—	—	—	—
—	—	2	—	—	—	70. *Zosterops anomala* M. & Wg.[2]	—	—	—	—	—
S	—	—	—	—	—	71. *Malia grata* Schl[3]	—	—	—	—	—
—	—	—	1	—	—	72. *Androphilus castaneus* (Bütt.)	—	—	—	—	—
—	—	S	—	—	—	73. *Cataponera turdoides* Hart.	—	—	—	—	—
—	—	2	—	—	—	74. *Trichostoma celebensis* Strickl.	—	—	—	—	—
—	—	—	—	—	—	75. *Geocichla erythronota* Scl.	1	—	—	—	—

[1] Partly African. [2] Chiefly Oriental. [3] Probably Oriental.

Doubtful	Indo-Australian	Oriental	Bornean	Javan	Philippine	Name of species	Lesser Sundan	Moluccan	Papuasian	Australian	Australasian
—	—	—	—	1	—	76. *Merula celebensis* Bütt.	—	—	—	—	—
—	—	1	—	—	—	77. *Phyllergates riedeli* M. & Wg.	—	—	—	—	—
—	—	—	—	·5	—	78. *Cryptolopha sarasinorum* M. & Wg.	·5	—	—	—	—
—	—	—	—	—	·25	79. *Munia formosana brunneiceps* (Wald.)	—	—	—	—	—
—	—	—	—	—	—	80. *Munia subcastanea* Hart.	1	—	—	—	—
—	—	—	—	—	—	81. *Munia molucca—propinqua*	·25	—	—	—	—
—	8	—	—	—	—	82. *Enodes erythrophrys* (Temm.)	—	—	—	—	—
—	—	—	—	1	—	83. *Acridotheres cinereus* Bp.	—	—	—	—	—
16	—	—	—	—	—	84. *Scissirostrum dubium* (Lath.)[1]	—	—	—	—	—
—	—	—	—	—	—	85. *Basilornis celebensis* G. R. Gray	—	2	—	—	—
16	—	—	—	—	—	86. *Streptocitta albicollis* (Vieill.)[2]	—	—	—	—	—
4	—	—	—	—	—	87. *Gazzola typica* Bp.	—	—	—	—	—
—	—	·5	—	—	—	88. *Oriolus celebensis* (Tweedd.)	—	—	—	—	—
—	—	—	—	·5	—	89. *Osmotreron wallacei* Salvad.	—	—	—	—	—
—	—	—	—	—	2	90. *Ptilopus fischeri* Brügg.	—	—	—	—	—
—	—	—	—	—	2	91. *Ptilopus gularis* (Q. G.)	—	—	—	—	—
—	—	—	—	·25	—	92. *Ptilopus melanospilus* (Salvad.)	·25	—	—	—	—
—	—	—	—	—	·5	93. *Carpophaga paulina* (Bp.)	—	—	—	—	—
—	—	—	—	—	1	94. *Carpophaga radiata* (Q. G.)	—	—	—	—	—
—	—	—	—	—	2	95. *Carpophaga forsteni* (Bp.)	—	—	—	—	—
4	—	—	—	—	—	96. *Carpophaga poecilorrhoa* Brügg.[3]	—	—	—	—	—
—	1	—	—	—	—	97. *Myristicivora luctuosa* (Temm.)	—	—	—	—	—
—	—	—	—	—	—	98. *Turacoena manadensis* (Q. G.)	1	—	—	—	—
—	—	—	—	—	—	99. *Macropygia albicapilla* Bp.	—	·5	—	—	—
—	—	—	—	—	—	100. *Macropygia macassariensis* (Wall.)	·5	—	—	—	—
—	—	—	—	—	2	101. *Phlogoenas tristigmata* Bp.	—	—	2	—	—
—	—	—	—	—	—	102. *Megacephalon maleo* (Hartl.)	—	—	16	—	—
—	—	—	—	—	—	103. *Turnix rufilatus* Wall.	1	—	—	—	—
—	—	—	—	—	—	104. *Gymnocrex rosenbergi* (Schl.)	—	2	2	—	—
8	—	—	—	—	—	105. *Aramidopsis plateni* (W. Blas.)[4]	—	—	—	—	—
—	—	—	—	—	—	106. *Hypotaenidia celebensis* (Q. G.)	—	—	1	—	—
—	—	—	—	—	1	107. *Rallina minahassa* Wall.	—	—	—	—	—
—	—	—	—	—	2	108. *Amaurornis isabellina* (Schl.)	—	—	—	—	2
79	31	37·5	5·75	7·25	44·5		15	7·25	33·75	2	10·5

[1] Probably Oriental. [2] Probably Australasian. [3] Probably Oriental. [4] S. American.

The above totals for each area added together give the sum of 273·5. The percentage of "Doubtful" components in the Celebes avifauna is then:

$$\frac{79 \times 100}{273{\cdot}5}, \text{ or } 29 \text{ per cent.}$$

In the same manner the percentage of the other components is obtained.

The total number of peculiar forms in Celebes is 108. Dividing the value of a species where the nearest affinities with these peculiar forms are found in two or more of the neighbouring areas, the shares are:

Doubtful	10	forms
Indo-Australian	12	»
Oriental (incl. Bornean and Javan	29·25	»
Philippine	23·75	»
Lesser Sundan	13	»
Australasian	20	»
	108	

The table then affords the following percentages:

	Number of forms	Comparative value
Forms of doubtful affinities	9·3 per cent	29 per cent
Forms of Indo-Australian affinities	11·1 per cent	11·3 per cent
Forms of Oriental affinities (incl. also strictly Bornean and Javan)	27·0 per cent	18·46 per cent
Forms of Philippine affinities	22·0 per cent	16·27 per cent
Forms of Lesser Sundan affinities	12·0 per cent	5·5 per cent
Forms of Moluccan affinities	5·0 per cent	2·6 per cent
Forms of Papuasian and Australian affinities	13·5 per cent	16·94 per cent
	99·9	100·07

Thus, the forms of doubtful affinities in Celebes have the highest value, viz. a little over 3 each;

those of Indo-Australian and of Australasian affinities have the value 1
those of the Oriental Region about ·7
those of the Philippines about ·74
those of the Lesser Sunda Islands only about ·5.

Consequently, the "Doubtful" elements seem to be the oldest, and the Lesser Sundan generally the most recent in Celebes.

Including the Philippines in the Oriental Region, and comparing the area thus formed with the Australian Region, Celebes shows itself to be decidedly Oriental.

Oriental components . . 49 per cent, value 35·73 per cent
Australasian[1] components 18·5 per cent, value 19·54 per cent

[1] The Lesser Sundan forms are not added, being shared about equally between the Australian and Oriental Regions.

That is to say, one-half of the peculiar birds of Celebes have their nearest affinities in the Oriental Region, and one-fifth only in the Australian Region; but the Australasian forms seem to be on an average rather more strongly differentiated than the Oriental forms.

While the Philippines display nearly as many points of affinity with Celebes as do all the other parts of the Oriental Region taken together, they also show fewer points of dissimilarity — i. e. a far smaller number of genera not found in Celebes.

A comparison of all the genera occurring in the Philippines, Borneo, Java, and Papuasia and the Moluccas with those of the Celebesian area gives the following results[1]):

	Present in the Celebesian area	Absent in the Celebesian area
Genera occurring in the Philippines (not including Palawan) .	154	68
Genera occurring in the Bornean Group	150	147
Genera occurring in Java	135	125
Genera occurring in Papuasia and the Moluccas	136	169

The figures show that, as regards genera, the Celebesian area agrees much better with the Philippines than with the neighbouring countries.[2])

We now turn to examine the various parts of the Celebesian area itself, giving lists of the birds of the different groups of islands, with a few remarks on their general affinities and derivation. The relations of the Northern and Southern Peninsulas of Celebes to one another are similarly discussed.

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[1]) The numbers are taken respectively from Prof. D. C. Worcester's "Contributions to Philippine Ornithology" (Pr. U. S. Nat. Mus. 1898 XX, pp. 551—564), Mr. Everett's "List of the Birds of the Bornean Group of Islands" (J. Str. Br. R. A. S. 1889, pp. 96—212), Dr. Vorderman's "List of the Birds of Java" Nat. Tdschr. Ned. Ind. 1885, XLIV, pp. 189—207), and Count Salvadori's "Orn. Papuasia e Molucc." 1880—82 vols. I—III.

[2]) It would be suggestive to compare the number of the endemic genera and species of Celebes with those of other islands of the earth, say Borneo, Mindanao, Java, Timor, New Guinea, New Zealand, Madagascar, etc., etc., but such data are not yet readily available. It would, however, be worth while to draw up such lists, as we possess them to a greater or less extent for plants. We mention for instance that endemic genera of *Phanerogamae* are known from Fiji 13, Ceylon 21, New Zealand 22, Sandwich Islands 32, the Mascarenes 34, New Caledonia 38, Japan 48, Madagascar 91, and that from New Guinea about 35 are as yet known (see O. Warburg, Bot. Jahrb. 1891 XIII, 231).

List of the Birds of the Sangi Islands.

Name of species	Great Sangi	Siao	Tagulandang, Ruang & Biarro
1. *Spilornis rufipectus* J. Gd. (?typical)	—	*	—
2. *Tachyspizias soloensis* Horsf.)	*	*	—
3. *Butastur indicus* (Gm.)	*	*	—
4. *Haliastur indus* Bodd.	*	*	*
5. *Pandion haliactus* L. typical	*	—	—
6. *Pandion haliactus leucocephalus* J. Gd.	*	*	—
7. *Ninox scutulata japonica* (Temm. Schl.	*	*	*
8. *Scops manadensis* (Q. G. typical	*	*	—
9. *Strix flammea rosenbergi* Schl.	*	—	—
*10. *Eos histrio* (St. Müll.) typical	*	*	*
11. *Prioniturus platurus* Vieill.)	*	*	—
12. *Prioniturus flavicans* Cass.	?*	—	—
*13. *Tanygnathus muelleri sangirensis* M. & Wg.	*	—	—
14. ?*Tanygnathus luconensis* L.	*	—	—
15. *Tanygnathus megalorhynchus* Bodd.) typ.	*	*	*
*16. *Loriculus catamene* Schl.	*	-	—
17. *Cuculus canorus canoroides* (S. Müll.)	*	—	—
18. *Eudynamis mindanensis sangirensis* (Blas.)	*	*	*
19. *Centrococcyx bengalensis* (Gm.)	*	*	*
20. *Merops ornatus* Lath.	*	*	—
21. *Alcedo ispida* L.	*	*	—
22. *Alcedo moluccana* Less.	*	*	—
*23. *Ceycopsis sangirensis* M. & Wg.	*	-	—
24. *Halcyon coromanda rufa* (Wall.)	*	*	—
25. *Halcyon sancta* Vig. Horsf.	*	*	*
26. *Halcyon chloris* (Bodd.) (typical)	*	*	*
*27. *Cittura sangirensis* Sharpe	*	*	—
28. *Eurystomus orientalis* (L.	*	*	*
29. *Cypselus pacificus* Lath.	—	*	—
*30. *Pitta palliceps* Brügg.	—	*	*
*31. *Pitta caerulcitorques* Salvad.	*	—	-
*32. *Pitta sangirana* Schl.	*	—	—
33. *Pitta irena* Temm.	—	—	*
34. *Hirundo rustica gutturalis* Scop.) and *H. rustica—gutturalis*	*	—	—
35. *Hirundo javanica* Sparrm.	*	—	—
*36. *Hypothymis rowleyi* A. B. M.	*	—	—
*37. *Monarcha commutatus* Brügg.	*	*	—
*38. *Colluricincla sangirensis* Oust.	*	—	—
39. *Lanius lucionensis* L.	*	—	—
40. *Graucalus leucopygius* Bp.	*	—	—
*41. *Edoliisoma salcadorii* Sharpe	*	—	—
*42. *Dicrurus leucops—axillaris*	—	*	*
*43. *Dicrurus leucops axillaris* Salvad.	*	—	—
*44. *Dicaeum sangirense* Salvad.	*	—	—
*45. *Acmonorhynchus sangirensis* Salvad.	*	—	—
*46. *Eudrepanis duivenbodei* Schl.	*	—	—
*47. *Hermotimia sangirensis* (A. B. M.)	*	*	*
48. *Anthreptes malaccensis chlorigaster* Sharpe	*	*	—
*49. *Zosterops nehrkorni* W. Blas.	*	—	—
*50. *Iole platenae* (W. Blas.)	*	—	—
51. *Petrophila cyanus solitaria* (P. L. S. Müll.)	*	—	—
52. *Locustella fasciolata* (G. R. Gray)	*	—	—
53. *Phylloscopus borealis* Blas.	*	—	—
54. *Munia molucca—propinqua*	*	*	*
55. *Calornis panayensis sangirensis* (Salvad.)	*	*	—
* *Calornis panayensis—sangirensis*	—	—	*
*56. *Oriolus formosus* Cab. typical	—	*	—
*57. *Oriolus formosus sangirensis* M. & Wg.	*	—	—
* *Oriolus formosus—sangirensis*	—	—	*
*58. *Osmotreron sangirensis* (Brügg.)	*	*	*
59. *Ptilopus xanthorrhous* (Salvad.)	*	*	*
60. *Carpophaga concinna* Wall.	*	*	*
61. *Myristicivora bicolor* (Scop.)	*	*	*
62. *Columba albigularis* Bp.	—	—	*
*63. *Macropygia albicapilla sangirensis* (Salvad.)	*	*	—
* *Macropygia albicapilla—sangirensis*	—	—	*
64. *Turtur tigrinus* Temm. Kn.)	—	*	*
65. *Chalcophaps indica* (L.)	*	*	*
66. *Calocnas nicobarica* (L.)	*	*	—
67. *Gallus ferrugineus* (Gm.	—	*	—
68. *Megapodius sangirensis* Schl.	*	*	*
69. *Megacephalon maleo* (Hartl.	*	*	—
70. *Amauronis phoenicura* (Forst.)	—	—	*
71. *Amauornis moluccana* (Wall.)	—	*	—
72. *Aegialitis geoffroyi* (Wagl.	*	*	—
73. *Heteractitis brevipes* (Vieill.	*	*	—
74. *Actitis hypoleucos* (L.	*	*	—
75. *Tringa ruficollis* (Pall.	*	—	—
76. *Numenius variegatus* (Scop.)	*	*	—
77. *Ardea sumatrana* Raffl.	—	*	—
78. *Demiegretta sacra* (Gm.	*	*	—
79. *Herodias garzetta* (L.)	*	—	—
80. *Bubulcus coromandus* (Bodd.	*	—	—
81. *Nycticorax caledonicus* (Gm.	*	—	—
82. *Xanthocnus flavicollis* (Lath.)	—	*	—
83. *Xanthocnus melanus* (Salvad.)	*	—	—
84. *Sula leucogaster* (Bodd.)	*	*	—
85. *Hydrochelidon leucoptera* (Meisn. Sch.	*	—	—
86. *Sterna anaestheta* (Scop.	*	—	—
87. *Anous stolidus* (L.	*?	—	—
88. *Podiceps gularis* (J. Gd.	*	—	—

* signifies autochthonous.

List of the Birds of the Talaut Islands.[1])

Name of species	Karkellang	Kabruang	Salibabu
1. *Tachyspizias soloensis* (Horsf.)	*	—	—
2. *Butastur indicus* (Gm.)	*	—	*
3. *Haliastur indus—girrenera*	—	*	*
4. *Pandion haliaetus* (L.)	—	—	*
Pandion haliactus leucocephalus J. Gd.	*	—	—
5. *Ninox scutulata japonica* (Temm. Schl.)	—	*	*
*6. *Eos histrio talautensis* (M. & Wg.)	*	*	*
*7. *Prioniturus platurus talautensis* Hart.	*	—	*
*8. *Tanygnathus muelleri—sangirensis*	*	*	*
*9. *Tanygnathus talautensis* M. & Wg.	*	*	*
10. *Tanygnathus megalorhynchus* (Bodd.) (typ.	*	*	*
11. *Cuculus canorus canoroides* S. Müll.)	*	*	*
12. *Eudynamis mindanensis sangirensis* W. Bl.	*	*	*
13. *Centrococcyx bengalensis* (Gm.	*	*	*
14. *Scythrops novaehollandiae* Lath.	—	—	*
15. *Merops ornatus* Lath.	*	—	—
16. *Alcedo ispida* L.	*	—	—
17. *Alcedo moluccana* (Less.)	—	—	*
18. *Halcyon coromanda rufa* (Wall.)	*	—	*
19. *Halcyon sancta* Vig. Horsf.	*	*	—
20. *Halcyon chloris* (Bodd.) (typical)	*	*	*
21. *Eurystomus orientalis* L.	*	*	*
*22. *Pitta inspeculata* M. & Wg.	*	*	*
23. *Hirundo javanica* Sparrm.[2])	*	—	—
24. *Muscicapa griseosticta* (Swinh.)	*	—	*
*25. *Zeocephus talautensis* M. & Wg.	*	*	*
26. *Monarcha inornatus* (Garn.)	*	*	*
27. *Lanius lucionensis* L.	*	*	—
*28. *Edolisoma talautense* M. & Wg.	*	*	*
*29. *Dicaeum talautense* M. & Wg.	*	—	*
*30. *Hermotimia talautensis* M. & Wg.	*	*	*
*31. *Zosterops babelo* M. & Wg.	*	—	*
32. *Petrophila cyanus solitaria* P. L. S. Müll.	—	*	*
33. *Locustella fasciolata* (G. R. Gray)	*	—	*
34. *Phylloscopus borealis* (Blas.	*	*	—
35. *Motacilla flava* L.	—	*	—
*36. *Munia molucca typica* >[3])	*	—	*
37. *Calornis panayensis sangirensis* Salvad.	*	*	*
*38. *Oriolus melanisticus* M. & Wg.	*	*	*
39. *Ptilopus xanthorrhous* Salvad.)	*	*	*
40. *Carpophaga concinna* Wall.	*	*	*
*41. *Carpophaga intermedia* M. & Wg.	*	*	*
42. *Carpophaga pickeringi* Cass.	—	*	*
43. *Myristicivora bicolor* (Scop.)	*	*	*
44. *Chalcophaps indica* (L.	—	—	*
45. *Macropygia albicapilla sangirensis* (Salvad.	—	—	*
46. *Megapodius sangirensis* Schl.	*	*	*
47. *Amaurornis cinerea* (Vieill.)	*	*	*
48. *Amaurornis phoenicura* (Forst.)	—	*	—
49. *Porphyrio pulverulentus* Temm.	*	—	—
50. *Charadrius fulvus* Gm.	*	*	—
51. *Aegialitis vereda* (J. Gd.)	*	—	—
52. *Aegialitis geoffroyi* (Wagl.)	—	*	—
53. *Totanus glareola* (L.)	*	*	—
54. *Heteractitis brevipes* (Vieill.	—	*	—
55. *Actitis hypoleucos* (L.)	—	*	*
56. *Limosa novaezealandiae* (G. R. Gray)	—	*	—
57. *Numenius variegatus* (Scop.)	—	*	—
58. *Demiegretta sacra* (Gm.)	—	*	—
59. *Herodias garzetta* (L.)	—	*	—
60. *Herodias alba* (L.)	—	*	—
61. *Bubulcus coromandus* (Bodd.)	—	*	—
62. *Gorsachius kutteri* (Cab.)	*	—	—
63. *Ardetta eurhythma* (Swinh.[2])	*	—	—
64. *Xanthocnus flavicollis* (Lath.)	—	*	*
65. *Dendrocygna guttata* (Schl.	*	*	—
66. *Dendrocygna arcuata* (Horsf.[2])	*	—	—
67. *Sterna bergii* (Lcht.	—	*	—
68. *Podiceps gularis* (J. Gd.	—	*	—

[1]) A small collection of forty species obtained by Mr. Waterstradt's Bornean hunters on Salibabu has recently been recorded by Mr. Hartert (Novit. Zool. 1898, pp. 88—91). Of these 21 were new to Salibabu, and 3, *Pandion haliactus*, *Alcedo moluccana*, and *Munia molucca*, had not yet been recorded from the group, though the last is present in the Dresden Museum from Karkellang, as well as a small form of *Pandion*. *Trichoglossus ornatus* (L.), *Iyngipicus temminckii* (Malh.), and *Lyncornis macropterus* (Bp.), are included in Mr. Hartert's list, but omitted in the above, as we have little doubt that they were obtained in Celebes. For the same reason Hartert omits *Oriolus celebensis* and *Dicrurus leucops*.

[2]) *Hirundo javanica*, *Ardetta eurhythma*, and *Dendrocygna arcuata* were included in a third collection from Talaut, received in 1897.

[3]) The formula *Munia molucca typica* > is more accurate than the *Munia molucca* > *propinqua* used in the text, p. 551, the Talaut birds being, as one might say, more typical than the type!

The nearest affinities of the peculiar species of the Sangi Islands.

	Celebes	Philippines	Bornean Group	Moluccas and Papuasia
1. *Eos histrio* (S. Müll.) (typical	—	—	—	*
2. *Tanygnathus muelleri sangirensis* M. & Wg.	*	—	—	—
3. *Loriculus catamene* Schl.	—	—	—	*
4. *Ceycopsis sangirensis* M. & Wg.	*	—	—	—
5. *Cittura sangirensis* Sharpe	*	—	—	—
6. *Pitta pallidiceps* Brügg.	*	—	—	—
7. *Pitta caeruleitorques* Salvad.	—	*	—	—
8. *Pitta sangirana* (Schl.)	—	*	*	—
9. *Monarcha commutatus* Brügg.	—	—	—	*
10. *Hypothymis rowleyi* (A. B. M.)	*	—	*	—
11. *Colluricincla sangirensis* (Oust.)	—	—	—	*
12. *Edoliisoma salvadorii* Sharpe	—	—	—	*
13. *Dicrurus leucops axillaris* (Salvad.)	*	—	—	—
14. *Dicaeum sangirense* Salvad.	*	—	—	—
15. *Acmonorhynchus sangirensis* (Salvad.)	*	—	—	—
16. *Eudrepanis duivenbodei* (Schl.)	—	*	—	—
17. *Hermotimia sangirensis* (A. B. M.)	*	—	—	—
18. *Zosterops nehrkorni* W. Blas.	*	—	—	*
19. *Iole platenae* (W. Blas.)	Togian Sula	—	—	—
20. *Oriolus formosus* Cab.	—	*	—	—
21. *Osmotreron sangirensis* (Brügg.)	*	—	—	—
	12	4	2	6

The nearest affinities of the peculiar species of the Talaut Islands.

1. *Eos histrio talautensis* M. & Wg.	—	—	—	*
2. *Tanygnathus muelleri sangirensis* M. & Wg.	*	—	—	—
3. *Tanygnathus talautensis* M. & Wg.	—	*	—	—
4. *Prioniturus platurus talautensis* Hart.	*	—	—	—
5. *Pitta inspeculata* M. & Wg.	—	—	—	*
6. *Zeocephus talautensis* M. & Wg.	—	*	—	—
7. *Edoliisoma talautense* M. & Wg.	—	—	—	*
8. *Dicaeum talautense* M. & Wg.	*	—	—	—
9. *Hermotimia talautensis* M. & Wg.	*	—	—	—
10. *Zosterops babelo* M. & Wg.	—	*	—	—
11. *Munia molucca typica* >	—	—	—	*
12. *Oriolus melanisticus* M. & Wg.	—	*	—	—
13. *Carpophaga intermedia* M. & Wg.	—	*	*	—
	4	5	1	4

Six of the Talaut forms (numbers 1, 2, 7, 8, 9, 12) have still nearer affinities in Sangi, and there are five other species or subspecies which are "identical" in Sangi and Talaut. One of these latter (*Macropygia albicapilla sangirensis*) has

its nearest affinities in Celebes, one (*Eudynamis mindanensis sangirensis*) in the Philippines, and three (*Calornis panayensis sangirensis*, *Ptilopus xanthorrhous*, *Megapodius sangirensis*) in Celebes and the Philippines alike. Consequently it might be claimed that the Philippines are known at present to have 9 forms in Talaut, and Celebes only 8 forms; but as the avifauna of Sangi presents the strongest agreement with Talaut, and Sangi belongs to Celebes, it is convenient to include Talaut with Sangi in the Celebesian area.

The peculiar birds of the Sangi and Talaut Islands seem to be of comparatively recent origin; there is not a form among them which can be termed an ancient type. There is not a single peculiar genus, and all, or almost all, the endemic species are geographical races of forms in the lands lying near at hand to north, south, east or west. Moreover, ill-flying birds, such as the *Bucerotidae* and *Phoenicophainae*, are absent, or at least not known as yet. Everything points to the recent colonisation of these islands, and their highly volcanic or coral character and the deep sea around them are suggestive of their recent upheaval[1]).

As has been pointed out elsewhere, almost all of the peculiar species of Sangi and Talaut have increased in size (see p. 58).

List of the Birds of the Peling Group.

Name of species	Peling	Banggai	Name of species	Peling	Banggai
*1. *Spilornis rufipectus* < *sulaensis*	*	*	*13. *Loriculus sclateri ruber* M. & Wg.	*	*
2. *Accipiter sulaensis* (Schl.)	*	*	14. *Aprosmictus sulaensis* Rchw.	*	—
3. *Haliactus leucogaster* (Gm.)	—	*	15. *Cacomantis virescens* Brügg.)	—	*
4. *Polioaetus humilis* (Müll. Schl.) (typical)	*	—	16. *Eudynamis melanorhyncha* S. Müll.	*	—
5. *Haliastur indus—girrenera*	*	—	17. *Merops ornatus* Lath.	*	—
6. *Pernis celebensis* (Wall.)	*	—	18. *Alcedo moluccana* (Less.)	*	—
7. *Baza celebensis* Schl.	—	*	19. *Alcedo meninting* Horsf.	*	*
8. *Tinnunculus moluce. orientalis—occidentalis*	*	—	*20. *Pelargopsis dichrorhyncha* M. & Wg.	*	*
9. *Pandion haliaetus leucocephalus* J. Gd.	—	*	21. *Halcyon coromanda rufa* (Wall.)	*	—
10. *Trichoglossus ornatus* (L.)	*	*	22. *Halcyon chloris* (Bodd.) (typical)	*	*
11. *Prioniturus platurus* (Vieill.)	*	*	23. *Halcyon sancta* V. & H.	—	*
12. *Tanygnathus mucllcri* (Müll. Schl.) (typical)	*	*	24. *Eurystomus orientalis* (L.)	*	—

[1]) Such a change need call for no surprise; Worcester shows (Pr. U. S. Nat. Mus. 1898, 581) that such has evidently been the case with Siquijor, an island, with an area of about 90 sq. miles, to the north of Mindanao. "There is a tradition among the natives to the effect that the island has been thrown up from beneath the sea within a comparatively short time, and there is abundant geological evidence that this tradition is founded on fact. Every stone cracked open by the hammer shows evident signs of its coral origin. The tops of the highest hills, which rise a thousand feet above sea level, are strewn with the shells of the very same mollusks which to-day live along the shores. The hills themselves are mere masses of coral rag, to which a few trees cling with difficulty, as the soil washes down into the valleys almost as fast as it is formed. The fresh-water streams are without fish." Our native collectors sent 16 species in a small collection from Ruang, a volcano rising out of the sea close to Tagulandang in the Sangi Islands, and it is pretty certain that these species must have settled there since the eruptions of 1870 and 1871, which destroyed the vegetation (see p. 634 of text).

Name of species	Peling	Banggai
25. *Collocalia esculenta* L.	*	*
26. *Macropteryx wallacei* J. Gd.	*	*
27. *Hypothymis puella blasii* Hart.	*	*
28. *Monarcha inornatus* Garn.	*	*
29. *Culicicapa helianthea* Wall.	—	*
30. *Pachycephala clio* Wall.	*	*
31. *Graucalus schistaceus* Sharpe	—	*
32. *Graucalus melanops* Lath.	*	—
33. *Edoliisoma obiense* Salvad.	*	*
34. *Lalage leucopygialis* Tweedd.	*	*
35. *Artamus leucogaster* Val.	*	*
36. *Artamus monachus* Bp.	—	*
37. *Dicrurus pectoralis* Wall.	*	*
38. *Dicaeum sulaense* Sharpe	—	*
39. *Cyrtostomus frenatus* S. Müll.	*	*
40. *Hermotimia auriceps* G. R. Gray	*	*
41. *Anthreptes malaccensis celebensis* Shell.	*	*
*42. *Zosterops subatrifrons* M. & Wg.	*	—
43. *Iole longirostris* Wall.	*	*
44. *Cisticola cursitans* Frkl.	*	—
45. *Cisticola exilis* Vig. Horsf.	*	—
46. *Munia molucca — propinqua*	*	—
47. *Calornis sulaensis* Sharpe	*	*
48. *Scissirostrum dubium* Lath.	*	*
*49. *Basilornis galeatus* A. B. M.	—	*
50. *Oriolus frontalis* Wall.	*	*
51. *Osmotreron wallacei* Salvad. typical	*	*
*52. *Ptilopus subgularis* M. & Wg.	*	*
53. *Ptilopus chrysorrhous* Salvad.	*	*
54. *Carpophaga paulina* Bp.	*	*
55. *Myristicivora luctuosa* Temm.	*	*
56. *Columba albigularis* Bp.	—	*
57. *Turacoena manadensis* Q. G.	*	—
58. *Macropygia albicapilla* Bp.	*	*
59. *Chalcophaps indica* L.	*	—
60. *Glareola isabella* Vieill.	*	—
61. *Aegialitis geoffroyi* Wagl.	*	—
62. *Nycticorax caledonicus* Gm.	—	*

List of the Birds of the Sula Islands.

*1. *Spilornis rufipectus sulaensis* Schl.
2. *Tachyspizias soloensis* (Horsf.)
3. *Accipiter sulaensis* Schl.
4. *Spizaetus lanceolatus* Temm. Schl.
5. ? *Ictinaetus malayensis* Reinw.
6. *Haliastur indus—girrenera*
7. *Baza celebensis* Schl.
*8. *Pisorhina sulaensis* Hart. †
9. *Ninox scutulata japonica* Temm. Schl.
*10. *Trichoglossus flaviviridis* Wall.
11. *Tanygnathus muelleri* (Müll. Schl.) (typical
*12. *Loricalus sclateri* Wall. typ. also from Mangoli †
13. *Aprosmictus sulaensis* Rchw.
14. *Eudynamis melanorhyncha* S. Müll. (= **fascialis* Wall.)
15. *Cuculus canorus canoroides* S. Müll. †
16. *Cacomantis virescens* Brügg. †
17. *Merops ornatus* Lath.
18. *Alcedo moluccana* Less.
*19. *Pelargopsis melanorhyncha cutreptorhyncha* Hart. †
*20. *Ceyx wallacei* Sharpe
21. *Halcyon coromanda rufa* (Wall.)
22. *Halcyon sancta* Vig. Horsf.
23. *Halcyon chloris* Bodd.
24. *Eurystomus orientalis* L.
25. *Macropteryx wallacei* J. Gd.)
26. *Pitta irena* Temm.
*27. *Pitta dohertyi* Rothsch. Bull. B. O. C. 1898. p. XXXIII
28. *Hirundo javanica* Sparrm.
*29. *Hypothymis puella blasii* Hart. †
30. *Monarcha inornatus* Garn.
31. *Pachycephala griseonota* G. R. Gray (= *lineolata* Wall.)
32. *Pachycephala clio* Wall.
*33. *Rhinomyias colonus* Hart. †
34. *Graucalus melanops* Lath. †
35. *Graucalus schistaceus* Sharpe)
36. *Graucalus temminckii* S. Müll.) [1]
37. *Edoliisoma obiense* Salvad.
38. *Lalage leucopygialis* Wald. †
39. *Artamus monachus* Bp.
40. *Dicrurus pectoralis* Wall.
41. *Dicaeum sulaense* Sharpe
42. *Cyrtostomus frenatus* S. Müll.)
43. *Hermotimia auriceps* G. R. Gray
44. *Anthreptes malaccensis celebensis* Shell.)
45. *Zosterops subatrifrons* M. & Wg. Sula Mangoli: Doherty †
46. *Iole longirostris* Wall.
47. *Phylloscopus borealis* Blas. †
48. *Munia molucca — propinqua*
49. *Calornis sulaensis* Sharpe
50. *Calornis metallica* Temm.)

† Mr. Hartert has kindly sent us (April, 1898) an early copy of his "List of a Collection of Birds made in the Sula Islands by William Doherty" Nov. Zool. vol. V. Nr. 2. May 1898; all species marked † are new additions.

[1] Accidentally omitted in the distribution of the species in the text.

51. *Basilornis galeatus* A.B.M. †
*52. *Charitornis albertinae* Schl.
53. *Corvus enca* Horsf. (Celebesian race)
54. *Oriolus frontalis* Wall.
55. *Osmotreron wallacei* Salvad. (typical)
56. *Ptilopus chrysorrhous* (Salvad.)
*57. *Ptilopus mangoliensis* Rothsch. (Bull. B. O. C. 1898, p. XXXIV)
58. *Carpophaga paulina* (Bp.)
59. *Myristicivora luctuosa* (Temm.)
60. *Columba albigularis* (Bp.) †
61. *Turacoena manadensis* (Q. G.)
62. *Macropygia albicapilla* Bp. (typical)
63. *Chalcophaps indica* (L.)
*64. *Megapodius bernsteini* Schl.
*65. *Hypotaenidia suleirostris* Wall.
66. *Rallina minahassa* Wall.
67. *Amaurornis moluccana* (Wall.) †
68. *Esacus magnirostris* (Vieill.
69. *Numenius variegatus* (Scop.
70. *Herodias alba* (L.)
71. *Herodias garzetta* (L.)[1]
72. *Querquedula circia* (L.) †

Peling and Sula. The Peling or Banggai Archipelago and the Sula Group seem to have formed in comparatively recent times one large island. Although the island of Peling lies only about 12 miles from the coast of East Celebes, the majority of the characteristic Celebesian genera (*Microstictus*, *Pyrrhocentor*, *Phoenicophaes*, *Cranorrhinus*, *Rhabdotorrhinus*, *Monachalcyon*, *Cittura*, *Ceycopsis*, *Meropogon*, *Coracias*, *Myza*, *Malia*, *Cataponera*, *Enodes*, *Streptocitta*, *Megacephalon*, *Aramidopsis*) were not included in the only collection yet made upon the island, while the peculiar species or subspecies are generally the same as Sula forms. Fifteen species are identical with Sula forms, or are local races thereof, but only four agree with Celebes forms not known to occur in Sula; ten Sula species were not sent from Peling and Banggai (though some of them are pretty sure to occur there); while twenty-two Celebes species not known from Sula were contained in the above collection from the neighbouring mainland of Celebes, but not from Peling or Banggai (see, Abh. Mus. Dresd. 1896, Nr. 2, pp. 1—6).

List of the Birds of Saleyer Island.

1. *Spilornis rufipectus* J. Gd.[1])
2. *Haliaetus leucogaster* (Gm.)
*3. *Pernis sp.*
4. *Cuculus canorus canoroides* (S. Müll.)
5. *Alcedo moluccana* (Less.)[1])
6. *Alcedo ispida* L.[1])
7. *Halcyon chloris* (Bodd.)[1])
8. *Caprimulgus macrurus* Horsf. (typical)
9. *Macropteryx wallacei* (J. Gd.)[1])
10. *Siphia banyumas* (Horsf.)
11. *Culicicapa helianthea* (Wall.)
12. *Gerygone flavcola* Cab.[1])
13. *Pratincola caprata* (L.)
*14. *Pachycephala teijsmanni* Bütt.
15. *Pachycephala orpheus* Jard.
16. *Lalage timorensis* (S. Müll.)
17. *Artamus leucogaster* (Val.)
18. *Dicrurus leucops* Wall. (typical)
19. *Dicaeum splendidum* Bütt.
*20. *Cyrtostomus frenatus saleyerensis* Hart.
21. *Myzomela chloroptera* Tweedd.
22. *Zosterops intermedia* Wall.
23. ? *Malia grata* Schl. (typical)
24. *Phylloscopus borealis* (Blas.)
25. *Motacilla flava* L.
26. *Munia molucca* < *propinqua*
27. *Calornis minor* (Bp.)[1])
28. *Osmotreron wallacei* Salvad. (typical)
29. *Ptilopus melanocephalus* (Forst.)
30. *Macropygia macassariensis* (Wall.)
31. *Geopelia striata* (L.)
32. *Megapodius duperreyi* Less. Garn.
33. *Amaurornis phoenicura* (Forst.)
34. *Charadrius fulvus* Gm.
35. *Strepsilas interpres* (L.)
36. *Himantopus leucocephalus* J. Gd.
37. *Totanus glottis* (L.)
38. *Totanus calidris* (L.)

[1]) Accidentally omitted in the distribution of the species in the text.

39. *Actitis hypoleucos* L.
40. *Tringa ruficollis* Pall.
41. *Gallinago megala* Swinh.
42. *Bubulcus coromandus* Bodd.
43. *Butorides javanica* Horsf.
44. *Nettion gibberifrons* S. Müll.
45. *Sterna anaestheta* Scop.

List of the Birds of the Djampea Group.

1. *Urospizias torquatus* Temm.
2. *Accipiter virgatus gularis* Temm. Schl.
3. *Elanus hypoleucus* J. Gd.[1])
4. *Baza reinwardti* Müll. Schl.
5. *Tinnunculus moluccensis occidentalis* M. & Wg.[1])
6. *Pandion haliaetus leucocephalus* (J. Gd.)[1]
7. *Ninox scutulata japonica* Temm. Schl.
8. *Strix flammea* L. (typical)
*9. *Trichoglossus forsteni djampeanus* Hart.
*10. *Cacatua sulphurea djampeana* Hart.
*11. *Tanygnathus megalorhynchus — sumbensis*
12. *Cuculus canorus canoroides* (S. Müll.)
13. *Centrococcyx bengalensis* (Gm.)[1])
14. *Alcedo moluccana* (Less.)
15. *Halcyon chloris* (Bodd.[1])
16. *Eurystomus orientalis* (L.)[1])
17. *Caprimulgus macrurus* Horsf. (typical)
18. *Collocalia francica* (Gm.)
19. *Collocalia esculenta* (L.)[1])
*20. *Pitta virginalis* Hart.
*21. *Siphia djampeana* Hart.
*22. *Siphia kaluoensis* Hart.
(*?)23. *Rhipidura celebensis* Bütt.
24. *Monarcha inornatus* (Garn.)
*25. *Monarcha everetti* Hart.
26. *Myiagra rufigula* Wall.
*27. *Pachycephala everetti* Hart.
*28. *Edoliisoma emancipata* Hart.
29. *Lalage timorensis* S. Müll.
30. *Artamus leucogaster* (Val.)
31. *Dicaeum splendidum* Bütt.
(*?)32. *Cyrtostomus teijsmanni* Bütt.
33. *Myzomela chloroptera* Tweedd.
34. *Zosterops intermedia* Wall.
35. *Phylloscopus borealis* (Blas.)
36. *Motacilla flava* L.
37. *Anthus gustavi* Swinh.
38. *Munia molucca < propinqua*
39. *Calornis minor* (Bp.)[1]
*40. *Oriolus boneratensis* M. & Wg.
*41. *Osmotreron wallacei pallidior* Hart.
42. *Ptilopus melanocephalus* (Forst.)
43. *Carpophaga rosacea* (Temm.)
44. *Carpophaga concinna* Wall.[1])
45. *Myristicivora bicolor* (Scop.)
46. *Macropygia macassaricusis* (Wall.)
47. *Megapodius duperreyi* Less. Garn.
48. *Amaurornis cinerea* (Vieill.)
49. *Esacus magnirostris* (Vieill.)
50. *Nycticorax caledonicus* (Gm.)
51. *Phalacrocorax melanoleucus* (Vieill.)

Saleyer and the Djampea Group. It has been shown by Büttikofer and Hartert that these islands have many points of affinity with Timor and the other Lesser Sunda Islands, as well as with Celebes. On counting out the respective forms, and allowing for the nearest affinities of the peculiar species, it appears that there are 9 Celebesian forms and 14 Lesser Sundan forms in these islands. Of the nine Celebesian forms four are not known from the Djampea Group, but only from Saleyer, as likewise two or three of the Lesser Sundan forms, so that it appears that the Djampea Group has much stronger relations with the islands to the south than with Celebes.

List of the Birds of Togian Island.

1. *Spilornis rufipectus* J. Gd.[1])
2. *Haliastur indus — girrenera*[1])
3. *Trichoglossus ornatus* L.
4. *Prioniturus platurus* (Vieill.)
5. *Prioniturus flavicans* Cass.
6. *Tanygnathus muelleri* (Müll. Schl.) (typical)
*7. *Loriculus quadricolor* Tweedd.
8. *Microstictus fidens* (Q. G.)
9. ? *Cacomantis merulinus* (Scop.)
10. *Eudynamis melanorhyncha* S. Müll.

[1] Accidentally omitted in the distribution of the species in the text.

11. *Pyrrhocentor celebensis* (Q. G.) (typical
12. *Phoenicophaes calorhynchus* Temm. (typical)
13. *Cranorrhinus cassidix* (Temm.)
14. *Merops ornatus* Lath.[1])
15. *Alcedo meninting* Horsf.
16. *Pelargopsis melanorhyncha* (Temm.)
17. *Halcyon coromanda rufa* (Wall.)
18. *Halcyon sancta* Vig. Horsf.
19. *Halcyon chloris* (Bodd. (typical)
20. *Macropteryx wallacei* (J.Gd.)
21. *Pitta celebensis* Müll. Schl.
22. *Hirundo rustica gutturalis* (Scop.) and *H. rustica —gutturalis*
23. *Hirundo javanica* Sparrm.
24. *Hypothymis puella* (Wall.)
25. *Graucalus bicolor* (Temm.)
26. *Graucalus leucopygius* Bp.
27. *Edoliisoma morio* (S. Müll.)[1])
28. *Artamus leucogaster* (Val.)
29. *Dicrurus leucops* Wall. (typical)
30. *Dicaeum celebicum* S. Müll.
31. *Cyrtostomus frenatus* > *saleyerensis*
32. ?*Hermotimia porphyrolaema scapulata* M. & Wg.
33. *Anthreptes malaccensis celebensis* (Shell.)
*34. *Iole aurea* (Tweedd.
35. *Cisticola exilis* (Vig. Horsf.)
36. *Munia formosana brunneiceps* (Wald.)
37. *Calornis panayensis* (Scop. (typical)
38. *Scissirostrum dubium* Lath.
39. *Streptocitta torquata* (Temm.)
40. *Corvus enca* Horsf. (Celebesian race)
41. *Oriolus celebensis* (Tweedd.) (typical
42. *Osmotreron wallacei* Salvad. (typical
43. *Ptilopus melanospilus* (Salvad.
*44. *Carpophaga pulchella* Tweedd.
45. *Turacoena manadensis* (Q. G.)
46. *Macropygia albicapilla* (Bp.) (typical
47. *Chalcophaps indica* (L.
48. *Gallus ferrugineus* Gm.
49. *Megapodius cumingi* Dillw.
50. *Charadrius fulvus* (Gm.)
51. *Totanus glareola* (L.)[1])
52. *Actitis hypoleucos* (L.)
53. *Dissoura episcopus* (Bodd.)
54. *Phoyx manillensis* (Meyen)[1])
55. *Herodias garzetta* (L.)
56. *Hydrochelidon hybrida* (Pall.)
57. *Sterna media* Horsf.[1])

Only two species, *Loriculus quadricolor* and *Iole aurea*, are known to be peculiar to this group of islands in the Gulf of Tomini; for a third form, *Carpophaga pulchella*, which has been separated, is probably the same as *C. paulina*.

Peculiar species and subspecies of Celebes (Mainland).

1. *Spilornis rufipectus* J. Gd. (typical)
2. *Astur griseiceps* Schl.
3. ?*Astur tenuirostris* Brügg.
4. *Spilospixias trinotatus* (Bp.) (typical)
   Spilospixias trinotatus hacsitandus Hart.
5. *Accipiter rhodogaster* Schl.
6. *Ninox ochracea* (Schl.)
7. *Cephaloptynx punctulata* (Q. G.)
8. *Strix inexpectata* Schl.
9. *Trichoglossus meyeri* Tweedd. (typical)
   Trichoglossus meyeri bonthainensis (A. B. M.)
10. *Cacatua sulphurea* (Gm.) (typical)
11. *Loriculus exilis* Schl.
12. *Loriculus stigmatus* (Müll. Schl.)
13. *Iyngipicus temminckii* (Malh.)
14. *Mierostictus fulvus* (Q. G.) ǂ
15. *Mierostictus wallacei* (Tweedd.)
16. *Hierococcyx crassirostris* Tweedd.
17. *Pyrrhocentor celebensis* (Q. G.) (typical) ǂ
    Pyrrhocentor celebensis rufescens M. & Wg.
18. *Phoenicophaes calorhynchus* Temm. (typical) ǂ
    Phoenicophaes calorhynchus meridionalis M. & Wg.
19. *Rhabdotorrhinus exaratus* (Temm.)
20. *Cranorrhinus cassidix* (Temm.) ǂ
21. *Meropogon forsteni* Bp.
22. *Ceycopsis fallax* Schl.
23. *Monachaleyon monachus* (Bp.) (typical)
    Monachaleyon monachus intermedius Hart.
24. *Monachaleyon capucinus* M. & Wg.
25. *Monachaleyon princeps* Rchb.
26. *Cittura cyanotis* (Temm.
27. *Coracias temminckii* (Vieill.)
28. *Caprimulgus celebensis* Grant
29. *Lyncornis macropterus* Bp.
30. *Pitta forsteni* Bp.
31. *Pitta celebensis* Müll. Schl. ǂ
32. *Siphia rufigula* (Wall.)
33. *Siphia bonthaina* Hart.
34. *Stoparola septentrionalis* Bütt.
35. *Stoparola meridionalis* Bütt.
36. *Rhipidura teijsmanni* Bütt.
37. *Gerygone flavcola* Cab.
38. *Pachycephala sulfuriventer* Tweedd.)
39. *Pachycephala meridionalis* Bütt.
40. *Pachycephala bonthaina* M. & Wg.
41. *Pachycephala bonensis* M. & Wg.

[1]) Accidentally omitted in the distribution of the species in the text.
ǂ Occurs also on Togian Island.

42. *Graucalus bicolor* Temm. ┤
43. *Graucalus leucopygius* Bp. ┤
44. *Edoliisoma morio* S. Müll. typical
Edoliisoma morio septentrionalis M. & Wg.
Edoliisoma morio—septentrionalis M. & Wg.
45. *Dicaeum celebicum* S. Müll. ┤
46. *Dicaeum nehrkorni* W. Blas.
47. *Dicaeum hosei* Sharpe
48. *Aemonorhynchus aurcolimbatus* (Wall.)
49. *Aethopyga flavostriata* Wall.
50. *Cyrtostomus frenatus > saleyerensis* ┤
Cyrtostomus frenatus < saleyerensis
Cyrtostomus frenatus dissentiens Hart.
51. *Hermotimia porphyrolaema* Wall. typical
Hermotimia porphyrolaema scapulata M. & Wg.
52. *Hermotimia grayi* Wall.
53. *Melilestes celebensis* M. & Wg. typical
Melilestes celebensis meridionalis M. & Wg.
54. *Myza sarasinorum* M. & Wg.
55. *Zosterops squamiceps* Hart.
56. *Zosterops atrifrons* Wall.
57. *Zosterops sarasinorum* M. & Wg.
58. *Zosterops anomala* M. & Wg.
59. *Malia grata* Schl. typical
Malia grata recondita M. & Wg.
60. *Androphilus castaneus* Bütt.)
61. *Cataponera turdoides* Hart.
62. *Trichostoma celebensis* Strickl.)
63. *Trichostoma finschi* Tweedd.
64. *Geocichla erythronota* Scl.
65. *Merula celebensis* Bütt.
66. *Phyllergates riedeli* M. & Wg.
67. *Cryptolopha sarasinorum* M. & Wg.
68. *Munia subcastanea* Hart.
69. *Enodes erythrophrys* Temm.
70. *Aeridotheres cinereus* Bp.
71. *Basilornis celebensis* G. R. Gray.
72. *Streptocitta albicollis* Vieill.
73. *Streptocitta torquata* Temm. ┤
74. *Gazzola typica* Bp.
75. *Oriolus celebensis* Tweedd. typical ┤
Oriolus celebensis meridionalis Hart.
Oriolus celebensis—meridionalis
76. *Ptilopus fischeri* Brügg.
77. *Ptilopus meridionalis* M. & Wg.
78. *Ptilopus gularis* Q. G.
79. *Ptilopus melanospilus* Salvad.
80. *Carpophaga radiata* Q. G.
81. *Carpophaga forsteni* Bp.
82. *Carpophaga poecilorrhoa* Brügg.
83. *Phlogoenas tristigmata* Bp.
84. *Phlogoenas bimaculata* Salvad.
85. *Megacephalon maleo* Hartl.
86. *Turnix rufilatus* Wall.
87. *Gymnocrex rosenbergi* Schl.
88. *Aramidopsis plateni* W. Blas.
89. *Hypotaenidia celebensis* Q. G.)
90. *Amaurornis isabellina* Schl.)

Contrast between North and South Celebes. Almost all links between the Lesser Sunda Islands and Celebes occur in the Southern Peninsula, but not always in the North. This is shown by *Butastur liventer*, *Chrysococcyx malayanus* and *basalis*, *Muscicapula westermanni*, *Lalage timorensis*, *Zosterops intermedia*, *Munia pallida* and *M. punctulata nisoria*, *Calornis minor*, *Macropygia macassariensis*, *Geopelia striata*, which are not known from the North. Up to the present *Loriculus exilis*, though allied to *L. flosculus* of Flores, is only known from the North, but we anticipate its discovery, or of a race of it, in the South.

On the other hand there are as well as *L. exilis* Schl. several peculiar species which occur in the North and not in the South, for instance, *Ninox ochracea* Schl.), *Strix inexpectata* Schl., *Meropogon forsteni* Bp., *Lyncornis macropterus* Bp., *Pitta forsteni* Bp., *Myza sarasinorum* M. & Wg., *Enodes erythrophrys* (Temm.), *Carpophaga poecilorrhoa* Brügg., *Gymnocrex rosenbergi* (Schl.), *Aramidopsis plateni* W. Blas., *Megacephalon maleo* (Hartl.) and others, besides such migratory species as only touch the North. It must, however, be taken into consideration that it is more than probable that at least some of these species will still be found in the South, which is much less thoroughly explored than the North, and the Centre is almost unknown. Conclusions, therefore, cannot be drawn from these data.

That there are a number of forms differing specifically or subspecifically in the North and South Peninsulas will appear from the pages of our book. These representative forms are:

North Peninsula	South Peninsula
Spilospizias trinotatus (typical)	*S. trinotatus haesitandus*
Trichoglossus meyeri (typical)	*T. meyeri bonthainensis*
Microstictus fulvus	*M. wallacei*
Phoenicophaes calorhynchus (typical) . .	*P. calorhynchus meridionalis*
Monachalcyon monachus	*M. capucinus*
Stoparola septentrionalis	*S. meridionalis*
Pachycephala sulfuriventer	*P. meridionalis*
Pachycephala bonensis	*P. bonthaina*
Edoliisoma morio septentrionalis	*E. morio* (typical)
Cyrtostomus frenatus > *saleyerensis* . . .	*C. frenatus* < *saleyerensis*
Hermotimia grayi	*H. porphyrolaema*
Melilestes celebensis (typical)	*M. celebensis meridionalis*
Malia grata recondita	*M. grata* (typical)
Trichostoma celebense	*T. finschi*
Streptocitta torquata	*S. albicollis*
Oriolus celebensis (typical)	*O. celebensis meridionalis*
Ptilopus fischeri	*P. meridionalis*
Phlogoenas tristigmata	*P. bimaculata*

When it is remembered that the distance from the extreme ends of the North and South Peninsulas is between 800 and 900 miles and that the interior is in most parts very mountainous, the difference in the birds of the North and South need not cause surprise, since isolation, one of the essential conditions for the origin of a new species or subspecies, can occur here very readily.

There are differences of other kinds in other classes of animals in the North and South, but as the fauna of Celebes is so insufficiently known, the cases cannot yet be grouped together from a more general stand-point. We may mention, however, that Prof. v. Martens showed (in Weber's Zool. Ergebn. 1891 II, 259), that of the 64 land-shells known from Celebes only 2 are doubtless identical in the North and South, while 23 occur only in the North and 21 only in the South-west, etc. Among the Land Planarians collected by Dr. P. & Dr. F. Sarasin (Verh. D. Zool. Ges. 1897, 114), Prof v. Graff found that in North Celebes the Oriental, in South Celebes the Australian character prevails. It may be added that Prof. Wichmann (Tijdsch. K. Nederl. Aardr. Gen. 2. ser. 1890 VII, 978, and Petermann's Mitth. 1893, 281) surmises that during the second half of the Tertiary age single parts of South Celebes were raised as islands above the surface of the sea and only later, when the whole of it was upheaved, became united with Central Celebes as one land. Whether certain differences in the fauna of North and South Celebes may be explained hereby, we leave over to future decision. That, for instance, the Moleo of the North does not occur in the South is no zoological proof of former geological conditions, for as a rule animals have a restricted distribution.

The result of our study of the birds of Celebes, as well as of those of the countries around, is that by its Avifauna Celebes has far stronger connections with the Philippines than with any of the other neighbouring lands, and that the relation of its birds with the Oriental Region is more than twice as strong as with the Australian Region.

The line between Celebes and Borneo, though not that between Bali and Lombok, no doubt represents a conspicuous faunistic frontier, which remains unaltered even if the oldest continental frontier in earlier times was more to the east, but this line between Celebes and Borneo has not the fundamental significance which is still attributed to it by many writers. Even to-day the broad strait is nearly bridged over by shallows between South Celebes and Borneo (see map I). The line is not the western frontier of the Australian Region. The origin of the Celebesian Avifauna is principally an Asiatic one, but Celebes as a whole, or as a group of islands, was separated early from the continent, or never was intimately connected with it; its Avifauna, therefore, remained poor and must be pronounced an impoverished Asiatic one, but in consequence of isolation, peculiar forms were developed. The Papuan elements in it can be simply explained in view of the geographical position by the dispersal of birds through flight. This agrees very well with the results arrived at by Prof. Weber and Prof. v. Martens and others (see above pp. *85*, *87* et seq.).

The special faunas of Celebes, however, and of all islands of the East Indian Archipelago are far from worked out and we shall not live to see this. It will be the labour of a century and more. The future, therefore, only can decide, whether the ornithological facts as at present known teach us correctly that Celebes belongs to the Oriental Region and not to the Australian, and that it is most appropriate and safe to adopt a Transition-Zone between these two Regions, comprising a Celebesian Area, besides severally a Philippine, a Moluccan and a Lesser Sundan Area, of which the Celebesian has been treated of as to its Avifauna in our present essay.

After all we have not been able to discover anything very extraordinary about the birds of the island of Celebes. Its most striking feature is not that it has so many highly peculiar forms, but so extremely few. It has nothing among its birds to compare with a Dodo, or a Kiwi; it has not even a single peculiar avian family; only a few well marked peculiar genera, a large number of well characterized species belonging to genera not peculiar to the island, a still larger number of less well characterized species, local races or "subspecies", others which only very close observers believe they can discriminate; while the rest are by common consent termed absolutely identical with the individuals of their kind in the neighbouring lands. Islands like New Caledonia and Fiji have in proportion to their size quite as much that is peculiar about them, as has Celebes. The chief interest in the latter depends upon its intermediate position between Asia and Australia. the faunas of which are so vastly different.
