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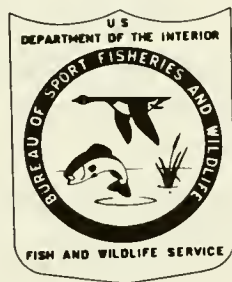
ARIZONA DOVE WING SURVEY, 1964

by

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ABSTRACT

The first large-scale effort to collect dove wings by mail was made in 1964, in Arizona. Each of 2,356 dove hunters was sent 10 wing envelopes with instructions for recording data and handling wings. A total of 992 hunters submitted 22,362 wings in 2,349 envelopes, including wings from 17,666 mourning doves (Zenaidura macroura) and 4,696 white-winged doves (Zenaida asiatica). The survey yielded information on (1) age ratios in the Arizona dove harvest; (2) the chronologic and geographic distribution of the kill within the State; and (3) the feasibility of using a wing survey to obtain reliable age ratios and kill data. The weighted kill for Arizona was 676,974 mourning doves and 182,711 white-winged doves. The young:adult age ratio in the kill of mourning doves was 0.83:1, which was abnormally low. Correction for differential vulnerability by use of banding data raised the ratio to 1.80:1. This low age ratio probably resulted from migration of immatures to little-hunted areas before the September hunting season. The age ratio in the kill of white-winged doves was 1.78:1. Most hunters hunted within their county of residence. Hunter numbers and dove kill were related closely to both human and dove populations.

ARIZONA DOVE WING SURVEY, 1964

Wing-collection surveys have been made on such migratory species as waterfowl and woodcock, but the first large-scale attempt to collect dove wings through the mail was in 1964. Arizona was selected for the initial investigation because interest in doves was high in the State, data had accumulated from past wing collections at checking stations, and the Game and Fish Department was willing to cooperate in developing a data-gathering technique. We felt the technique would provide data which should (1) help determine the feasibility of using a dove wing survey as a data-gathering tool, (2) explain the abnormally low age ratio in the kill as compared with that from eastern States, and (3) provide information on the distribution of dove hunters and the dove kill.

This study was made possible largely through the efforts of Howard Wight, formerly of Migratory Bird Populations Station, who initiated the project. We appreciate the statistical help and critical review by Dr. Aelred Geis, Migratory Bird Populations Station, and Ron Smith, Arizona Game and Fish Department. Joe Truett, University of Arizona graduate student, assisted in aging a large number of wings. Many members of the Automatic Data Processing Section of the Migratory Bird Populations Station provided help in tabulating data. Ruth Betz, Arizona Game and Fish Department Research Secretary, did yeoman service in sorting wing envelopes as they arrived and in sending additional envelopes as requested. We especially thank dove hunters who contributed wings to the survey.

PROCEDURES

We first obtained the names and addresses of a sample of licensed dove hunters. To do this, the 1963 Arizona hunter questionnaires were examined and 2,500 hunters who indicated they hunted doves were selected systematically from a random start. The original sample was reduced to 2,356 by eliminating non-residents.

Each hunter was sent 10 dove wing envelopes with instructions on how to record data and handle wings. All envelopes

were numbered so that each could be associated with the hunter to whom it was sent. Spaces were provided for indicating the place and date of hunting and whether more envelopes were needed. The survey was made during the first half of Arizona's split season (September 1-27), and wings of both mourning and white-winged doves were requested.

Wing collection envelopes were self-addressed to the Arizona Game and Fish Department. A large wire cage was used as a collection container for the envelopes to provide protection from animals and to improve aeration. As soon as possible after postal delivery, the wings were identified as to species, age, and stage of primary molt. This information was recorded in spaces provided on the envelope. This part of the envelope was then cut off and sent to the Migratory Bird Populations Station, Laurel, Md., where the data were tabulated by the Automatic Data Processing Section.

Harvest data were calculated both directly and by use of weighting factors. The data were weighted in final calculations of kill because this procedure "irons out" the sample bias caused by hunters from some counties being more intensively sampled than those from other counties. The weighting factors were calculated by dividing the number of dove hunters residing in a county by the number of resident respondents from that county. The number of dove hunters was provided through a separate survey by the Arizona Game and Fish Department.

The weighted kill for each harvest area (county of kill) was determined by multiplying the weighting factor for each county of residence times the number of wings received from those hunters in each county of kill. If hunters from more than one county of residence killed doves in a harvest area, the weighted kills were totaled.

RESULTS

Hunter Response

Of the hunters sampled, 992 (42.1 percent) cooperated by returning 2,349 envelopes, each containing one or more wings (table 1). Most contacts and respondents were from Maricopa and Pima Counties, which are the major centers of both dove and human populations.

Forty-five envelopes contained wings from whitewings, 1,483 contained wings from mourning doves, and 821 had wings from both species (tables 2 and 3). Although the number of respondents and the number of returned envelopes seemed low, 23,362 wings were received (tables 1 and 4). Most of these wings (17,666) were from mourning doves.

Distribution of the Kill by County of Hunter's Residence

Most of the dove harvest (89.3 percent) was attributed to hunters who hunted in their county of residence (table 1). Of the hunters living in the two most populous counties, Maricopa and Pima, 93.4 percent and 83.5 percent, respectively, of their harvests were made in their home counties. In contrast to other county data, hunters residing in Gila County killed less than half (44.4 percent) of their doves in that county.

The proportion of each county's total dove kill taken by residents varied widely from 30.2 percent in Santa Cruz County to 100.0 percent in Apache, Gila, Greenlee, and Mohave Counties (table 1). Most of the harvest in Santa Cruz County was made by Pima County residents. Maricopa and Pima County residents killed 23.1 percent and 28.2 percent, respectively, of the total doves taken in Pinal County. Many Pima County residents hunt in Santa Cruz County because of its high dove population and its proximity to Tucson. Likewise, Pinal County, because of its high dove population and its proximity to Maricopa, Pima, and Gila Counties, is subjected to much interchange in hunting pressure.

Characteristics of the Mourning Dove Harvest

Age Ratios - Arizona collections of mourning dove wings made during past September hunting seasons have usually been composed of less than 50 percent immatures. In most southeastern States, immature mourning doves invariably exceed 50 percent of the total kill and usually run about 70 percent. Since most wing collections made previously in Arizona were somewhat localized, a statewide collection might reveal a different pattern. However, the unweighted wing data showed a statewide age ratio (immature/adult) of 0.79:1 or 44 percent immature (table 5). The weighted age ratios were almost identical (0.83:1, or 45 percent immatures).

The age ratio in the kill varied greatly among counties, revealing an interesting distributional pattern (fig. 1). With two exceptions, those counties which lie generally in the Basin and Range Province had age ratios less than 1:1, while those to the north (Mogollon and Plateau Provinces) had age ratios greater than 1:1. The two exceptions were Graham and Yuma Counties. The sample from Graham County was small, and although Yuma County provided the fourth largest kill, it is located along the Colorado River and possibly received early migrants. On a weekly basis, age ratios increased in favor of immatures for the first 3 weeks in the north zone. In the south zone, the ratio started at 0.86:1 and continued to decrease through the 4th week (table 6). This variation in age ratios and migration will be discussed more completely on pages 11 and 12.

The statewide age ratio of 0.83:1 or only 45 percent immatures in the kill suggests an unusual age structure when compared to that in southeastern United States. However, if the age ratio is adjusted to bring out differences between ages in their likelihood of being shot, it becomes more comparable to those in other areas. For example, banding data from Arizona show that the immature mourning dove recovery rate is 1.82 percent and the adult recovery rate is 3.94 percent. Thus, immatures are less than half ($1.82/3.94 = 0.46$) as likely to be shot as adults. Therefore, the estimated age ratio in the preseason population was 1.80:1 ($0.83/0.46 = 1.80$). These data suggest that the population will decline if annual mortality rates exceed 64 percent.

Geographic Distribution of the Kill - Mourning dove harvest by county was closely related to the number of hunters in a county, whether resident or nonresident. Maricopa, Pima, Pinal, and Yuma Counties were the areas of greatest hunter concentration and were foremost in dove harvest (table 7). In hunter response, the first three counties were grouped in the same order, but more Cochise and Coconino County hunters responded than did those from Yuma (table 1).

Chronological Distribution of the Kill and Hunting Success - Most mourning dove wings, both adult and immature, were sent in during the first week (6 days) of the season (table 8). In

succeeding weeks, the harvest progressively declined, although some variation occurred among days with weekend hunting being reflected by increased kill. This decrease in kill did not necessarily correspond with a decrease in the actual number of doves present during the season. The implication may be that the population available at the beginning of the season is the easiest to harvest since many mourning doves were present throughout September. It is even possible that numbers increased during the month due to migration from northern areas.

The daily wing collections probably reflect hunter activity since both the number of hunters responding and weekly kill decreased as the hunting season progressed, while kill rate (number of wings received per hunter response) remained relatively constant (tables 8 and 9). In the north zone (fig. 1), there were 8.1 mourning dove wings returned per hunter response during the first week, 7.0 the second week, 7.8 the third week, and 7.0 the final week. In the south zone, the rate of return was 7.7, 7.8, 7.3, and 7.6 wings per hunter response for the 4 weeks.

The uniformity of kill rates throughout the September season has important implications since it suggests that hunting success is independent of population levels. The dove population in Arizona certainly does not remain constant for the entire hunting season because of natural and hunting mortality and much influx and efflux of birds.

Daily Bag Size - Records were not available for unsuccessful hunters, so all bag sizes are based on reports from hunters who sent in one or more wings per envelope. Many cooperating hunters were successful in bagging 10 or more mourning doves on a given day (fig. 2). Of 2,244 envelopes received, 439 (19 percent) contained the limit of 12 wings, 182 (8 percent) contained 11 wings, and 256 (11 percent) contained 10 wings. About 59 percent of the envelopes contained 1 to 9 wings and 3 percent had 13 to 20 wings enclosed. The latter records suggest that a few hunters either sent both wings of each bagged dove or wings from doves shot by other hunters in their party.

Hunters who reported killing 12 or fewer mourning doves averaged 7.5 birds per day. This average daily kill per hunter day is almost twice that of 4.0 recorded for hunters in southeastern States, where the daily bag limit was eight doves (South-eastern Association of Game and Fish Commissioners 1957:109). The comparison is somewhat misleading since the figure for the southeastern study was based in part on incomplete hunts.

Estimated Size of the Harvest - The weighted mourning dove kill was calculated to be 676,974, almost 175,000 fewer than that determined by the hunter questionnaire of the Arizona Game and Fish Department (table 7). The kill, as determined by the 1964 wing survey, was based on wings received per respondent, but all respondents may not have sent wings from every hunt. The kill data from the questionnaire were based on doves taken per hunting trip and perhaps were biased in that the hunter had to depend on memory in reporting both the number of trips and the number of doves killed. Therefore, it seems probable that the actual kill by licensed hunters was somewhere between the two estimates.

Characteristics of the White-winged Dove Harvest -

Age Ratios - Only four counties can be considered as prime whitewing hunting areas, since they contributed 98.8 percent of the wings (table 4). Based on ageable wings from these four counties (4,611 and 4,545 in tables 10 and 11, respectively -- discrepancy was due to omission of wings of unknown harvest date in table 11), the age ratio was 1.78:1 (64 percent immature), varying from 1.40:1 to 2.70:1. These figures represent the season total and agree closely with bag checks made by Game Department personnel in preceding years.

White-winged dove age ratios seem to be the reverse of those for mourning doves. We obtained a larger percentage of immatures than adults in the kill; this proportion increased slightly as the month progressed (table 1).

No more than 16 percent of the immature whitewings had molted beyond the fifth primary during the first week, and only about 15 percent through all 4 weeks of the hunting season (table 16). These rates are quite comparable to those for immature mourning doves in the north zone, but much lower than

those in the south zone. In contrast, about 92 percent of adult whitewings had molted the sixth primary or beyond for both the first week and all 4 weeks. A greater percentage of adult whitewings are in the later primary molt stage than are adult mourning doves. Adult whitewings apparently stop nesting and begin migration before most adult mourning doves.

Geographic Distribution of the Kill - The harvest of white-wings was greatest in Maricopa, Pima, Pinal, and Yuma Counties (table 7), where whitewing concentrations and hunting pressure are also greatest. No wings were received from five counties showing a low incidence of white-winged doves or whitewing hunting. The total kill computed from the wing survey data was based on the county of harvest, whereas that calculated from the questionnaire data was by county of residence. While no direct comparison can be made by county, it is noteworthy that both surveys showed that whitewings were not killed anywhere by residents of three counties (table 6). By both surveys, Maricopa County hunters took about 60 percent of the whitewing harvest, and about 80 percent of the birds were killed in Maricopa and Pima Counties. At least 97 percent of the harvest occurred in the four main counties listed previously, with most hunting concentrated in only a small area in these counties.

Chronological Distribution of the Kill and Hunting Success - Eighty-seven percent of the whitewing kill was accomplished during the first week as compared with only 63 percent for mourning doves in the same period (tables 8 and 12). Accordingly, succeeding weeks showed even a greater decline in harvest than that shown for mourning doves. In addition to a rapid and progressive decrease in kill, the number of wings received per hunter response (kill rate) also decreased weekly (table 13). The weekly averages were 6.1, 3.3, 2.5, and 1.9 wings per hunter response. This decline in white-winged dove kill and kill rate was due largely to rapid departure of migrating birds.

Daily Bag Size - The average daily kill was 5.4 whitewings. Although the daily bag limit was 25, only 15 (1.7 percent) of the hunters reported getting the limit, whereas 296 (34.2 percent) reported bagging only one whitewing (fig. 3). Almost 50 percent

of the wing envelopes had only one or two wings enclosed. This may indicate that few Arizona dove hunters hunt specifically for whitewings.

Estimated Size of the Harvest - The white-winged dove kill as determined by the wing survey (182,711) was less than one-half of the kill determined by the State questionnaire (table 7). This was a much greater difference than that shown for the mourning dove harvest.

DISCUSSION AND SUMMARY

We stated previously that mourning dove age ratios calculated from September harvest data are considerably lower in Arizona than in many eastern States. Since annual mortality of this dove is normally high, a reproductive rate greater than that indicated by the survey is essential in maintaining population numbers. Three possible reasons for low harvest of immature mourning doves in Arizona are herein considered: (1) low reproduction; (2) high mortality of young prior to the hunting season; and (3) early movement of immatures into areas of low hunting intensity.

Low reproduction has been discounted by the adjusted age ratio (1.80:1), which is based on the relative band recovery rate of adults and immatures. High mortality of young in late summer could be possible because of the stark terrain and because trichomoniasis and fowl pox are common diseases, especially in young mourning doves (Blankenship et al., 1966). However, the annual mortality estimate for immature mourning doves, obtained from banding data, is about 50 percent, which is low compared with that of southeastern States. Therefore, the third explanation (early movement of immatures into nonhunted areas) seems most likely.

If reproduction is as high as the adjusted ratio indicates, it must be that some immatures migrate before the hunting season begins. In addition, the percentage of mourning doves that cannot be aged (early-hatched immatures or adults which have molted all wing feathers diagnostic of age) in the September harvest is not as great as would be anticipated if all immatures were subject to harvest.

Further explanation of the last point is in order. According to data obtained from backdating the ages of 1,818 immatures banded in 1962 and 1963, between 16.7 and 28.7 percent of these mourning doves would have been classified as unageable on September 1. Backdating the ages of both penned and trapped adult doves suggests that 4.7 percent of a sample of 443 could have molted their 10th primary before September 1. Older immatures were possibly better represented in the trapped sample than were young immatures, since the early-hatched bird has a longer time in which to encounter traps. However, the great difference between actual and expected unageable wings cannot be explained only by unrepresentativeness of the trapped sample.

Most mourning doves that cannot be aged in September by the presence or absence of white-tipped primary coverts (Pearson and Moore, 1940) are immatures. Such was evident in 1964 when we examined 139 doves which were not ageable by the usual wing technique. We checked 89 of these for the presence or absence of the bursa of Fabricius and found 67 were immatures (75.3 percent). For the remaining 50 birds, of which 78 percent were immatures, we used some recently reported criteria for determining age such as the presence of sub-alular white-tipped feathers or buff-tipped 10th primaries, since the greater primary coverts were all new. We have found in Arizona that about 20 percent of the immatures will retain some sub-alular, white-tipped feathers beyond the complete molt of greater primary coverts. Also, in nearly 100 percent of mourning doves examined in Maryland, Wight, Blankenship, and Tomlinson (1967) found that the buff-tipped 10th primary is a good criterion for distinguishing previously unageable immatures. This criterion is somewhat less reliable in the Southwest due to more feather wear.

These data suggest that a sizeable group of mourning doves, especially immatures, should have molted the 10th primary by September 1, and, therefore, could not have been classified as adults or immatures. Such was not the case. In 1962, during the first 3 days of September, only 13 of 6,475 (0.2 percent) mourning doves taken in the Arlington-Buckeye-Phoenix area could not be aged. In 1963, during the first weekend of the hunting season, 3,728 mourning doves were examined near Phoenix and 64 (1.72 percent) could not be aged. In 1964, at the Arlington dove hunter

checking station, 139 of 4,038 (3.4 percent) mourning doves were unageable. During the first week of the dove wing mail survey, there were 176 of 10,863 (1.62 percent) unageable mourning dove wings received. This category of unknown age increased gradually, but still comprised only 5.27 percent of the total during the fourth week.

Since there is such a large difference between the actual number (less than 4 percent) and the expected number (more than 20 percent for immatures alone) of mourning doves in Arizona that could not be aged, something must have happened to the young before September. The most logical explanation of this is that many young doves move into less heavily hunted areas of southern Arizona and Mexico before September.

Age ratios also indicate differences in movement. A peculiar statewide distribution of age ratios was mentioned earlier. The low ratio of immatures to adults in southern counties (0.77:1) could mean that young in these areas had migrated southward. Why then did the ratio favor immatures (1.31:1) in the northern tier of counties and in Yuma County (1.05:1)? We think the answer is twofold: (1) these counties probably received early migrants from the north, and (2) the breeding season in the northern counties is slower in starting, and therefore may result in a higher portion of younger birds in the population during September. Molt data from the first week of the season show more immatures in the earlier stages of primary molt in northern than in southern counties (fig. 4). Although the sample sizes were greatly different, the relative proportion of wings in each primary molt is quite evident. About 10 percent of immatures from the north zone and 37 percent from the south zone had molted beyond the fifth primary during the first week in September (table 14). This ratio did not change materially in either the north or south zone during the remainder of the September season. If anything, there was a suggestion of a decrease in the percentage that had molted beyond the fifth primary in the south zone during the third and fourth weeks of the season.

Molting in adult mourning doves also was slower in the north zone than in the south (table 15). However, molting of adults was greatly advanced over that of immatures in both zones. About 38 percent of the northern adults and 69 percent of the southern

adults had molted beyond the fifth primary in the first week of September. For the entire month, the proportion was 43.9 and 75.0 percent for the north and south zones, respectively. Since it is likely that initiation of primary replacement by adult mourning doves is connected with some stage of nesting cycle, birds in northern counties may differ in timing of molt and production from birds in the south.

The dove wing survey was a success both in response by hunters and in data received. It showed that, by the technique described, useful information about doves can be collected, and that a similar survey is likely to be useful over a larger area. One major problem developed: some employees of the Phoenix Post Office believed that the wing envelopes had too strong an odor for processing through the mail. It would be advisable in future surveys to process wing envelopes through a smaller post office where a daily mail pickup by designated employees of the cooperating agencies would be more convenient.

Some difficulty was also encountered because of inadequate storage facilities. If the wings cannot be "read" immediately, they should be kept under refrigeration to prevent dessication, putrefaction, or molding. Mold obscures white-tipped feathers which are necessary for age determination and extreme dryness hinders handling by technicians.

The benefits provided by the wing survey include an estimate of: (1) age ratios in the population when used with banding data, (2) geographic distribution of kill, (3) chronological distribution of the kill, (4) estimation of total kill, and (5) frequency of occurrence of daily bag sizes. These data help explain seasonal movements, mortality, and the effects of hunting regulations in controlling the kill.

This study was successful in providing information relative to the three problems introduced in the beginning of this report. First, more adults than immature mourning doves were shot in much of Arizona during the September hunting season. Using band recovery data to correct for differential vulnerability, it was determined that production of immatures was greater than that

indicated by the low age ratios in the kill. Most evidence agreed with the hypothesis that the low age ratio in the kill was due to a movement of immatures into inaccessible areas of Arizona and Mexico. Two studies on disease and movement of immature doves are in progress in southern Arizona to determine more specifically what happens to these immatures during late summer.

Second, we were able to measure hunter activity and dove kill with more precision than previous data afforded. The survey showed that hunting was concentrated in areas of high human populations. Also, the dove kill ascertained by the wing survey did not agree with that obtained by the Arizona Game and Fish Department questionnaire, but the actual kill probably fell somewhere between the two estimates. Information on the frequency of bag sizes indicated the degree of hunting success and the effectiveness of the daily bag limit in limiting the kill. For respondents the average daily bag size of 7.5 mourning doves in Arizona was considerably higher than the average of 4.0 in the southeastern States, and possibly indicates a greater success by Arizona hunters. The average daily kill of white-wings (5.4) was not as high as expected, but hunting success and pressure evidently vary with the weather and availability of the birds.

Finally, the proportion of externally unageable doves in the September harvest in Arizona was so low that it should not have materially affected the age ratio based on ageable wings. Combined dove hunter checking station and wing survey data reveal that less than 4 percent of the mourning doves could not be aged in September, and about 75 percent of these were immatures. The proportion of unageable doves increases as the September hunting season progresses but this proportion still did not exceed 6 percent in the wing survey.

Future dove wing surveys should allow us to refine our techniques and to improve our current knowledge about several phases of dove behavior, dove hunter behavior, and dove population dynamics.

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Table 1. - Hunter response and distribution of dove kill in Arizona in 1964.

County	No. of Contacts Responding	No. Envelopes Sent by Residents of Co.	No. Wings Taken by Residents of Co.		Percent Taken		No. Wings Taken in Co.	Percent Taken	
			In Co.	Outside Co. of Residence	In Co. of Residence	Outside Co. of Residence		By Residents of Co.	By Non-residents of Co.
Apache	10	4	123	81.0	19.0	85	100.0	0.0	
Cochise	93	36	854	100.0	0.0	914	93.4	6.6	
Coconino	28	15	487	62.8	37.2	323	94.7	5.3	
Gila	44	18	482	44.4	55.6	214	100.0	0.0	
Graham	20	6	59	78.0	22.0	56	82.1	17.9	
Greenlee	13	3	15	100.0	0.0	15	100.0	0.0	
Maricopa	1,404	591	12,957	93.4	6.6	12,309	98.3	1.7	
Mohave	5	2	72	100.0	0.0	72	100.0	0.0	
Navajo	26	9	311	92.3	7.7	331	86.7	13.3	
Pima	531	244	5,524	83.5	16.5	4,725	97.6	2.4	
Pinal	93	39	893	96.2	3.8	2,373	36.2	63.8	
Santa Cruz	11	5	65	100.0	0.0	215	30.2	69.8	
Yavapai	18	5	82	87.8	12.2	154	46.8	53.2	
Yuma	60	15	438	88.8	11.2	576	67.5	32.5	
TOTALS	2,356	992	22,362	89.3	10.7	22,362	89.3	10.7	

Table 2. - Wings received from Arizona dove hunters by county of residence, 1964.

County of Residence	MOURNING DOVE WINGS ONLY		WHITE-WINGED DOVE WINGS ONLY		WINGS FROM BOTH SPECIES	
	Envelopes	Wings/Env.	Envelopes	Wings/Env.	Envelopes	Wings/Env.
Apache	11	85	0	0	2	38
Cochise	104	783	0	0	9	71
Coconino	58	423	0	0	4	64
Gila	32	264	0	0	15	218
Graham	9	59	0	0	0	0
Greenlee	5	15	0	0	0	0
Maricopa	771	5,922	33	364	507	6,671
Mohave	7	50	0	0	2	22
Navajo	31	287	0	0	2	24
Pima	362	2,746	9	47	222	2,731
Pinal	58	448	3	28	33	417
Santa Cruz	7	49	0	0	3	16
Yavapai	13	82	0	0	0	0
Yuma	15	166	0	0	22	272
TOTALS	1,483	11,379	45	439	821	10,544
				9.8		12.8

Table 3. - Wings received from Arizona dove hunters by county of kill, 1964.

County of Residence	MOURNING DOVE WINGS ONLY		WHITE-WINGED DOVE		WINGS FROM BOTH SPECIES	
	Envelopes	Wings/Env.	Envelopes	Wings/Env.	Envelopes	Wings/Env.
Apache	11	85	0	0	0	0
Cochise	110	843	0	0	9	71
Coconino	50	323	0	0	0	0
Gila	19	161	0	0	5	53
Graham	9	56	0	0	0	0
Greenlee	5	15	0	0	0	0
Maricopa	758	5,862	26	312	472	6,135
Mohave	7	50	0	0	2	22
Navaajo	35	331	0	0	0	0
Pima	329	2,437	9	46	189	2,242
Pinal	98	746	10	81	109	1,546
Santa Cruz	17	161	0	0	7	54
Yavapai	18	142	0	0	1	12
Yuma	17	167	0	0	27	409
TOTALS	1,483	11,379	45	439	821	10,544
						12.8

Table 4. - Numbers of envelopes and dove wings received in 1964 in Arizona by species and county of kill.

County of kill	MOURNING DOVE WINGS ONLY		WHITE-WINGED DOVE WINGS ONLY		WINGS FROM BOTH SPECIES	
	Number	Number	Number	Number	Number	Number
	Envelopes	Wings/Env.	Envelopes	Wings/Env.	Envelopes	Wings/Env.
Apache	11	85	0	0	11	85
Cochise	119	903	9	11	119	914
Coconino	50	323	0	0	50	323
Gila	24	194	5	20	24	214
Graham	9	56	0	0	9	56
Greenlee	5	15	0	0	5	15
Maricopa	1,230	9,487	498	2,822	1,256	12,309
Mohave	9	68	2	4	9	72
Navajo	35	331	0	0	35	331
Pima	518	3,842	198	883	527	4,725
Pinal	207	1,603	119	770	217	2,373
Santa Cruz	24	200	7	15	24	215
Yavapai	19	153	1	1	19	154
Yuma	44	406	27	170	44	576
TOTALS	2,304	17,666	866	4,696	2,349	22,362
						9.5

Table 5. - Age ratios of mourning doves killed in each county in Arizona, 1964.

County Where Shot	Sample Size	UNWEIGHTED DATA		WEIGHTED DATA	
		Immature/Adult	% Immatures	Immature/Adult	% Immatures
Apache	82	2.04:1	67.1	2.04:1	67.1
Cochise	895	0.52:1	34.1	0.53:1	34.8
Coconino	322	1.16:1	53.7	1.20:1	54.6
Gila	192	0.60:1	37.5	0.60:1	37.5
Graham	55	1.12:1	52.7	1.05:1	51.3
Greenlee	15	0.50:1	33.3	0.50:1	33.5
Maricopa	9,093	0.97:1	49.3	0.97:1	49.3
Mohave	68	1.52:1	60.3	1.52:1	60.3
Navajo	331	1.35:1	57.4	1.31:1	56.6
Pima	3,792	0.55:1	35.6	0.55:1	35.4
Pinal	1,581	0.54:1	34.9	0.51:1	33.7
Santa Cruz	195	0.35:1	26.2	0.34:1	25.4
Yavapai	147	0.69:1	40.8	0.68:1	40.5
Yuma	396	1.05:1	51.3	1.05:1	51.1
TOTALS	17,164	0.79:1	44.1	0.83:1	45.2

Table 6. - Weekly ratios of immature to adult mourning doves in Arizona in 1964.

Period	NORTHERN COUNTIES				SOUTHERN COUNTIES			
	Immatures		Age		Immatures		Age	
	Adult	Total	Ratio	Percent	Adult	Total	Ratio	Percent
September	248	475	1.09	52.2	4,731	10,218	0.86	46.3
7-13	107	185	1.37	57.8	1,638	3,915	0.72	41.8
14-20	83	108	3.32	76.8	396	802	0.49	33.1
21-27	21	35	1.50	60.0	275	571	0.48	32.5
	459	807	1.33	56.9	7,040	16,177	0.77	43.5

Table 7. - Estimated dove harvest in Arizona in 1964.

Harvest Area	DOVE WING SURVEY				GAME DEPARTMENT QUESTIONNAIRE			White-Winged Dove
	MOURNING DOVE		WHITE-WINGED DOVE		County of Residence	Mourning Dove	White-Winged Dove	
	Adult	Immature	Adult	Immature				
Apache	641	1,307	1,948	0	0	Apache	1,062	---
Cochise	10,627	5,680	16,307	85	103	Cochise	14,071	1,980
Coconino	10,156	12,191	22,347	0	0	Coconino	15,576	1,408
Gila	1,926	1,156	3,082	225	96	Gila	10,177	1,628
Graham	941	990	1,931	0	0	Graham	5,094	---
Greenlee	316	159	475	0	0	Greenlee	708	---
Maricopa	176,239	171,523	347,762	36,372	71,307	Maricopa	519,568	258,215
Mohave	3,780	5,740	9,520	280	280	Mohave	6,549	528
Navajo	8,595	11,221	19,816	0	0	Navajo	11,859	968
Pima	87,485	47,863	135,348	12,868	18,056	Pima	185,579	77,315
Pinal	36,840	18,707	55,547	10,725	16,229	Pinal	18,584	12,585
Santa Cruz	4,093	1,394	5,487	55	220	Santa Cruz	---	---
Yavapai	7,042	4,797	11,839	0	38	Yavapai	13,540	4,444
Yuma	22,259	23,306	45,565	5,142	10,630	Yuma	47,877	39,736
TOTALS	370,940	306,034	676,974	65,752	116,959		850,194	398,807

Table 8. - Chronology of the 1964 mourning dove kill in Arizona.

Day	IMMATURES			ADULTS			TOTAL		
	Date (Sept) Wings	No. of Wings	Percent of all Imm.	No. of Wings	Percent of all adults	*No. of Wings	Percent of Tot. Sample	Imm./ Adult	
Tuesday	1	1,923	25.6	2,059	21.7	3,982	23.5	.93	
	2	749	10.0	841	8.9	1,590	9.4	.89	
	3	492	6.6	571	6.0	1,063	6.3	.86	
	4	337	4.5	485	5.1	822	4.8	.69	
Saturday	5	832	11.1	1,011	10.7	1,843	10.8	.82	
Sunday	6	646	8.6	748	7.9	1,394	8.2	.86	
<u>1ST WEEK</u>			(4979)	(66.4)	(5715)	(60.3)	(10,694)	(63.0)	(.87)
	7	734	9.8	787	8.3	1,521	9.0	.93	
	8	127	1.7	165	1.7	292	1.7	.77	
	9	140	1.9	145	1.5	285	1.7	.97	
	10	85	1.1	132	1.4	217	1.3	.64	
	11	94	1.3	133	1.4	227	1.3	.71	
Saturday	12	278	3.7	448	4.7	726	4.3	.62	
Sunday	13	287	3.8	545	5.8	832	4.9	.52	
<u>2ND WEEK</u>			(1745)	(23.3)	(2355)	(24.8)	(4100)	(24.2)	(.74)
	14	40	0.5	66	0.7	106	0.6	.61	
	15	34	0.5	54	0.6	88	0.5	.63	
	16	51	0.7	40	0.4	91	0.5	1.28	
	17	56	0.8	65	0.7	121	0.7	.86	
	18	42	0.6	95	1.0	137	0.8	.44	
Saturday	19	111	1.5	216	2.3	327	1.9	.51	
Sunday	20	146	1.9	290	3.1	436	2.6	.50	
<u>3RD WEEK</u>			(480)	(6.4)	(826)	(8.7)	(1306)	(7.6)	(.58)

Table 8. - Chronology of the 1964 mourning dove kill in Arizona (continued).

Day (Sept)	IMMATURES		ADULTS		TOTAL		
	No. of Wings	Percent of all Imm.	No. of Wings	Percent of all adults	*No. of Wings	Percent of Tot. Sample	
Monday	21	0.3	32	0.3	55	0.3	
	22	0.3	33	0.4	53	0.3	
	23	0.3	57	0.6	77	0.5	
	24	0.1	33	0.4	40	0.2	
	25	0.5	92	1.0	128	0.8	
Saturday	84	1.1	138	1.5	222	1.3	
Sunday	107	1.4	199	2.1	306	1.8	
		(297)	(3.9)	(584)	(6.2)	(881)	(5.2)
TOTALS	7,501	100.0	9,480	100.0	*16,981	100.0	.79

*Data submitted by hunters that failed to record date of kill are not tabulated above.

Table 9. - Chronology of mourning dove kill per hunter response in Arizona, 1964.

September	NORTH ZONE*		SOUTH ZONE*	
	No. Hunter Responses	Wings per Hunter Response	No. Hunter Responses	Wings per Hunter Response
1	13	8.1	508	7.7
2	9	6.7	204	7.6
3	4	8.8	147	7.2
4	7	7.4	106	7.5
5	15	8.5	220	8.0
6	11	8.7	173	7.6
<u>1ST WEEK</u>	<u>59</u>	<u>8.1</u>	<u>1,358</u>	<u>7.7</u>
7	10	7.5	191	7.8
8	3	4.7	34	8.4
9	3	7.0	36	7.6
10	3	3.7	35	6.5
11	3	9.7	25	8.1
12	3	9.7	91	8.1
13	2	4.5	109	8.0
<u>2ND WEEK</u>	<u>27</u>	<u>7.0</u>	<u>521</u>	<u>7.8</u>
14	1	12.0	14	7.0
15	2	11.0	12	5.8
16	2	8.0	12	6.3
17	3	8	15	6.9
18	2	1.0	18	7.7
19	3	6.3	45	7.4
20	1	12.0	57	7.9
<u>3RD WEEK</u>	<u>14</u>	<u>7.8</u>	<u>173</u>	<u>7.3</u>
21	0	0	7	8.4
22	1	1.0	8	6.6
23	1	11.0	10	7.4
24	0	0	9	4.8
25	0	0	15	9.0
26	2	10.5	26	8.3
27	1	2.0	44	7.4
<u>4TH WEEK</u>	<u>5</u>	<u>7.0</u>	<u>119</u>	<u>7.6</u>
<u>TOTAL</u>	<u>105</u>	<u>7.7</u>	<u>2,171</u>	<u>7.7</u>

* See Figure 1

Table 10. - Age ratios of white-winged doves killed in Arizona in 1964.

Where Shot	Sample Size	UNWEIGHTED DATA		WEIGHTED DATA	
		Imm./Adult	Percent Immatures	Imm./Adult	Percent Immatures
Cochise	11	0.83:1	45.5	1.21:1	54.8
Gila	20	0.43:1	30.0	0.43:1	29.9
Maricopa	2,803	2.00:1	66.7	1.96:1	66.2
Mohave	4	1.00:1	50.0	1.00:1	50.0
Pima	876	1.40:1	58.4	1.40:1	58.4
Pinal	763	1.50:1	60.0	1.51:1	60.2
Santa Cruz	15	4.00:1	80.0	4.00:1	80.0
Yavapai	1	---	100.0	---	100.0
Yuma	169	2.07:1	67.5	2.07:1	67.4
TOTAL	4,662	1.77:1	63.9	1.78:1	64.0

Table 11. - Age ratios of white-winged doves killed weekly* in five counties of Arizona, 1964.

Period	MARIKOOPA COUNTY				PIMA COUNTY				PINAL COUNTY						
	Imm.	Adult	Total	Age Ratio Percent	Imm.	Adult	Total	Age Ratio Percent	Imm.	Adult	Total	Age Ratio Percent			
Sept.															
1-06	1644	823	2467	2.00	66.6	405	306	711	1.32	57.0	359	254	613	1.41	58.6
7-13	191	91	282	2.10	67.7	70	43	113	1.63	61.9	77	39	116	1.97	66.4
14-20	9	1	10	9.00	90.0	22	9	31	2.44	71.0	11	9	20	1.22	55.0
21-27	6	2	8	3.00	75.0	4	0	4	0.00	100.0	1	0	1	0.00	100.0
TOTAL	1850	917	2767	2.02	66.9	501	358	859	1.40	58.3	448	302	750	1.48	59.7

Period	YUMA COUNTY				TOTAL					
	Imm.	Adult	Total	Age Ratio Percent	Imm.	Adult	Total	Age Ratio Percent		
Sept.										
1-06	109	54	163	2.02	66.9	2517	1437	3954	1.75	63.7
7-13	5	1	6	5.00	83.3	343	174	517	1.97	66.3
14-20	0	0	0	0.00	0.0	42	19	61	2.21	68.8
21-27	0	0	0	0.00	0.0	11	2	13	5.50	84.6
TOTAL	114	55	169	2.07	67.5	2913	1632	4545	1.78	64.1

* Wings with date of kill unknown are excluded.

Table 12. - Chronology of white-winged dove kill in Arizona, 1964.

Day	IMMATURES			ADULTS			TOTALS		
	Date (Sept) Wings	No. of Wings	Percent of All 'Imm.	No. of Wings	Percent of All Adults	*No. of Wings	Percent of Tot. Sample	Imm./Ad.	
Tuesday	1	1,284	43.7	938	56.6	2,222	48.4	1.37	
	2	341	11.6	164	9.9	505	11.0	2.08	
	3	246	8.4	66	4.0	312	6.8	3.73	
	4	127	4.3	73	4.4	200	4.4	1.74	
Saturday	5	354	12.0	124	7.5	478	10.4	2.85	
Sunday	6	188	6.4	94	5.7	282	6.1	2.00	
<u>1ST WEEK</u>			(2540)	(86.4)	(1459)	(88.1)	(3999)	(87.0)	(1.74)
	7	131	4.5	81	4.9	212	4.6	1.62	
	8	42	1.4	21	1.3	63	1.4	2.00	
	9	26	0.9	9	0.5	35	0.8	2.89	
	10	2	0.1	1	0.1	3	0.1	2.00	
	11	4	0.1	2	0.1	6	0.1	2.00	
Saturday	12	68	2.3	21	1.3	89	1.9	3.24	
Sunday	13	73	2.5	40	2.5	113	2.5	1.83	
<u>2ND WEEK</u>			(346)	(11.7)	(175)	(10.6)	(521)	(11.3)	(1.98)
	14	4	0.1	1	0.1	5	0.1	4.00	
	15	1	0.0	1	0.1	2	0.0	1.00	
	16	2	0.1	1	0.1	3	0.1	2.00	
	17	0	0.0	0	0.0	0	0.0	---	
	18	3	0.1	1	0.1	4	0.1	3.00	
Saturday	19	19	0.7	3	0.2	22	0.5	6.33	
Sunday	20	15	0.5	12	0.7	27	0.6	1.25	
<u>3RD WEEK</u>			(44)	(1.5)	(19)	(1.2)	(63)	(1.4)	(2.32)

Table 12. - Chronology of white-winged dove kill in Arizona, 1964 (continued).

Day	Date (Sept)	IMMATURES		ADULTS		TOTAL	
		No. of Wings	Percent of All Imm.	No. of Wings	Percent of All Adults	*No. of Wings	Percent of Tot. Sample
Monday	21	1	0.0	0	0.0	1	0.0
	22	0	0.0	1	0.1	1	0.0
	23	0	0.0	0	0.0	0	0.0
	24	0	0.0	0	0.0	0	0.0
	25	0	0.0	0	0.0	0	0.0
Saturday	26	9	0.3	1	0.1	10	0.2
Sunday	27	1	0.0	0	0.0	1	0.0
<u>4TH WEEK</u>		(11)	(0.4)	(2)	(0.1)	(13)	(0.3)
TOTALS		2,941	100.0	1,655	100.0	*4,596	100.0
							1.78

* Data submitted by hunters that failed to record date of kill are not tabulated above.

Table 13. - Chronology of white-winged dove kill per hunter response in 1964 in Arizona.

<u>September</u>	<u>No. Hunter Responses</u>	<u>Wings per Hunter Response</u>
1	282	7.9
2	84	6.0
3	56	5.6
4	46	4.3
5	105	4.6
6	<u>87</u>	<u>3.3</u>
SUB-TOTAL	660	6.1
7	72	2.9
8	14	4.5
9	11	3.2
10	4	1.2
11	3	2.0
12	21	4.3
13	<u>34</u>	<u>3.4</u>
SUB-TOTAL	159	3.3
14	2	2.0
15	4	1.0
16	2	1.5
17	0	0
18	1	4.0
19	11	2.4
20	<u>8</u>	<u>3.5</u>
SUB-TOTAL	28	2.5
21	1	1.0
22	1	1.0
23	0	0
24	0	0
25	0	0
26	4	2.5
27	<u>1</u>	<u>1.0</u>
SUB-TOTAL	7	1.9
GRAND TOTAL	854	5.4

Table 14. - Progress in the molt of primaries of the immature mourning dove.

Zone	Week	PRIMARY										Total	Percent molted beyond 5th primary	
		0	1	2	3	4	5	6	7	8	9			?
<u>NORTH</u>	1	48	37	47	36	26	28	11	12	2	1	0	248	10.5
	2	26	24	11	16	11	12	3	4	0	0	0	107	6.5
	3	26	18	9	4	10	8	3	3	2	0	0	83	9.6
	4	9	6	1	3	0	0	2	0	0	0	0	21	9.5
TOTAL		109	85	68	59	47	48	19	19	4	1	0	459	9.4
PERCENT		23.7	18.5	14.8	12.9	10.2	10.5	4.1	4.1	0.9	0.2	0		
<u>SOUTH</u>	1	383	379	414	538	583	668	674	495	396	194	6	4,730	37.2
	2	195	162	157	192	206	210	182	174	105	47	8	1,638	31.2
	3	57	48	59	40	45	40	49	27	25	4	3	397	26.6
	4	56	23	37	28	28	22	17	23	22	9	1	266	26.8
TOTAL		691	612	667	798	862	940	922	719	548	254	18	7,031	34.8
PERCENT		9.8	8.7	9.5	11.3	12.3	13.4	13.1	10.2	7.8	3.6	0.3		

Table 15. - Progress in the molt of primaries of the adult mourning dove.

Zone	Week	PRIMARY									Total	Percent molted beyond 5th primary		
		0	1	2	3	4	5	6	7	8			9	?
<u>NORTH</u>	1	0	3	8	17	35	77	74	12	1	0	0	227	38.3
	2	0	0	0	7	15	20	28	6	2	0	0	78	46.2
	3	0	0	1	1	2	6	8	4	3	0	0	25	60.0
	4	0	0	0	0	1	0	7	5	1	0	0	14	92.9
	TOTAL	0	3	9	25	53	103	117	27	7	0	0	344	43.9
	PERCENT	0	0.9	2.6	7.3	15.4	29.9	34.0	7.8	2.0	0	0		
<u>SOUTH</u>	1	6	3	23	94	327	1068	1379	1478	490	99	0	4,967	69.4
	2	7	3	4	28	108	314	731	692	314	73	2	2,276	79.6
	3	8	5	7	5	22	69	194	246	182	63	3	804	85.5
	4	4	0	0	5	8	35	100	176	159	70	3	560	90.7
	TOTAL	25	11	34	132	465	1486	2404	2592	1145	305	8	8,607	75.0
	PERCENT	0.3	0.1	0.4	1.5	5.4	17.3	27.9	30.1	13.3	3.5	0.1		

Table 16. - Progress in the molt of primaries in the white-winged dove.

Age	Week	PRIMARY										Total	Percent molted beyond 5th primary	
		0	1	2	3	4	5	6	7	8	9			?
<u>ADULT</u>	1	4	1	1	7	17	87	410	689	226	13	2	1,457	92.0
	2	1	1	2	0	2	11	44	72	39	3	0	175	90.3
	3	0	1	0	0	0	1	4	4	6	2	0	18	88.9
	4	0	0	0	0	0	0	1	3	0	0	0	4	100.0
TOTAL		5	3	3	7	19	99	459	768	271	18	2	1,654	91.8
PERCENT		0.3	0.2	0.2	0.4	1.1	6.0	27.8	46.4	16.4	1.1	0.1		
<hr/>														
<u>IMMATURES</u>	1	379	378	393	385	329	278	196	152	47	2	1	2,540	15.6
	2	75	70	58	46	35	18	16	17	5	2	4	346	11.7
	3	7	7	8	4	4	2	8	1	0	2	0	43	25.6
	4	0	2	4	3	1	1	0	0	0	0	0	11	0.0
TOTAL		461	457	463	438	369	299	220	170	52	6	5	2,940	15.3
PERCENT		15.7	15.5	15.7	14.9	12.6	10.2	7.5	5.8	1.8	0.2	0.2		

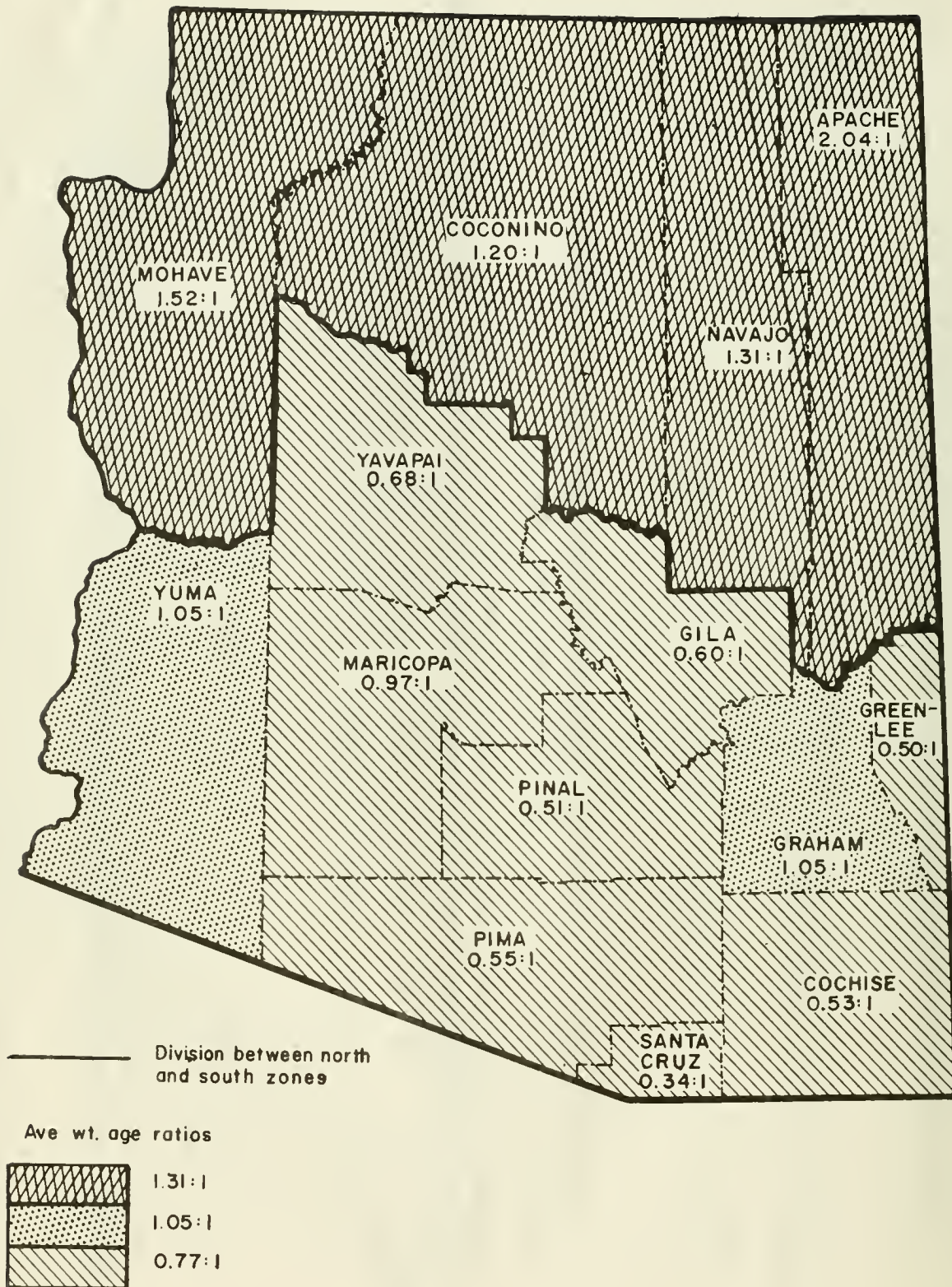


Figure 1.--Weighted age ratios of mourning doves in Arizona counties as reflected by wings collected in 1964.

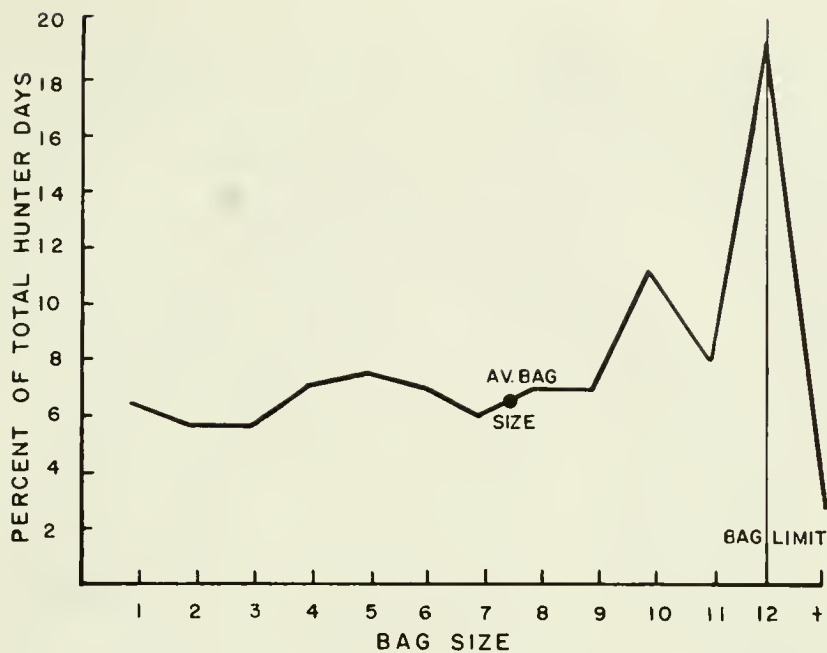


Figure 2.--Frequency distribution of bag sizes for mourning doves in Arizona, 1964.

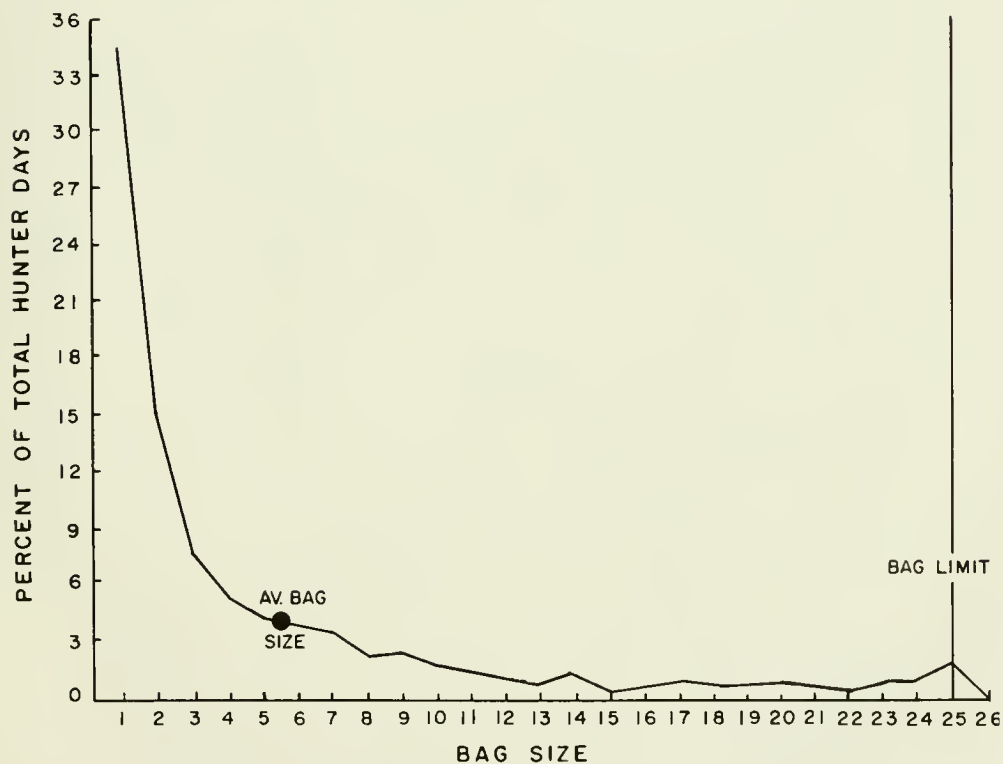


Figure 3.--Frequency distribution of bag sizes for white-winged doves in Arizona, 1964.

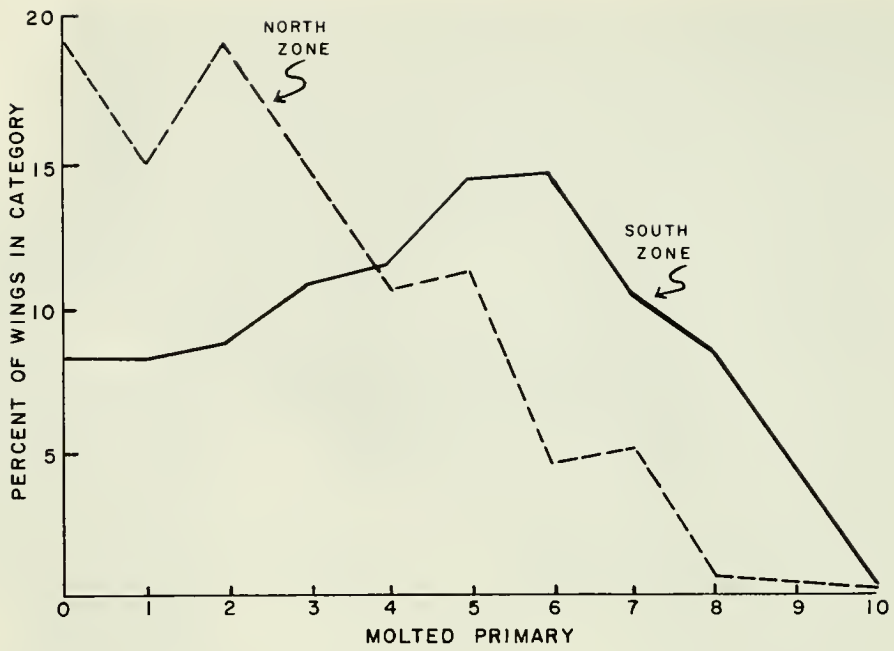


Figure 4.--Progress of the molt of primaries in immature mourning doves during the first week of September, 1964.

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DEPARTMENT OF THE INTERIOR
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