

The  
Family Aquarium  
& by  
H. D. Butler

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G B Goodr

Amenia

Dutchess Co

N Y

August

1858

G B Goodr

G B Goodr

Amenia

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List of the different kinds of  
fishes in the vicinity of Amenia

Eels

Suckers bull

Bullhead

Perch

Trout

Pickered

Catfish

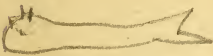
Roaches

Shiners

Lucr

Minnows

Pike





FRESH WATER AQUARIUM.

J. TRODIC

W. G. ATEL.



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~~B985~~

THE

# FAMILY AQUARIUM;

OR,

## AQUA VIVARIUM.

A

“NEW PLEASURE” FOR THE DOMESTIC CIRCLE:

BEING A

FAMILIAR AND COMPLETE INSTRUCTOR

UPON THE SUBJECT OF THE CONSTRUCTION, FITTING-UP, STOCKING,  
AND MAINTENANCE OF THE

### FLUVIAL AND MARINE AQUARIA,

OR “RIVER AND OCEAN GARDENS.”

BY HENRY D. BUTLER,



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1858

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TO

THE GIFTED LITTÉRATEUSE WHOSE NOM DE PLUME IS

“Fanny Fern,”

THIS SUCCINCT TREATISE ON

“THE FAMILY AQUARIUM,”

DESIGNED TO FAMILIARIZE

AMATEURS IN A NOVEL BRANCH OF NATURAL SCIENCE WITH AN  
ATTRACTIVE INSTRUMENT ENABLING THEM TO

“LOOK THROUGH NATURE UP TO NATURE'S GOD”

WITH DELIGHT AS WELL AS REVERENCE,

IS RESPECTFULLY DEDICATED BY

THE AUTHOR.

ENTHOLOGICAL  
NATIONAL MUSEUM  
WASHINGTON

1871  
1872  
1873  
1874

## P R E F A C E .

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I CONCEIVE it but just to say that, in the following little work, I have indulged in no attempt at scholarly display or literary effect. My object has simply been to prepare a treatise calculated to familiarize the family circle with that "New Pleasure," the AQUARIUM, in its more domestic form, and to do it in language intelligible to the plainest capacity. If it shall prove that I have been successful, my endeavor will have been accomplished, and the reader somewhat entertained and certainly instructed.

The AQUARIUM has become, within a short period, almost a necessary luxury in every well-appointed household, both of Europe and America. It has wholly superseded the old fashioned fish-globe in the popular affection. Its neatness and elegance; its fascinating combination of subtle philosophy and commonplace every day facts; its ever-changing, never-wearying; feature, of kaleidoscopic novelty; its tempting peculiarity, to thoughtful minds, as an introduction to the study of nobler and more recondite pages in the volume of natural history; all constitute an attraction as chaste as it is beautiful, as refined as it is irresistible.

As the great pioneer of the AQUARIA in the United States, Barnum's American Museum, in New York, presents, of course, that variety and perfection in the number, quality and surpassing finish, of its specimens in this particular branch of art, which are necessarily due to long experience and fertile resources. The tanks constructed there are the handiwork of artificers originally taught and employed at the Gardens of the Royal Zoölogical Society of London. The "fitting up," at the Museum, of those tanks (which technical expression includes the materials used to impart to their interior a picturesque effect, and also the artistic taste required to introduce and unite those materials daintily and characteristically), may be termed a classic example in this country, and is a subject of universal imitation. The Museum "stock"

of animal and vegetable life, of rare sea-plants, of choice zoöphytes, of appropriate fish, of useful and ornamental mollusca, etc., obtained from all parts of the world and cultivated there, is equally admirable; the demand for handsome AQUARIA being extensive, the supply at such an establishment of everything contingent upon their prompt and *recherché* production is proportionately copious and superior.

And yet, regardless of facilities so ample and at all times so available, many a family will take delight in constructing, fitting up, stocking and maintaining, wholly or in part, an AQUARIUM for itself. To enable each, however humble or however unlearned in the art, to indulge in this innocent enjoyment and to precisely the extent it may feel inclined, this work will be found, I think, exactly *the* desideratum. It is a complete adaptation to American peculiarities of every species of useful information upon the subject to be met with in the elaborate volumes of European authority. It is a careful concentration of all the practical results of my own, by no means limited, experience in the structure and management of AQUARIA and their constituents; while it embraces, at the same time, much that is new and important, for which I have been indebted to the erudition of esteemed friends and eminent naturalists. To Mr. Charles F. Durant and Dr. John Torrey, I have been particularly placed under profound obligations. The suggestions of the former as to the locality of American algæ and zoöphytes, and the advice of the latter in the more strictly botanic department of this treatise, have been invaluable. On the strength of such able assistance, coupled with an honest conviction that I have withheld nothing of the knowledge in the premises with which, in my daily intimacy with the "Ocean and River Gardens" at the Museum, I must have possessed myself, this *brochure* must chiefly rely for a favorable reception at the hands of the public. That it will not fail for want of earnestness in the subject, or a sincere desire to communicate that feeling to others, is, at any rate, the complacent impression of its author,

HENRY D. BUTLER.

BARNUM'S AMERICAN MUSEUM,  
New York, June 1, 1858.

# CONTENTS.



	PAGE
CHAPTER I.	
THE CHARACTERISTICS OF AN AQUARIUM, .....	9
CHAPTER II.	
THE TANK—ITS NATURE AND CONSTRUCTION, .....	22
CHAPTER III.	
THE TANK—HOW TO FIT IT UP PICTURESQUELY, .....	30
CHAPTER IV.	
PLANTS—THEIR NATURE AND PHENOMENA—STOCKING THE TANK, .....	37
CHAPTER V.	
THE FRESH-WATER AQUARIUM—ITS VEGETATION—WHERE TO SEEK FOR IT, AND HOW TO RECOGNIZE IT, .....	44
CHAPTER VI.	
FRESH-WATER FISH AND MOLLUSCA—THEIR DESCRIPTION AND PECULIARITIES, .....	58

	PAGE
CHAPTER VII.	
FRESH-WATER REPTILES AND INSECTS—THEIR KINDS AND PURPOSE, .....	70
CHAPTER VIII.	
THE SALT-WATER, OR MARINE AQUARIUM—FITTING IT UP APPROPRIATELY, .....	80
CHAPTER IX.	
SUB-MARINE VEGETATION—SEAWEEDS AND THEIR HAUNTS, ...	86
CHAPTER X.	
ANIMAL LIFE IN THE MARINE AQUARIUM—THE PLANT-ANIMALS, OR ZOÖPHYTES—THE MOLLUSCA—ANNELIDES, ETC., ETC.,	98
CHAPTER XI.	
THE FISH AND THE CRUSTACEA FOR THE MARINE AQUARIUM—CONCLUSION, .....	112



# THE FAMILY AQUARIUM.

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## CHAPTER I.

### THE CHARACTERISTICS OF AN AQUARIUM..

“Canst thou draw out leviathan with an hook? or his tongue with a cord which thou lettest down?”—BOOK OF JOB, chap. xli.

THE LEVIATHAN may not be caught, or, in all human probability, his skeleton would now be on exhibition at Barnum's Museum. The sea-serpent, like the mermaid, has hitherto been considered a poetic myth, visible only to imaginative sailors, and the more enterprising keepers of neglected ocean-bathing places. Yet many a monster may have escaped the vast destruction of animal life that seems to have accompanied the deluge; may not some of them, driven from the land as perilous associates for the teeming population thenceforth destined for the new-born earth, have become fitted, at length, to remain the imprisoned denizens of the world beneath the sea? May they not still enjoy the unabbreviated age vouchsafed to all existences before the flood? May they not roam, from age to age, the stormless depths

of the glittering ocean-bed, breathing the emerald atmosphere of its valleys forested with crimson and purple foliage, or gathering in picturesque groups upon its mountain tops lit up with the gorgeous water-rays of phosphorescent gold? The serpent may be, alone, for some wise purpose, and through some anomalous condition of his organization, occasionally manumitted—a prisoner on parole. Navigating his tedious way through the amethystine gates and coral palaces of the great deep, may he not come to us, from time to time, a messenger of God's infinite wonders in that universe of mysterious romance?

It is not for us to unveil the awful secrets interred by His hand amid those inaccessible gulfs of rare magnificence. It is sufficient for us to know that poet's pen and painter's pencil shrink back, appalled, in the attempt to depict their surpassing marvellousness. We may, with aerial inventiveness, soar boldly upwards towards the glittering stars. With sub-aquean audacity we may dive down, down, towards the gem-strewed floor of the ocean. Alas! how limited are our most ambitious endeavors in either direction. Ere we can reach the feeblest height or depth, our panting lungs bid us, peremptorily, return or die. The taunting clouds roll open, that the blue firmament may laugh, beyond, at our discomfiture. The murmuring billows divide, that the myriad creatures of the surge may mock at, far below, our human impotence. The limit to man's curiosity is fixed, the field of his personal explorations is circumscribed, by the organism of

his nature. The telescope is our substitute in the "blue empyrean," and we measure orbs, weigh out their substance, and compute their revolutions, if we cannot touch them. In the "world of waters" what is the resource of philosophy? The microscope reveals to us much that is sublime, beautiful, and profoundly interesting. It has remained for the wondrous AQUARIUM to do more. That extraordinary combination of science and art may be called the crowning glory of the spirit of discovery characteristic of the nineteenth century. It opens to our inquisitive gaze the hidden chambers of the deep. If it does not actually place us where our foot-prints may be seen among the jewelled corridors, the many-pillared halls, the shining temples, the pebbled grottoes, the incomparable gardens where time's ravages are unknown and eternity seems stamped on all that is matchless in its grandeur, it gives us, at least, a faithful copy, in little, of those enchanting scenes, for our leisurely perusal and admiration. It presents us with a miniature fac-simile of the fascinating reality in its exquisite colors, and replete with its inexplicable revelations. It exhibits, in other words, LIFE BELOW THE BILLOWS in all its surprising shapes, and amid all its amazing phenomena. The imperishable rocks are there in their peerless dyes of multi-tinted verdure. And there, for us to ponder on in rapt delight, are the flowers whose countless hues beggar the most fantastic pictures gotten up by an extravagant fancy. The miraculous zoöphytes, half animal and half plant,

beaming with the innocent loveliness of the one, and manifesting the destructive instincts of the other, are there. The graceful fish—the brilliant reptiles—the shining insects that people this rare world, whilom hermetically sealed up from our yearning view, are now displayed in the AQUARIUM, sporting—feeding—slumbering—pursued and pursuing—leaping into life, and fading into dissolution—each in its natural haunts, and yet all “at home,” in these crystal palaces, to the enraptured eye of the most timid spectator.

But, what is an AQUARIUM? questions, perhaps, some reader unenlightened upon this new topic of popular excitement?

AN AQUARIUM, we answer, in plain, untechnical language, is *a receptacle for aquatic animal and vegetable life in fresh or in salt water, which (like the water of a river or an ocean) need never be changed.*

To complete the illusion, the bed of the AQUARIUM is assimilated, in appearance, to the bottom of the river and ocean, and is supposed to unmask all its diversities of hill and dell, rock and meadow, flower-field and forest, barren sand and luxuriant herbage.

AQUARIUMS (OR AQUARIA, as they are generally termed, when two or more of them are alluded to,) are usually made of glass, in order to facilitate the popular observation of their living contents, and are prepared in a manner which we have intelligibly described, and at full length, in another chapter.

The old-fashioned fish globes were not AQUARIA, in a proper sense, because it was *absolutely necessary to change the water* in them, pretty frequently, lest the fish should die. The vitalization of the water *without this change*, comprehends the leading *principle of the Aquarium*.

That principle, generally applied, may be reduced to the common apprehension in the following simple, yet sufficiently exact manner.

Animal life absorbs oxygen, and throws off carbonic acid gas. Vegetable life, on the contrary, absorbs carbonic acid gas, and throws off oxygen. What one rejects the other needs; what would suffocate the one, if not removed, the other would die of exhaustion if it could not obtain. This is the universal compensating action of nature, and applies, under certain circumstances, to man and a rose-bud, as peculiarly as it does to an ox and an oak, a trout and a water lily.

An AQUARIUM exhibits a very accurate self-adjustment of this delicate balance of vitalization and destruction. It should contain precisely enough animal to sustain vegetable life, and sufficient vegetable to meet the demands of animal life. It is a very nice scale of physical equivalents. The fish, insects and reptiles, must, to thrive, consume the oxygen with which the plants impregnate the water; and they supply, in return, the carbonic acid gas, all of which the plants must absorb for their own growth and the water's purification.

This reciprocal action, nicely maintained *in equilibrio*,

preserves and supports both classes of existences ; while, with an excess or deficit of either, disorganization and death ensues. The lower species of life, besides, play the important, though subordinate rôle of scavengers in that curious cosmos, the AQUARIUM. Some of them devour as food the feculence of the fish, etc., and some the decayed particles of the plants, while the two kind spawn, prolifically, a banquet for their piscinal associates.

The great principle of the AQUARIUM was faintly indicated by Priestley, as long ago as the close of the last century. Ingelhauss approached it more closely in 1778-9. Daubeny touched its verge in 1833. Ward, in 1837, suggested it with some distinctness. Dr. Johnston partially demonstrated it in 1842. Dr. Lankester, in 1849, and Warrington, in 1850, rendered it conclusive ; but Gosse, in 1852, perfected all the labors of his predecessors in a series of decisive experiments that left no room for doubt or contradiction.

An AQUARIUM had, also, about this time, established itself, by accident, at Hampton Court, England, and was described by Mr. Jesse. In a water tank, in the open air, plants and snails made themselves unbidden *confrères* with the fish. Nature did the rest, as she does in those more gigantic AQUARIA, the placid lake and the majestic river.

Next followed the grand AQUARIA of London and Dublin under regal auspices. These were sumptuous exhibitions ; and in a short time created such a popular

excitement in Great Britain that all the other curiosities of nature sank, at once, into comparative insignificance. An AQUARIUM-mania seized upon the public mind. The AQUARIUM was on everybody's lip. The AQUARIUM rang in everybody's ear. Morning, noon, and night, it was nothing but the AQUARIUM. Books innumerable were written upon it. Lectures, without end, were delivered in elucidation of it. The gardens of the Zoölogical Society, in Regent's Park, groaned with the crowd ; and the AQUARIUM-house therein sweltered beneath the multitudes that suffered martyrdom, every day, to contemplate the cause of the sensation.

It could not be expected that such a novelty would long escape the vigilant gaze of American enterprise. In the autumn of 1856 Mr. P. T. Barnum departed for Europe, carrying with him a *carte blanche* from Messrs. Greenwood & Butler, the current proprietors of the AMERICAN (BARNUM'S) MUSEUM, for the purchase of such curiosities as his matured experience might select. He visited the principal cities of Britain, France and Germany, as well as the continent generally ; but nothing struck his observant eye as so preëminent in its attractiveness as the AQUARIUM. Being personally intimate with Mr. David Mitchell, the gentlemanly secretary of the Zoölogical Society of London, Mr. Barnum promptly secured his valuable aid in the introduction of this "new pleasure" to the American public.

Through Mr. Mitchell's influence, Mr. Barnum was ena-

bled to engage the services of the two principal naturalists who had organized and developed the celebrated AQUARIA of the Royal Society. This was a triumph ; but the next step was to endeavor to obtain a supply of, or learn how to manufacture, perfect glass tanks. This proved to be an exceedingly delicate and difficult operation. But one chemist had yet been successful in the composition of a cement thoroughly calculated to resist the action of salt water. He had no leisure to furnish tanks for exportation, and was unwilling, of course, to impart to others his original discovery. To this gentleman, however, Mr. Barnum repaired and, after a liberal outlay, finally possessed himself of the critical secret. With this precious piece of knowledge, and several workmen who had for the previous three years devoted their skill and ingenuity to the construction of these crystal tanks in all their faultlessness, he hurried back to New York.

The result is patent to the world. The GRAND AQUARIA at the AMERICAN (BARNUM'S) MUSEUM, New York, has no competitor whatever in the western hemisphere, and is, beyond dispute, the largest, most costly, most complete, and most elegant production of the kind on the face of the globe ! It is not yet, however, what we may expect to find it when, in a few short months, the inestimable specimens of zoöphyte, anemone, etc., shall have arrived that have been selected in Asia, Africa, and South America, and assume their place in this peerless collection.



As these glass tanks are now manufactured at reasonable prices in the Museum (by the only process whatever, that has proved unequivocally successful) and as they are "stocked," or fitted up with the appropriate animal and vegetable life at the same establishment, on generous terms, by the experienced adepts whose handiwork is so renowned in New York and in London, what is there to prevent the AQUARIA from becoming the universal embellishment of the private parlor or the sitting-room, the conservatory or the garden, as well as the place of public entertainment?

The pretty carp we call a "gold-fish" was a popular house-favorite in its day, and still remains so in many localities. When first imported from China into France to gratify the luxurious whim of Madame de Pompadour, it became a general pet, because it was found to thrive in water almost up to fever heat, as well as in water down to winter chilliness. These fish were tamed to come at a whistle-call, in ponds. They were crossed into the production of every variety in color, as well as made to assume such grotesque forms that some grew up crescent-shaped, and progressed not by swimming but by tumbling over and over, headlong, in the water. Cannot other fish be made to minister as piquantly to our innocent enjoyments? With the bountiful contents of the wide ocean and the flowing river made so accessible, where is the taste, however *bizarre* or capricious, that must, perforce, go ungratified?

Would you desire an aquatic flower-show ?

The sea and the lake have their gardens, beside which the garish beauty of man's proudest efforts at floriculture pale into sickly impertinence. Behold them, reproduced in all their splendor, in the AQUARIA !

There lie the quiet *Corallines*, from the rosy-tinted "arboret of jointed stone," or its blue and purple congener, up to the richest group of carmine that the eye would choose to dwell upon. In striking contrast, behold the delicate green *Ulva*—the pale, sulphur-colored *Melobesia*—the bright crimson *Rhodymenia*—the spotted *Asperococcus*—the fan-formed and wildly radiated *Padina*—the Sea-leaf, formed of "twenty thousand or more cradles for young Polyps"—the Trees of Glass, covered with trumpet-shaped bells, each one of which is the cosy frame of a "delicate monster"—the Water Soldier, with its handsome white flower, and its pointed leaf that, like a sharpened sword, pricks the fingers of the unwary connoisseur—the Iris, rainbow-colored as it is rainbow-called—the Grace of the Waters, with its dainty white flowerets peeping from out their bed of purplish leaves—the Starwort, that wears rosettes—the Duck Weeds, with their game-preserves of diminutive living creatures, the provender of fish—and a goodly host in addition, whose names we cannot at this moment remember, and whose captivating qualities we have not, at present, leisure to describe.

Would you witness the grand spectacle of Life, as

performed in that other theatre of being, to which nature has so long refused even to sell us a ticket of admission?

Turn to the AQUARIA! Ring up the curtain of your thoughts. *There*, indeed, is comedy and tragedy, broad farce and exciting melodrama.

For warriors, lo! we have the fish known as the Goby, who turns quite black with rage when he beholds his prey, and whose turquoise-colored eyes light up with fury as he dashes to the fierce encounter. We have, too, the graceful Stickleback, who makes his nest like a bird, waits upon his mistress with all the gentle complaisance of the knight-errand of old, and enters the lists in his uniform of glowing scarlet trimmed with white and green, or deep, deep purple, to do battle for the object of his affections. The Stickleback adores the tournament. In the heat of conflict his gorgeous colors flash out intensely in their brilliance. Defeated, his war-paint fades into the dulllest hues, or only flickers changefully up in his dying throes, as if, in death, he had a dream of victory. For ogres, we have the *Actinia*, who, garbed in the seductive costume of the gayest flowers, lie in wait for thoughtless victims. Their delicate petals are a thousand murderous arms, prepared to grasp at all of *Annelid* life that may be tempted to embrace them; while every pretty crimson dot conceals a poisoned barb, which they project unerringly as death at passing *Infusoria*. For sentimental performers we have the Sea Cucumber and the Starfish. Some of the former, when irritated, deliberately commit suicide

by expectorating the whole of their intestines, leaving their empty shells behind. Some of the latter, under like circumstances, suddenly explode themselves into fragments, as though filled with gunpowder, and touched off by electricity. For rakes, we have the Limpit and the Water Beetle, who, if permitted, will abandon the AQUARIA every night to go on "a spree," returning, like other licentious ones, early in the morning. For beauties, we have the Sea Mouse, clothed in silken hair, and glittering in all the iridescent colors of the butterfly; we have the Sea Slug, covered with gem-like specks, that may well pass muster for sapphires and emeralds; and we have the Minnow, the dandy of his tribe, with his vest of roses and his coat of olive green. For Jeremy Diddlers we have the Hermit Crab, who pilfers a whelk-shell for his residence; we have the *Nereis*, who attaches himself, *perdu*, to the Crab's doorway, and gormandizes on all the food he can seize as it enters; and we have the Cloak Anemone, which insidiously mantles the two, and then devours all it can abstract from the mouth of both. To this category we might add the *Phyllodoce*, who turn themselves inside out, like a stocking, and when the inverted stomach fills with passing pabulum, restores his sated organ to its original position. The comic actors on this stage of life are too multitudinous for detail. The Climbing Frog and Climbing Crab are gymnasts of the first order; the Red-nose carries a natural syringe, with which he squirts water upon all who inconvenience him; the Pipefish uses his

two ventral fins for "suckers," as boys do bits of wetted leather ; the Caddisworm sports a portable domicile of sticks and stones ; the Newt is alive with graceful evolutions, full of merry twists and laughable eccentricities.

Such is an AQUARIUM, and such the unsolicited amusement and instruction it ever furnishes. Could we have anything purer ? Could we entertain anything more delightful ? And if we hymn the Creator's praise in admiring the perfection of His works, is not the study of the AQUARIUM an honest, an ennobling devotion ?

That every reader may, with very little trouble, supply himself or herself with an AQUARIUM, we proceed to give copious and lucid directions for the formation of the tanks, and for "stocking" them, subsequently, with fresh and salt-water plants and animals.

## CHAPTER II.

### THE TANK.

#### ITS NATURE AND CONSTRUCTION.

**W**E have already stated that a proper vessel, so fitted up with animal and vegetable life, in water, that the liquid need never be changed, is called an **AQUARIUM**. We have also mentioned that the vessel in question is called a "tank," no matter what its shape, or of what materials it may be composed. There are tanks of all sizes, all kinds, and all characters. A wide-mouthed vial forms one of a simple kind. The chief objection to it is the unequal refraction occasioned by the thick bottom. The sides not being, always, perfectly perpendicular, is an inconvenience to the tiny rockwork or other marine architecture it might be desirable to introduce. Occasionally, as a toy, a lamp-glass, or the glass-chimney of an argand burner is adapted for the purpose. A cork is fitted tightly into one extremity, and covered on the inside with black sealing-wax varnish, to make it water-tight. On a slightly larger scale, amateurs sometimes select a bell-glass with cylindrical sides,

or what is known in the seed-stores as a "propagating glass." An article of this kind is inverted, and the knob at the bottom set in a wooden stand of mahogany, or oak, or pine, to suit the taste or other views of the proprietor. A common fish-globe has been converted into a tank for an AQUARIUM with very little difficulty.

Constructed entirely of glass, all these substitutes for a regularly prepared tank permit their contents to be inspected with facility, but they are all alike obnoxious to two fatal objections. One of them we have alluded to as an unequal refraction, which distorts and deforms every object placed in the water, and subjects them to a change of shape and magnitude, while in motion, at every moment. The other may be found in the fact that, if manufactured of any size worth consideration, they will not stand the pressure of the water, and are liable at the slightest touch to burst into fragments, scattering a collection the result perhaps of patient study and comparison, as well as of some outlay in time, and money, and affection, over the carpeted floor. The vibration produced by an approaching footstep, we have known to occasion such a calamity, long after all reason for apprehension seemed to have passed away. In truth, glass tanks of a spherical or cylindrical form are not to be depended upon in any respect. They are never perfect. Their mode of manufacture renders them, of necessity, frail; and it is a poor economy that will hazard, to save the expense of a suitable and permanent tank, all the

beautiful array of marine vegetation and animal existence which time, taste, skill and experience, have nicely adapted to each other's association, rendered reciprocally supporting, and converted as it were into a natural "Happy Family."

We conceive that a square, or oblong form is, under all the circumstances, infinitely preferable to any other, for a perfect tank. The more angles presented, the more confused will be the picture afforded the eye by the AQUARIUM, and this confusion embarrasses, annoys and sometimes quite destroys, the enjoyment of its contemplation. The rectangular shape is decidedly the most elegant. It is, also, the simplest and the strongest. It is the best adapted to impart satisfaction, and involves the least expenditure, as well as the least risk. We would also suggest the propriety of making a revolving top to the stand on which the tank is to be secured, as it facilitates the examination of the AQUARIUM on all sides, without subjecting the observer to the necessity of going round it. The top of a piano stool affords a good example. The sides of the tank should be constructed of plate glass, of sufficient thickness to sustain, agreeably to the size of the tank, the pressure of the water. The ends and bottom should be made of marble or slate. There are those who conceive that the back should be of the same material, in order to exclude the superfluous light. But this notion we look upon as slightly fantastic. With the front and back of glass, we have the animated embel-



lishments of the AQUARIUM in a condition that leaves us an opportunity to scrutinize their habits and performances from a more advantageous point of view ; and should the light, at particular periods of the day, become too strong for the comfort of our little colony, we may easily diminish it by fitting some green or other dark-colored calico to the side whence the inconvenience is experienced. This will remedy the evil instantly. With an excess of light, the plants may give off oxygen redundantly, and "too much of a good thing," we are assured, "is good for nothing." Besides this, the fish, like other creatures more human, like to retire at times to the privacy of their own apartments. There, amid the rockwork, weeds and flowers, whether engaged in their toilette with a view to coquetry and a conquest, or whether seeking to enjoy a siesta in the sultry noon, too much light makes them restless and unhappy.

With the two ends and bottom prepared of marble, or slate, we are enabled to get up the marine scenery with more security. The cement used in constructing archwork, for instance, will not adhere to glass ; and when the cavernous grottoes, the mossy hillocks, the "coral palaces," and the other little poetic addenda for the "set-scenes," the "wings," etc., of this new theatre of life are artistically transferred to their most effective places, it is better that they should be fastened there in the most complete manner. We shall not then be constantly afflicted with a fear that, with an unexpected jar, they will topple

over, and crush the unconscious objects of our admiration, and just perhaps as our enthusiasm may have worked us up into a state of enjoyment, like Shelly's—an

——“eternal heaven distilled  
Down to one thick, rich minute.”

The glass and the marble, or slate, are carefully fitted into a solid frame, grooved to receive them. These grooves being first filled with an appropriate cement, the whole tank becomes, in a short time, as compact as possible, and as strong as the combination of materials can make it. The use of iron, in this connection, cannot be too earnestly condemned. The action of the salt water upon it, especially, soon covers the glass with trickling rust, and not only discolours the water, but contaminates it until it becomes destructive to its inhabitants. If common putty, or if white-lead, be employed to secure the glass, slate, etc., to the panes, an equally injurious result will ensue. The water will acquire properties so poisonous that even the plants must expire, and with them will rapidly bid adieu to all our care the fish, insects, and reptiles, which we may have made their companions. The character of the cement used, therefore, is of the utmost importance. It must be powerfully adhesive, or else the tank will be too fragile for the purpose intended, and may shatter without a moment's warning. It must be calculated to resist the chemical as well as the physical action of the water. It must also, as a *sine quâ non*, contain nothing calculated to

impart to the water a deleterious property, or the fate of the AQUARIUM, so far as its living qualities are concerned, will be inevitable.

These points remembered, let us examine the proportions which experience points out as the most serviceable for a tank, under ordinary circumstances. We have tried almost every imaginable variety, to arrive at a sound practical species of knowledge on this subject. We have had them under investigation when quite small, and tested them when of as great magnitude as we yet have the means, either in Europe or America, of manufacturing them. Our settled conviction is that the following proportions, other things being equal, afford the most desirable tanks, viz :

18 in. long,	by 13	wide,	and 13 in.	height.
30 in.	“	“	18	“
48 in.	“	“	24	“

The more closely these proportions are adhered to, the more perfect, we conceive, will be the Aquarium in all those more important peculiarities which go to constitute its excellence.

A cover will be required for the tank in order to keep some of the more active denizens of the miniature lake or sea from leaping out of their limited homes in a moment of discontent, or while in sportive playfulness pursuing each other, absorbed perhaps in the profound minutiae of a game of “tag,” or carried away with the excitement of

some piscatory "prison-baste." The cover will also keep the dust from temporarily disfiguring the surface of the water. It might be dispensed with, perhaps, without much impropriety, as the dirt soon settles down to the bottom of the tank ; but we prefer its presence, whether made of fine muslin or of glass. It adds a neatness and finish to the AQUARIUM ; and if simply laid over the top of the vessel so as to permit the gases to escape, and occasionally removed so as to allow a change of the superincumbent air, it will be found both useful and ornamental.

Double tanks, it has been suggested, might be so constructed that the water would, to a certain extent, imitate the ebb and flow of the tide, by running regularly first into one division and then into the other. This alternation of high and low water might serve to develop some very interesting phenomena connected with those plants and animals whose natural habits are associated with such a change. There are marine animals whose organization demands an entire or partial exposure to the air, and this mode of gratifying their instincts might prove more effective than the usual one of supplying them with rockwork sufficiently elevated to enable them to reach and enjoy our rarer atmosphere. There are plants, too, which will not thrive in tranquil waters. Sir John Paxton, knighted for his successful conception of the plan of erecting the novel building so renowned and imitated as the Crystal Palace, discovered this fact when he was a simple florist to the Duke of Devonshire. A gigantic S. American water-lily,

brought from the River Amazon, and well known at the present time as the *Victoria Regia*, refused to flower under his care in the elegant tank he had prepared for it. It was provokingly obstinate. Suspecting, at length, that the want of motion in the water might have something to do with its contumacy, he arranged a little paddle-wheel in such a manner that a mimic stream should roll over it, and thus, in its fall into the tank, continually agitate its contents. The ruse was successful. The lily imagined itself once more at home, and being perfectly at its ease, expanded its giant flowers without further reluctance or solicitation. But these, of course, are only luxurious accessories to the AQUARIUM, which it may be as well to note, by way of appropriate information or entertainment. We do not expect the reader of this simple treatise, or the mere amateur in the matter of which it treats, to undertake such expensive or erudite experiments.

## CHAPTER III.

### THE TANK.

#### HOW TO FIT IT UP PICTURESQUELY.

WE will now suppose the tank suitably constructed, to be ready for "fitting up," as a preliminary to "stocking" it. Now an opportunity is afforded for the display of much ingenuity and a correct taste. So far, whether it was intended for a fresh or for a salt-water AQUARIUM, our tank has been the same in all its process of preparation. At this point, however, we begin to diverge. It is obvious that the scenery, or the *landscape* (if we may use the term in this sense), intended to represent the bed of the ocean, will not answer for the bed of a river or lake. Each locality has its characteristics, just as it has its respective population. To render the "fitting up" picturesque is one thing—to give it *vraisemblance* is another. Branches of coral might look pretty enough in a fresh-water tank, but they would be as ludicrously out of place as warming-pans in the tropics, or grapes growing in Nova Zembla. And yet we have been shocked with just such *niaiseries* in

the AQUARIA of gentlemen who profess no small share of *gout* and refinement. Eschew it, good reader, we advise you, altogether! Arrange your rockwork in its details, artificially as you please, but let its *tout ensemble* be quiet and natural. Do not overload with filagree embellishments or exaggerations; and, above all things, remember that every inch of space thus occupied with the "still life" of your marine arcadia, will compel you to diminish, to a proportionate extent, the animal and vegetable life with which you may propose subsequently to accommodate it.

We do not consider it judicious, therefore, to introduce much rockwork into a small AQUARIUM. A large one will admit of ample ornament of this character without offending a sense of harmony, and without a sacrifice of valuable space. In a small one, however, enough fancy may be displayed with a very pleasing effect. The slate ends of the tank might be quite concealed by facing them with irregular projections and ledges of rock, which you can fashion into quaint shapes and fantastic abruptness out of Roman, Portland, or other cement, which, under water, quickly hardens into a semblance of stone. Into some of the precipitous declivities and rude precipices thus executed, you might hollow out cavities for such stones as support the growing plants. In salt-water tanks the seaweeds may be arranged to drop from the mimic cliffs very naturally; while the branching corals, having their bases first dipped in the cement, may be attached permanently

to the floor of the tank, as though they were a luxuriant growth of arborescent madrepores. The rockwork in the centre may be of any kind of stone whatever. Two points in this connection, must be peremptorily attended to, if you desire to see your AQUARIUM meet your sanguine expectations ; the one is the production of your rockwork across the tank, with a careful eye to the elevation of the same point of it above the surface of the water ; the other is the soaking of the tank itself for a considerable period after the use of the cement. The purpose of the elevated rock we have already alluded to, in speaking of such marine animals as require an occasional exodus from the world of waters. The object of well soaking the tank is to remove the free lime that may be disengaged from the cement, as its subsequent incorporation with the water of the AQUARIUM would be destructive to all of the animal life it might contain. The only safe mode of ascertaining when this pernicious transfusion has completely ceased, will be to continue soaking the tank, by filling it with clean water and removing the latter as fast as it becomes impure until the prismatic scum, which you will have noticed on the surface, entirely disappears. When you are quite confident that it has ceased to present itself, and neither your sight nor your scent can, with the keenest effort, detect the presence of the slightest soil or effluvia, your tank will be ready for use.

You may now prepare the bed of your AQUARIUM with the certainty of having proceeded with a caution worthy of



complete success. First procure some coarse river or sea sand, such as is used for building purposes, and next supply yourself with a quantity of river or sea pebbles, of small size. Wash both well. Place the latter in a common wire sieve, and let the water run upon, as you disturb them, until it runs clear. The sand can be washed in any manner you find most convenient. "Silver sand," as housewives call it, and scouring sand, as we so often find it mixed with dirt, will not answer. At every agitation of the tank they will obscure the water and mar your view of the fish, besides introducing lime, ochre, etc., into your AQUARIUM, much to the annoyance, if not injury, of its living inhabitants. When thoroughly cleaned, distribute to the depth of an inch or so, this sand evenly upon the bottom of the tank. Over this sand strew a layer of the cleansed pebbles, and your tank will be complete. The burrowing aquatic animals will find, in the stones and sand, all the facilities they require for their amusement. They will excavate hiding-places and cosy retreats to suit their own temporary caprices, and do it much more satisfactorily than we could by any process of art. And if you have carelessly thrown your pieces of granite, sandstone, limestone or conglomerate, together with skill, so as to give their arrangement an air of accidental adaptation, their colors blending and their rough projections creating extempore caverns, you will have produced the gloomy haunts which, at times, the fish, etc., love to dart into from

the garish sunlight, or to occupy in order to escape observation.

The water in the tank, it is hardly necessary to say, because the intelligent reader will presume it to be obvious, should be of good quality. For a fresh-water AQUARIUM or River Garden, river, pump, or well water is, of course, to be sought, and should be as pure as it may be practicable to obtain it. Chalybeate water (water impregnated with iron and certain salts), and spring waters known to have mineral and other medicinal qualities, although suitable enough for invalid humanity, are scarcely suitable for an AQUARIUM. Nor will water that has been boiled, to purify it, suit our purpose, for the process of boiling expels too much of the oxygen, the presence of which is absolutely necessary to sustain aquatic life. The water we ordinarily drink, if well settled, is the kind to be, in fact, selected ; and if it be poured back and forth from one vessel into another, a few times, in order to aërate it (impregnate it with air), nothing could be more apposite. This aëration will be found a somewhat important consideration in the maintenance of a thriving AQUARIUM. Its effect is to impart, so to speak, fresh life to the water, and restore the equilibrium which may have been seriously disturbed by the want of an exact balance between your combination of animal and of vegetable existence. At the Dublin Zoölogical Gardens they have quite an ingenious arrangement for aërating all the tanks of the AQUARIA at

the same moment. A pair of bellows has been provided, and to its nozzle are attached gutta percha tubes that communicate with the tanks in question. When the bellows are worked, the effect upon the water and its living contents is very interesting. Indeed, it is so much so, that the visitors are constantly working the bellows to witness the result, and they do it so vigorously that the attendant who was employed for that purpose has been dismissed as a superfluity.

Some prefer to effect this aëration, and supply, at the same time, the loss of water through evaporation, by sprinkling from a little height above the surface of the tank. They suspend a drip-glass, or a bee-glass, or a simple funnel with a sponge in it, or a finely perforated mouthpiece of a garden watering-pot, over the tank. To this they attach a tube from a hydrant or reservoir, and in this manner produce a species of light shower, whenever they feel like amusing themselves with a treat bestowed upon their little favorites. This is not absolutely required in any AQUARIUM that is sedulously attended to, or is promptly deprived of such impurities as occasionally accumulate from decaying vegetation and similar incidents of the moment. There are many who never think of doing more than agitate the water with a small stick. Others again draw off a portion of the water, at times, with a syphon, and supply its place with some that is fresh. Others, more whimsical, contrive to erect a little fountain in the centre of the AQUARIUM for effect, spray from

which is certainly picturesque, and leaves nothing more to be desired in the way of aëration. But many of these schemes are expensive ; few of them are of much importance, and none indispensable. The tank must be so placed as to throw an abundance of light on the vegetable portion of the AQUARIUM to enforce their growth, and with this light we cannot always avoid, even with a cover, an absorption of the air, in a dry atmosphere, and an evaporation of the water. These, of course, when they occur, should be remedied.

The simplest mode of aërating the water in a small tank, however, is either to use a common fire-bellows, such as all have at hand who burn wood. When coal is the customary fuel, and the bellows has become obsolete, as it has in some portions of the United States, a large syringe will answer as a substitute. The syringe, of course, must be lifted, after each discharge of air, out of the water, in order to fill it again. In a few moments, the water under this disturbance will be seen to grow white with bubbles, and will resemble, on a small scale, the appearance of the sea or river in a storm, when the waves dash about, and dance, and grow furiously hilarious in their excitement. In truth, it is this violent agitation of the sea and the river that aërates their waters, and disengages the gases that would otherwise tend to affect aquatic life, and carries down to considerable depths, to be distributed by under currents, in every direction, the renovating and exhilarating influence.

## CHAPTER IV.

### PLANTS—THEIR NATURE AND PHENOMENA.

#### STOCKING THE TANK.

“**T**O stock,” signifies to associate in a tank those living things which, when arranged in the just proportion that enables each to contribute sufficiently to the support of the other, constitute an AQUARIUM. “Stocking” a tank is, therefore, the placing in it of appropriate plants, fish, reptiles, insects, etc.

It will strike the most careless observer that a fresh-water AQUARIUM and a salt-water (or marine) AQUARIUM, cannot be “stocked” at all in a similar manner.

Vegetable life takes precedence in stocking an AQUARIUM. Your plants should be deposited and suffered to remain in the tank at least a week before it may be deemed prudent to supply the necessary amount of animal existence. Some may die from transplantation. The tank must be carefully watched for indications of such a calamity, and every dead leaf, branch, root, etc., must be ejected as soon as discovered. Placed in a good strong light, each plant will rapidly develop its intention in this

respect ; and when all that remain exhibit unequivocal signs of strength and vitality, you may proceed without hesitation. Perhaps the more exact plan will be to wait patiently until the water, after becoming quite clear, seems, when the sunlight is allowed to fall upon it, to fill with bubbles, which cluster upon the rockwork, as well as upon the bottom and sides of the tank. These bubbles will indicate the oxygenation of the water and the growth of incipient vegetation. They demonstrate, therefore, that your new world is prepared for the animal life you design to bestow upon it.

Let us, before we leave this branch of the subject, and before we go into the minutiae of propagation in the Aquarium, say a few words in regard to plants generally.

A plant is philosophically called an organized body without voluntary motion. What it is, practically, we all know, for we can distinguish it (except in some exceedingly delicate cases) without difficulty. A plant has its solid and its fluid parts, like all other organized bodies. The cellular substance, the various vessels, the fibres and pith, belong to the former category ; to the latter belong the sap, the air, and the various juices. The juices contain nourishment adapted for assimilation into the substance of the plant, and may be called its blood. In many other points, in a physiological sense, there is a remarkable correspondence between the organization of plants and animals. Sometimes this correspondence reaches a point that almost defies human discrimination. Many of the

zoöphytes, although now determined to be animals, so closely resemble plants that, until lately, they have been classed by science with the vegetable kingdom. The sponge affords us an illustration of this fact, and so does the sea-anemone. It is only the enlightened who are prepared to comprehend, even at the present time, that a sponge is an animal, and that its multiplied orifices are simply natural aqueducts, through which flow the tidal streams whence it obtains its food—aqueducts on which, after sufficiently nourishing its young, it launches them forth into the world to seek their fortune by their independent exertions. The habits of the anemone, and its curious characteristics, we have alluded to in our opening chapter. Nothing could approach more closely, as far as appearances go, the peculiarities of a flower, than this zoöphyte. It is difficult to realize, while watching it, that it is not a beautiful specimen of some sea-rose, instead of a creature whose every lovely spot, almost, conceals a dart waiting in alluring disguise the approach of a victim.

Motion, as a consequence of vital power, is not to be denied to plants. The motion in some of them may almost be attributed to sensation, although having no nervous system that we can perceive, this apparent sensation may be reduced to simple irritability. The Quiver-worts, or *Oscillatoria*, for instance, have movements that have given rise to grave and learned treatises in the scientific world. They have been thought to form, in fresh-

water, the same link between vegetable and animal life, which is conceded in sea-water to the lower order of polyps : that is, they are supposed to be neither perfect plants nor perfect animals, but a combination of both—a sort of first starting-point at which the higher species of existence commences to depart, in development, from the inferior. The *Spirillum* are similarly remarkable, though Dr. Lankester attributes the motion of both these classes of plants, as in the *Protophyta* and *Protozoa*, to the “proteinoaceous protoplasm within the cell,” which is, in substance, a concession to them of the essential elements of a nervous and muscular system.

Plants sleep, too, after having been in continued and violent activity. Some of them which inhabit those high latitudes where the sun is withdrawn from sight for months at a time, regularly fold themselves up in slumber every twenty-four hours, and with as much exactness as if possessed of a time-piece, or as if enacting the part of one for the benefit of the less gifted by nature.

The disposition of plants to turn to the light is too well known to demand more than a passing allusion. The stalks, branches, leaves, and blossoms, all move in the same direction in this effort, and the fact has suggested to many a poet a pretty image of affection. The sun-flower follows with its yellow eyes, “the course of the day-god’s illuminous ray” with a fondness that is particularly striking, though commonplace. Robbed of all romance, however, this yearning for the light is owing, probably, to the



circumstance that plants may be said to breathe only in the light, and that to the action of light they are indebted in a great measure for their colors. By "breathing" is meant that absorption of carbonic acid gas and that exhalation of oxygen, the recent satisfactory demonstration of which has led to the formation of the AQUARIUM. This vital operation, it is insisted by some observers, is partially, if not wholly, suspended at night, and proceeds rapidly only when the plants are exposed to the sun, and hence their enjoyment in such an exposure. Hence, also, the importance of sunlight, and the disadvantage of gloom, in successfully encouraging the vegetable life inclosed in an AQUARIUM.

As regards color, even Aristotle observed that plants were colored by the sun. Senebrer found that when they were put in a dark place their green leaves first became yellow on the surface and then white, while young plants which had grown up in the dark, when brought gradually to the light, exchanged their white color for a yellow, which, after a time, darkened, exhibited green spots, and finally assumed that general complexion. Van Mons and Vasali assert that the light of a lamp and even of the moon, exercises a coloring influence over plants as well as that of the sun.

How the original constituents of plants are absorbed by light and heat; how they are so united by the vegetable organization as to produce the various substances of which plants are composed—the gum, starch, sugar,

gluten, albumen, gelatin, wax, oils, resins, acids, aroma, the ligneous fibre, etc. ; how these substances in their last analysis are resolved back into their original constituents, and so on, this is no place for us to explain. We may, however, properly close this portion of our subject with a glance at the mystery of vegetable propagation.

Most plants have both sexes united in one flower. The pollen, or farina, is prepared and preserved in certain masculine vessels called anthers. The finer particles of this pollen penetrate through the stigma in the feminine portion, to the ovary, and fructify the germs or ovules there deposited. But then some plants do *not* unite the two sexes in one flower. Some have male and female blossoms on one stem. Some plants of a kind are wholly masculine in their organization, and some wholly feminine. Sometimes these grow near each other, and sometimes they grow miles apart. When in proximity, the wind carries the pollen from one to the other, or else nature adopts a very ingenious plan of effecting her purpose. Certain small flies, attracted by the honey of the male flower, are compelled to dust themselves all over with the pollen in order to get at the luscious luxury. The moment they visit the female-flower for honey, that flower closes on them, and crawling in all directions to escape, they fructify the plant perforce. For plants of different sexes, that grow at a distance from each other, bees and other insects perform the part of involuntary go-betweens. In pilfering the honey from the male flower they powder themselves with the pollen,

and they convey it to the female in devouring the honey with which *she* attracts them. We may perceive from this how important a part the smallest atom of animal life enacts in the wise and wonderful economy of nature ; and when we feel vexed at insect-annoyances, and are disposed to wonder why Providence permits the existence of such occasional torments to us, it may be as well to remember that without some of them the glorious world of flowers would soon become a desolate waste, and without others to devour these, they would become too numerous for human endurance.

## CHAPTER V.

### THE FRESH-WATER AQUARIUM:

ITS VEGETATION—WHERE TO SEEK FOR IT, AND HOW TO  
RECOGNIZE IT.

**T**HE aquatic plants suitable for an AQUARIUM in this country are abundant, and easily obtained. They are necessarily of that kind which grows in streams and ponds, although, in certain cases, there are some that grow upon the margin, but whose roots only love the water, which might be introduced into an AQUARIUM with a happy effect. Long Island, New Jersey, and New York will supply the amateur with specimens enough for any useful purpose. A ramble by the river side—a stroll beside the creeping creek—a step around almost any collection of water of sufficient magnitude—will betray, when the eyes are rendered acute by the heart's inspiration with a love of the subject, a host of candidates for favor from which taste may readily make a selection. We append the names of a few, after which we shall proceed to indicate those which should be entitled to the preference.

- |                             |                                   |
|-----------------------------|-----------------------------------|
| 1. WATER LOBELIA . . .      | <i>Lobelia dortmanna.</i>         |
| 2. HORNWORT . . . . .       | <i>Ceratophyllum demersum.</i>    |
| 3. BROAD-LEAVED STARWORT    | <i>Callitriche verna.</i>         |
| 4. NARROW-LEAFED DO. . .    | <i>Callitriche autumnalis.</i>    |
| 5. RIVER WEED . . . . .     | <i>Podostemon ceratophyllum.</i>  |
| 6. GOLDEN CLUB . . . . .    | <i>Orontium aquaticum.</i>        |
| 7. SWEET FLAG . . . . .     | <i>Acorus calamus.</i>            |
| 8. NAIAD . . . . .          | <i>Naias flexiles.</i>            |
| 9. POND WEED . . . . .      | <i>Potamogeton.</i>               |
| 10. WATER WEED . . . . .    | <i>Anacharis Canadensis.</i>      |
| 11. TAPE GRASS . . . . .    | <i>Valisneria spiralis.</i>       |
| 12. WATER STAR-GRASS . . .  | <i>Schollera graminea.</i>        |
| 13. QUILLWORT . . . . .     | <i>Isoetes lacustris.</i>         |
| 14. WATER CRESS . . . . .   | <i>Nasturtium officinalis.</i>    |
| 15. WHITE WATER-LILY . . .  | <i>Nymphaea alba.</i>             |
| 16. YELLOW DO. . . . .      | <i>Nuphar lutea.</i>              |
| 17. SMALL YELLOW DO. . . .  | <i>Nuphar pumila.</i>             |
| 18. DUCKWEED . . . . .      | <i>Lemna tribe.</i>               |
| 19. COMMON DOCK . . . . .   | <i>Rumex aquaticus.</i>           |
| 20. COMMON RUSH . . . . .   | <i>Juncus and Scirpus tribes.</i> |
| 21. WATER VIOLET . . . . .  | <i>Hottonia palustris.</i>        |
| 22. SPIKEWORT . . . . .     | <i>Myriophyllum spicatum.</i>     |
| 23. BROOKLIME . . . . .     | <i>Veronica beccabunga.</i>       |
| 24. THE FERNS . . . . .     |                                   |
| 25. FORGET-ME-NOT . . . . . |                                   |

We might increase this list indefinitely ; but, of the number we have thus presented merely to give an idea

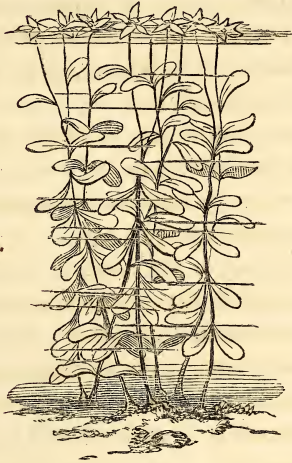
of the copiousness of nature's supply, not more than half a dozen, perhaps, would be chosen by a sound discretion as fitted, in all respects, for a private AQUARIUM. For AQUARIA of large proportions, wherein the plants may be of a corresponding size, as well as varied in character, and quite numerous, we might enlarge our catalogue four or fivefold ; but, in this treatise, which we design more especially for the *popular perusal*, our object is to enable the *family taste* to gratify itself in a neat, useful, innocent and inexpensive manner, without running into idle display, or indulging in scientific exhibitions.

No. 1. The Water Lobelia is to be found on the borders of many a pond in northern New York, and throughout New England. The *Lobelia syphilitica* also grows in moist places, throughout the middle and western States. It is the plant once so famous for its medicinal qualities. It grows to a considerable height, and bears large and beautiful flowers of a fine blue color. The *L. cardinalis* is another of the moist tribe, with brilliant, scarlet flowers, and though indigenous here, is much cultivated in European gardens. The *L. dortmanna* is the only one, however, of the ten species of *lobelia* which inhabit the United States, that can be said to suit the AQUARIUM.

No. 2. Hornwort is a common plant in ponds and other sluggish waters. It takes its name from the horny excrescences of its leaves, and is not very pretty.

No. 3. and 4. Broad-leafed and Narrow-leafed Star-

worts are also common pond plants. They may be trans-



*Callitriche Autumnalis*—(Narrow-leaved Starwort.)

planted to the tank with ease, and thrive satisfactorily in confinement. Their leaves invariably assume a singular position on the surface of the water, forming a number of handsomely shaped asteroids, or small stars. On the leaves, if examined by a microscope, may be observed minute, rosette-shaped excrescences, that appear to be substitutes for the hairs on other plants.

No. 5. River Weed, may be looked for on rocks and stones at the bottom of small streams in New Jersey.

It resembles a seaweed, but grows only in fresh water. It takes up but little space, is ornamental, because it may be made to add a look of verdure to the otherwise naked rocks in the tank, and it throws off oxygen liberally to sustain the animal life in the AQUARIUM, which is always a point of material importance.

No. 6. Golden Club is an inhabitant of slow streams and ponds. Its leaves float on the water, and its flowers are a bright yellow in color and attractive. It would not be of much value in a small tank.

No. 7. Sweet Flag, is the common Calamus, so abundant in swamps and on the borders of streams, and is too well known to need much description. The *C. aromaticus* (*acorus* of the botanists), is an odoriferous plant formerly brought from India, but now found all over northern Europe and America. It is much chewed by children and others in this country. The distillers of Dantzic use it to correct the smoky odor of spirits and impart a peculiar flavor. *C. pastoralis*, in the olden time, was the reed or cane employed as a musical instrument. The *fistula*, or shepherd's pipe, was made of this substance, and is hence figuratively used by the poets for the pipe itself. The *C. scriptorius*, or *chartarius*, sharpened with a knife or a rough stone and split like our pens, was used, by the ancients to write with on substances such as papyrus, parchment, etc., which the common *stylus* might injure. The Calamus is too large for an ordinary AQUARIUM, in our opinion.



No. 8. The Naiad, grows in ponds and slow streams, but we cannot recommend it highly.

No. 9. Pond-weeds exhibit twelve distinct varieties in the United States, most of which may be seen in the vicinity of New York, and some in brackish water, as well as fresh. They differ considerably in size, and in the form of their leaves ; and while the leaves of a few float on the water, those of the remainder are submerged. The latter kind of any plant is always to be preferred for an AQUARIUM, the reader should remember, and for an obvious reason. The plants in an AQUARIUM are chiefly desirable for their ability to purify the water by oxygenizing it. Those whose leaves lie on the surface, or rise above it, necessarily waste upon the atmosphere just so much of the oxygen they exhale, while those that live wholly submerged diffuse all their vitalizing property where it is most needed. When ornament and utility may be combined in any plant the acme of essential service is at once reached in its employment in the AQUARIUM ; when that is impossible, mere beauty must be sacrificed on the altar of the practical.

The *Potamogeton natans*, has a broad, green, pointed leaf, and might be mistaken for a lily. Occasionally we meet a *P. natans* with brown, ovate leaves, floating on leaf-stalks rooted at the bottom. This makes a good resting-place for the little Tritons, or Water Newts, and for similar animals that require now and then an introduction to the atmospheric air. The *P. densus* is a small plant

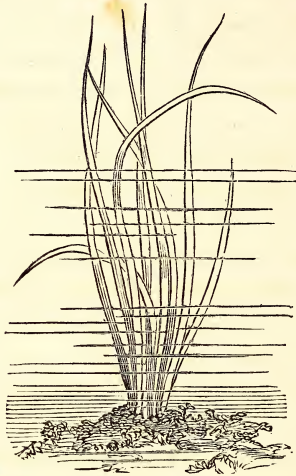


Potamogeton densus—(Pond-weed.)

with waved leaves attached to the stem opposite each other. The *P. Crispus* has a reddish stalk with brownish-green leaves, and adapts itself to any vessel. The only objection that may be urged to the best of these Pond-Weeds is the relish for them manifested by the Molluscs which an AQUARIUM demands (as will be seen by and by), to keep it in wholesome order. The little creatures will leave all other plants to feed on these, and thus soon destroy their beautiful appearance.

No. 10. Water-weed. This is one of the most preferable of all aquatic plants for an AQUARIUM. It belongs to ponds and sluggish streams, and grows so easily and is so prolific that, if cut off, and thrown into a tank, it will soon fill up all the space that may be devoted to it. The *A. Canadensis* has, of course, a northern origin, but is abundant in Fishkill Creek, and can be had in the ponds on this island, and particularly in the small streams out the Third Avenue, New York. It is exceedingly ornamental, and of a bright green color. It should be frequently pruned and kept under; for, unlike most water-plants that require some earth to attach themselves to, the Water-weed, the *A. Canadensis* or *alsinastrum*, flourishes in a manner wholly independent of its position, and grows as it travels tardily down a stream without being attached to anything but its fellows. In England it acquired notoriety by singular accident. Some of it was sent from Canada to a Cambridge professor, who threw it away. It fell into a drain that emptied into the river, and soon afterwards quite a consternation was created by the choking up of the river in question by a river-weed. This weed, when examined, proved to be the *Anacharis*. Since then it has made itself a home in the Thames, where it is called Water Thyme, and is one of the most troublesome of weeds, while in not a few of the English canals it fairly threatens, at times, to lay an embargo on navigation. As it is hardy, easily obtained, graceful, gaily colored, prolific, easily thinned out, and ac-

tive in its oxygenizing capacity, nothing could be more appropriate for an AQUARIUM than the *Anacharis Canadensis*, or Water-weed. The same high praise may be bestowed on :



*Valisneria spiralis*—(Tape Grass.)

—No. 11. Tape Grass, which may be had in the Hudson River, especially near Newburgh, or in the Delaware and Raritan canal, where it becomes seriously abundant occasionally, about Princeton, N. J. The *Valisneria spiralis* came originally from Italy, and is named after Valisnei, an Italian naturalist, who wrote on insects and plants in

the last century. As the male and female flowers of this plant grow from different roots, care must be taken to secure both for propagation. They may be distinguished without difficulty. The female flowers are borne on long, spiral foot-stalks; the male ones are on straight, short, flower-stalks. The female flowers ascend by the assistance of a coil and float on the surface of the water. The male flowers, when matured, gallantly detach themselves from the parent stalk, and follow their feminine relatives to the surface. Here they expand, float among their favorites and impart to them the pollen with which they are laden. The female plant then descends to the bottom and the process of reproduction goes on agreeably to the order of nature. The Tape Grass is also propagated by offshoots. A lateral shoot, branching from the mother plant, pushes forward until it discovers some suitable spot in which it may strike root. Here it fixes itself at once, and in its turn assumes all the characteristics of the parent plant, and devotes itself to the same functional performances. This plant, and the one last mentioned, look uncommonly well when grown together, and with a few choice fish, and some fresh-water mollusca, will constitute as picturesque an AQUARIUM, on a small scale, as a family could desire.

No. 12. Water Star Grass, grows in the slow streams of New York and New Jersey.

No. 13. Quillwort, is to be found at the bottom of ponds and slow streams.

No. 14. Water Cress, everybody is familiar with. It grows on the margin of, and is sometimes immersed in clear streams, over nearly all the globe. In France, the Cress is cultivated for the table in clear streams, being inserted in rows in the direction of the current. The flowers are small and white.

Nos. 15, 16, and 17. Water Lilies. The white lily belongs, botanically, to the *Nymphaea*, and the yellow to the *Naphar*. They embellish our lakes and slowly-moving waters, and are amongst the most elegant and handsome of aquatic plants. The leaves are rounded and heart-shaped, supported on stalks so long as to enable them to float on the surface. The flowers are large, and contain numerous petals, so as to appear double. In color, some are a brilliant white, occasionally possessing a tinge of red, and diffuse a delightful fragrance ; some, again, are yellow, and these are called, in England, on account of their peculiar fragrance, the "Brandy Bottle." It has broad, shining leaves, that form a pleasant resting-place for the amphibia—such animals as live both in the air and water. The flowers raise themselves, every morning, out of the water and expand. In the afternoon they close again, as if for slumber. The famous *Lotus* of the Nile, is a lily with flowers of a pink color, and leaves with a toothed margin. The roots are still cooked and eaten in Egypt, and the seeds bruised and made into bread, as they were in the time of Herodotus and Theophrastus.

No. 18. Duckweeds are not so attractive to the eye,

but are very useful. From the close manner in which they cover the water, they have been named *Lemna*—from *lepis*, a scale. The duckweeds produce a capital shade in an AQUARIUM, so as to screen the animals from the sun, and harbor a host of minute creatures that provide an ample game-preserve for the fish, etc., as well as a wide field for the inquisitive observer, if armed with a good microscope. The surface of any pond will furnish you with duckweed, and as it is a floating plant altogether, it need only be thrown into the tank, where it will establish itself a home and spread rapidly. As it looks best in a mass, the loose pieces might be picked out and rejected with advantage.

No. 19. Common Dock is too large a plant for our purpose. It may be seen along the margin of rivers, has a stout root, alternate and often entire leaves, and bears panicles of small greenish flowers. There are about sixty varieties, five or six of which are natives of America. Dock is somewhat esteemed in medicine.

No. 20. Common Rush needs little or no description. It is a sedge-like plant, chiefly growing in marshes, with inconspicuous greenish flowers. It is botanically called the *Juncus*. The soft rush, or *J. effusus*, is remarkable for its tufts of long, awl-shaped leaves and stems, looking something like the spines of a porcupine, with flowers in loose, lateral panicles. These are the leaves and stems used in making mats, etc. The *J. scirpus*, or club-rush, is common in marshes. Its flowers are disposed in little,

solid, oval spikelets. The bulrush grows in deep water. In China the *S. tuberosus* is cultivated in tanks, and the tubers are eaten, both boiled and raw. None of this species can be commended highly for the AQUARIUM.

No. 21. The Water Violet is, properly speaking, an exotic plant, and is rarely found growing wild in this country. We have met with it, but the reader may not be so successful. It has bright green, feathery leaves, and whorls of pinkish-purple flowers.

No. 22. Spikewort is also a scarce aquatic plant. It is bushy ; looks somewhat like fennel, and is found in ponds and rivulets. It gives off oxygen liberally.

No. 23. Brooklime, has sky-blue flowers in loose, lateral spikes. The leaves are ovate and very thick. The flower-stalks proceed from the joint.

No. 24, Ferns, and No. 25, Forget-me-not, are cultivated upon the projecting pieces of rock in an AQUARIUM. Both kinds love to grow *near*, but not *in* the water. They are only employed, therefore, as embellishments. The ferns are very numerous, and if the foot-stalks of the fronds or leaves are placed in the water, so as to allow the feather-like foliage to droop over the rockwork, the effect is agreeable. In a similar position, the tender shades of delicate turquoise-blue of the forget-me-not are admirable, with the small touches of white and amber at the base of their petals. The German legend has embalmed this flower and made it immortal. A lady, desiring some that grew in the Rhine, her lover sought to



grasp a few, but, overreaching himself, was precipitated into the stream, and, as he sunk, exclaimed, "*Vergiss mich nicht.*" Hence the name.

This closes our chapter on the fresh-water plants. We should advise, when placing in the tank any one of those plants which demand a fixedness in the earth at the bottom, the following process: First make a ball of wet clay; with this ball inclose your roots. Deposit it in its proper place, and then carefully surrounding it with your sand or gravel, cover it with the weightier pebbles to keep it down. The water, which it is better to put in the tank by installments, and not all at once, will not then disturb your river-garden arrangements.

## CHAPTER VI.

### FRESH-WATER FISH AND MOLLUSCA.

#### THEIR DESCRIPTION AND PECULIARITIES.

THE tank is now presumed to be fully prepared for the introduction of animal life. In order to keep it in that condition, it becomes obligatory upon its proprietor to supply it with a few common pond-snails. These will consume the decaying vegetation. They will even do more than this, as we shall see presently. If your tank be placed in too strong a light—and particularly if placed in such a position as to catch the direct rays of the sun—you will soon observe its effects both upon the plants and the water. A greenish, slimy kind of mucus will soon be found adhering to the sides of the glass, and obstructing the view, besides barring the passage of the light. This will become gradually denser and denser until thoroughly intolerable. This deposit is, in fact, a new vegetable growth of an infinitely small species of *algæ*, or vegetable weed, and is termed the *confervæ*. With too little light, your large plants languish ; with too much, your AQUARIUM fills with *confervæ*. Hence the necessity of observing a prudent medium. With the growth of the *confervæ*,

your shell-covered mollusca—the snails, for instance—come additionally into play. They act as natural scavengers, and soon devour the obstruction, if not entirely too abundant. In the latter case, the tank must be placed in a comparatively dark place for a few days, when all the superfluous matter will disappear.

As variety is of some consequence, it may be as well to have more than one kind of Mollusca to enact their humble but valuable rôle in the AQUARIUM. Considerable caution, however, must be exercised in making a selection. Some of the Mollusca prefer to feed altogether on the *confervæ* and on the vegetable decay, while some are of so destructive a nature, that they demolish indiscriminately the confervoid growth and the large favorites of the AQUARIUM. The latter should, of course, be avoided. They may be interesting to contemplate, but they are expensive to keep.

Of the most useful and harmless Mollusca, we should recommend the common Marsh Shell (*Paludina vivipara*) the Trumpet Snails (*Planorbis corneus* and *P. carinatus*), and the snail known as the *Glutinosa*. The first has a light-colored shell, with thin red lines. Occasionally one has a shell of a greenish-brown, marked transversely with brownish-red bands. The second are flattened in shape, sometimes angular and sometimes keeled. They may be found in low marshes and ditches, as well as in ponds. The last mentioned is a smaller snail, but active and industrious.

The *Planorbis Armigerus* is common in the swamps and ponds of every portion of this State. The *P. trivolvis* is common to most of the northern and western States. It is a pale yellow, and is twisted up like a ram's horn. The *P. bicarinatus* is abundant here in every sluggish stream. The *Physa heterostropha* is a pretty snail, yellowish, or a greenish yellow, in color. The *Paludina dioscisa* is a snail to be obtained without difficulty.

These mollusca would present quite as large an assortment for an ordinary AQUARIUM as would seem desirable. As long as too great a number of them were not placed in the tank together, they would not interfere with the general harmony of the community of which they formed a part. If rendered so numerous as to make their usual food insufficient in its supply, perhaps they, too, might be tempted to turn destroyers; but that would be the result of their protector's negligence, not of their own voracity. On the other hand, these snails breed rapidly in a tank, but the fish have an excessive appetite for their young, and if permitted, will devour them as rapidly as they appear. It would be judicious, therefore, to remove the spawn, occasionally, to a jar containing healthy plants, whence they could be transferred to the tank when sufficiently matured.

The FRESH-WATER MUSSEL (*Unio radiatus*), as well as the *Anodon fluviatilis*, another neat mussel, would not be out of place in a perfect AQUARIUM. The mill-ponds and dull streams, here and to the eastward, will supply them.

The CRAWFISH, or fresh-water Lobster, makes a striking addition to the tank. It is common in most streams, and is well known and easily recognized.

The FRESH-WATER FISH. Fish of every size may answer for the AQUARIA. Those of considerable magnitude require tanks of corresponding proportions, and such tanks are too cumbrous and ungraceful for domestic use. We shall chiefly confine ourselves, therefore, to the smaller class of fish in these pages.

THE PIGMY DACE (*Leuciscus pygmaeus*), is a pretty little article, excellently well adapted to the AQUARIUM. He is ornamented with a small black spot, margined with white, on each side of the tail. In most of the brooks in this and in the New England States he may be captured.

THE BLACK-NOSED DACE is an active specimen, of good habits and prepossessing appearance. He may be found in nearly every clear stream and rivulet.

THE TESSELLATED DARTER (*Boleosoma tessellatum*), is a singular fish, of small size, and equally plentiful. In a perfectly limpid stream you may observe him lying motionless at the bottom, as if asleep, when suddenly he will spring towards his passing prey with marvellous velocity. It is this practice that has bestowed upon him his name.

THE SPOTTED TROUTLET (*Baione fontinalis*) is another dwarf-fish, lively, handsome, graceful, and well behaved. Nothing could be better fitted for a tank.

GOLD AND SILVER FISH everybody is familiar with, and properly selected, they make very eligible denizens of the

AQUARIUM. The common kind, obtained in open ponds, are the best for the purpose. They are not so prolific as others, but they are more beautiful, far more hardy, and are not so liable to be destroyed by changes of temperature. In a house, however, the most delicate of these Carp, for they belong to that family, may be kept for years with a little attention.

There is an infinite variety of the goldfish (*Cyprinus aureus*). In China, whence they originally came 150 to 200 years ago, they are raised by those who pursue it as a business, and the breeds are crossed to produce in them fantastic colors and habits. They exhibit some with streaked markings resembling Chinese letters ; some that are white as paper, with pearly-pink splashes on the body, and curious markings about the head and tail ; some that are a rich scarlet, shading to black on the back, in the midst of which is a white cross, with two transverse bands ; some that are a flesh-color ; some covered with crimson spots bordered with blue ; some of a deep carmine color, and shaped like an egg ; some with a drooping, fringe-like, ruby tail ; some, in short, of all conceivable hues and combinations. As a matter of *recherché* taste, any of these may be placed, when met with, in the tank, since their natures are much the same ; but they can be had sufficiently handsome at much less cost and with less anxiety.

THE STICKLEBACK (*Gasterosteus*), the MINNOW (*Leuciscus phoxinus*), and the GUDGEON (*Gobio fluvialis*), are

all pigmy fish, that may be chosen with discrimination for the AQUARIUM.

The Stickleback, which is also termed the Prickleback, on account of the small spines with which nature has armed it for defence, is one of the tiniest of all fish, besides being one of the most interesting. Though a dapper little fellow, very active and very courageous, he would soon fall a prey to all his companions, on account of his dwarfish size, were it not for the stiff, sharp, prickly arrangement, like a row of fixed bayonets, which embellishes the lower surface of his body. He can erect this at pleasure; and in that condition it is impossible for his natural antagonists to make a mouthful of him without seriously lacerating themselves, particularly as he is an irritable little creature, and remarkably pugnacious. With this weapon at command, he plunges into an impromptu quarrel, occasionally, with fish of considerable magnitude, and has been known to rip up their stomachs in his ferocity, leaving them dead upon the field of combat. Indeed, the stickleback is so mettlesome, and in his habits so belligerent, that when several are placed in a tank together, the males often make it a point to commence with a severe battle to determine which shall possess the favorite females of the company, and which shall be entitled to the choicest localities of their new domain. In this engagement death sometimes ensues; for the victor seldom gives the conquered much peace, unless quite exhausted himself in the struggle. The females in

the meantime, being inactive lookers-on, quietly bestow their affections on the conquerors.

The female stickleback is not often pretty, and the male is sometimes nearly black ; but the more showy ones are robed in a style of fanciful elegance. They may be found with many a shade of rich purple, blending into green and white adown their glossy backs, and with a vivid scarlet glowing on their breasts. As we have said in another part of this treatise, these colors intensify when the stickleback is excited, until they gleam with a brilliance and beauty beyond all imagination. The moment he is defeated, however, by a superior force, his colors fade away into a dingy, dull white, or a common-place combination of hues of no attraction. What is still more extraordinary, he, like a chameleon, assumes, for the nonce, the color of any vessel in which you place him. In a white bowl, he becomes white ; in a pink one, he rivals the rose. This is why he is so frequently indistinguishable in his place of abode ; and this may enable us to impart to him the complexion we most prefer.

With all his pugnacity, however, the stickleback is an affectionate and attentive mate. His gallantry is perfectly *exemplaire*. Unlike other fishes, he builds a nest, even, for his chosen partners. He is somewhat of a Mormon in the polygamous principle of his domestic economy, it must be confessed ; but this failing aside, he is a model of a husband. In his little mouth he conveys, about spawning-time, all the necessary materials, even from



great distances. With these he first constructs his foundation, and as each layer is formed, covers it with sand to give it weight, keep it in place and prevent it from being washed away by the stream. He then rubs himself carefully and well over all these layers, and a glutinous substance that exudes from his skin furnishes a cement that secures the whole. With roots and twigs he attaches the floor, thus reared, permanently to its anchorage-ground. This done, he erects his uprights, fills in the sides and top, cements the entire edifice as before, and completes a tidy, well-inclosed, comfortable dwelling, with two orifices for entrance and retreat. With a home of his own—every stickleback is his own landlord—it is to be presumed he then settles down, a well-behaved family-fish, and attends to the marital duties which nature has set before him.

The MINNOW is so called from *minimus*, the least ; because, with the exception of the stickleback, he is the infinitesimal specimen of fresh-water fish. He is handsome, lively, exceedingly agile, uncommonly graceful, very hardy, and in all respects a very "pink" amongst his congeners. In fact, he is known in popular parlance as the Pink in some quarters ; but that is probably on account of his summer wardrobe. His back is ordinarily a fresh olive-green in color, very glittering in the sun-light, and shades to a silvery white beneath. This white, in warm weather, is delicately tinted with rose. The minnow is readily tamed. With a little patience he can be

taught to come to the side of the AQUARIUM, and take food from the hand. He soon acquires confidence, if undisturbed, and will follow his fair keeper quite around the tank, manifesting considerably what may be called a grateful recognition.

The GUDGEON is another amusing little fish. He seldom grows to over four inches in length; but as he is gregarious, and accustomed to swim in company, three or more, if any, should be introduced into the AQUARIUM together. His back is of a purplish-green; his belly a faint purple running into a dusky-white; his tail and dorsal fin a light brown, waved or spotted with darker brown. He thrives fully as well in the tank as in his native home.

The SUNFISH, or common Pondfish (*Pomotis vulgaris*), is so familiar to the least instructed that he needs no description. He owes his common name to the glittering hues he exhibits while basking in the sun. In some parts of this country he is known as the Pumpkin Seed, on account of the numerous spots that adorn his body. He is quick, comely, and interesting; but we cannot commend him as a companion for other fish in the AQUARIUM. He is excessively quarrelsome, and has a vicious habit of attacking the eyes of his associates, as if he took a delight in rendering them blind to his own pursuits.

The SHINER (*Stilbe chrysoleucas*) is a beautiful little fish, and well adapted to the AQUARIUM. He is to be found in the fresh-water streams of this and the adjoining States. We have kept a number of them for months,

in a small tank, without impairing in the least their health or playfulness.

The BARRED KILLEFISH (*Fundulus zebra*) is found in the salt-water creeks about New York, but thrives well in a fresh-water AQUARIUM. His body is marked with a variety of silvery white spots and steel-blue dots, which present, at times, a singularly beautiful appearance. He is a vivacious little fellow, full of spirit and mirthfulness.

Small EELS are sometimes selected for an AQUARIUM. If quite small, they may answer. Their sinuous movements may form an agreeable contrast to the rapid and elegant motions of some of the fish we have named.

In a large tank, the following would increase the list, in enumerating a variety. We do not recommend them, except in special cases, where space is of not so much moment.

The RIVER MOON-EYE (*Hyodon tergisus*) is popularly known as Herring, as River Herring, and as the Toothed Herring. We have kept them finely in a capacious tank.

The COMMON SUCKER (*Catostomas communis*) is abundant in this State. We have caught them of excellent quality for rearing, in the Croton River.

The BRILLIANT CHUBSUCKER (*Labes oblongus*) is a handsome fish. It has a green back, shading into a lemon-yellow at the sides. It is common to most fresh-water streams, both here and in the eastern States.

The BROWN CATFISH (*Pomelodus pullus*).

The AMERICAN YELLOW PERCH (*Pera flavescens*).

The BROOK TROUT (*Salmo fontinalis*).

The COMMON PICKEREL (*Esox reticulatus*.)

#### FEEDING THE FISH.

Before we leave this portion of our subject, it may be as well to indulge in a few remarks relative to supplying the fish with food, now that we are supposed to have gotten them, with the plants and mollusca, into the AQUARIUM. The spawn of the mollusca serve in a measure, it is true, to furnish the daily table of our favorites, and, in peculiar circumstances, this might be enough to satisfy their hunger. But, we desire to do more than this. It is our wish to render them plump and hearty ; to bestow on them all the beauty of shape and brilliancy of coloring, of which they are susceptible. To effect this, they must be made happy and contented ; they must be so well fed as to make life an enjoyment to them ; their wants and necessities must be so anticipated as to rob them of all disposition to forage upon each other, or thin themselves in their endeavors to hunt up a banquet. In short, they must be fed, and fed daily ; but *never with biscuit or bread*, both of which are always perilous to their health, and never nutritious. Common red worms, cut up small, form the best food for them. As an occasional change, you may give them well-scoured gentles and millet seeds. The worms are best, at any time, for small fish, and may be easily kept through the winter, by placing them in a

small box filled with earth, and keeping the box in some spot where it cannot be reached by the frost. Pieces of dried beef, divided into minute fragments, will do as a substitute sometimes for the worms. A little flour, mixed up into paste, and made into pills, is relished by all kinds of fish. About a pill to each fish is sufficient. In spawning time, a few of the brewer's fresh ale-grains are given in England, and might answer here. But care must be taken not to kill with kindness. They must be fed sparingly, and whatever is not eaten must be removed, to avoid the unpleasantness of its decomposition.

## CHAPTER VII.

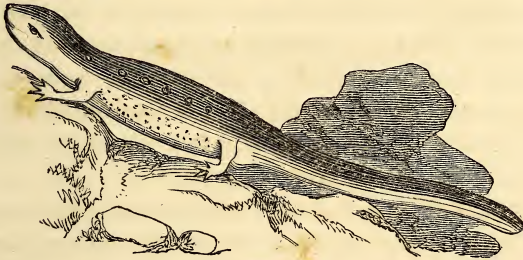
### FRESH-WATER REPTILES AND INSECTS.

#### THEIR KINDS AND PURPOSE.

**I**N order to maintain the pleasing resemblance of our **AQUARIUM** to the flowing river and majestic lake, it will be judicious in us to introduce a few fresh-water reptiles and insects, to complete the illusion. If they perform no other part in the aquatic entertainment, at least they strengthen the company like so many supernumeraries in costume, and fill up the gaps which, in some diverting performance, might mar the perfection of a brilliant scene. They are not positively demanded by the exigencies of the case. We could do without them, perhaps. But the **AQUARIUM**, as an artistical imitation of Nature, who leaves no unfilled hiatus in her scale of nicely balanced existences, would not be complete without this addendum, and many an hour's satisfaction would be lost for want of such a costless opportunity to study some of the more diminutive but not less extraordinary phenomena of vitality. As it is advisable to be more fastidious than generous in supplying this department, we shall only

allude to the animal life of this kind most serviceable in an AQUARIUM for private purposes. The first one and the best one, to our taste, is :

The CRIMSON-SPOTTED TRITON (*Millepunctatus*), often called the Water Newt, and by many the Eft, or the Evet. No fresh-water tank can be said to be perfect



Crimson-spotted Triton (*Millepunctatus*).

without this droll and playful creature. He is to be found in ponds and similar localities, but readily accustoms himself to any place where he enjoys comfortable accommodations and good treatment. Nothing could be more nimble, more eccentric, more curious than his movements, as, now balancing himself upon a leaf, now "treading water" in the centre of the tank, now darting headlong towards the bottom, and anon dashing gallantly to the surface and creeping like a pigmy crocodile to the top of a projecting rock as if for observation, his symmetrical proportions are displayed to the greatest advantage. He

is a notable little swimmer, and withal, although his shape *does* put us in mind of "the monster of the Nile," an inoffensive, light-hearted animal, who gambols his time away in the happiest possible manner. Some of the Tritons are nicely colored, are vividly marked about the tail and under parts of their bodies, and have bright laugh-like, glittering eyes.

It would be as well to keep the cover on the tank in which the Triton is confined, for he is as adventurous as he is lively, and when permitted, will extend his explorations into the room itself, crawling about in places to which he can find access without the slightest regard to ladies' nerves or the delicacy of the occasion.

As the Tritons feed upon the minute parasitical insects that injure aquatic plants, as well as upon ordinary earth worms (of which they are fond), they are really useful, as well as comely, in the AQUARIUM. Besides this, they go through no less than nine different stages of being from the time of their first appearance from the egg, before they perfect their physique and accomplish their mission in the world, and every stage presents us with some novelty worthy of an idle hour's consideration.

There are three kinds of Tritons, but our allusions have chiefly reference to the smaller kind, which has a smooth skin, and in summer is a full rich grey on the back, spotted with black, while he is of a fine orange color underneath, enriched with large prettily-formed spots of crimson, and has a remarkable fin-like crest running the whole



length of his head and tail. The female is not so richly colored, at that season.

The RED SALAMANDER (*Rubra*) is a common species of the Triton, and to be found under stones in shallow streams. It is a still handsomer animal than the one last



Red Salamander (*Rubra*).

described, its color being a red, more or less vivid, ornamented with small black spots profusely scattered over the body and tail.

The DARKEY TRITON (*Triton niger*) is much larger in its proportions. His haunts are similar to those just mentioned. By all means have a few Tritons or Newts in your AQUARIUM.

The FROG (*Rana viridis*) is a relative of the Triton, and in the tadpole state the two cannot easily be distinguished. As they grow, however, their differences become more apparent. The *branchiæ*, or external gills, of the Triton spread out beautifully, and assume a distinct form. His tail also lengthens, while that of the frog tadpole diminishes. The frog, in his tadpole condition, makes an

agreeable addition to the AQUARIUM ; after his gills have disappeared, however, his tastes alter and he has a decided hankering for more terrestrial enjoyment. As a frog, he cannot live exclusively in the water. He is a first-class diver, and an expert at natation, but he cannot remain altogether under the billows, and if forced to, inevitably drowns. By obtaining in April or May, some of the spawn, you will be able to witness, as the frog develops, a continuous succession of piquant phenomena.

The SPRING FROG (*Rana fontinalis*) makes his home in clear pools and running streams, and feeds exclusively upon water insects. He is one of the very earliest products of the season, and is easily domesticated, when his mode of satisfying his hunger is exceedingly interesting to witness.

The BOAT-FLY (*Natanecta*) is ingeniously adapted to an aquatic life. His hinder legs are fringed and compressed in the lower joints, so as to look like oars, and he delights in swimming upon his back—his eyes being so placed, that he can observe both above and below his body, and thus gain intelligence of the approach of danger or the vicinity of his prey. You will find him in stagnant ponds, and in tardily-flowing streams, and will be gratified with his comical antics and manœuvres if you make a place for him in your aquatic community, and feed him so as to keep him in health and activity. If not fed regularly, he becomes voracious, and preys upon other insects without mercy or remorse. You will see him lie, listlessly, close

to the surface of the water, with his legs extended as if ready to move off. He is then watching for a victim, and if one comes within reach, he darts upon it with rapidity, and is out of sight with it in a moment, carrying it to some hiding-place, where he sucks out all its living juices. And he in turn becomes the food of—

The MARGINED BEETLE (*Dyticus marginalis*), a singular, scorpion-like creature, in its larva state, that it would be better to avoid altogether in your tank. When it has grown into a Water Beetle it is pretty, and when well fed, by suspending a piece of meat to a string for its use, *may* be innocent. In its larva state, it is so destructive and so homely, that it is known as the Water Tiger or Water Devil, and should a boat-fly approach within its range, the intruder is torn piecemeal in an instant. At the proper time, this Tiger builds himself a case, something like that of a chrysalis when about to be transformed into a butterfly. In this case his change occurs, and he comes forth a DIVING BEETLE, emerging from the mud at the bottom of the stream where he has buried himself, with shining wings and a form altogether much more prepossessing than his original. It is unsafe, however, to keep him, or in fact, any of the water beetles, in a tank with fish.

The CADDIS-WORMS are the larva stages of the various species of the *Phryganea*. The angler is well acquainted with it, as it makes its home in running streams, and resides in a grotto or cell which it constructs around its

person while awaiting its metamorphosis into a winged creature. With wonderful patience it collects very small shells and stones to form its tube-like dwelling, which is about the size of a wheat-straw ; and having cemented them together, and rendered the whole quite smooth inside, as well as at the bottom, he drags himself along the bed of the tank, with his house about him, or else adds a piece of light wood to his habitation, and floats up nearer to the surface.

The DIVING WATER SPIDER (*Argyroneta aquaticus*) dwells in ponds and running streams, and is a particularly agreeable inhabitant of the AQUARIUM. Its habits and appearance are very remarkable. Although it lives at the bottom of the tank, and is surrounded by water, it is never touched by that element ! It is inclosed in a bubble of air, which surrounds it like a silver box, and on the bed of a stream may easily be mistaken for a globule of quicksilver. Within that bubble the little creature performs all his functions of eating, spinning, and sleeping. He lives, in fact, in a crystal palace, built for himself, as though he were the inhabitant of an enchanted castle. This spider must not be placed in a tank containing fish or other animals of the kind that consider him and his shining raiment a *bonne bouche*, or he will soon become their victim. His tank, too, should be covered with gauze.

The ONISCUS AQUATALIS, and also the HYDROUS PICENS, or LARGE WATER BEETLE, may, on the contrary, be associ-

ated with the fish, etc., in a tank, for they are both inoffensive. The *hydrous* feeds upon the animalculæ that



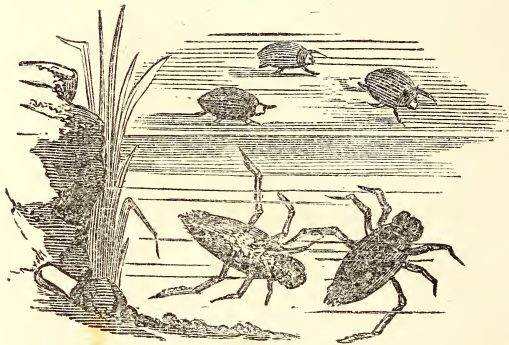
Large Water Beetle—(*Hydrous picens*).

are always abundant in the vicinity of aquatic plants, and may be taught to become very tame and familiar. The

Oniscus has a body composed of seven articulations, besides the head and tail. His is round on the back, and flat underneath, while from each side spring seven feet, each growing larger as it approaches his inferior extremity. He is active and eccentric. To complete the list we may add

The WHIRLIGIG (*Gyrinus natator*), a pleasant, playful little fellow, with a brilliant coat of bright bronze. He

Gyrinus Natator



Boat-fly (Notanecta).

spins around in the sun, on the surface of the water, and amuses himself as though he had been created for no other purpose. His good nature and well regulated appetite may always be depended upon. He is the prince of jolly ones in his sphere, and too good-natured to injure anything that may think proper to share his

hospitality. He is as shy, however, as he is nimble, and it demands no little dexterity to catch him, as he dives on the approach of a footstep. He inhabits all quiet waters, and can be seen gyrating in and on almost every roadside pool.

## CHAPTER VIII.

### THE SALT-WATER, OR MARINE AQUARIUM.

#### FITTING IT UP APPROPRIATELY.

HAVING completely instructed the reader (if he or she have paid sufficient attention to our remarks), in the part of forming, fitting up and stocking with plants, animals, etc., a FRESH-WATER AQUARIUM, we now propose to go as minutely into the details of the construction and management of a SALT-WATER, or MARINE AQUARIUM.

All that we have said in chapters two, three, and four, applies to an AQUARIUM of any character.

The MARINE AQUARIUM differs from its fresh-water relative, of course, in the "fitting up." The rockwork placed in it is designed to illustrate the aquatic landscape presumed to exist, not in a river, but in "the great deep," and in exercising his taste the amateur should be scrupulous to introduce nothing which will not harmonize with this prevailing idea. Coral will prove, on this occasion, an appropriate ornament to the tank, although in the fresh-water tank it would have been so much out of place.



At this stage of the enterprise, as we have said before, there is an abundant opportunity for artistic display, and on a scale limited only by the exigencies of size and consistency. Little and graceful, is better than much and ungainly, in this connection. In making up your scene do not overcrowd the canvas ; be as picturesque as you please, but study simplicity ; and above all other things, be natural. Then will your AQUARIUM, with its storehouse of wonders, become truly attractive. Its elegant contents will be set "like apples of gold in pictures of silver," and its gems from the ocean-depths acquire new charms from the good common sense, as well as the dainty taste and delicate aptitude which characterize all that surrounds them.

Having fitted your rockwork to the tank, and secured everything in its place in such a manner that an ordinary movement or an accidental jar will not disarrange its architecture or disturb its foundations, we next proceed to supply the minor forms of being which must precede the advent of the fish and other animals.

The ocean, as a garden, will not afford us so wide a margin for selection as the lake and river ; not because marine vegetation is less plentiful or less diversified, but because only a certain number of the plants accustomed to flourish amid the vastness of the sea-parterres, are willing to be "cribbed, cabined and confined" within the limits our AQUARIUM can afford them. They soon languish and die ; and as, however prepossessing they may be at

first, their decomposition affects the general health of the sojourners in the AQUARIUM, we are compelled to dispense with their presence altogether. The Oar-weeds and Tangles (*Laminaria*), as a general rule, are all open to this important objection. They cannot endure captivity, however young, and however assiduous you may be in your attentions. They decay rapidly, and begin to slough off in slimy shreds, at once very homely and very pernicious. The class called *Fuci* are not so precarious, but their deformity excludes them from all consideration under this head. The *Sponges* will not live under any circumstances in a tank. As they are really not plants, but animals, it may seem somewhat out of place to allude to the fact here ; but as most people persist in considering them vegetable in their nature, we treat them as such for the present purpose. In obtaining, therefore, small pieces of rock, with plants attached, you cannot be too particular to render them as clean as possible. They must be completely divested of all spongy growth, as well as of all other vegetation that will not thrive in your AQUARIUM, for the moment they begin to decompose they give off a most obnoxious gas, sulphureted hydrogen, which rapidly converts your tank into a miniature ocean of ink—a Black Sea without hyperbole.

Should you propose to supply yourself with specimens for your AQUARIUM while on a visit to Newport, Nahant, Cape May, Rockaway, Bath, or other bathing-places, a suggestion or two in regard to the manner of usefully

accomplishing the agreeable duty may not, at this juncture, prove *mal à propos*.

In the first place, provide yourself with an attendant, and let him accompany you with a crowbar, a cold-chisel, a hammer with a cutting edge as well as a striking one, and a basket containing a couple of wide-mouthed jars. Select low water as the time for your exploration. The spring-tides occur twice in a month, at the changes of the full and new moons. The ebb-tides that succeed them are, of course, the lowest possible, and the exact hour at which you may best avail yourself of the circumstance you will find noted down in the almanac. Few marine plants or animals live in situations much exposed and hence, when the waves retreat well from the shore they leave it supplied with many an unexpected curiosity of which you may take lawful possession, provided you are early enough upon the ground, are active, vigilant and industrious.

With his crowbar, let your assistant turn over the large stones you meet; beneath their shadow, or under their surface, you may often secure excellent specimens. Pry into the rough clefts and fissures covered over with Bladderweed and Oliveweed, which abound among the low, dark ledges of shelving rock. Peep into the little pools and basins scooped out of the stony mass where it rises in rude, irregular, massive forms, about you. Hidden in these secluded spots you will often discover the loveliest of marine plants; and when you do, make no attempt to remove it from its bed, but out with your hammer and

chisel, and carefully cut away a sufficiently large piece of the rock to which it is attached, and place the whole in your basket. A bed of fresh seaweed for it to repose on, and more with which to cover it, will keep it uninjured till you return. When the plant thus obtained is a very delicate one, particularly if taken from beneath the surface of the water, it will be better to place it at once in a jar and cover it with the element it loves, as a few minutes' exposure to the air will metamorphose its beautiful colors into the dull hues of death.

In these researches for plants, you will be able to obtain your mollusca, as they go crawling freely over the surface of the rocks, or reposing idly amid the thick under-growth of weeds. You will also perceive the Acorn Barnacle in great numbers, as well as the swimming Crustacea. The Actinia, etc. (Sea Anemones), will be seen adhering to the rocks. Insert your thumb nail nicely beneath their base, where they are so accessible, and you dislodge them at once. Your chisel must dispossess of their abiding-places those which reside in cavernous localities. The Sea Stars, Sea Urchins, etc., will be detected, and also many a novelty among the Annelides, under loose stones, at the lowest tide-level. There, too, love to dwell many a singularity of the Crab kind, as well as the Nudi-branch Mollusca, which, transferred to your AQUARIUM, will amply reward you for all your patience and all your exertion. It must be frankly confessed that you can have your tank fitted up with still greater perfection (and at

very little expense) by those who make it a speciality and a profession. Your personal sacrifice of time and attention is wholly superfluous, except as a matter of entertainment. It is as well, however, to know to what extent the amateur might supply himself with subjects for his future marine conservatory, if unable to reach those whose resources can be made promptly available, or if disposed to enjoy himself in a ramble as a practical naturalist. An hour or two spent in such an intimate communion will only the better adapt an observant mind for subsequent interviews with Nature on the more limited scale of an AQUARIUM; and cannot but gift it with enlarged conceptions of that eternal beauty, fitness and order, which preëminently characterize the mysterious and fascinating phenomena of which he must become the privileged witness.

## CHAPTER IX.

### SUB-MARINE VEGETATION.

#### SEAWEEDS, AND THEIR HAUNTS.

**T**HE WATER.—The water from the ocean itself is, beyond all question, the best for a marine AQUARIUM. No artificial substitute can approach it in point of excellence. It should always be procured, too, not from the beach, or from any spot in the vicinity of the shore. A trifling sum will tempt the cook or steward of any sea-going vessel to fill you a cask from the clear and open ocean ; and this done, you have the material provided by nature herself, and with which, therefore, other things being equal, her creatures have no right to express dissatisfaction. The cask itself, if not new, should never have contained, at least, anything calculated to impart a taint to the wood, as the sea water would be certain to acquire, from that defect, some quality that would, or might, render it fatal to all the life deposited in it. No cask that has been used for spirits, wine, acids, chemicals, etc., will answer. Even the bungs should be, if possible, quite

new, if a proper regard be paid to the success of the AQUARIUM.

There may, however, be circumstances in which the use of actual sea-water is left temporarily out of the question. In such a case, we are coerced into the choice of an artificial combination which will approach as nearly to the original as science may permit. The following formula will be found to adapt itself to this necessity with tolerable exactness, as it corresponds, with a slight exception or two, to the chemical constituents of sea-water, viz. :

Common table salt, . . . . .	3½ ounces,	} Troy.
Epsom salts, . . . . .	¼ ounce,	
Chloride of magnesium, . . . . .	200 grains,	
Chloride of potassium, . . . . .	40 grains,	

Add to these salts a little less than four quarts of river water, and you will have a solution that we do not recommend, except *au pis aller*, when you are unable to supply yourself with the genuine article. It is confidently stated that the iodine, iron, silica, lime, etc., which is found in sea water will soon be communicated, by use, to the composition above given. How far this statement may agree with the fact, it is not in our power to decide, as we have never been placed in a position which demanded a resort to such extremities. The assertion is made, however, on good authority.

Your tank "fitted up," and the salt water provided,

you will next proceed, as directed in chapter fifth, to supply the latter by installments. This effected, and the usual care exercised, the tank will be prepared in about a week for its share of vegetable existence—since, in the water, as on earth, animal life must always be preceded by that copious organization of subordinate being, which, comparatively insignificant as may seem its pretensions, enacts so important a part in the physical economy of nature.

**MARINE PLANTS.**—In this department of service, we are afraid that we shall have to affect an air of erudition we should much prefer, if possible, to avoid, for the sake of more readily reaching the understanding of the unlettered. On land, and about fresh-water streams, we have common or popular names for almost every object, in addition to those titles bestowed on them by science, for the purpose of facilitating their classification. The ocean flowers have much escaped this species of familiarity. For ages “born to blush unseen,” they are only, in the present era, becoming the subjects of vulgar manipulation and admiration. They stand, with few exceptions, therefore, nameless in our vernacular tongue; and we are compelled to introduce them in those classic terms by which they are recognized in every country, no matter what its local speech or native diction.

The following list of names will be found to embrace the names of such as have been tried in the marine **AQUARIUM**, and discovered more or less satisfactory. We arrange



them alphabetically, for convenience, after which we shall select for the reader those we are convinced will prove most worthy of experiment in private AQUARIA.

ALPHABETIC LIST OF SEAWEEDS SUITABLE FOR THE  
AQUARIUM.

<i>Asperococcus Turneri</i>	- -	Turner's asperococcus.
<i>Bangia fusco-purpurea</i>	-	Dark-purple bangia.
<i>Bryopsis plumosa</i>	- - -	Feathery bryopsis.
<i>Chondrus crispus</i>	- - -	{ Curly chondrus, or carra- geen moss.
<i>Chrysiomenia rosea</i>	- - -	Roseate chrysiomenia.
<i>Corallina officinalis</i>	- -	Common corallina.
<i>Chordaria divaricata</i>	- -	Small-branched chordaria.
<i>Callithamnion arbuscula</i>	-	Tree-like callithamnion.
<i>Chordaria flagelliformis</i>	-	Whip chordaria.
<i>Codium tomentosum</i>	- -	Close-haired codium.
<i>Codium bursa</i>	- - - -	Purse-like codium.
<i>Ceramium strictum</i>	- -	Pink ceramium.
<i>Delesseria Americana</i>	- -	American delesseria.
<i>Delesseria alata</i>	- - - -	Winged delesseria.
<i>Delesseria sanguinea</i>	- -	{ Crimson or oak-leaved de- lesseria.
<i>Dumantia filiformis</i>	- -	Slender dumantia.
<i>Ectocarpus siliculosus</i>	- -	Podded ectocarpus.
<i>Ectocarpus tomentosus</i>	- -	Hairy ectocarpus.
<i>Gigartina acicularis</i>	- -	Pointed gigartina.

<i>Gracilaria confervoides</i>	-	Sponge-like gracilaria.
<i>Hildebrandtia rubra</i>	- -	Red hildebrandtia.
<i>Iridæa edulis</i>	- - - -	Eatable irideæ.
<i>Laurencia pinnatifolia</i>	-	Pinnate-leafed laurencia.
<i>Laminaria phyllitis</i>	- -	{ Leafy laminaria, oar weed, or tangle.
<i>Leathesia Berkleyi</i>	- - -	Berkley's leathesia.
<i>Laminaria digitata</i>	- -	Fingered tangle.
<i>Melobesia lichenoides</i>	- -	Lichen-like melobesia.
<i>Nemaleon multifida</i>	- - -	Many-cleft nemaleon.
<i>Nyctophyllum punctatum</i>	-	Spotted nyctophyllum.
<i>Polysphonia parasitica</i>	-	Parasitic polysphonia.
<i>Ptilota plumosa</i>	- - - -	Feathery ptilota.
<i>Punctaria latifolia</i>	- -	Broad-leafed punctaria.
<i>Plocamium coccineum</i>	- -	Scarlet plocamium.
<i>Porphyra vulgaris</i>	- - -	Common porphyra.
<i>Peyssonetia Dubyi</i>	- - -	Duby's peyssonetia.
<i>Rhodymenia palmata</i>	- -	Dulse or dillis.
<i>Rhodymenia lacinata</i>	- -	Lace-edged rhodymenia.
<i>Rytiphlæa pinastris</i>	- - -	Pine-like rytiphlæa.
<i>Taonia atomaria</i>	- - -	Speckled taonia.
<i>Ulva latissima</i>	- - - -	{ Broad-leaf ulva or sea-let- tuce.
<i>Vaucheria submarina</i>	- -	Submarine vaucheria.
<i>Zonaria parvula</i>	- - -	Lesser zonaria.

To which we may add the

*Cladaphoræ rupestris.*

*Chylocladia articulata.*

*Dorsga elegans.*

*Entomorpha ramulosa.*

*Entomorpha compressa.*

*Gelideum corneum.*

*Phyllophora.*

*Padina pavonia.*

*Polysiphonia arceolata.*

*Tubularia indivisa.*

The *Asperococcus* is a singular looking, tube-shaped, light-yellow plant. The *Spotted Asperococcus* is of a light green, dotted with black.

The *Bangia Fusco-purpureæ* are seen in red violet tufts, and resemble glass-plumes, colored up to suit a taste for the purples.

The *Bryopsis plumosa* is a very elegant seaweed, and one that thrives exceedingly well in an AQUARIUM, besides adding greatly to its attractions. Its name, "Bryopsis," is derived from a couple of Greek words signifying a resemblance to moss; and the "Plumosa" is indicative of its light, pretty, feathery appearance. Its color may be termed a yellowish green. It is common between the tide-marks at Hurlgate, Yellow Hook, Bergen Point, and in various portions of New York bay. It may be seen early in the season, velveting over, as if with a rich carpet, the floating timber. At a later period it mosses in its delicate embrace the rugged face of rocks. The latter is the choice

kind for selection, as the timber is certain to decompose and contaminate the water in your tank.

The *Chondrus crispus* is another strikingly appropriate as well as handsome plant for the AQUARIUM. When dried, this weed constitutes the carrageen moss of trade, and is made up into jellies as an article of medical value. It may be found sometimes in open pools, and sometimes hidden away under piled up rocks, where, entirely enveloped by a thick and tangled mass of the rank olive-weed (*Fucus*), it grows in little leafy bushes, each leaf widening to a flattened tip. In its native element this plant is a perfect aggregation of brilliant hues, some of its leaves gleaming with nacreous tints, as though made of mother-of-pearl, and some shining like tempered steel, in blue, violet, and glistening semi-crimson.

The *Chrysemenia rosea*, with its pink fronds, is a unique specimen. It is hard to say what it resembles, but it is not inelegant.

The *Corallina*, in its earlier stage, may be seen, like a shelly or stony cast, incrusting with a dull purple hue, like that of some of the mosses, the rocky surface of low-lying pools. It is exhibited in irregular patches, continually increasing from the circumference in concentric zones. By and by, it shoots up into little bushes of many-jointed twigs, which jut out on every side, or gather in bunches, and hang lovingly over the verge of the precipitous rocks. It is chiefly composed of lime, and is of a stony hardness; yet it is a vegetable beyond dispute, and in a

tank lives well and long, besides adding to its perfection. When white in color reject them, as they robe themselves, like true Orientals, in that color to indicate the season of death.

The *Chordaria divaricata* is a bright green plant, with a multitude of little branches. The *C. flagelliformis* is a deep olive, and, as its name imports, stands up like a bunch of whips.

The *Callithamnion arbuscula* is a bushy specimen of the *Algæ* tribe, and has all the aspect of a juvenile tree.

The *Codium tomentosum* is remarkable for its complexion of light, vivid green. Each branchlet is ornamented with an edging of delicate ciliæ, as if it were a border of a daintier shade. The *C. bursa* belongs particularly to the coast of France, and is an oddity, if nothing more interesting.

The *Ceramium strictum* grows in crimson tufts, and may easily be mistaken, except in color, for a *Bangia*.

The *Delesseria Americana* and *D. sanguinea* are dark scarlet weeds, abundant in the environs of Hurlgate, and about Boston harbor. It is a showy specimen for the AQUARIUM, but the season enjoyed by it is much briefer than many other of its species. It is, in fact, unusually delicate, and a few minutes' exposure to the air imparts to it that jaundiced tint which shows that death has already commenced his work of destruction. The *D. alata* grows in thin, much cut leaves of crimson.

The *Dumantia filiformis* may be recognized by its tufts of lively green.

The *Ectocarpus siliculosus* is a bright green, feathery-shaped plant. The *E. tomentosus* is much closer in form, and resembles a spray of wild broom.

The *Gigartina acicularis* is a dark brown, verging on black, and were it exaggenated and placed on the head of a buck, would pass very respectably for antlers.

The *Gracilaria confervoides*, with its purple branchlets, is graceful and curious.

The *Hildebrandtia rubia* grows on pebbles and rocks, and rejoices in a garb of brilliant red.

The *Iridæa edulis* is known by its solid, deep crimson, or dark-brownish scarlet fronds, looking, at times, like red morocco cut into pear-shaped pieces. It is easily torn, and amid the waves its smooth leaves are soon made rugged.

The *Laurencia pinnatifolia* and *L. pinnatifida* are found in tufts, with cut leaves, and a pointed outline, occasionally of a deep yellow, and occasionally a dull purple hue, as the plant may have happened to grow exposed to the sunlight or hidden in the ocean shadows. The sunny colors are the bright ones, of course.

The *Laminaria phyllitis* is seen in clusters, neatly frilled, of delicately thin texture, and a yellow brown in color, like some fair lady's ringlets. The *L. digitata* has a broad, smooth, leathery leaf of dark brown, on a slender stalk, and as it matures, splits into long fingers, or ribbon-like

bits. These Oar-weeds, or Tangles, are of no value, we think, to the AQUARIUM.

The *Leathesia Berkleyi* look like convex kernels done up in bronze.

The *Melobesia lichenoides* is a pale, sulphur-colored plant, of moss-like appearance.

The *Nemalion multifida* has violet, antler-like fronds.

The *Nyctophyllum punctatum* is a charmingly marked plant, with a richly frilled edge, and black maculations.

The *Polysiphonia parasitica* is a delicately branched parasite, that makes its home on the lichen-like *Melobesia*.

The *Ptilota plumosa* is a feathery plant, of a dull, red hue.

The *Punctaria latifolia* is a delicate pale plant, thin as tissue-paper, with a light buff surface, sprinkled over with minute dots of vivid black.

The *Plocamium coccineum* grows in pretty pink tufts.

The *Porphyra vulgaris* is a very common, but surprisingly picturesque, sea weed. It has a large and gracefully-bending frond of rich purple, with narrower and younger fronds springing from the same root.

The *Peyssoneta Dubyi* is a pale crimson plant, embracing the first convenient pebble.

The *Rhodymenia palmata* grows in bunches of broad, dark-red leaves, the size of one's hand, smooth and glossy in appearance. The red often runs into a dark crimson, which shades off into a pale green towards the tips. The *R. lacinata* is bright crimson, and has the finest possible

transparent fronds. The Rhodymenias are not much to be recommended for the AQUARIA. They are pleasing, but too uncertain.

The *Rytiphæa pinastris* is a brown-fronded plant, and wins its title on account of its pine-like formation and growth.

The *Taonia atomaria* grows like a bunch of fascies, of a brownish-green hue.

The *Ulva latissima*, or Sea Lettuce, grows everywhere, almost, on the coast, and is one of the best sea weeds for a tank in the entire category. It prospers in that species of confinement as well as in its home in the ocean, and throws off oxygen continually and in great abundance, for the support of the animal life around it. The green weeds, as a general rule, are less precarious than the red ones, and hence ought always to be preferred by the amateur; but the *Ulva* is most to be preferred of all. Its broad leaves, of brilliant green, are familiar to nearly every eye. They are thin as silver paper, all puckered up and folded at the rim, and usually torn and chafed away at the edges. It is to be found in the hollows of the rocks, between tide-water marks, luxuriating almost to the level of high water.

The *Vaucheria submarina* is a graceful light green, and not unattractive plant.

The *Zonaria parvula* is a small brown plant of the pebble-hugging species.

The *Cladophoræ rupestris* does well in a tank, and fills



up the hollows in the artificial rock to advantage. It is of a bluish green, that harmonizes well with the sea water.

The *Chylocladia articulata* is a pretty weed, like a multitude of "tiny, oval bladders of red wine, set end to end in chains." It grows in dense, mossy patches, on the perpendicular face and overshadowed edges of the rocks.

The *Dorsga elegans*, a showy red weed, may be found in all portions of our harbor, from half-tide to low-water mark. When removed young to the tank, it flourishes very satisfactorily.

The *Entomorpha compressa* is also quite common in our bay, and in the vicinity of Long Island Sound. It is a green weed, and grows rapidly in the AQUARIUM. The *E. ramulosa* is equally suitable. In form and size this plant exhibits great variations. It is full branched, and much twisted in figure.

The *Gelideum corneum* is a red weed, usually slender and of small size, its leaves fringed with delicate processes all round. It is a hardy plant, and so is

The *Phyllophora*, a brilliant red weed.

The *Padina pavonia* is a comely plant, fan-shaped and brightly radiated.

The *Polisyphonia arceolata* grows in reddish-purple tufts, and presents an agreeable contrast beside the light green or pale yellow leaves of its companions.

## CHAPTER X.

### ANIMAL LIFE IN THE MARINE AQUARIUM.

THE PLANT-ANIMALS, OR ZOÖPHYTES ; THE MOLLUSCA, ANNE-  
LIDES, ETC., ETC.

THE Marine AQUARIUM now supplied with appropriate vegetation, and fitted at length for that more active organization of existence which we term animal life, our next duty is to tenant it with creatures to whose good character, suitable habits, and prepossessing wardrobe we can bear honest testimony.

We might proceed at once to introduce our select *coterie* of mollusca, crustacea, or even fish, but, in the natural gradation of being, the wonderful *zoöphytes*, which, to all appearance, are ocean flowers, and yet are really animals, endowed with mouth and stomach, and the means of locomotion, should take precedence in this connection.

ZOÖPHYTES.—The Actiniæ, or Sea Anemones, may safely be pronounced the most gorgeous, as well as the most extraordinary of the zoöphytes. They are all entitled to the character of beautiful, but the colors of the actiniæ are superb beyond ordinary realization. With

their tentacles thrown out like the petals of a flower, but employed, in that fair disguise, as arms for arresting



Group of Actiniae.

their unsuspecting prey, nothing could be less suspicious, nor more bewitchingly deceitful. It is not at all marvellous that they passed so long for oceanic vegetation,

nor yet when, only a portion of their novel peculiarities became the subject of observation, that they were so generally held to be the grand connecting link in which were imperceptibly fused the attributes of animal and vegetable existence.

There are many species of *actiniæ* known to naturalists, all of which would be highly ornamental to a marine AQUARIUM, but some of them perish when wrested from their habitat in the sea; while others, with little persuasion, accommodate themselves to their new condition. The former may be briefly alluded to, but the latter should be the particular object of our attention.

The Sea Anemones adhere to rocks. A certain class often dwell high up, exposed to the air, but the rarer kind in more concealed and out of the way places. They must be carefully removed, as we have suggested in other cases, by inserting the finger-nail beneath their base, loosening their hold, and quietly shoving them off. Those that refuse to yield to such insinuating influences, must be captured by chiselling away that portion of the stone to which they cling so pertinaciously. When secured, the next difficulty is to transport them safely. To accomplish this feat, first place some wet, green *algæ* (sea-weeds) at the bottom of a basket. On this downy bed lay each one, after enveloping it well in more wet seaweed. Over them put another layer of the same material. In this condition they may remain for a day or two without injury. Great care must be taken, however, of

the base by which the animal affixes itself to the piece of rock, for a wounded base often occasions death. If the anemone enjoys the luxury of nerves at all, it is quite probable that the base is where the ganglion may be concentrated. Once in the AQUARIUM, if disposed to live at all, they will soon provide themselves with a suitable position, and proceed to business.

The *Actinia crassicornis* (Thick-horned Sea Anemone) would probably take the palm from all its congeners for beauty. The mouth is of a delicate straw color, the tentacles white, with bands of pink, and the body or stem a rich orange-brown, sprinkled with tubercles of a bright yellow. It seldom if ever flourishes in the AQUARIUM. The *A. gemmacea* (Gemmed Sea Anemone) might possibly contest the point of elegance with the *Crassicornis*; for its body is also embellished with rows of brightly tinted tubercles, and its whole surface toned with orange-pink, blue, and pale rainbow hues, while gem-like touches of blue, yellow, and brown, are seen about its mouth and sharply-pointed tentacles. The tentacles, as we have mentioned, are food-seizers, in fact, although they look so innocent; the tubercles have an air of still greater innoxiousness, but they are perfect engines of war, for they contain a thread, armed with a barbed and poisoned dart, which the creature can project to a considerable distance, and with an unerring certainty that leaves its prey but little hope of escape, however secure he may have imagined himself in his distance.

The *Actinia mesembrianthemum* (Carnation-like Sea Anemone) is well adapted to the tank, and not so difficult to



*Actinia dianthus.*

preserve as the species just mentioned. Its body is usually of a rich, warm brown, and its tentacles of a rosy

pink color. They are found, however, with a great variety of hues, and may be so chosen as to create increased interest by comparison. The *Actinia dianthus* (Plumose or Feather-like Sea Anemone) is another with an assortment of colors to suit itself. Some of them are scarlet, some snow-white, some a dull brown, some orange, and some even a light green. The *A. clavata* (Nailed Sea Anemone) is a brilliant white. The *A. anguicomis*, or Snake-haired, looks as if it were shaking a mass of serpents from its conical head. The *A. vestita* (Clothed Sea Anemone) constructs a shell for itself, into which it retires when disturbed, or when forsaken by the tide, thus metamorphosing itself into an article too common to attract attention. The *A. marginata* make its home on the rocks, at low water-mark, about our eastern coasts. The *A. carneola* belongs to the coast of Maine, and is only about half an inch in diameter. It may be known by its mouth, which protrudes far upwards on the disk, on the edge of which are the tentaculæ. These alternate in two rows of eighteen each. The *A. obtruncata* has a short body, and a broad, flat disk. The tentaculæ are placed between the mouth and the margin. They are short, and very blunt at the extremities, as if cut off. They are indistinct, and not numerous, and arranged alternately in rows of four or five. The *A. rapiformis* dwells in the sand on the coast of New Jersey. You may find them washed up sometimes on the sand, by the waves, when a careless observer would mistake one of them for an onion, or something of

that character. This is because, when disturbed, it withdraws the tentaculæ it usually displays above the common surface, and retreating thus into its habitation, loses its peculiar appearance. The young are more transparent than the old ones, and sometimes of a darker color.

The class of Zoöphytes, known as the *Lucernariæ*, are not without claims to favor. The *L. auricula* is a light pink in color, and is supposed to resemble the flower after which it is named, though some naturalists pronounce it more like the convolvulus. The *Campanulata* is more bell-shaped, and is of a liver color. All the *Lucernariæ* are too frail for the AQUARIUM.

The *Polyps*, or compound Zoötypes, may furnish us with a few specimens of utility. The *Pennatula phosphoræa*, or Sea Pea, is seen at times standing upright, its bare portion or trunk, which is of a purplish red, resembling a quill, and its purple branches, or pinnæ, standing sponsor for the feathered end. When plunged into cold water, it emits, in its irritation, a shower of phosphoric sparks. The *Alyconium digitatum* (Many-fingered Anemone), is sometimes called Dead-men's Toes by the fisherman. It looks like a mass of short fingers when the final florets are closed; and each finger-like cell contains a separate being, while, at the same time, each is virtually a portion of the common body or spine that supports them all.

THE MOLLUSCA.—The *Mollusca*, as we have suggested in our chapters on the Fresh-water AQUARIUM, perform the



ignoble but important part of scavengers, and cannot be dispensed with. They devour the refuse of decaying plants, and decomposing animal substances. They also feast upon the millions of spores, or seeds, of the Algæ, held in suspension at times by the water. In this manner they are enabled, if sufficiently numerous, to keep the tank in a cleanly condition, and deliver us from all that might interfere with a good view of our cherished favorites.

The Periwinkle (*Littorina littorea*) is a sea snail, that they boil and eat in England, as we boil and eat chestnuts in this country. It is as popular among children there, and as common in the theatres, as peanuts are here. The periwinkle may be gathered everywhere on our seashores, and is one of the Aquarium's most valuable adjuncts. The decaying vegetation is its natural food. It rejoices in a multitude of colors, from a dull grey up to orange, red, and even bright scarlet, and indulges occasionally in black bands. The small, yellow kind are not to be depended upon as thoroughly as the rest.

The WINKLE (*Pyruca canaliculata*) is a common shell upon all our coasts. It is hardy, and can be sustained for months in a tank.

The Sea Hares (*Aplysia*) should not be omitted, when they can, without much difficulty, be secured. The *A. hybrida* succeed well in European AQUARIA, and its congeners might with us. The *A. leporinæ* of the Mediterranean is said to have supplied the poison with which Locasta terminated the intrigues of Nero's enemies, as

well as composed the draught he finally directed for himself, but had not the courage to swallow.

The *Trochus* tribe, vulgarly known as Tops, are as useful as the Periwinkles. They have evenly-conical shells, from the peculiar shape of which they derive their names. The *T. cinerarius* is of a dull purplish grey, marked with zig-zag lines. The *T. umbilicatus* is of a dull olive or green, with narrow, reddish bands radiating from the centre. The shells have a remarkably pearly appearance inside, while not a few are strikingly finished off with iridescent tints, and brilliant changeable shades of the nacreous character. The *T. ziziphinus*, or Pearly Top, is of a rich orange color, striped with black. The most profitable to the AQUARIUM is the *T. cinerarius*, who, if you have a good pocket-lens, will be found a busy little customer. The Tops and the Periwinkles, when viewed through a proper instrument, may be seen putting forth their probosces and turning them inside out, like a stocking, until the silky surface, which is the tongue, encounters the glass sides of the tank. Here each proboscis makes a grand sweep, like a mower with his scythe, taking up in its swath all the mass of confervæ on the spot. When the proboscis infolds its walls the tongue disappears, and with it goes to the interior all the collected material. A forward movement is made, and another portion of the glass swept clean, after a similarly unique fashion, until, having reached the end of their field of industry, they recommence again.

The *Baccinum obsoletum* is a good scavenger for the AQUARIUM. He inhabits all our coasts.

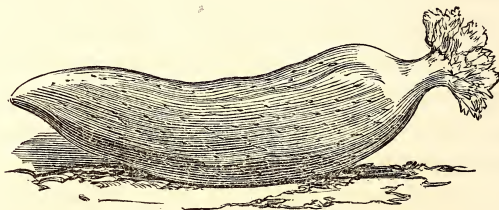
The *Fusus imbricatus* is a pretty and useful snail, and can be procured, by dredging, in our bay and harbor. The *F. cinerens* is called the DRILL by oystermen, and is in full possession of the implacable hatred of that class of our industrial population. It is stated to be very destructive in the oyster beds, boring holes in the shells of the luscious bivalves, and helping itself remorselessly, through the orifice, to the body of the helpless animal within.

The *Scollop* (*Pecten*) sometimes called the Cockle, is abundant on our coast. The empty shells always attract attention by their beauty ; but the animals once the occupants of these frescoed walls, and who, as they mature, grow fashionable and erect edifices still more imposing, are more prepossessing than their late tenements. The rows of blue eyes, like fine points, which are visible upon the very margin of the shell, when the valves are partially open, give us a faint indication of the royal colors worn by the gaudy and luxurious creature within.

The SEA CUCUMBER (*Holothuria*) can be obtained on our eastern coast, and is a very gay and showy appendage to the tank. There is a great variety of the class, some of which uncommonly resemble a gherkin lying in the water. The tentaculæ of many are colored a bright red, of many others a pale brown or yellow, while you occasionally meet them of a dark purple. They always adhere to the surface of rocks by the side on which the

suckers are developed. Now and then you may perceive them in the gravel, near low water. They merit all the space they will occupy, so do not omit them.

The Oyster ; the Sea-Mussel ; the Murex ; the Anomia ; the Bullas ; the Chitons ; a species of Sea Wood-louse ; the Modioles ; all the *Nudibranch* or naked-gilled, and most of the *Tectibranch* species, may be placed in the AQUARIUM with advantage. The sand-burrowing bivalves, as *Mactra*, *Pallastræ*, *Venus*, etc. ; the *Gastrochæna*

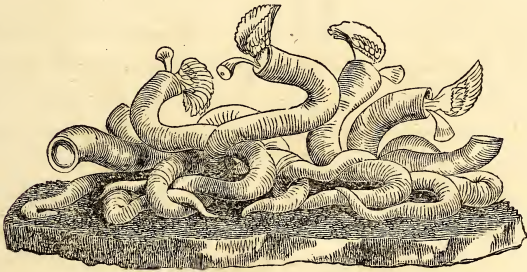


Sea Cucumber (Holothuria.)

and *Saxicava*, burrowers in stone ; the Whelk ; the Cowry ; the *Ascidia* ; the *Natica* ; the *Cynthia* ; the little *Rissoæ* ; the *Acmeæ* ; the *Phasianella* ; the *Calyptrea*, or Cup and Saucer ; will all prove welcome additions.

ANNELIDES.—The tubular cells of the *Serpulæ*, formed of hard shell, out of which rise the dashingly gay colored tentacles, deserve appreciation. The *S. Contortuplicata* has a “stopper” of white sometimes, but sometimes of a glowing orange color, which accompanies the fan-like and feathery group of tentacles that serve the animal for

a breathing apparatus. The slightest disturbance induces these tentacles to withdraw themselves hastily into their tubular shell, and when they do, the "stopper" follows, closing the orifice completely, as if with a cork. The *Sabellas* construct their tube of mud. The Gold Comb (*Amphitrite auricoma*) is very curious. It "corks up" like the *Serpula*, but it has scarlet gills just below its cork-like head, and across the latter article runs an appendage, from the color and shape of which it has obtained its title. The

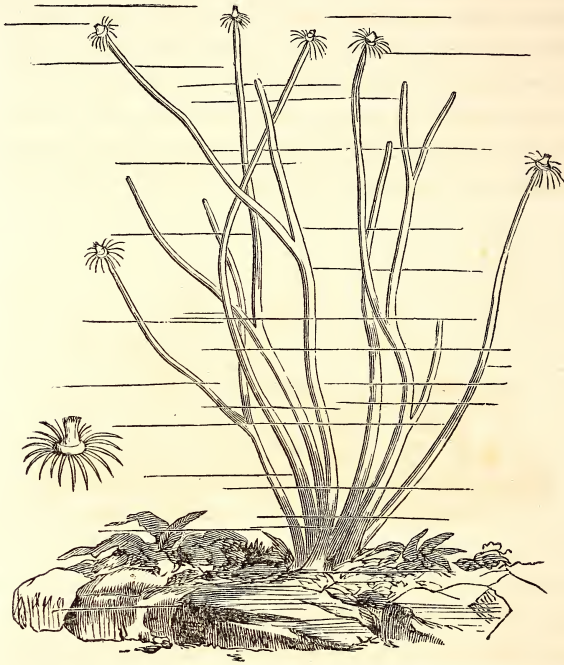


*Serpula Contortuplicata.*

Long Worm ; the Sea-Mouse ; the Terebellas ; the Nerides ; the *Planariae* and the Sea-Leech, may be presented in this company.

The *Tubularia Indivisa*, of which we give a graphic engraving, is one of the most beautiful objects of the AQUARIUM. It may be procured at Hurlgate, where it is seen grouped in masses of thirty or forty together, upon

the surface of shells and stones, as though resolved to fashion a brilliant bouquet of animal flowers for marine



*Tubularia Indivisa.*

admiration. It exhibits a head resembling a superb scarlet blossom, with a double row of tentacula, and often hanging in pendent clusters, like grapes. These heads are

of different dimensions, figures and shades, and when witnessed in combination are inconceivably magnificent. In the tank a singular phenomenon occurs with these Tubularia. After a few days' confinement, their heads drop off. Subsequently the stalk darkens again, and new heads are observed internally advancing towards the point whence their precursors had fallen. By and by, *these* heads drop and are succeeded again by other new ones ; and so on *ad infinitum*, perhaps, though we are unable to state, from observation, to what extent the curious process is carried out. Our own specimen, from which the artist has made his life-like sketch, has been in the tank since August 1857, and blossoms in the novel manner described about once in two days. It looks extremely well beside the Actiniæ and Serpula.

CIRRIPEDES.—The Common Barnacle (*Pentelasmis anatifera*) is too well known to need description. The Acorn Barnacles (*Balani*) usually attach themselves parasitically, to the shell of a Whelk or some univalve, and spread out a cast-net of the feathery filaments of which their tentacles are composed, to entangle the minute *Infusory* or *Annelid*. The *Pyrgoma* cements himself to the plates of the large *Madrepore*, and travels in this manner an original "dead head."

## CHAPTER XI.

### THE FISH AND THE CRUSTACEA FOR THE MARINE AQUARIUM.

#### CONCLUSION.

**F**ISH.—The fish indigenous (if we may use that term in this connection) to the sea, are generally proportioned in size to their *habitat*—to the locality they inhabit. Our choice from amongst them, therefore, is somewhat limited, though the list is certainly copious enough for ordinary purposes. We may congratulate ourselves also on the fact, that it comprises some of the prettiest and most interesting specimens of that branch of natural history. Those which have been tried in the AQUARIUM successfully may be thus enumerated, viz: the fifteen-spined stickleback, the minnow or killifish, common bass, striped bass, bagall, tom cod, pigmy catfish, banded garnard, flounder, poggee, and the eel, to which we might add certain fish that have thriven uncommonly well in the London AQUARIA, viz.: the tansy the young of the grey mullet, the wrasse, the black goby, and the pipefish.

The catalogue might be increased indefinitely, perhaps,



because any fresh-water fish that spawns in salt water, and *vice versâ*, will flourish in either condition ; but, as we have repeatedly observed, large fish occupy an amount of space, and demand an amount of oxygen, that will not admit of those addenda without which we cannot produce a characteristic AQUARIUM ; we are compelled, on that account, to restrict our attention not only to fish more diminutive, but to those accidental aberrations of nature which furnish us with dwarfish specimens of such as are of greater magnitude.

The STICKLEBACK, Triton (*Gasterosteus*), and also the MINNOW (*Leuciscus*), we have amply described, under the head of the Fluvial or Fresh-water AQUARIUM. They will do admirably together. The minnow, however beyond the stickleback in size, is not often disposed to try the point of those two-edged swords with which his companion goes ready armed, like a warrior arrayed *cap à pie* in all the panoply of battle. The stickleback, though a pigmy, is one of the most truculent of his tribe ; yet he little cares to do more than chase up the minnow, when the latter provokes him by a display of too much inquisitiveness, unless the exasperation be prolonged, when he (metaphysically) “ takes off his coat—rolls up his sleeve ”—and usually leaves his antagonist under the impression that—

“ Jordan is a hard road to travel, I believe.”

The bass, bagall, tom-cod, catfish, flounder, poggee, and

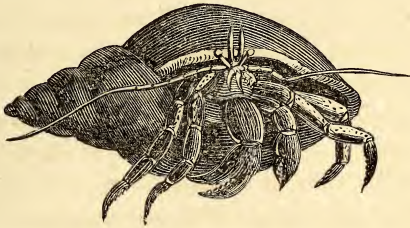
eel, are so familiar to our readers, that we forbear all expatiation upon their appearance or peculiarities. Almost any breakfast or dinner-table, on the seaboard of our country, will be prepared to exhibit them. Our inland friends may obtain them from the nearest coast by furnishing, not a description, but the mere titles of them. Young flounders, when quite small, are amusing on account of their novel mode of swimming. The poggee is rather too much disposed to hug the bottom of the tank to show to advantage; and yet his plate-armor, running in regular longitudinal lines, and displaying so many sharp ridges from head to tail, would be unique and attractive, could he often be tempted to invite criticism.

The Tansy (*Blennius pholis*) is a sort of changeable silk in color, and has bright scarlet eyes. He can exist on the smallest possible amount of oxygen, and is a pocket-edition of a fish nicely suited to an AQUARIUM, when you can get hold of him. The mullet will do, because, if the water be not well oxygenated he will ascend to the surface, and pilfer it from the atmosphere.

The WRASSE (*Labrus maculatus*), with his crimson maculations, is inconveniently overgrown in point of longitude, in our opinion, for our object. He is handsome, but cannot conveniently "come in."

The BLACK GOBY (*Gobius niger*), with his turquoise-blue eyes, is another illustration of the occasional defects of beauty. He is a voracious glutton. "Dog will not eat dog" is a common saying, but the goby will devour his

own species, as well as all other fish sufficiently timid or amiable to accommodate his appetite. We cannot countenance such a savage. The PIPEFISH (*Syngnathus acus*) would not prove an improper member of your sea-cabinet.



Hermit crab—(*Pagurus Longicarpus*.)

CRUSTACEA.—The little HERMIT CRAB (*Pagurus longicarpus*) may be discovered in great abundance upon all our coasts, and merits a good place in the variety of subaqueous life which constitutes a true AQUARIUM. He is a pugnacious individual, however, and when two or more are placed in one compartment, it would be judicious to select them as nearly as possible of one size and physique. They travel all over the tank, and when they meet invariably indulge in a savage encounter, until one, convinced of his inferiority, abandons the contest, and hastens out of the way on the approach of his antagonist. The Hermit Crab seldom inhabits a shell of his own. He may be found in almost every kind of shell whatever. He is not at all

particular as to the character of its last possessor ; he is simply delicate as to its exact fit ; that quality conceded, he looks no farther, but introduces himself to such an extent that it is impossible to seize and dislodge him. He must be fed, though, with some regularity, and will relish bits of almost any animal substance. Raw, lean meat, given him every day, will suit his inclinations and habits exactly, and his movements in feeding are well worthy of careful study.

The SPIDER CRAB, or Sea Spider (*Libinia canaliculata*), is also common upon our coast, and is among the most useful of his tribe in the AQUARIUM, as he is a capital and diligent scavenger. They are very destructive creatures among the oyster-beds, as they devour the spawn with incredible voracity. The spider crab, like the hermit crab, often carries on his shell a number of zoöphytes. Some of the *actiniæ* seem especially to enjoy this species of locomotion, and indulge in it to an extravagant extent. We have had a spider crab for months in a tank, and find him quite a diverting companion. Now and then he tears the *algæ* from the rockwork, and adorns himself with it, and in this shape presents himself as proudly as though he had just purchased, in some fashionable quarter, a new suit in the latest *mode*.

The CLIMBING CRAB (*Eurynome aspera*) always insists upon clambering to the topmost object in the tank. The FIDDLER CRAB may be found scampering awkwardly along the beach everywhere by the seaside. He is astonishing-

ly nimble, though he does make such odd progress, and he darts down his hole in the sand with a celerity that is



Star fish, Sea-spider, Crab.

marvellous. The HORSE-FOOT, equally plentiful, looks well in the AQUARIUM.

The SHRIMP must not be forgotten. With his long,

hair-like horns, he steals along with a gentle motion—the Grimalkin, as it were, of the AQUARIUM—his eyes glaring intently around, as if watching for some hidden culprit. His semi-transparent body, his wary movements, his unusual fashion of personal cleanliness, etc., all render him a subject of entertaining observation.

A few STAR-FISH (the *Asterizæ*) would be a fitting ornament to a neat AQUARIUM. The animal of this genus is well known, and may be had, by dredging, in great variety in New York bay and harbor. They are of all colors and characters. Some have the power, when irritated, of exploding themselves to pieces, and dying in this manner (to speak irreverently) on a *bust*. Others, again, have the *Polypi* capacity of reproducing whole animals from any small portion broken off; still others have the power only of reproducing mutilated parts; and still others, if divided into as many fragments as there are rays, provided a portion of the mouth be attached to each, are able to create of each a perfect Star fish. These creatures, like the Drill and the Spider Crab, are the ravagers of the oyster-beds, and when caught are deliberately trampled under foot, to crush any disposition they may have to rise again remultiplied. They increase by the internal formation of a species of bud, or *gemmae*, which, when fully formed, are cast out by the parent to “seek their fortune,” and commence a voyage of discovery at once to that end. They are tranquil-looking, apparently respectable, “old foggy” denizens of the “great

deep ;” but they are sad rakes, if naturalists do not calumniate them, and, like other wicked ones, are much more mischievous than they seem.

#### CONCLUDING REFLECTIONS.

So much for the AQUARIUM ! The unthinking may call it a toy. The reflecting will aptly term it a wonder. But may we not make of it something more ? Who loves not the billowy ocean, with its wild, weird-like, melancholy wail, and its light, dancing foam-tops, shaking, as they go, their “loosening silver in the sun ?” Who loves not the glistening river, and the wide, solemn lake, in whose glorious face, all day, but heaven itself seems mirrored, and at night whose bosom “throbs with stars like pulses ?” Yet here, in the AQUARIUM, we have their “counterfeit presentment,” faithfully drawn by nature herself, in her most artistic moments, and finished up to life with all her tintings of romance. Here we may sit face to face with reality, in

“ Silent speech—a converse that affords  
Surer communion ”

than the babbling of the schools, or the dim picturing even of eloquent books. Here we may still learn something in the simplest act to expand our narrow circle of useful knowledge. Here we may, indeed, find “sermons in brooks,” for every pebble in the AQUARIUM is a text, and every leaflet on it a living accordance for study and

consultation. A new world of wisdom will be opened for our private instruction. When the wind howls, and the storm rudely "draws the pale curtains of the vapory clouds" to shut out the light; when the frightened waters leap frantically about, looking for help, and the tall ships groan as they fold their weary wings, and roll in their billowy beds as if in anguish; we shall no longer ignorantly presume that its only purpose is to alarm or to destroy. We shall look at the AQUARIUM, and perceive that it is but one of nature's gigantic efforts to accomplish a duty which she owes to millions on millions of her helpless dependents, down, down amid "the sombre depths of the silent sea." And though, to our finite vision, the orgasm may seem, at times, to sacrifice a painfully unnecessary amount of life, we may confess that, to eyes more infinite, that sacrifice is but an offering on the altar of fate to avert the destruction of ten thousand times as many existences just as important in the vast economy of the universe, however to our selfish conceptions so insignificant. When the rain-drops patter upon the sounding roof; when the "windows of heaven are open," and the silver bubbles caper so nimbly over the troubled pond, and the big tear-trops chase each other adown the casement-panes, like diamond splinters on a "spree;" when the parched flowers and the thirsty road drink up the shower with such a look of grateful gladness; we shall turn to the AQUARIUM, and chide the egotism that could fancy it all done to stimulate the growing crop, or



beautify for us the face of nature. We shall gaze, in our mind's eye, upon the heated stream, the seething rivulet, the steaming river, and before us will stand a countless myriad of living forms, to whose heart every splash of the rain must bring a universe of enjoyment ; to whom every iridescent globule is a messenger of renewed being ; to whom every tiny drop falls gushing with champagne exhilaration ; who revel in the temporary perturbation with all the intense delight with which we, higher intelligences, languish through a *bal masqué*, or contemplate the fascinating and brilliant tumult of a carnival !

THE END.



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