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THE POINT LOMA BLIND FISH AND ITS RELATIVES.

With Plate II and III.

BY CARL H. EIGENMANN.

San Diego Bay is in part surrounded by mud flats which are covered by water at high tide. Where the channel approaches the shores, sand beaches take the place of mud flats. On the ocean shores a sandy beach stretches several miles to the southeast from the mouth of the bay, while on the west rises the point of land called Point Loma. The entire ocean beach at the base of this promontory is rocky. In many places all the earth has been removed by the action of the waves, leaving the bare rock; in other places, and more especially between the outer point and Ballast Point, large boulders lie imbedded in the sand. These are all covered at high tide, while but a few small pools remain about the rocks at low tide. Many of them are covered with sea weeds, actineans, and especially large chitons.

All these localities are inhabited by relatives of the Point Loma blind fish.

The sloughs traversing the mud flats of the bay are inhabited by *Gillichthys mirabilis*, the young of which is represented in fig. 15, pl. iii.

In every tide-pool as large as a man's hand, and larger, in the mud flats are found *Clevelandias*, fig. 4, pl. ii; nearer low-water mark in similar localities are found, but less abundant than *Clevelandia*, the *Lepidogobius y-cauda* represented in fig. 5, pl. ii.

On digging in the sandy beaches of the bay specimens of another species of this genus, *Lepidogobius gilberti*, are sometimes found buried in the sand.

In the crab holes under the rocks about Point Loma occurs the most remarkable of this family, the Point Loma blind fish *(Typhlogobius californiensis)* figs. 6 and 7, pl. iii.

In the deep water off Point Loma the Albatross has recently taken still another goby *(Gobius nicholsoni).*

It is thus seen that almost every nook available has been taken possession of by these diminutive fishes. All of them have the two ventrals united along the median line, and a thin membrane stretched across their bases to form a pouch. By appressing the ventrals and then raising them, a partial vacuum is formed in this pouch, and the fish is enabled to cling to any substance with which its ventral happens to be in contact. In confinement the blind fish frequently utilizes the surface of the water of an aquarium for a surface of attachment.

Most of these have also a peculiarly enlarged maxillary bone in the adult stage. In *Gillichthys* this bone becomes quite phenomenal with age, reaching to the pectoral fins. This fish increases in bulk out of proportion to its development, so that the young of a size equal to the adult, *Clevelandia* or *Lepidogobius*, have a much shorter maxillary bone than the latter, although in the adult of *Gillichthys* this growth is larger in proportion than in any other goby. The adult of *Lepidogobius gilberti*, *y-cauda* and *Clevelandia longipinnis* have until the past year been confounded with the young of *Gillichthys.* In collecting about San Diego I soon noticed this fact, but supposed *Lepidogobius y-cauda*, on account of its large maxillary, to be the young of *Gillichthys*, and described the young of *Gillichthys* with short maxillaries as a new species of *Gobius.**

All the species in the bay have the habit, if disturbed, of hiding in crab or clam holes. *Clevelandia* will sit on its tail and pectorals until the hand is near it. Then with a quickness which would do honor to a Johnnie Darter, with a flirt of the tail and a stroke of the pectoral, it disappears in its hole from which it, however, at once thrusts its head to await developments. Several of them frequently take refuge in the same hole.

Gillichthys is the largest of these gobies, and is found from San Francisco to San Diego, or somewhat further south. It then disappears and is found again at the head of the Gulf of Mexico. About San Diego the young are abundant throughout the year. The adult can be caught with hook and line in quantities, especially just at the

* We discovered our mistake sometime before the description of the new species was printed, and hoped to make the necessary corrections in the proof, which never reached us. C. H. & R. S. E.

return of tide during summer. Towards their spawning season they retire to their respective crab holes, and no morsel, be it ever so tempting, will lure them forth. They first spawn at San Diego about the end of March. The young, when first observed, have but a few color cells. They are very active, jumping several times their own length, if left dry in a watch crystal. Under the microscope a series of slender threads are seen to extend out from the lateral line (figs. 18 and 19), and similar threads are grouped about the head. Provided with such delicate tactile organs and well-developed eyes, the young *Gillichthys* is well equipped for its early existence.

As hinted above the young, not larvæ, of this species but little resembles the adult. The maxillary does not reach beyond the eye, the color is in more or less well-defined cross-bars, and the scales which in the adult are cycloid, have several large teeth, fig. 16, pl. iii. The color under the microscope still resolves itself into distinct cells, fig. 17. The skull is also quite different from that of the adult in specimens even more than an inch long. In short, the young is a *Gobius*, while the adult is a *Gillichthys*.

The two species of *Lepidogobius* have but recently been discovered. The one figured (5, pl. iii) was first described from Guaymas, and was but the past year recorded from California waters. It was collected by Jordan and Gilbert, as early as 1880, and several specimens have also been in our collection for sometime, having been taken from the stomach of a larger fish. The *L. gilberti* was discovered while a Chinaman was digging for "craw-fish" in the beaches between Roseville and La Playa. In the little pools formed in the holes dug by the Chinaman little fishes were soon seen swimming about; all but one of them proved to be this species. Professor Gilbert, for whom the species was named, has since found it in many places along lower California, including the gulf coast. It is thus seen that both of these species have a wide distribution.

Clevelandia is by far the most abundant of the gobies, and in fact the most abundant of any fish in the bay of San Diego. They are found everywhere between high and low-water mark, and doubtless form an important item of the food of the larger fishes; they spawn in the early part of May. The young, fig. 1, pl. iii, rise to the surface at night, and are then sometimes taken in the surface dredge. They can, however, be procured more abundantly

in the latter part of May in the pools left at low tide about the piles of wharves. They beautifully illustrate the metamorphosis undergone by the tail from the lophocercal to the heterocercal and homocercal stages. This fish has until the past year been known from only four specimens. Three of these were from Los Animas Bay, and one from San Francisco.

The most remarkable of the gobies is undoubtedly the blind one inhabiting the crab holes under rocks at Point Loma. It has been found nowhere else about San Diego, but has been taken at Ensenada. Its habitat is, as far as known, quite limited. In its pink color and general appearance it much resembles the blind fishes inhabiting the caves of southern Indiana. Its peculiarities are doubtless due to its habits. The entire bay region is inhabited by a carideoid crustacean which burrows in the mud. It, like the blind fish, is pink in color. Its holes in the bay are frequented by *Clevelandia*, etc., while at the base of Point Loma, where the waves sometimes dash with great force, the blind fish is its associate.

On rough days few fish are seen, though ever so many stones are overturned, a task rendered somewhat laborious and bad for the fingers by the numerous worn tubes, etc., attached to the rocks. On mild days, on the contrary, on very low tides quantities are found and almost invariably in company with one of the crustaceans mentioned above. Sometimes the fishes live quite out of water on the damp gravel and sand under a rock, but more frequently small pools of water fill all the depressions under the rocks, and the fishes swim rapidly away in their attempt to hide in the crab holes, several of which always branch from the cavity in which the rock has lain.

In the bay the gobies habitually live out of the holes into which they descend only when they are frightened, while at Point Loma they never leave their subterranean abode, and to this fact we must attribute their present condition.

How long these fishes have lived after their present fashion it would be hard to conjecture. The period which would produce such decided structural changes cannot be a brief one. The scales have entirely disappeared, the color has been reduced, the spinous dorsal has been greatly reduced; not only have the eyes become stunted, but the whole frontal region of the skull and the optic nerves have been profoundly changed.

The skin, and especially that of the head, has become highly sensitized. The skin of the snout is variously folded and puckered, and well supplied with nerves; the nares are situated at the end of a fleshy protuberance which projects well forward, just over the mouth. At the chin are various short tentacles and a row of papillæ, which very probably bear sensory hairs similar to those represented in 18 and 19, extends along each ramus of the lower jaw, and along the margin of the lower limb of the preopercle. The eye is, however, the part most seriously affected. In the young, fig. 7, it is quite evident, and is apparently functional. Objects thrust in front of them are always perceived, but the field of vision is quite limited. With age the skin over the eyes thickens, and they are scarcely evident externally. As far as I could determine they do not see at this time, and certainly detect their food chiefly, if not altogether, by the sense of touch. A hungry individual will swim over meats, fish or a mussel, etc., intended for its food without perceiving it by sight or smell, but as soon as it comes in contact with any portion of the skin, especially of the head region, the sluggish movements are instantaneously transformed, and a stroke of the fins brings the mouth immediately in position for operations.

I have not been able to raise the fishes from the egg. The youngest individual ever seen is represented in fig. 7. In this specimen the membranes of the fins were thin, the color cells were well formed and arranged not unlike those of the young *Gillichthys*, fig. 15. The movements were similar to those of the other gobies, and not at all sluggish like those of the adult. Their favorite position is standing or sitting, one with the broad pectorals extending out at right angles to the body. In this position the fish can, with a sudden stroke of its pectorals, move quickly and rapidly. In the old the fins are thick and smaller in proportion, and all the vivacity seems to have disappeared. The color has degenerated, or at least not developed in proportion to the growth of the fish.

The minute structure of the eye was not examined on account of the entire lack of the proper facilities for sectioning, etc. The eye and optic nerve have been isolated by treatment with 20 per cent. nitric acid, and by simple dissection of alcoholic specimens. The lens is large in proportion to the size of the eye, which does not materially differ in size in the smallest and largest

specimens examined. The optic nerve is very slender and long as compared with that of any of the other gobies.

All these gobies are tenacious of life, especially the blind one. Several of the latter have been kept in a half-gallon jar of water for several weeks without change of water, and others have been kept several months in confinement in my laboratory. When the water becomes somewhat stale they frequently rise to the surface and use the surface of the water as a plane to which they attach themselves by means of their ventrals.

It was my intention to study the development of the eyes, etc., of this fish, and with this end in view I kept many specimens alive and made frequent trips to Point Loma to procure fresh individuals in order that too long confinement might not have impaired the reproductive function. They spawn in the latter part of May and June, but I have not found the eggs in nature. Those deposited in confinement would not develop, and attempts at artificial fertilization of freshly-caught individuals were not successful. An absence from San Diego prevented me from visiting their habitat during July, and in August the tides were not favorable.

The earliest date at which I procured young was October 25th, the smallest caught at that time is represented in figure 7.

Though I did not secure developing eggs, those procured enable me to describe the remarkable membranes of the egg, which are probably similar in many other gobies.

The covering of the ovarian egg consists first of a finely striate membrane, the zona radiata of all telostean eggs. Exterior to this is a network of threads with the meshes coarsest at the entodermic pole and forming almost a continuous membrane at the ectodermic pole, figs. 4 and 5. The eggs were examined from the surface only, and I am not able to say how intimate the connection between the threads and the zona is in the ovary. When the eggs are deposited the meshwork of threads is stripped off the egg and remains attached to the zona radiata around the micropyle, figs. 1, 2, 3 and 5. In the eggs deposited naturally by the females in confinement the threads had been wound together to form a cord at the micropylar end of the egg, fig. 1. The cords of many of these eggs were attached to each other, and the eggs thus came to be laid in bunches like those of grapes. Whether this is usual or not I am not able to say. The bunches of eggs resemble so closely those of the

crustacean with which this fish is associated, and which spawns at the same time, that the idea of a highly specialized mimicry at once suggests itself. The similarity between the eggs is heightened by the fact that they are both bright yellow. In females with ripe eggs they can frequently be seen forming a yellow band along the flanks.

The yellow of the blind-fish egg is entirely confined to the yolk which contains many oil globules. The granular potoplasm is opaque.

In the eggs deposited naturally the water space remained quite small, while in those forced from the ovary it soon became enormous, being many times the size of the egg proper; the egg shell assumes an ovate shape at the same time. Which of these two forms is the natural one I am not able to say. Hoffman * gives the figure of the egg of *Gobius minutus*, which resembles fig. 3, pl. and may be the normal condition.

PLATE II.

1. Young *Clevelandia* or *Lepidogobius* taken with the surface dredge.
2. Tail of a young *Clevelandia*.
3. Tail of a more advanced individual.
4, 4a. *Clevelandia longipinnis*, adult $\times 2\frac{2}{3}$.
5, 5a. *Gillichthys y-cauda*, adult $\times 3$.

PLATE III.

1. Egg of *Typhlogobius californiensis* undergoing the first cleavage.
2. Micropylar region of an egg of the same species under pressure, showing the margin of the attachment of the outer membrane.
3. An egg forced from the ovary. A very large breathing chamber has been formed. Abnormal (?).
4. A portion of the network of the outer membrane remote from the micropyle of the egg represented in fig. 3.
5. Micropylar region of the egg represented in fig. 3.
6. Adult *Typhlogobius*, natural size, in the position usually assumed in the aquarium.
7. Young *Typhlogobius* $\times 4\frac{2}{9}$, showing color markings and the eye.
8. Dorsal view of skull of *Typhlogobius* $\times \frac{2}{3}$.
9. Lateral view of same $\times \frac{2}{3}$.
10. Ventral view of same $\times 1\frac{1}{3}$.
11. Eye, optic nerves and portion of brain of same, showing the very much elongate slender optic nerves and the comparatively large lens as compared with the cup of the eye $\times 24$, from nitric acid maceration of a specimen ½ inch long, January 29, 1888.
12. An isolated eye after treating with nitric acid showing the film of translucent substance surrounding it.

* Zer Ontogonie der Knochenfische, pl. iii, fig. 9, 1881.

13. The same eye in a later stage of maceration, the film entirely removed, the optic nerve torn.

14. Dorsal surface of brain of *Typhlogobius* showing cranial nerves, the 2d, 3d and 4th pairs removed.

15. *Gillichthys mirabilis* $\times 4\frac{2}{9}$.

16. A single scale of same more enlarged.

17. Several scales with color cells from the tail of same.

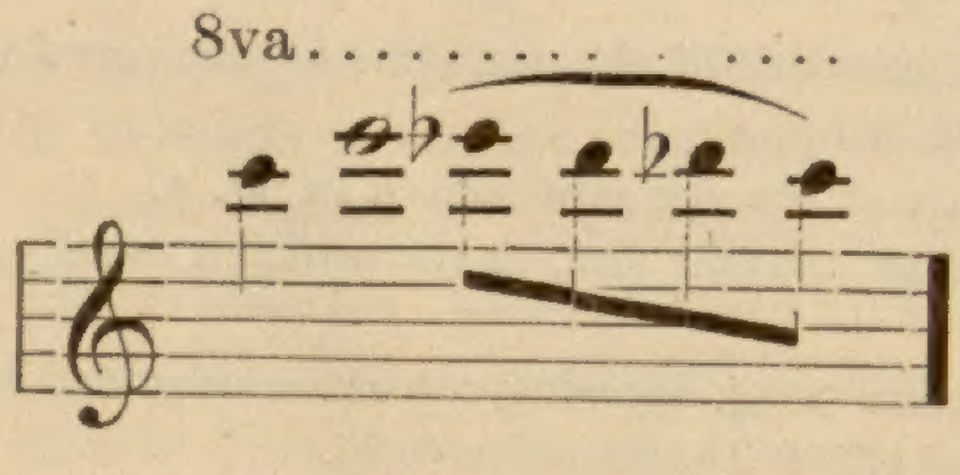
18. Sense organs of the lateral line of a younger specimen of *Gillichthys*, from about the middle of the body.

19. Solitary sense organ of the same from the base of the caudal.

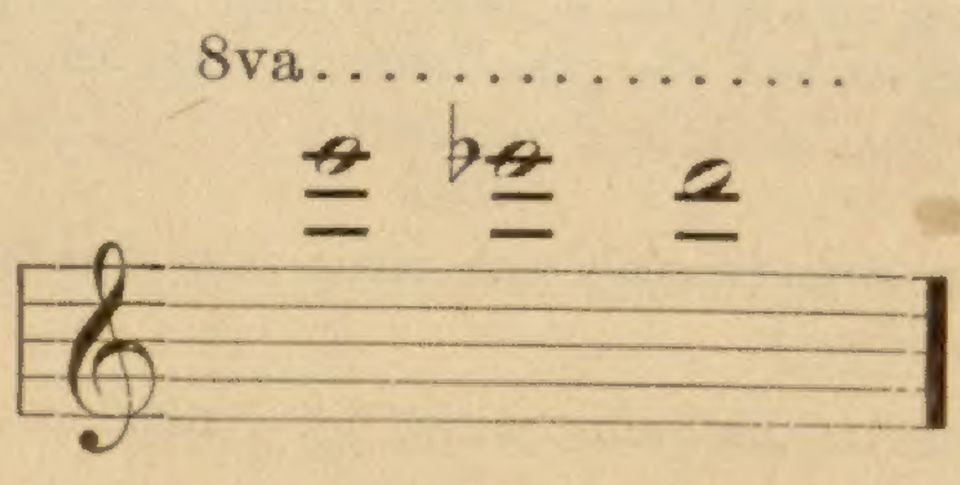
SONGS OF SOME CALIFORNIAN ZONOTRICHIÆ.

BY CHARLES A. KEELER.

As the distinction between the songs of Gambel's white-crowned sparrow *(Z. leucophrys gambeli)* and the golden-crowned sparrow *(Z. coronata)* does not seem to be generally recognized by ornithologists, a few remarks on the subject may not be out of place. Neither of these birds possess any great powers of song, the notes of both being high, fine, long-drawn whistles, very similar in the quality of the tone. There is, however, one distinction between the songs which is present, I think, in all their variations, viz., that the song of Gambel's white-crowned sparrow begins on an ascending scale, while the song of the golden-crowned sparrow begins on a descending scale. The typical song of Gambel's white-crowned sparrow is as follows:



The typical song of the golden-crowned sparrow is much simpler, being represented by the following notes:



The above songs are by far the most common; in fact, any departure from them is quite the exception. Variations of both songs are always sufficiently near to these types to be immediately recognized, and generally consist of a simplification of the above. Thus the golden-crowned sparrow frequently omits the last note, and sometimes sings nothing but the first. Occasionally, also, the final note is not flatted, so that the last two notes are the same. I have not noted down any of the variations of the songs of Gambel's sparrow, but these can always be identified from their similarity to the song given. Sometimes on a mild day during the winter or spring, when numbers of these birds are congregated in a garden, several variations of their usual song will be heard, the birds seemingly vying with one another in producing changes, but under other circumstances I have seldom heard any but the song here recorded.

The golden-crowned sparrow sings all winter from the time of its first appearance in the fall until its departure in April. During the cold rains of winter, however, its song is generally hushed and its ordinary *tsip* is its only note. This is most commonly heard when a flock are started out of the brush. Gambel's white-crowned sparrow also utters a call note indistinguishable from that of the preceding species. It has in addition a note heard only at the beginning of the mating season, generally in March, which is characteristic of this species. It consists of a low trill or rattle uttered while the wings are rapidly vibrated. I have never heard this note uttered when the female was in sight.

The night song of Gambel's white-crowned sparrow is of great interest. Late in the night, when all the world is wrapped in slumber, a wild burst of song will rise on the silent air, then subside, and all is again quiet. Only a single bar is sung, and I have never heard the strain repeated on the same night. I first heard this night song on February 26, 1888. The day had been warm, but a thick fog came on in the evening which darkened the sky. It was nearly half past ten when the bird sang, and the effect of this song, coming through the dark, still night, was very peculiar. On March 7 of the same year, the song was heard at eleven o'clock at night, and on the 12th inst. it was heard at nine o'clock. In both cases the night was dark and foggy. If these night songs were uttered only on clear, moonlight nights they could be more easily

explained, but the fact is they are much more frequently heard on dark nights. The songs are always heard early in the mating season, generally in March, and the most reasonable explanation, it seems to me, is that the birds are unusually excited at this time, and, awakening in the night, involuntarily break forth into song. That it is involuntary and unpremeditated, all who have heard this song will certainly agree.

THE ECONOMY OF NATURE AS EXEMPLIFIED BY VEGETABLE AND ANIMAL PARASITES. II.

BY H. H. BEHR.

The concatenation of cause and effect which produces the harmony in nature cannot be interrupted with impunity by interferences of violent character. The violent destruction of one evil almost always opens the door to a series of new evils, because the immense network of cause and effect called Nature being once disturbed it is impossible to know at what point the given impetus will stop.

It cannot be helped that our own interests interfere with the harmony in nature. Neither cultivation of the ground nor raising of stock is possible without disturbance of the original forms of organic life, because the very object of all agricultural pursuits is to promote the prevalence of certain animals and plants useful to man to the more or less complete exclusion of the organisms previously occupying the same ground.

We will first notice the immediate consequences of the interference in favor of the more desirable species at the expense of the original fauna and flora.

Every species, animal and plant, is decimated or limited in its multiplication by other species, or else the variety of organic life now inhabiting and decorating the surface of this earth would have disappeared a long time ago, and would have made room to monotony. Each climatic girdle would be covered by a vegetation closely resembling cultivated grounds, each inhabited by one herbivorous animal, serving as food to one carnivorous animal. There is no place on this earth where such state of things actually has taken place, the agencies just mentioned preventing.

Nature favors variety and opposes equality, the only things in which all organisms are equal, being birth and death. In all other

respects, organization, conditions of life, relation to each other, they differ so much that already in ancient time Aristotle arranged them in classes, and modern science talks in a rather unphilosophical way about higher and lower animals and plants.

As a general rule the so-called higher forms of life exercise their influence by individuality, the lower ones chiefly by their numbers—the one endangers our interests by organs of destruction, the other by their unlimited powers of multiplying.

Now as to what takes place when the original variety of organisms in an area is superseded by the exclusive cultivation of one or several organisms introduced by man:

Each species has its antagonists, and these rise and multiply in proportion to the facilities offered to them. These facilities are of two kinds; first, an ample supply of food; second, protection against the species to which they serve as food themselves, and which we call, by a not quite exact expression, their enemies.

As long as the ground is covered by a varied vegetation, inhabited by different kinds of animals, the enemies of the different species lose a great deal of their feeding time by searching and selecting the peculiar plant or animal that serves them as food. As soon as a plant or animal occupies the ground to a more or less complete exclusion of other plants and animals, its enemies do not lose much time in the search for food, and will multiply at a more or less undesirable rate. The enemies of the species that formerly occupied the ground and are now excluded, will disappear at the same rate as the species disappear that formed their food when the original flora and fauna occupied the ground.

In studying the multitude of phenomena developed during and after the change of a so-called wild state into the state of cultivation we find some the most striking developed in the insect world.

At the same time it is indispensable to refer frequently to phenomena of a different order, because, with all her variety, nature is a unit, and it is only in text books that the citizens of the two kingdoms may be studied in isolation.

The first change produced by cultivation is an increase of the enemies of the cultivated species. We have seen that nature opposes any predominance that would end in monotony, so she has recourse to the same remedy used against the prevalence of the cultivated species and corrects her own remedy by raising an enemy to the enemy.

This enemy of the enemy is the friend of the cultivated species, and as such our own, because in agriculture as in politics and warfare, the enemy of the enemy is an ally.

Some forty years ago financial considerations had gradually influenced forest culture in northern Germany in such a way that a predominance of coniferous plantations had developed. The consequence was an increase of such insects as feed on the pine and spruce. These insect pests developed to such a degree that great damage was done by the destruction of entire forests, and for a considerable time all remedies proved futile in the afflicted districts.

The first enemy of the enemy was the bird. Insectivorous birds soon took care of those insect larvæ not covered with hair, nor having a disagreeable smell indicating some poisonous substance. So the naked caterpillars of *Sphinx Pinastri* and *Trachea Piniperda* were speedily reduced to a proportion no more interfering with the harmony in nature, but the hairy ones of *Gastropacha Pini* and the *Tenthredo* larvæ full of irritating substance, remained almost unmolested, as the only European bird feeding on hairy caterpillars is the cuckoo.

But then a gradual increase of two classes of insects took place, the carnivorous and the parasite. The carnivorous was chiefly represented by the beautiful rainbow-colored *Calosoma Sycophanta*, the parasite first by the ubiquitous *Tachina*, afterwards by whole hosts of minute parasitic wasps, of the Ichneumon and Ophion tribes, that laid their eggs on the injurious larvæ, and the maggot developing devoured the insect pest from inside. The sick and dying larvæ offering a wide field for the dissemination of vegetable parasites, different fungi, especially those of the *Saprolegnia* and *Torrubia* types, spread from the sick to the healthy and destroyed whole annual generations by epidemics.

Here is seen clearly the means applied by nature to restore the disturbed balance of power. Nevertheless it must be confessed that nature did not do the work quite alone. It is true that the combined efforts of whole communities, collecting the caterpillars, throwing them into ditches and destroying them by fire, did but little good and considerable evil, because it disturbed the insect-feeding birds. The system was also soon abandoned. But laws passed for the protection of insect-feeding birds took good effect, and finally the gradual change in the system of forest culture, by

which the uniformity of the coniferous plantation was more frequently relieved by interspersed birch, oak, beech, or mixed plantations, produced a favorable change.

The insect pests of course did not become extinct—nature takes as much care as possible even of her naughty children—but they ceased to be pests;

Variety of plantation, therefore, prevents to a certain degree insect pests, or at least diminishes their power. It is very probable that the prevalence of insect pests in this country to some extent is owing to the uniformity of cultivation, as compared to the variety in other countries where agriculture and stock-raising are much more combined on the same farm, and the fields themselves are cultivated to and grown over by a greater variety of plants.

This is the place to discuss a class of insect pests not created by the monotonous cultivation of the soil, but owing their origin to an analogous condition of things without human interference. I refer to those pests that owe their origin to the monotony of desert lands.

There are certain regions where a dead level of the surface, the chemical compound of the soil, absence of water, or imperfect drainage, oppose vegetation in general. Still there are certain organisms adapted to conditions detrimental to the existence of the majority of types. The vegetation of such localities in some instances can exist only under the very conditions of the locality; in other instances it could exist in cultivation, but would be superseded by the more powerful organization of other types, so that it is driven to the desert regions by its inability to stand competition.

The number of types that are original inhabitants or adapted immigrants in such localities is naturally a limited one, but the small number of species is frequently made up by an enormous number of individuals. The sage-brush vegetation of our alkali plains, the heath *(Erica)* that covers the plains of northern Europe, the lichen tundra of the Arctic, the pampas of the Argentine Republic, the Russian and Siberian steppes, and many other regions, are well characterized instances of this state of things.

The small number of species and great number of individuals produces monotony, and the monotony is the cause of a series of phenomena similar to those produced by exclusive occupation of cultivated grounds by one or a few species. The differences in the

phenomena on desert lands and cultivated grounds consists chiefly in the intensity and rapidity of their development on the former, and their proportions are quite in keeping with the expanse of horizon and unrelieved monotony of the surface.

As long as the inordinate multiplication of the species affects only the desert region it is of the highest biological, but of little practical interest. Unfortunately in many instances even the immense extent of the desert cannot hold the swarms of suddenly accumulated beings. Like a cup filled to the brim it foams over and sends its myriads into distant regions to destroy and to be destroyed, because enemies in the shape of birds follow the wandering host, and even in their own bodies the wanderers carry the parasitic germs of animal as well as fungoid destroyers.

I have had no opportunity to study the wandering grasshoppers which occasionally, from southern and western deserts, are poured into California, and so I do not know if they are followed by a host of birds as are those in the Hungarian puszta, the Russian steppes or the Sahara. In Europe it is especially a little hawk or falcon, *Tinnunculus*, whose swarms appear almost with the wandering pest when an hour before no bird was visible.

The only enemy of the grasshspper whose acquaintance I have had an opportunity to make is a beetle of the Cantharid order, a *Tigrodera*. I have always received a certain number of specimens of this useful insect during a grasshopper year, never at any other time, and as I am frequently consulted about insects, especially when they are as showy as the *Tigrodera*, I conclude that under ordinary circumstances the species is rather rare and only multiplies in proportion to its larva food, the grasshopper. Judging from analogy the larva of the *Tigrodera* needs several years before it turns to a beetle, the only stage in which I have seen it. All the related insects are carnivorous and parasitic on other insects, devour first eggs, then young larvæ, and generally in the last stage of their larval existence are parasitic.

I am inclined to consider this insect also parasitic in its last larval stage, but have not yet had opportunities to collect evidence. I suspect that the frequent deaths occurring amongst the herds of turkeys that are led out against the grasshopper are not owing to indigestion caused by greediness of the bird, but to having swallowed a grasshopper infested by this parasite which contains,

like all beetles of this group, a considerable amount of cantharadine.

So the phenomenon of the grasshopper swarm demonstrates the same tendency of nature to destroy the prevalence of a single species or a small group of species (in our case the Artemisia or the *Chenopodiaceæ* of the alkali lands), but there is a difference in the means which nature applies in the destruction of the destroyer, or, let us say, in the second part of the phenomenon. It is not only that nature raises a destructive enemy in the parasite, and calls in the enemy in shape of birds which assemble around the swarms, and the coyote that follows them. Nature uses besides these remedies another and a most effective one. She implants in the locust swarm an irresistible instinct to wander. Millions are drowned in the rivers, others are crushed and mangled in the density and confusion of the wandering swarm, the bodies of others cover the ground at the foot of cliffs, walls of cities, and other insurmountable obstacles.

Perhaps I should mention here an incident that to the non-entomologist is scarcely credible, but which is well calculated to give an idea of the destructive character of the migratory instinct as well as of the multitudes of the destroyers which perish.

In the year 1844, when, on a voyage to Australia, the vessel passed the heights of the Cape Verde Islands, we sailed for more than two days through the bodies of grasshoppers, most of them dead or dying, but some still sufficiently strong to crawl out of the bucket which was used to draw the water for washing the deck.

It is easy to understand that in presence of phenomena of such magnitude man is powerless. The grasshopper, or, as it is called in the English translation of scripture, the locust, is recorded as a periodical plague in all countries bordering on desert lands. Measures against this pest always have proved futile. Prayers have been ordered by all creeds at all times, by the authorities, and profanity in all languages has been practiced by the suffering farmer, with equal success, till the calamity was removed by the remedies the plague carried along in its own nature.

As far as I know there is no instance on record of a real intense grasshopper plague having visited the same district in two consecutive years, a proof of the efficacy of the remedies applied by nature herself.

These remedies are of four different kinds. First, the individual

destroyer collecting around the swarm, represented by beast and bird; second, the gregarious destroyer multiplying in the midst of an ample supply of food, represented by the carnivorous insect; third, animal and vegetable parasites developed inside the grasshopper, and acting in the shape of an epidemic, or, better, epizootic; fourth, the migratory instinct leading the destroyer to his own perdition.

MIGRATORY INSTINCT IN CAGED WILD BIRDS.

BY W. OTTO EMERSON.

I have raised from the nest several pairs of black-headed grosbeaks *(Habia melanocephala)* during the past three years, that have shown me how true remains the migratory instinct in birds even when kept in confinement.

I will attempt to give such notes as I have observed regarding these birds and their evident desire to migrate twice each year.

Of three fledglings taken in June, 1885, two males grew to be strong, handsome singing birds. By fall these grosbeaks began to show a desire to fly, but at night only, between the hours of eight and nine, sometimes as late as ten o'clock. It was not possible to quiet them by any means, and for long afterwards it did not occur to me that this was the premonition of migration showing in these young birds.

The uneasy flight of these grosbeaks was not caused by the presence of strange cats, dogs or other animals liable to provoke such a commotion among them after dark. Again it was not caused by the troublesome bird-lice which sometimes makes canaries so uneasy after dark. No amount of cover over their cage or the placing of it in the darkest part of the house had any effect towards quieting them.

By the following March, 1886, I had about forgotten this uneasy disposition of the grosbeaks, when one warm, spring-like evening, as the cage hung at the east porch, they all at once commenced an uneasy fluttering of their wings as though suddenly waking up to the instinct of migration, if I may so express it. They kept moving back and forth in the cage, calling to one another in lonesome notes such as I have often noted in the migrating wild birds when passing overhead during the early evenings at my home in Haywards, Cal.

They would continue this restless moving for some time, then

after resting for a few minutes off they would start again, as though migrating from the south to the northern breeding grounds. At the times of seasonal migration, the grosbeaks were apparently able to see fully as well at night as in the day time, it making no difference in their uneasy flight if they were covered up in total darkness in the house. By the middle of September following they again showed the disposition to migrate as before, which lasted from three to four weeks, and at the end of this time they began to settle down quietly as though the flight southward had ended. Their foreheads by this time were bare of all feathers from continual beating against the cage wires.

On March 3, 1887, the migratory movement set in again; this season they would often break forth in short bars of their song as one may hear the free birds in summer at the first dawning of day.

I find that the desire to migrate is of shorter duration in the spring with these grosbeaks than in the fall. This fact leads me to believe that on moving southward in the fall the wild bird is not as liable to be overtaken by stormy weather as in the spring migration, and the desire of reaching the winter home is not as strong as that when coming northward to reach the breeding home.

I lost one of these males in December, 1888, but the lone grosbeak showed the same inclination to migrate as early as February 28, 1889, and even began to sing; this I accounted for by the warm open winter of 1888–9. By eight o'clock in the evening he would begin to wake up as if from a dream; he sang a few notes, then hopped back and forth along the perches, calling *pee-éep*, *pee-éep*. If I whistled in reply to him he would answer back.

I added a female to the grosbeak's cage in June, 1889, and when she had completed her fall plumage, September 20, she began to show the migratory instinct by flying wildly about the cage, from eight to nine o'clock in the evening only. The female seemed to show the disposition to start southward much stronger than the male did. She would sometimes strike the wires so hard that I expected to find her dead some morning. The whole top of her head soon became bare of feathers.

It would seem as though these birds, having been brought up from nestlings, would have lost more or less of that wild trait that we look for and see in the wild birds, but each spring and fall they exhibit the same peculiarities.

It was through having these birds caged before me for months, and having made a close study of bird migration during the last ten years, that these grosbeaks have given me a closer insight into the instincts of migratory bird-life, even though they be caged from the nest.

The fact of their being the offspring of wild parents that had the habitual desire of migration in the full sense of the word, may have intensified the instinct of the young when confined, but possibly it may be susceptible to diminution through successive generations.

Not until as late as March 30, 1890, did I notice a repetition of the spring uneasiness described above. On this date at half-past eight in the evening the pair almost simultaneously were seized with the desire to migrate. The weather was clear and cool, and the moon in about the second quarter.

[Dr. R. W. Shufeldt has noted (Auk, vii, 94) a similar inclination in a pair of evening grosbeaks to migrate in spring. He says: "When it came round to March a noteworthy change came over their night habits, for up to that date the pair invariably roosted together, with their heads under their wings, all night long. But during the early part of March the male only kept his perch, sleeping away, while the female bird nearly the entire night incessantly hopped from perch to perch in a restless, uneasy manner. This she persisted in for about a week, when she in turn kept quiet, and then it was the male, who had his week of nights devoted to the same performance."—W. E. B.]

NOTES ON WEST AMERICAN PLANTS. I.

BY KATHARINE BRANDEGEE.

CLEOME INTEGRIFOLIA, T. & G. grows on the northern side of the Little Sur, a stream which empties into the ocean about twenty-five miles south of Monterey. It is one of the showy Capparidaceous plants of the interior basin, not, so far as I am aware, before reported from California.

FREMONTIA CALIFORNICA is reported by Dr. Behr from the vicinity of Loma Prieta, in Santa Clara County. No one else appears to have observed it from that region.

MATRICARIA OCCIDENTALIS Greene, is found about the streets and vacant lots of San Francisco. Both this species and *M. discoidea*

have the appearance of being introduced plants, spreading about cities, country roads and barn-yards, and though found in other localities, usually in much less abundance.

PALMERELLA DEBILIS var. SERRATA Gray, comes from the same locality—which is probably nearly its northern limit.

CAMPANULA EXIGUA Rattan, was described from specimens collected by that gentlemen on Mt. Diablo, and has since been found along the road between the two summits of Tamalpais and along the trail leading to the summit of Mt. St. Helena.

RHODODENDRON CALIFORNICUM Hook. There is in the California Academy of Sciences a painting of this beautiful "Rose Bay" which bears the inscription, "Waddell's Mills, Santa Cruz County, May 10, 1869." It is to be hoped that some enterprising collector will carefully search that locality, as it is not otherwise known so far south.

LEDUM GLANDULOSUM Nutt. grows on Point Reyes, a few miles from Olema, in company with the "red elder" *Sambucus racemosa* (which also grows at Sausalito), and *Rubus spectabilis*, which, in this region, bears abundant fruit of two colors, amber and dark red.

LEMMONIA CALIFORNICA Gray, in robust specimens, was brought, some years ago, from Mt. Hanna, near Kelseyville, in Lake County.

The small *Mimulus* which was described as *M. androsaceus*, and reduced by Dr. Gray to a variety of *M. Palmeri*, has been found on sandy hillsides along the railroad between Felton and the village of Ben Lomond, in Santa Cruz County.

UTRICULARIA VULGARIS L., grows in a pond on the road to Bolinas, near the village of Olema, Marin County.

MONARDELLA MACRANTHA var. NANA Gray, grows about the Little Sur, in Monterey County.

ENCELIA FARINOSA Gray.

This species has received a synonym by the publication of *E. radians* in Proc. Cal. Acad., Ser. 2, ii, 176. The synonym was founded on a low, smooth form, upon which the striking silvery-white tomentum was lacking. This tall Encelia, often five feet high, is common in the southern portion of the Peninsula, and is one of the most handsome plants of that region. Its local name is "Incienso," so called because a resinous exudation from it is collected and burned as an incense in the churches. T. S. B.

BOTANICAL GENERIC NAMES IDENTICAL OR TOO NEARLY ALIKE.

BY H. W. HARKNESS.

This list in addition to a previous one in Bull. Cal. Acad., i, 176, deals only with such names as are held valid in Durand's Index Phanerog. and in the volumes of Saccardo's Sylloge Fungorum. Of course if the synonomical names were included, the list would be a very long one.

PHANEROGAMS.	FUNGI.
Chitonia Moç. & Sesse, DC. Prod. i, 707.	*Chitonia* Fr. Hym. 277.
Cladothrix Nutt. in Herb. Hook DC. Prod. xiii, ii, 259.	*Cladothrix* Cohn, Beitr. i, 3, 204.
Cryptodiscus Schrenck, Enum. pl. nov. 65.	*Cryptodiscus* Cda, Ic. fung. ii, 37.
Didymia Phil. Engl. Jahrb. xiii, 57.	*Didymium* Schrad. nov. pl. gen. i; Rost. Mon. 110.
Dilophia Thom. Hook. Kew Jour. v, 19.	*Dilophia* Sacc. Syll. ii, 357.
Endodesmia Benth. Gen. Pl. i, 166.	*Endodesmia* B. & Br. Ann. N. H. n. 1318
Gymnodiscus Less. Syn. Comp. 89.	*Gymnodiscus* Zukal, Ein. Ascom. 8, t. 1. Sacc. Syll. viii, 545.
Helicostylis Tréc. Ann. Sc. Nat. ser. 3, viii, 134.	*Helicostylum* Cda. Ic. Fung. v, 17 & 55.
Macropodium R. Br. Hort. Kew iv, 108.	*Macropodia* Fckl. Symb. 331.
Micrococca Benth. Hook. Niger Fl. 503.	*Micrococcus* Hall, Cohn, Beitr. Biol. Pflanz. i, 2, 157.
Microglossa DC. Prod. v, 320.	*Microglossum* Sacc. Consp. Gen. Disc. 2.
Syncephalum DC. Prod. vi, 202.	*Syncephalis* Van Tiegh. & LeMonnier, Ann. Sc. Nat. 1873, 372.
Tipularia Nutt. Gen. N. A. Pl. ii, 195.	*Tipularia* Chev. Fl. Par. i, 344.
Thozetia F. Müll. Fl. Austral. iv. 347.	*Thozetia* Berk. & F. Müll., Fungi Austral. 388, No. 304.
Trichoscypha H. f, Gen. Pl. i, 423.	*Trichoscypha* Cooke, Myc. 252.

The following names and numerous other are very inconveniently near in sound:

Acrospira Welw., *Acrospeira* B. & Br.; *Chamærops* L., *Camarops* Fr.; *Camellia* L., *Camillea* Karst.; *Coronilla* Tourn., *Corynella* DC., *Corynelia* Fr.; *Hyaloseris* Gr., *Hyaloceras* Dur. et Mont.; *Lachnæa* L., *Lachnea* Fr.; *Omphalea* L., *Omphalia* Fr.

CONVOLVULUS OCCIDENTALIS Gray (*C. macrostegius* Greene.)

BY T. S. BRANDEGEE.

This species was described by Dr. Gray in Proc. Am. Acad. 89, and is as he writes common in western California on and near the coast. The form is the one with large broad bracts, and is described as having often two and rarely even three flowers from the same pair of bracts. *C. macrostegius* was collected by Dr. Palmer on Guadalupe Island and published by Dr. Sereno Watson as *C. occidentalis* with the following note of Dr. Palmer: "In crevices of high rocks hanging down six feet or more; continuing in bloom from March through the summer. A thousand flowers were seen on a single plant." Prof. Greene in Bull. Cal. Acad. i, 208, considers this Guadalupe plant a distinct species and in Bull. Cal. Acad. ii, 408, reports it as growing upon Santa Cruz Island and also credits it to San Miguel Island. Dr. Gray in Sup. Syn. Flora, 435, gives San Clemente Island as a locality, and Mr. Lyon notes its presence upon Santa Catalina Island. Specimens from all these localities are in the herbarium of the California Academy of Sciences and I have carefully observed the plant growing upon Santa Catalina, Santa Cruz, Santa Rosa Islands, and have examined *C. occidentalis* at many places along the mainland coast. It will be seen that *C. macrostegius* has been considered an insular species closely related to a mainland species growing upon the adjacent coast. The description of and notes concerning *C. macrostegius* all refer to its largest forms. The two extremes in size are common on Santa Rosa, where all forms between those with stems nearly half an inch in diameter and plants less than two feet high bearing a single flower can be found. A form with the apex of the leaf rounded also grows upon Santa Rosa. On Santa Catalina, where it is common, this year I carefully examined many plants and was unable to find any peduncles more

than two-flowered. Those on the mainland in the gulches about San Pedro were either one- or two-flowered; otherwise there was no appreciable difference in size of plants, color of flowers or habit of twining. On Santa Cruz and Santa Rosa Islands the large robust plants are not good twiners, but the smaller and less luxuriant ones twine equally as well as those of the mainland coast. Young plants about eighteen inches high, from seeds of the mainland form and seeds brought by Prof. Greene from Santa Cruz Island, growing side by side in Mrs. R. F. Bingham's garden at Santa Barbara were exactly alike, and twined up their supporting strings as tightly as possible.

The most luxuriant mainland form was found common in the mountains near Santa Barbara, where the peduncles were often as many as five-flowered, each flower enclosed in large broad bracts after the manner of some of the island forms.

It must be apparent from the above notes that no sufficient grounds exist for separating specifically the island from the mainland forms.

ESCAPES IN THE COAST RANGE.

BY FRANK H. VASLIT.

In the moist climate of the Coast Range many garden flowers very easily escape from cultivation, and some of them promise to become quite troublesome in time.

The "Sweet Scabious" or "Mourning Bride," *Scabiosa atropurpurea*, is becoming naturalized in the mountains north of Pescadero, also in lowlands along the San Joaquin. It promises to be nearly as great a nuisance as its relative, the "Fuller's Teasel," *Dipsacus fullonum*, now so freely dispersed about the Bay of San Francisco.

The "Periwinkle," *Vinca major*, has escaped in numerous places, and though, like many of the plants of similar growth, it seldom forms seed, it spreads so freely by its prostrate rooting stems as to be very difficult of eradication.

Some of the Chrysanthemums, now so much cultivated, escape from time to time, and are rather troublesome to get rid of. One of the "Pompons" has apparently established itself on the heights between Redwood City and the sea.

THE CURLED LEAF (*Ascomyces deformans*).

BY H. W. HARKNESS.

This fungus, too well known to most peach-growers, has been given several generic names, but is, perhaps, best known as Ascomyces. It is now mature, and producing the countless spores which give a glaucous bloom to the distorted leaves. No remedy has been found which promises relief from its ravages, and a circumstance lately observed leads me to fear that its extirpation will be attended by an unexpected difficulty.

At several times during the past few years leaves and twigs of buckeye (*Æsculus California*) have reached me which were covered with an *Ascomyces*, practically indistinguishable from *A. deformans*, the only difference observed being a perhaps slightly more regular narrowing of the asci towards the base. All the specimens sent me, and all that have been observed, so far as I know, have come from the vicinity of infected peach trees. The localities noted are Salmon Falls, El Dorado County; Mormon Island, Sacramento County; San Gregorio Creek, San Mateo County; Scott Creek, near Santa Cruz; and Wildwood Glen, near Sausalito.

The fungus affects the buckeye somewhat differently from the peach. The infected tree usually has one or more rather dense bunches of small twigs, often one or two feet in diameter, the whole mass profoundly diseased, the mycelium ramifying to such an extent that the tender leaves are most frequently killed before the fungus matures, and the mass looks as if it had been dipped in boiling water or killed by a sharp frost. The mycelium evidently persists for years in these twigs and small branches, producing annually a crop of diseased leaves, and does not penetrate to the harder and older wood, for in that case it would be generally diffused. There are usually, besides these diseased bunches, scattered spots of infection upon the leaves in other parts of the tree. The difference in the action of the fungus is probably due to the very brief life of the buckeye leaves. In this State they usually fall in the early summer, the bare, white stems which form a conspicuous feature in so many of our hillside landscapes remaining leafless until the following April. The leaves are thus very apt to fall before the ramifying mycelium reaches the twig: this fact also lessens the danger of their infecting other trees.

The absolute identity of the buckeye *Ascomyces* with that of the peach can only be proved by a series of direct infections of healthy trees. In the meantime we trust our horticultural friends will pay some attention to their neighboring buckeyes, and furnish us notes as to the extent to which it prevails in various localities.

CORNUS SESSILIS Torr. fruits abundantly just below the railroad embankment at Blue Cañon and grows in Amador a few miles above Volcano to a much greater height than that given by Mr. Coulter in Bot. Gaz. xv, 33. The fruit is very dark red. T. S. B.

RECENT LITERATURE.

From the number of amateur ornithological papers received of late it would seem that this class of literature is steadily increasing. Whether these publications are a benefit or an evil to those who read them is a matter worthy of consideration. There is no doubt that they exercise considerable influence on the rising generation, some of whom are to be our future scientists, but is it a good influence? This question may best be answered by considering three of these papers of recent date, the Stormy Petrel, the Maine Ornithologist and Oologist, and the American Osprey.

The initial number of the Stormy Petrel was published in April of this year at Mendota, Ill. It is a four-page monthly which the editors (Smith & Co.) promise to enlarge in a short time, and it is their hope that their readers will help them "in making the Stormy Petrel the best ornithological paper published in America." (!) When we look over this insignificant little paper, this statement seems positively ludicrous. It would be a waste of time to look for a single new fact or even an original observation in its columns. The first page is largely taken up with an extract from "Oliver Davie's Book," while an advertisement of the same occupies the last page. The other articles are "The Largest Egg in the World" (that of *Æpyornis maximus*), "The Longevity of Birds" and the "Rubby-throated Humming Bird."

The April number of the Maine Ornithologist and Oologist, published at Garland, Me., is but a slight improvement on the paper considered above. It is an eight-page monthly, five pages and a half of which are devoted to editorials and advertisements. The

first article is on the "Nesting of Cooper's Hawk," the introduction to which is so novel that it will bear quoting: "As the habits and plumage, as also the nests and eggs, of nearly all our birds, has been laid before us on an elaborate scale by men of science, about all that remains for we lesser lights, is give our individual experiences, and they certainly have the merit of originality; therefore, my Oological friends do not expect to gain much wisdom from this article." Surely the warning is unnecessary! This number however has one article of slight interest on "Early Appearances of the Catbird."

The American Osprey, the April number (Vol. 1, No. 4) of which is before us, is printed in somewhat neater style, but the class of articles which it contains is not much in advance of those in the papers just considered. The anonymous article on "The Osprey" is the only thing of any interest in the number, but this contains no more valuable information than the statement that "they never eat anything but fish," and others of like value. The article entitled "Hints for Oologists" sounds like a very brief abstract of Ingersoll's Birds' Nesting.

From the preceding illustrations I think it is shown that these papers, which are typical of a score or more published in America, possess little of merit or originality. Their defenders may urge that the papers are useful in inciting the young to an interest in natural history, but the objection to this is that they they are inaccurate and misleading, that subscribers are asked to write for them; and consequently the beginner in ornithology is induced to attempt to teach long before he has learned anything worthy of being imparted.

C. A. K.

American Spiders and their Spinning Work. By HENRY C. MCCOOK, D. D. In the first volume of this work Dr. McCook has given special attention to the snares and nests of spiders. He has treated of the Pacific Coast species as fully as he could with the material sent him, not having been able to carry out his desire to visit California and study them in the field. Dr. McCook succeeded in hatching some spiderlings from cocoons sent him from San Diego, and studied several California species from living specimens. Three hundred and fifty-four figures embellish this volume. Some of the illustrations, although original with the author, have appeared with his magazine articles, or with Dr. McCook's contributions to the Proceedings of the Philadelphia Academy of Sciences. R. S. E.

Description of Two New Species of Snakes from California. By LEONHARD STEJNEGER. Smithsonian Inst. Issued Feb. 5, 1890. Dr. Stejneger states that "the genus *Lichanura*, the only North American genus of the family *Boidæ*, has hitherto not been recorded from the United States. It was, therefore, very interesting to receive * * a *Lichanura* from San Diego, and from Mr. C. R. Orcutt another from the same locality, as well as a third one collected in the Colorado Desert." R. S. E.

Notes on the Occurrence of Gillichthys y-cauda at San Diego, California. By CHARLES H. GILBERT. Smithsonian Inst. Issued March 4, 1890.

Notes on Fishes collected at Cozumel, Yucatan. By TARLETON H. BEAN. Washington: Gov't Printing Office, 1890. Dr. Bean enumerates sixty species, three of which are new species of *Labridæ*.

Myriopoda extranea Musæi Hungarici, Tab. iv, v. Dr. E. Daday in Journal of Hung. Nat. Museum, describes two new genera of myriopods, *Trachydesmus* and *Paradoxosoma*, and thirty-six new species, six of them, *Spirostreptus trisulcatus*, *Spirobolus ferrugineus*, *Spirobolus Hegedüsii*, *Euryurus flavocarinatus*, *Lithobius carinipes and Lithobius Californicus*, belonging to western North America.

Transactions Am. Entom. Soc. xvii, 1. The Species of Heterocerus of Boreal America, by George H. Horn, with descriptions and figures of all the species (11) of which two, *gemmatus* from Washington to Arizona and Nevada, and *Schwarzi*, from Texas, the Lake Superior region and near Alleghany, Pa., are new. Notes on the species of Ochthebius of Boreal America, by George H. Horn, gives full descriptions, with figure of thorax of 13 species. Notes on the species of Dendroctonus of Boreal America, by W. G. Dietz. Descriptions and notes of six species, one of which, *D. approximatus*, is new. The author is unable to separate *D. punctatus* Lec. from *D. rufipennis* Kirby, and considers *D. frontalis* Zimm. and *D. brevicornis* Lec. identical. Notes on some North American Odonata, by Philip P. Calvert, with notes, descriptions and figures of six species, three of which, *Lepthemis gravida* Hagen MS., from Florida and Texas, *Leucorhinia Hageni* Calvert from Pictou, Nova Scotia, and *Leucorhinia proxima* Hagen MS., from British America, Vancouver's Island, White Mountains and Mass., are described as new. Descriptions of some new species of *Agrotis* by John B. Smith. Describes

new species *A. abnormis, erratica, planifrons, congrua, inelegans, clemens satiens, insertans, cogitans, atomaris, remota, annulipes murdocki, quinquelinea incallida, lutulenta, alticola, basiflava, rena, spectanda nostra, furtivus, infelix*, and notes on *volubilis* Harv., and *tessellata* Harv. collected from British Columbia to California, principally in the latter. The larvæ seem not to be known in any case and it is to be hoped tbat the life history of some of these numerous species may soon be made known. New Species of North American Cynipidæ, by H. F. Bassett, describes as new *Rhodites lenticularis, tumidus, variabilis, Utahensis, nebulosus; Holcaspis duricoria, corallinus, canescens, Sileri, perniciosus; Dryophanta Clarkei, pumiliventris, eburneus, similis, corrugis, pedunculata; Andricus pulchra, pusulatoides, reticulata, ruginosus, saccularius, seminosus, pilula, Mexicana, Clarkei, cicatricula, speciosus, indistinctus, Howertoni, Maxwelli; Acraspis macrocarpæ, politus; Amphibolips Carolinensis, Palmeri; Neuroterus favosus, pallidus, pallipes, politus, Howertoni; Aulax podagræ, tumidus.*

American Naturalist, April. History of Garden Vegetables by E. L. Sturtevant continued from previous number. The Knees of *Taxodium distichum*, by Robert H. Lamborn.

Cryptogamic Laboratory of Harvard University, Contribution xii. The Structure and Development of *Tuomeya fluviatilis* Harv. with plate. (Proc. Am. Acad. xxv, 53–68.) The microscopic structure of the plant and its relation to *Lemanea* and *Batrachospermum* are well brought out. In a foot note concerning the name Dr. Farlow gives his reasons for preferring Harvey's to the earlier printed one of Kuetzing. It seems to us that doubt should not be thrown without good evidence on the date of a scientific publication. This evidence may be in existence but it is not made plain. H. W. H.

Insect Life, Vol. ii, Nos. 7 and 8. C. V. Riley and L. O. Howard. Full of interesting and well-observed facts and useful advice; in regard to *Tinea pellionella* and its congeners we would however as a remedy prefer naphthaline to benzine, because the dry substance is easier to handle, and the slower evaporation extends its beneficial influence over a longer period. In regard to the influence supposed to be exercised by irrigation on arid lands, a close observation has convinced me that the difference is more apparent than real. Before irrigation was practiced there were hardly any inhabitants in these

districts and the grasshopper invasions, like the electric storms on the plains, having no relation to human interests, passed unnoticed. Mr. Riley's notes on that entomological paradox, the Platyphyllus, are of the highest interest. The dipterous parasite on *Diabrotica soror*, described by D. W. Coquillet, from Los Angeles, is not only of agricultural importance, but it is a most interesting biological fact and rather isolated in the history of parasitism. Whether the author is justified in erecting a new genus containing only this newly discovered species, may be questioned by others than ourselves. We may expect a long series of connecting links in that yet very imperfectly explored ocean of parasitic life, where the microscope reveals every year new and mysterious types. In the meantime we admire the author's courage. H. H. B.

Psyche, No. 166–169. The Synopsis of the Odonata discussing the genus *Anax* is of the usual accurate and conscientious character which we are accustomed to find in the works of Dr. Hagen. A discussion of the Argynnides of North America by H. J. Elwes and W. H. Edwards, is of unusual interest. The matter is a very complicated one. Mr. Edwards having studied the life history of most of the types, and raised many of the species from the eggs, appears to be in possession of the more reliable material, while Mr. Elwes by his enormous collection from all parts of the globe commands a wider horizon, that gives him the advantage in drawing conclusions from analogies. J. J. Rivers adds some valuable observations, but is somewhat reserved in generalizing from the material in his possession.

H. H. B.

Entomologica Americana, Vol. vi, Nos. 4, 5. Descriptions of New or Imperfectly Known Lepidoptera, by B. Neumogen; Synopsis of Cerambycidæ by C. W. Leng; Description of a New Carabide of the genus *Cychrus*, by J. J. Rivers; Biological Notes on *Arachnis picta* from Los Angeles, by H. G. Dyar; on *Edema albifrons* by W. Beutenmuller; a series of descriptions of new Californian Homoptera by E. P. Van Duzee; Remarks on some Western Tenebrionidæ by H. F. Wickham, and a new species of *Botis*, by John B. Smith. This journal is an unmistakable proof of the growing interest and value of entomological studies, and we notice with pleasure in the publications before us an advance along the whole line. H. H. B.

California State Mining Bureau—Ninth Report of the State Mineralogist, pps. 1–352, 1889. This volume is largely made up of "Special Articles," of most interest being The Auriferous Gravels of California, by J. H. Hammond, with a series of geological sections and photographs of mining operations; San Nicolas Island, by Stephen J. Bowers; River Mining, by R. L. Dunn; The Value of Fossils as Indications of Important Mineral Products, by Dr. J. G. Cooper; and the papers on pottery and clays, by Linna Irelan and W. D. Johnston.

In the article on Santa Cruz Island W. A. Goodyear discusses the origin of this and neighboring islands, and denies that they were ever connected to the mainland, or, as Mr. Greene suggested, that "Our little archipelago may actually have been connected with some other continent than ours." The author discredits the statement that "any 'elephant' or 'mammoth' bones were ever found on Santa Rosa Island." It will be a relief to the friends of those gentlemen that he does not accuse Dr. Joseph Le Conte or Mr. R. E. C. Stearns of falsehood in this connection, but lays, by implication, the blame upon the collector. The argument of the "vast difference between the flora of these islands and the flora of the mainland," which is used by the author to strengthen his theory, is a remarkably weak one. As a matter of fact there are in all these islands only three genuine types not yet found on the adjacent mainland. One of these (*Hazardia*) is, according to Dr. Gray, not to be separated from the South American genus *Diplostephium*; the second is *Lyonothamnus*, said by Mr. Greene to be "rather too near *Vauquelinia* [a mainland genus], really a section of it." The remaining one, *Lavatera*, is a tender perennial, rapidly becoming extinct on the islands, and possibly may formerly have existed under less favorable conditions on the mainland. Most of the numerous species "peculiar" to the islands are found to be either identical with, or closely related to species found on the mainland, and nearly all the statements made about the great difference in relative abundance or distribution have been shown by later investigations to be founded in error.

Insular Floras, by Lorenzo G. Yates, is a list of the species of plants collected on the islands of Santa Cruz, Santa Rosa, San Miguel and Anacapa, by E. L. Greene, T. S. Brandegee, H. C. Ford and himself. The author confers the title of "Prof." upon all these

gentlemen, whereat they need not, however, feel undue elation, having in this land of republican simplicity to share the honor with a large number of fellow-citizens, including "astrologers," "tonsorial artists," etc. The tabulated list is chiefly remarkable for the number of errors contained. Many of the species occur under two different names, and no notice has been taken of reductions even when made by the authors of the species. The errors in the spelling of names are much beyond the average of official publications—the short list of lichens being almost a model in this respect. We doubt whether even so eminent an authority as Dr. Farlow, who is credited with their identification, would know what was meant by "*Rawalina howalea*," if taken out of its connection.

Botanical Gazette April. Flowers and Insects iv, by Charles Robertson. Mycologic Observations i, by A. P. Morgan. Glandular Pubescence in *Aster patens*, by A. A. Hitchcock. Revision of North American Cornaceæ, by John M. Coulter and Walter H. Evans, concluded from February number. The authors describe as new *Cornus Baileyi* and *C. Greenii*, founded principally on difference in pubescence and seed characters, which have, perhaps, been too much relied upon, as the authors themselves hint in a parenthesis, to the description of *C. pubescens*. Six species of *Garrya* are recognized, *G. Lindheimeri* being, we think, very properly reduced to a variety of the Mexican *G. ovata*, and *G. flavescens* to var. *flavescens* of *G. Veatchii* Kell. This last species, as well as *G. buxifolia*, will probably be found to be too closely related to *G. Fremontii*

Torrey Botanical Club, Bull., April. Contributions to Canadian Bryology 2, by John Macoun, the following mosses described as new by Dr. Kindberg: *Andræa Macounii*, *Gymnostomum platyphyllum*, *Dicranum angustifolium*, *D. Canadense*, *D. sulcatum*, and *D. subulifolium*. Enumeration of the plants collected by Dr. H. H. Rusby in South America 1885–1886,—xii, by Dr. N. L. Britton, with the following new species by A. Cogniaux: *Miconia elongata*, *M. Brittonii*, *M. polygama*, *M. Rusbyana*, *M. flavescens*, *Clidemia Boliviensis*. A New Entyloma (*E. Ellisii* on Spinach), by Byron Halsted. The New Edition of Gray's Manual, by Sereno Watson. A New Moss of the Genus Bruchia (*B. longicollis*), with pl. ci, by D. C. Eaton. Notes on some of the Plants found in Muskoka Lake, K. B. Claypole.

Garden and Forest, No. 113.—Native Shrubs of California, iii, by E. L. Greene; *Cattleya Skinneri*, with fig. No. 114.—New, or Little Known Plants *(Ligustrum Sinense)*, illustrated. No. 115.—New, or Little Known Plants *(Paulownia Fortunei)*, copied from Gardener's Chronicle; Notes on American Plants, by F. H. Horsford. No. 116.—The Mandioca, by Thomas Morong; The Redwood Forest, by Carl Purdy; New, or Little Known Plants *(Buckleya distichophylla)* with fig. No. 117.—New, or Little Known Plants *(Berberis Sieboldii)*, with fig.

Notes on New Remedies, ii, No. 12. The Active Principle of Loco Weed, by Prof. L. E. Sayre, State University, Kansas. The author remarks upon a previous analysis made of *Astragalus mollissimus* by Dr. Mary G. Day, considering the crystals obtained by her as of inorganic origin. In subsequent experiments made by himself he obtained a crystalline substance supposed to be organic, but not yet completely investigated. Further experiments and investigations are promised. The people of this Coast should have much interest in these studies, several of our species of Astragalus (rattleweed) having also a reputation for poisonous effects.

PROCEEDINGS OF SOCIETIES.

CALIFORNIA ACADEMY OF SCIENCES. *May 5, 1890.* Vice-President Behr in the chair.

Carl H. Eigenmann and Charles Fuchs were elected resident members.

May 19, 1890. President Harkness in the chair.

Chas. A. Keeler was proposed for membership.

Mr. F. Gutzkow communicated that he had lately occasion to examine the deposits of so-called pyrolusite or manganese ore found in many places within the city limits of San Francisco. He reported that they consisted principally of psilomelane, or "hard" ore of manganese, containing a notable quantity of barya and about 57 per cent. of peroxide of manganese. As the maximum percentage of psilomelane rarely exceeds 60 per cent., while the German pyrolusite assays up into the nineties, it will be easily understood why shipments made to England about twenty years ago had to be discontinued.

Examination of specimens from other Californian localities seems to show that most, if not all, deposits of pyrolusite mentioned in various geological publications ought to be properly called deposits of psilomelane.

Mr. C. H. Eigenmann spoke on the development of the membranes in the eggs of fishes. He said that the simplest form of an egg membrane is a thin membrane traversed by fine canals. This membrane, the *zona radiata*, which is present in all fish eggs, is the only covering of those eggs, which are lighter than water, and

therefore, pelagic. Those eggs which are heavier than water and would fall to the bottom and, in many cases, die in the mud, are provided with various contrivances to attach them to foreign substances as soon as deposited. In the herring, this consists of a membrane overlying the zona, which becomes extremely viscid when it is deposited, and causes the eggs to adhere to any substance with which they may come in contact. In the smelt (*Osmerus*), an outer membrane exists, which is attached to the zona only around the micropyle. At the time of spawning this membrane is stripped off and attaches itself to foreign substances, thus suspending the egg by the micropylar region. In the gobies, a network of threads similarly attached to the zona takes the place of the outer membrane in the smelt. In the sticklebacks a number of mushroom-shaped processes, attached to an outer membrane, are viscid.

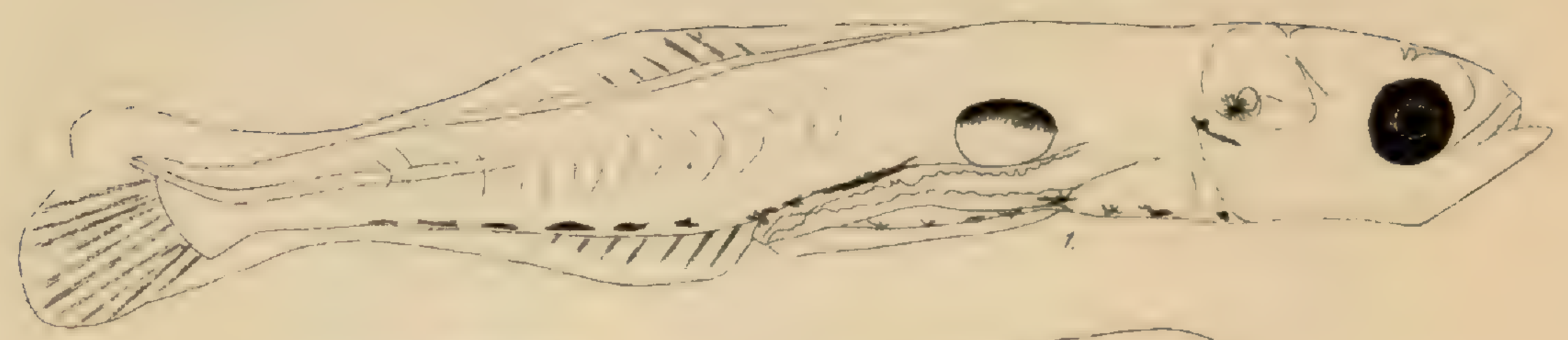
There are in many eggs long threads attached to the zona, which twine about sea-weeds, etc., and suspend the eggs. These threads vary greatly in different eggs. In *Isesthes* they are massed on one-half of the zona, and form a cushion by which the egg is attached. In the mud minnow (*Fundulus*) the threads are numerous, and mere prolongations of an outer thin membrane. In Atherinopsis they are fewer (10), with hollow bases which fit into projections of the zona. In the flying fish and gar fish they fit into pockets of the zona radiata.

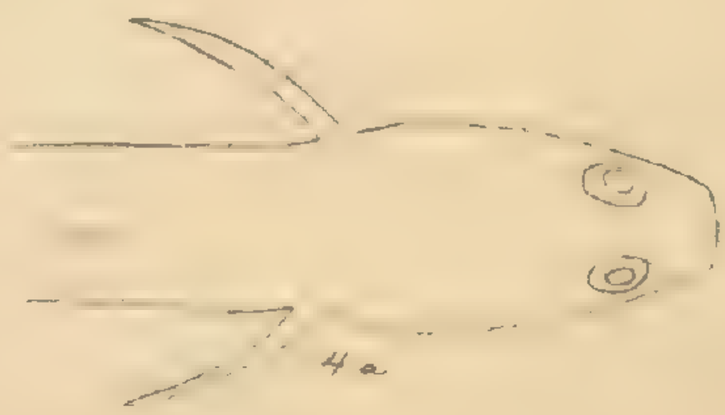
All the membranes and processes were shown to be the product of the egg itself, and in those eggs provided with processes these are usually developed before the zona makes its appearance.

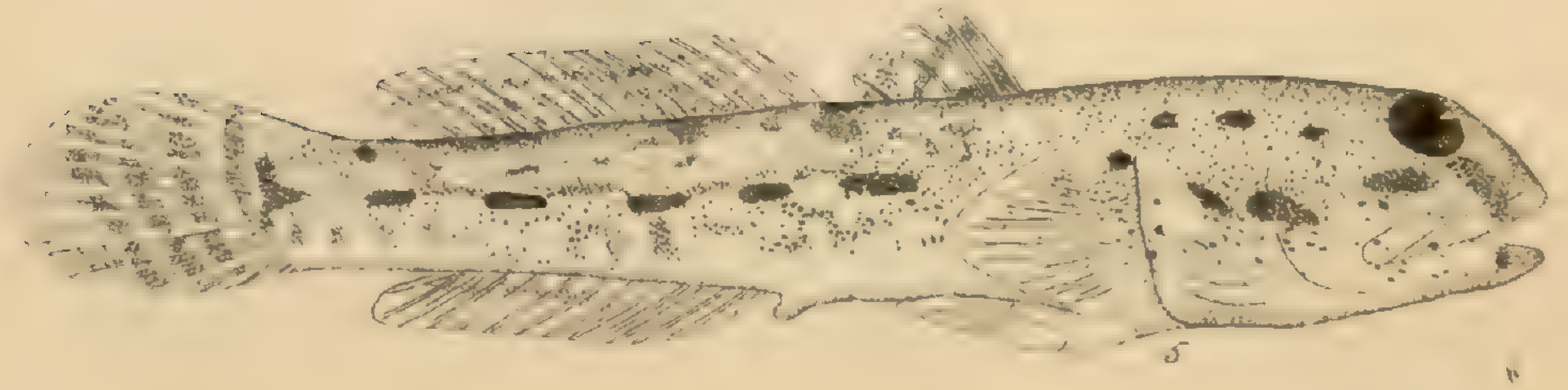
In the yellow perch a thick covering overlies the zona. This differs from all other structures in the fish eggs. It is the product of the granulosa cells overlying the zona, and is not formed until the latter has almost attained its full thickness.

It was further shown that the granulosa cells are modified in the region of the micropyle, and one large cell usually acts as a plug to the micropyle in ovarian eggs.

PLATE II.

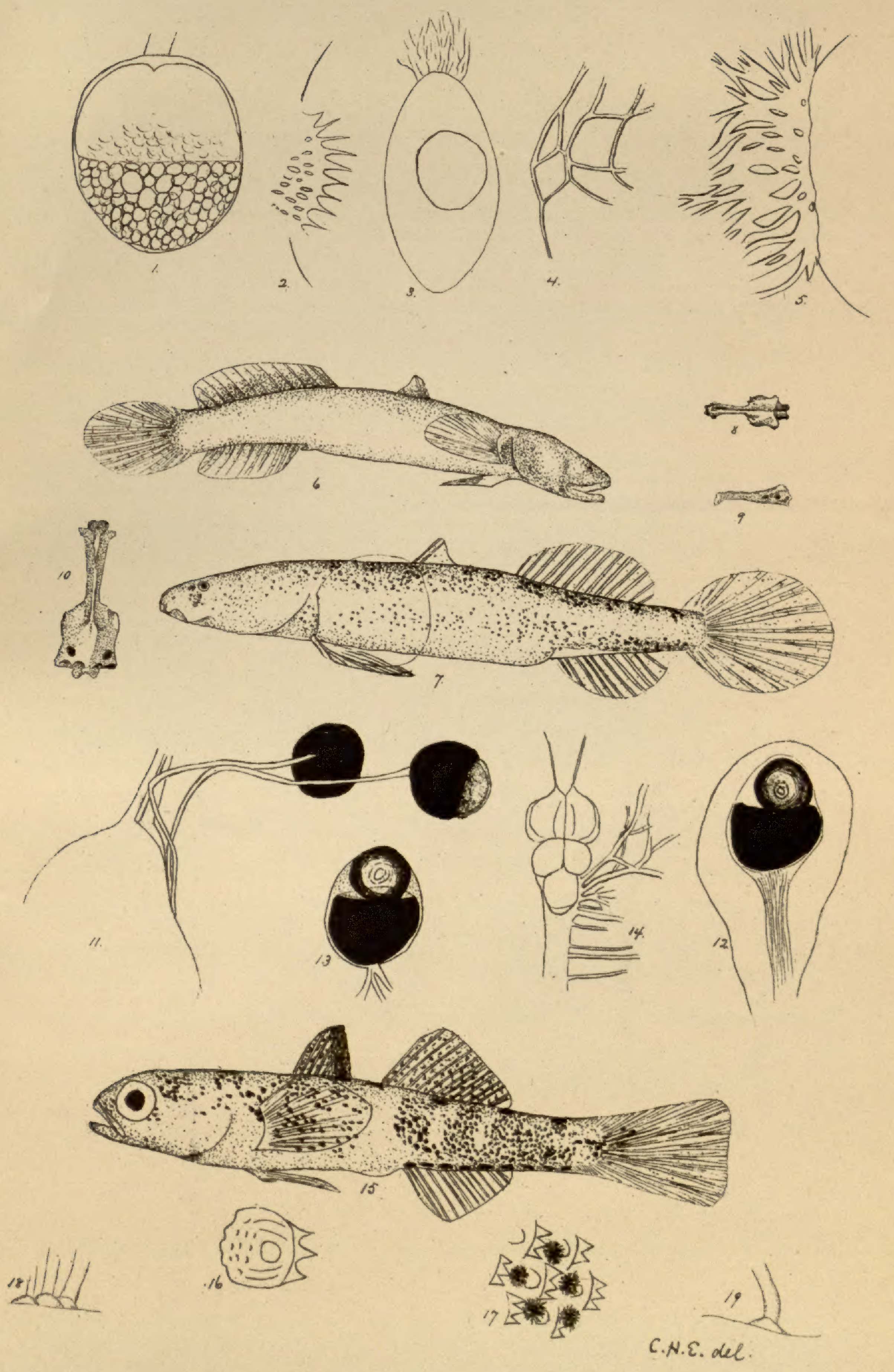






C. H. E. del.

PLATE III.

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