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PROCEEDINGS
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NOTES ON THE NESTS AND EGGS OF THE EIGHT NORTH AMERICAN
SPECIES OF EMPIDONACES.

By T. M. BREWER.

In the following paper are given the measurements of all the eggs of the eight species of *Empidonax* that are in the collections of the Smithsonian Institution, and also those in my own, and also a few others. Three of these species, *E. minimus*, *obscurus*, and *hammondi*, so far as is known, have eggs that are uniformly of an unspotted white. If ever spotted, they are so very rarely and so very slightly as hardly to constitute really an exception. In another species, *flaviventris*, of which, so far as I am aware, only five or six well-identified sets have been secured, at least two well-identified sets have been taken that are entirely of an unspotted white color, the others being all more or less spotted and marked. All the remaining four species, *traillii*, *acadicus*, *pusillus*, and *difficilis*, have eggs strongly marked, though, among them all, eggs are occasionally found that are of an unspotted white, or marked with very minute spottings. In the following brief mention I chiefly confine myself to the size of each egg, its locality, and the authority for its identification, if the record has been preserved.

Empidonax hammondi, Baird.

Four eggs in Museum of Comparative Zoölogy, Cambridge (No. 1681), from Blue River, Colo., Edwin Carter, measure .62 x .52; .60 x .54; .62 x .52; .64 x .53, averaging about .62 x .53.*

T. M. B.'s cabinet No. 1921. Anderson River. MacFarlane. .67 x .52; .68 x .51.

The first set is smaller and more rounded than average eggs of *E. minimus*, but they are otherwise indistinguishable. None are spotted.

Empidonax obscurus, Baird.

Smithsonian No. 15875. Utah. Ridgway. .71 x .55. Ground-color an immaculate dead white.

Smithsonian No. 13592. Austin, Nev. Ridgway. .72 x .55; .74 x .55.

Smithsonian No. 2335. Dodge Valley, Utah. McCarty. .70 x .55; .72 x .54.

* I am indebted for these measurements to Mr. J. A. Allen.

T. M. B. No. 999. Arizona. Dr. Palmer. .76 x .58; .77 x .54.

T. M. B. No. 1760. Utah. Ridgway. .75 x .58; .70 x .54.

Greatest length .77, least .70; greatest breadth .58, least .54. General average of all the examples .73 x .55.

Empidonax difficilis, Baird.

Smithsonian No. 17593. San Francisco, Cal. Samuel Hubbard. .70 x .52; .65 x .50; .68 x .50; average .68 x .51. The ground-color of these three examples is a creamy white, almost a dead white, and they are chiefly spotted around the larger end with markings of a brownish red and a few faint spots of lavender. The color of the markings of this set has no resemblance whatever to those of 13440 (*E. flaviventris*) when carefully compared.

T. M. B. No. 665. Monterey, Cal. Dr. Canfield. .76 x .59; .74 x .59. Spotted with light-brown markings, on a creamy ground, the markings being exclusively around the larger end.

T. M. B. No. 2960. Santa Cruz, Cal. William A. Cooper. The female parent was shot by Mr. Cooper, and was sent to Washington for identification. The nest was in a hollow in a bank, covered with roots and bushes. Incubation just begun, May 4, 1878. .69 x .50; .69 x .51; .70 x .52; .69 x .52. These four eggs, as indeed nearly all of the eggs of this species that I have ever seen, are conspicuously marked with vivid light reddish-brown spots. In three of this set they are chiefly on the larger end; in one the markings are distributed over the whole egg. Ground-color a creamy white.

T. M. B. No. 2959. Nicasio, Marin County, Cal. C. A. Allen. The female parent was shot by Mr. Allen and identified by Mr. Ridgway. .70 x .53; .70 x .54; .65 x .54; .70 x .55. Marked with large bright reddish-brown spots, chiefly about the larger end. This nest was also built in a cavity.

T. M. B. No. 2728. Santa Cruz, Cal. Geo. H. Ready. Sent me as *E. pusillus*, but evidently a wrong identification. The nest was on a horizontal sycamore limb, ten feet from the ground. .68 x .55; .70 x .57; .70 x .57; .68 x .58.

T. M. B. No. 2890. Haywood, Cal. Dr. J. G. Cooper. May 25, 1877. .70 x .55; .70 x .55; .66 x .55; .68 x .52. The last-mentioned egg is of a very nearly unspotted white.

T. M. B. No. 3053. Santa Cruz, Cal. Geo. H. Ready. April 22, 1877. Nest on the lower limb, at the extremity, of a sycamore, ten feet above the ground. .66 x .52; .65 x .53; .67 x .53. These eggs are, with hardly a doubt, those of *E. difficilis*, though mistaken by Mr. R. for *pusillus*. Their ground-color is pure creamy white. The spots are few, small, and of a more than usually faint brown, disposed in rings around the larger end, the residue of the egg being unspotted.

In 24 examples, the greatest length is .76, least .65, average .69; greatest breadth .59, least .50, average .54.

Empidonax pusillus, Cabanis.

Smithsonian No. 16305. Snake River. Merriam. .76 x .52; .75 x .50.

Smithsonian No. 15210. Parley's Park, Utah. Robt. Ridgway. .77 x .55; .76 x .55; .78 x .57.

Smithsonian No. 15207. From the same. .64 x .49; .70 x .51; .64 x .52.

Smithsonian No. 12982. Sacramento, Cal. Ridgway. .70 x .52; .74 x .55; .70 x .54; .70 x .52.

Smithsonian No. 8543. Vancouver Island. Hepburn. .74 x .55.

T. M. B. No. 960. Northern California. Hepburn. .72 x .58; .73 x .58; .73 x .59.

T. M. B. No. 2119. Lake Koskonong, Wis. Thure Kumlien. Both parents secured. .68 x .52; .71 x .54.

By the kindness of Mr. H. W. Henshaw I am enabled to give the measurements of two sets of eggs taken by him near Honey Lake, Cal., in the summer of 1878, June 25. The first set of three eggs has an unusually pinkish tinge to the cream-colored ground, and around the larger end is a beautiful wreath of markings of a light lilac-brown blending with others of reddish brown. These eggs measure .75 x .55; .74 x .58; .78 x .59.

The other set of four eggs have a nearly pure white ground, and are marked around the wider portion of the egg with small red-brown and a few lilac-brown spottings of a rounded shape. The rest of each egg, including the larger end, has an unspotted surface. One egg has only a very few very fine dottings, and is very nearly pure white. Their measurements are .69 x .55; .68 x .54; .70 x .55; .71 x .58.

All the eggs of this species have a certain family resemblance, which it is easy to recognize at sight, but very difficult to describe distinguishingly. They are all more or less marked with small, rounded spots, rarely blotched, and the markings are, some of them, much more minute than is usual in any other species. The spots are also scattered more about the entire egg, or, if confined, are chiefly on the larger portion of the circumference, and never, or certainly rarely, confluent.

Mr. Henshaw informs me that he has examined at least twenty-five nests of this species (*pusillus*), and that with only one exception they have all been built in willows. The nest before me, taken by Mr. H. near Honey Lake, June 25, 1877, is a well-woven structure, made of thin strips of the inner bark of deciduous trees, broken bits of dry grasses, lichens, &c., and is lined with fine grasses and hair. It is pyramidal in shape, tapering to a point at the base, and is $4\frac{1}{2}$ in external height and $3\frac{1}{4}$ in external breadth. The cavity is two inches deep. It contained the set of four eggs referred to above.

The exception referred to by Mr. Henshaw was a nearly completed nest of this species, found June 17, that was placed in a crotch of a swinging grape-vine. Its structure is said to have been unusually neat and firm for a Flycatcher's. (Wheeler's Report, 1876, p. 255.)

Empidonax traillii, Baird.

Smithsonian No. 4036. East Bethel, Vt. C. Paine. .74 x .52; .74 x .52; .70 x .53; .73 x .52.

Smithsonian No. 7330. Fort Resolution. Lockhart. .80 x .57; .75 x .55; .73 x .55; .72 x .55.

Smithsonian No. 8859. The same. .80 x .55; .80 x .55.

Smithsonian No. 4052. Three Rivers, Canada. Reikoff. .79 x .57.

Smithsonian No. 4395. Great Slave Lake. Lockhart. .79 x .57; .74 x .55.

Smithsonian No. 1229. Williamstown, Mass. Hopkins. .70 x .53; .70 x .55; .72 x .54.

Smithsonian No. 1819. Winnebago, Ill. .70 x .55; .68 x .55. This set is an almost unspotted white.

T. M. B. No. 412. Gorham, N. H. T. M. B. .73 x .49.

T. M. B. No. 413. E. Bethel, Vt. Paine. .76 x .50; .72 x .49.

T. M. B. No. 438. Coventry, Vt. Knight. .70 x .52.

T. M. B. No. 1978. Catskill Mountains, N. Y. Dr. James C. Merrill. .72 x .53; .70 x .52. One of these is very nearly an unspotted white.

T. M. B. No. 1006. Coventry, Vt. .75 x .57.

T. M. B. No. 2632. Milan, N. H. Welch. .79 x .60; .79 x .60.

T. M. B. No. 3054. Randolph, Vt. Prince. .75 x .58; .72 x .55; .73 x .57.

Empidonax flaviventris, Baird.

Smithsonian No. 13219. Halifax, N. S. Downes. Received with parent. .74 x .53. Of a uniform dead chalky white. The other eggs of this set measured .73 x .55 and .75 x .54.

Smithsonian No. 13440. St. Stephen, N. B. Geo. A. Boardman. Parent secured and identification perfect. The nest is small; had been built in a low bush; its breadth internally is 1.90 inches, depth 1.25; external diameter 3 inches, depth 1.75. It is constructed of flax-like fibres, fine shreds of the inner bark of deciduous trees, a few fine grasses mingled with feathers, and lined with horse-hair, downy feathers, and fine grasses. The eggs measure .75 x .54; .75 x .53; .76 x .55. Their original number was four. They have a ground-color of a pure white, with blotch-like spots on the larger end, of purplish drab and umber-brown, mixed with scattered black markings, but without a tinge of red, and are unlike any other eggs of this genus that I have ever seen.

T. M. B. No. 416. Centre Harbor, N. H. T. M. B. .70 x .56; .74 x .58; .67 x .55. One of these unspotted; two of them marked with small spots of purple drab.

T. M. B. No. 418. Halifax, N. S. Downes. .69 x .55. This egg and the two others in this set were of a nearly pure chalky white, with a few faint spots, so slight as, at first, to be overlooked. The parent secured and sent with the eggs. I exclude from this list the set secured by me in Grand Menan, referred to below, as, although the identifica-

tion was apparently satisfactory, it was not placed beyond doubt by securing the parent. The eggs averaged .68 x .53. Neither in size, shape, nor in the shade of ground-color, did they at all resemble any fresh eggs of *E. minimus* that I have ever seen.

In these ten specimens, the greatest length is .76, the least .67, average .73; the greatest breadth is .58, the least .53, average .55.

Since the above was written, my friend Mr. Wm. A. Jeffries has procured for me, through the courtesy of Mr. Deane, the measurements of the four eggs procured by the latter in Maine, and described by Mr. Purdie. These measure .70 x .55; .70 x .55; .65 x .52; .70 x .55, and reduce the average to .72 x .55. The eggs are described by Mr. Jeffries as of pure white ground, with markings in two eggs of fine dots; in the others, small irregular blotches, of a light red-brown, not so deep or so bright as in *difficilis*; mingled with these are a few markings of lilac. The ground-color appears to have lost the rosy tint mentioned by Mr. P. in the first description, in which, too, no mention is made of the lilac-colored spots.

Through the kindness of Mr. Osborne I have also been enabled to examine one of the eggs contained in the nest of this species found by him in Grand Menan. It measures .70 x .56, and agrees exactly with the description given by him, except that there is a slight roseate tinge in the white ground. The spots are a light reddish brown, and the egg is undistinguishable from several eggs in my collection of *E. difficilis*. It is very different from the eggs identified by Mr. Boardman.

Mr. Osborne writes me that none of this set differ more than $\frac{2}{100}$ in their measurements, and that in their color the only points in which any differ from the one described are the lighter shade of the ground-color and the larger size of the blotches.

Empidonax acadicus, Baird.

Smithsonian No. 10039. Maryland. Slack. .77 x .57.

Smithsonian No. 3430. Marion County, W. Va. Morgan. .67 x .57; .68 x .52; .68 x .55; .75 x .53; .74 x .56; .70 x .56; .67 x .57; .68 x .52; .68 x .55; .75 x .53; .74 x .56; .70 x .56.

Smithsonian No. 2018. Philadelphia. Mellvaine. .76 x .58; .71 x .56.

Smithsonian No. 1959. Locality not given. .75 x .55; .72 x .57.

Smithsonian No. 2128. Northern Georgia. Dr. Gerhardt. .77 x .57; .77 x .59.

Smithsonian No. 13470. Locality not given. .76 x .55.

Smithsonian No. 17607. Washington, D. C. H. W. Henshaw. .74 x .54; .70 x .55; .72 x .55.

Smithsonian No. 1681. Halifax, Va. .82 x .55.

T. M. B. No. 2735. Staten Island, N. Y. S. D. Osborne. June 5, 1875. .81 x .60; (nearly unspotted) .80 x .59; .79 x .59.

T. M. B. No. 1010. Indiana. Geo. Welch. .78 x .58; .78 x .60; .77 x .59; .75 x .58.

In these 31 examples the greatest length is .82, the least .67, the mean

.74; the greatest breadth .60, least .52, average .56. The eggs of this species uniformly have a ground-color of a creamy white, or a deep cream-color, and when fresh have a slight roseate tinge. In a few instances the markings are almost, though never wholly, wanting. The eggs of this species so closely resemble those of *traillii* as to be indistinguishable; but they may be readily told from those of *pusillus*.

Empidonax minimus, Baird.

The ground-color of the eggs of this species, as a general rule, is a uniform unspotted white, a creamy white when fresh, fading into a dead white when long exposed to the light and air. In one set of two eggs, both examples are faintly marked with dark or blackish-brown spots. In all the other instances I have seen where eggs of this species seemed to be spotted, the markings have had rather the appearance of stains than genuine natural characters.

Smithsonian No. 3771. Lynn, Mass. Welch. .65 x .48; .66 x .50.

Smithsonian No. 12770. E. Windsor Hill, Conn. Dr. Wood. .64 x .48; .65 x .50; .64 x .50; .65 x .50.

Smithsonian No. 8715. The same. .66 x .51; .65 x .50; .67 x .50; .65 x .50; .66 x .53.

Smithsonian No. 16677. Pembina. D. Gunn. .67 x .49; .65 x .50; .66 x .48.

Smithsonian No. 10485. Fort Resolution. Lockhart. .63 x .47; .65 x .50; .65 x .48.

Smithsonian No. 8861. The same. .69 x .50; .69 x .49; .68 x .48.

Smithsonian No. 2193. Randolph, Vt. Paine. .67 x .52.

Smithsonian No. 15030. Racine, Wis. Dr. Hoy. .60 x .50; .61 x .51. Both of these examples are slightly spotted with a very dark or blackish brown.

Smithsonian No. 6212. Fort Resolution. Lockhart. .70 x .52; .65 x .51; .63 x .52; .67 x .52; .67 x .52.

Smithsonian No. —. Pembina. D. Gunn. .60 x .52; .65 x .51; .63 x .52; .64 x .50.

Smithsonian No. 14562. Lynn. Welch. .62 x .50; .64 x .51; .65 x .49; .65 x .49.

Smithsonian No. 1854. The same. .62 x .52; .65 x .52; .60 x .52.

Smithsonian No. 2985. Sing Sing, N. Y. .64 x .52.

Smithsonian No. 13447. Calais, Me. Boardman. .64 x .52; .65 x .49; .64 x .51; .65 x .48.

Smithsonian No. 1973. Connecticut. Dr. Wood. .62 x .49; .70 x .50; .57 x .48.

Smithsonian No. 4097. Great Slave Lake. Lockhart. .63 x .51; .63 x .50; .65 x .50; .62 x .51.

T. M. B. No. 240. New Britain, Conn. Moore. .60 x .49; .62 x .52.

T. M. B. No. 1262. Lynn. Welch. .64 x .50; .66 x .50.

T. M. B. No. 226. The same. .66 x .52; .65 x .50; .64 x .50; .64 x .50.

T. M. B. No. 3055. E. Bethel, Vt. Prince. .63 x .49; .60 x .50; .59 x .50; .61 x .50; .61 x .50; .65 x .50.

In these 61 examples the extreme length, in two instances, is .70, the least .57, and the mean .64; extreme breadth .52, least .47, mean .50.

RECAPITULATION.

	Extreme length.	Least length.	Mean length.	Extreme breadth.	Least breadth.	Mean breadth.	No. of examples.
<i>Emp. hammondi</i> .....	.68	.60	.64	.54	.51	.52	6
<i>E. obscurus</i> .....	.77	.70	.73	.58	.54	.55	9
<i>E. difficilis</i> .....	.76	.65	.69	.59	.50	.54	24
<i>E. pusillus</i> .....	.78	.64	.72	.59	.49	.55	25
<i>E. trailli</i> .....	.80	.68	.74	.60	.49	.54	31
<i>E. flaviventris</i> .....	.76	.65	.72	.58	.52	.55	15
<i>E. acadicus</i> .....	.82	.67	.74	.60	.52	.56	31
<i>E. minimus</i> .....	.70	.57	.64	.52	.47	.50	61

Mr. S. D. Osborne (B. N. O. C. iii, 187) describes the nest and eggs found in a hummock of moss on the island of Grand Menan, the parent of which was procured, and was by him identified as *E. flaviventris*. "The cavity extended in about two inches, was about four inches in depth, and was lined with a very few fine grasses, black hair-like roots, and skins of berries. The eggs, four in number, are white, with a very delicate creamy tint, which differs in its intensity in the different specimens, and are spotted, mostly at the larger end, with a few dots and blotches of a light reddish shade."

Eight days later than Mr. Osborne's discovery, and in a different locality, Messrs. Deane and Purdie secured another nest and set of eggs, identified as of the same species, in Houlton, Me. This, too, was "in a ball of green moss." "The lining was mainly of fine black rootlets, with a few pine needles and grass stems." "The eggs, four in number, were perfectly fresh, rounded oval in shape, and of a beautiful rosy-white tint, well spotted with a light reddish shade of brown." (B. N. O. C. iii, 166.)

Mr. Osborne remarks that "there are several nests of this bird in different collections, the identities of most, if not all, of which are disputed"; and he adds, "the descriptions given by Baird, Brewer and Ridgway, agree very well with the nests of the Traill's Flycatcher," &c. The first clause is so vague as to make it doubtful to what nests he may refer. So far as I am aware, prior to 1878 only four or five nests of this bird had been procured, and of these three at least are as well and as completely identified as are those of either Mr. Osborne's or Mr. Purdie's. Their authenticity is as indisputable.

Mr. Purdie also assumes, "so great is the variation," "that there was some error of identification"; and finally refers the eggs to the Least Flycatcher, and cites Mr. Ridgway as authority. But Mr. Ridgway, on

the contrary, accepts them as genuine eggs of *flaviventris* in his recent report (p. 544), whatever may be their resemblance to those of *E. minima*; and he so accepts them still.* In fact, there is no more reason why we should reject the identification of these nests and eggs, than for our refusing to credit the statements of Messrs. Osborne, Purdie, and Deane. In either case the identification was complete, and the differences in the nest, if of any real moment, tell as much against the one as the other. Mr. Boardman's and Mr. Downes's birds were submitted to Prof. Baird, and have had his verification in addition.

In June, 1850, I met with a nest which I then had no doubt belonged to this species. It was in a low bush on Grand Menan, near the water. My nephew H. R. Storer, then a lad of sixteen, was with me. Both parents were seen, and the male was carefully observed through a good glass; the female, when first seen, was on the nest; a male, apparently its mate, was near by. Unfortunately, in the attempt to secure one of the parents, it was missed, and the birds became so wild that neither could be secured. We were obliged to leave the island and to take the nest without further identification, but we had no doubt as to the identity. The eggs were white, not cream-color, more oblong and larger than the average eggs of *E. minima*.

A few weeks later, the same year, I received, among other nests and eggs, collected near Halifax by Mr. Andrew Downes, two nests and two sets of eggs, with the parent of each, of *flaviventris*. The parents were sent to Prof. Baird, and by him identified as *E. flaviventris*. There were no notes as to the position of these nests; they were mere collections of broken grasses, and it is not improbable they had been built in hollow places. There was, at least, nothing to show to the contrary. Their authenticity there is no reason to question. The following summer a nest with three eggs and its parent were taken in Centre Harbor, two of the eggs being spotted. The same summer Mr. Boardman procured the nest, four eggs, and the parent bird referred to above as now in the Smithsonian collection. These eggs do not at all correspond, in the color of their markings, to the descriptions given of the sets found in 1878.

Entire reliance cannot be placed upon mere differences in the construction of nests to prove difference of species. However remarkable this may be, it is anything but conclusive. It will be seen that just the same differences are noted in the descriptions of the nesting of *E. difficilis*. While two are noted as built in holes in banks, corresponding with those of the recent examples of *flaviventris*, others were built near the extremities of sycamore limbs ten feet from the ground. Mr. J. A. Allen (B. N. O. C. iii, p. 25) speaks of the *E. acadicus* building a much ruder nest than *E. minimus*, and most probably the specimens before him justified his conclusions; but my experience would lead me to reverse their relative positions. In fact, both of these species vary greatly in their architecture, the Acadian most of all, and no one, but

* But see these Proceedings for 1878, p. 425, footnote.—R. R.

for his positive knowledge of their specific identity, could suppose that a certain flat platform-nest of one pair; the deeply-hollowed nest, with its remarkable border of *chevaux de fris*, of another; and, again, the beautiful pensile nest, like a Vireo's, of a third, were all nests of this same species *acadicus*.

The differences in the color of the eggs identified as those of *flaviventris* are, perhaps, more unusual and remarkable, certainly to their extent. Here are two well-identified sets, those from Halifax, of an unspotted white; another set, but slightly spotted; then Mr. Boardman's set, strongly marked, but very differently from the eggs belonging to the two most recently identified nests. The eggs of *hammondi* and *obscurus* are plain white, and no record exists of any spotted example of either. The same is almost equally true of *minus*. In sixty-one eggs, only two are found with even faint spots; but this exception may show the possibility of there being more variations than we are now aware of. Among the eggs of *difficilis* a single specimen occurs of very nearly unspotted white. The same is true of one egg of *E. pusillus*. Among the eggs of *E. traillii* unspotted eggs are comparatively more common. Among my eggs of *E. acadicus* there is also one very nearly an unspotted white. So that these variations in nests and in color of eggs cannot be received as necessarily conclusive as against such positive identifications as those of Mr. Boardman's and Mr. Downes's examples.

If we take the product of the average length multiplied by its average breadth at the point of the largest diameter as a proximate test of the relative size of the eggs of each species, we find the following result:

<i>Acadicus</i>	4144
<i>Obscurus</i>	4015
<i>Traillii</i>	3996
<i>Flaviventris</i>	3960
<i>Pusillus</i>	3930
<i>Difficilis</i>	3726
<i>Hammondi</i>	3328
<i>Minus</i>	3200

Since the above was in type, Mr. Charles A. Allen of Nicasio, California, has furnished me with some very interesting and apposite notes on the nidification of *Empidonax difficilis*, demonstrating the remarkable variations that may exist in regard to the position and structure of the nests of one and the same species of birds. After mentioning that he has taken and identified some forty or fifty nests of this species, he adds:

"I find *E. difficilis* breeding in all situations. Sometimes I find them on the curled root of a tree on the banks of a stream or brook, not over six inches above the water; again I find them in the jagged end of some half-submerged log in mid-stream; again within the loose bark of a tree, no matter what kind, nine or more feet up; again I find them in a

cavity in some decayed tree or limb, or in any kind of depression that gives a base to begin to work on. I also find them in out-houses, or buildings removed from dwellings, on the rafters, or on any spot where they can stick their nest. They are also very common under bridges, and I have found four built in the forks of small trees, some four or five feet up. These were all the same veritable *E. difficilis*."

A LIST OF EUROPEAN FISHES IN THE COLLECTION OF THE
UNITED STATES NATIONAL MUSEUM.

By TABLETON H. BEAN.

About 350 nominal species are mentioned. Since the list is intended simply to facilitate the exchanges between the United States National Museum and museums in Europe, no attempt has been made to distribute the names in accordance with the latest knowledge concerning the classification and specific identity of the species in question. The names given to them by those who presented them are, with few exceptions, retained.

One species (*Gasterosteus Blanchardi*, Sauvage), which was described from specimens sent to Paris from Boston, United States, is referred to *Gasterosteus pungitius*, Linn. (= *Pygosteus occidentalis*, (C. & V.) Brevort), with which it is identical.

The numbers at the left are those of the National Museum Catalogue; those at the right were attached to the fishes when they were received.

Class, PISCES.

Order, PLECTOGNATHI.

Family, TETRODONTIDÆ.

Tetrodon marmoratus, Ranzani.

10208. Canaries. Vienna Museum. (14.)

Family, BALISTIDÆ.

Monacanthus filamentosus, Val.

10217. Canaries. Vienna Museum. (34.)

Order, LOPHOBRANCHII.

Family, HIPPOCAMPIDÆ.

Hippocampus brevisrostris, Cuv.

21122. La Rochelle. Mus. d'Hist. Nat. Paris. (22.)

Hippocampus comes, Cantor.

21163. Madagascar. Mus. d'Hist. Nat. Paris. (63.)

Hippocampus abdominalis, Lesson.

21169. Australia. Mus. d'Hist. Nat. Paris. (69.)

Hippocampus guttulatus, Cuv.

21121. Naples. Mus. d'Hist. Nat. Paris. (21.)

21164. Sicily. Mus. d'Hist. Nat. Paris. (64.)

Family, SYNGNATHIDÆ.

Syngnathus phlegon, Risso.

21124. Nice. Mus. d'Hist. Nat. Paris. (24.)

Syngnathus acus, Linn.

17490. Bergen, Norway. Norwegian Government. (132.)

22022. Christiania, Norway. R. Collett.

22023. Christiania, Norway. R. Collett.

Syngnathus rubescens, Risso.

21123. Nice. Mus. d'Hist. Nat. Paris. (23.)

Syngnathus abaster, Risso.

21113. La Rochelle. Mus. d'Hist. Nat. Paris. (13.)

Syngnathus Agassizii, Michahelles.

21112. Nice, France. Mus. d'Hist. Nat. Paris. (12.)

Syngnathus pelagicus, Linn.

12566. Dr. J. E. Gray. British Museum. (80.)

Siphonostoma typhle, Linn.

12620. Europe.

12520. Europe. (256.)

17489. Bergen, Norway. Norwegian Government. (131.)

21119. France. Mus. d'Hist. Nat. Paris. (19.)

12519. Constantinople.

Siphonostoma Rondeletii, De la Roche.

21118. Marseilles. Mus. d'Hist. Nat. Paris. (18.)

Siphonostoma pyrois, Risso.

6056. Europe.

Nerophis æquoreus, Linn.

17491. Bergen, Norway. Norwegian Government. (133.)

22019. ♂. ♀. Stavanger, Norway. R. Collett.

Nerophis ophidion, Linn.

21114. Algeria. Mus. d'Hist. Nat. Paris. (14.)

22020. Christiania, Norway. R. Collett.

Nerophis papacinus, Risso.

2969. Europe. Bonaparte Collection. (258.)

Nerophis teres, Rathke.

21116. Crimea. Mus. d'Hist. Nat. Paris. (16.)

Nerophis lumbriciformis, (Willughby) Kröyer.

21115. La Rochelle. Mus. d'Hist. Nat. Paris. (15.)

22024. ("Scyphius lumbriciformis, (Willughby) Nilss.") Stavan-
ger, Norway. R. Collett.

Nerophis annulatus, (Risso) Günth.

21117. Nice. Mus. d'Hist. Nat. Paris. (17.)

Order, PEDICULATI.

Family, LOPIIIDÆ.

Lophius budegassa, Spinola.

12683. Europe. Bonaparte Collection.

Order, TELEOCEPHALI.

Family, SOLEIDÆ.

Solea vulgaris, Quensel.

12514. Cast. London, England.

21177. France. Mus. d'Hist. Nat. Paris. (77.)

17324. Helsingburg, Sweden. Swedish Centennial Commission.
(38.)

22033. Christiania, Norway. R. Collett.

17354. Bergen, Norway. Norwegian Government. (87.)

5913. Locality unknown.

Solea ocellata, Linn.

10204. Canaries. (44.)

Solea lascaris, Risso.

10091. Europe. Bonaparte Collection. (17?)

Solea lutea, Risso.

10067. Europe. L. Agassiz.

Anmopleurops lacteus, (Bon.) Günth.

10092. Europe. Bonaparte Collection.

Microchirus linguatula, (Thompson).

10070. Europe. Bonaparte Collection. (36.)

Family, PLEURONECTIDÆ.

Pleuronectes platessa, Linn.

21175. France. Mus. d'Hist. Nat. Paris. (75.)

10061. Christiania, Norway. R. Collett.

22028. Nordland, Norway. R. Collett.
 17360. Bergen, Norway. Norwegian Government.
 17316. Helsingburg, Sweden. Swedish Centennial Commission.
 (31.)
 10029. Kiel Bay. Dr. Möbius.

Pleuronectes limanda, Linn.

17357. Bergen, Norway. Norwegian Government. (84.)
 22030. Christiania, Norway. R. Collett.
 22031. Young. Christiania, Norway. R. Collett.
 17337. Helsingburg, Sweden. Swedish Centennial Commission.
 (34.)
 22087. Christiania, Norway. R. Collett.
 10036. Norway. R. Collett.
 21174. ("Pleuronectes flesus.") France. Mus. d'Hist. Nat. Paris.
 (74.)

Hippoglossoides limandoides, (Bloch) Günth.

10032. ("Pleuronectes limandoides, Bloch.") Norway. R. Collett.
 22034. Lofoten, Norway. R. Collett.

Pleuronectes Boscii, Risso.

10085. Europe. Bonaparte Collection. (9.)

Pleuronectes microcephalus, Donov.

17290. Helsingburg, Sweden. Swedish Centennial Commission.
 (30.)
 17359. Bergen, Norway. Norwegian Government. (82.)
 17358. Bergen, Norway. Norwegian Government.

Pleuronectes cynoglossus, Linn.

17320. Helsingburg, Sweden. Swedish Centennial Commission.
 (33.)
 17355. Christiania, Norway. Norwegian Government. (86.)
 10068. Europe. L. Agassiz.

Pleuronectes flesus, Linn.

17323. Sweden. Swedish Centennial Commission. (32.)
 22029. Young. Christiania, Norway. R. Collett.
 10031. Norway. R. Collett.
 17356. Bergen, Norway. Norwegian Government. (85.)
 10028. ("Platessa flesus.") Kiel Bay. Dr. Möbius.

Platessa passer, Bon.

10069. Europe. Bonaparte Collection. (12.)

Hippoglossus vulgaris, Flem.

17308. Helsingburg, Sweden. Swedish Centennial Commission.
(35.)
17363. Bergen, Norway. Norwegian Government. (76.)

Rhombus maximus, Linn.

16771. England. Liverpool Free Public Museum.
17332. Helsingburg, Sweden. Swedish Centennial Commission.
(36.)
22032. Christiania, Norway. R. Collett.

Rhombus lævis, Rondel.

22182. France. Mus. d'Hist. Nat. Paris. (82.)
16772. England. Liverpool Free Public Museum.
10684. Europe. Bonaparte Collection. (11.)
12512. London, Eng. (174.)

Phrynorhombus unimaculatus, (Risso) Günth.

10066. Europe ?

Zeugopterus punctatus, (Bloch) Gottsche.

17361. Bergen, Norway. Norwegian Government. (80.)

Zeugopterus megastomus, (Donov.) Gottsche.

17362. Bergen, Norway. Norwegian Government. (78.)

Zeugopterus norvegicus, Günth.

22035. Christiania, Norway. R. Collett.

Rhomboidichthys podas, (De la Roche) Bleek.

10086. ("*Bothus rhomboides*.") Bonaparte Collection. (15.)

Rhomboidichthys mancus, (Risso) Günth.

6514. Madeira. Wm. Stimpson.

Family, MACRURIDÆ.

Macrurus rupestris, Bloch.

8571. Europe. Bonaparte Collection.

Macrurus norvegicus, Nilss.

17364. Bergen, Norway. Norwegian Government. (75.)

Family, FIERASFERIDÆ.

Fierasfer imberbis, Cuv.

10165. Europe. Bonaparte Collection. (358.)

Family, OPHIDIIDÆ.

Ophidium barbatum, Linn. *pars*.

3562. Europe ?

Ophidium Vasalli, Risso.

2920. Europe. Bonaparte Collection. (484.)

Family, RANICEPITIDÆ.

Raniceps niger, Nilss.

17367. Bergen, Norway. Norwegian Government. (72.)

10956. Christiania, Norway. R. Collett.

10238. Bergen, Norway. (138.)

Family, GADIDÆ.

Gadus poutassou, Risso.

17379. Bergen, Norway. Norwegian Government. (61.)

17378. Bergen, Norway. Norwegian Government. (67.)

Gadus morrhua, Linn.

17388. Ova. Lofoten, Norway. G. O. Sars. (52.)

9561. Ova in various stages of development. G. O. Sars.

9562. Young recently hatched. G. O. Sars.

9564. Two weeks old. G. O. Sars.

9563. One month old, collected on surface of sea.

17390. About 1½ months. Lofoten, Norway. G. O. Sars. (50.)

17391. About two months old. Lofoten, Norway. G. O. Sars. (49.)

17392. Two months old. Lofoten, Norway. G. O. Sars. (48.)

17393. Two and one-half months. Lofoten, Norway. G. O. Sars.
(47.)

17395. Three months. Lofoten, Norway. G. O. Sars. (45.)

17394. Three months. Lofoten, Norway. G. O. Sars. (46.)

17396. Four months. Lofoten, Norway. G. O. Sars. (44.)

9568. Four or five months. Norway. G. O. Sars.

17397. Four or five months. Lofoten, Norway. G. O. Sars. (43.)

17398. About five months. Lofoten, Norway. G. O. Sars. (42.)

17400. Five to six months. Lofoten, Norway. G. O. Sars. (40.)

17399. Five to six months. Lofoten, Norway. G. O. Sars. (41.)

9569. Nearly six months, near shore. Lofoten, Norway. G. O.
Sars.

17401. About six months. Lofoten, Norway. G. O. Sars. (39.)

17402. Six months. Lofoten, Norway. G. O. Sars. (38.)

17403. Eight to nine months. Lofoten, Norway. G. O. Sars. (37.)

17404. Ten to eleven months. Lofoten, Norway. G. O. Sars. (36.)

17405. One year. Lofoten, Norway. G. O. Sars. (35.)

17389. Young. Lofoten, Norway. G. O. Sars. (51.)

22052. Lofoten, Norway. R. Collett.

22053. Christiania, Norway. R. Collett.

16770. England. Liverpool Free Public Museum.

10105. Kiel Bay.

10036. Norway. R. Collett.

17406. Bergen, Norway. Norwegian Government. (34.)
 17407. Bergen, Norway. Norwegian Government. (33.)
 17503. (Stuffed.) Bergen, Norway. Norwegian Government.
 17352. ("Gadus callarius, L.") Bohuslän, Sweden. Swedish Centennial Commission. (23.)
 17305. ("Gadus callarius, L.") Baltic, Sweden. Swedish Centennial Commission. (24.)

Gadus æglefinus, Linn.

17387. Young. Bergen, Norway. G. O. Sars. (53.)
 17385. Young. Lofoten, Norway. G. O. Sars. (55.)
 17386. Young. Lofoten, Norway. G. O. Sars. (54.)
 22055. Christiania, Norway. R. Collett.
 17384. Young. Lofoten, Norway. G. O. Sars. (56.)
 17383. Young. Lofoten, Norway. G. O. Sars. (57.)
 17328. Helsingburg, Sweden. Swedish Centennial Commission. (25.)
 10057. Christiania, Norway. R. Collett.

Gadus merlangus, Linn.

17382. Young. Bergen, Norway. Norwegian Government.
 10035. Norway. R. Collett.
 10106. Kiel Bay. Dr. Karl Möbins.
 17329. Helsingburg, Sweden. Swedish Centennial Commission. (26.)
 21134. Calais, France. Mus. d'Hist. Nat. Paris. (34.)

Gadus minutus, Linn.

10038. Norway. R. Collett.
 22054. Christiania, Norway. R. Collett.
 17381. Young. Bergen, Norway. Norwegian Government.

Gadus esmarkii, Nilss.

10034. Norway. R. Collett.
 22056. Christiania, Norway. R. Collett.
 17380. Christiania, Norway. Norwegian Government. (60.)

Gadus melanostomus, Nilss.

10054. Christiania, Norway. R. Collett.

Gadus pollachius, Linn.

17335. Helsingburg, Sweden. Swedish Centennial Commission. (37.)
 17377. Bergen, Norway. Norwegian Government. (62.)
 22057. Christiania, Norway. R. Collett.

Gadus virens, Linn.

17374. Young. Lofoten, Norway. Norwegian Government. (65.)
 17373. Young. Lofoten, Norway. Norwegian Government. (66.)

9565. Young. Lofoten, Norway. G. O. Sars.
 17375. Young. Bergen, Norway. Norwegian Government.
 17502. (Stuffed.) Bergen, Norway. Norwegian Government. (6.)

Phycis mediterraneus, De la Roche.

10209. Spain. Vienna Museum. (32.)

Phycis furcatus, Flem.

17371. Bergen, Norway. Norwegian Government. (68.)

Molva vulgaris, Flem.

10050. Christiania, Norway. R. Collett.
 17370. Bergen, Norway. Norwegian Government. (69.)
 17504. (Stuffed.) Bergen, Norway. Norwegian Government.
 17330. Sweden. Swedish Centennial Commission. (66.)
 17350. Helsingburg, Sweden. (28.)
 16775. England. Liverpool Free Public Museum.

Molva abyssorum, Nilss.

17369. Bergen, Norway. Norwegian Government.

Motella mustela, (Linn.) Nilss.

5747. Near Liverpool, Eng. Wm. Stimpson.

Motella tricirrata, (Bloch) Nilss.

17368. Bergen, Norway. Norwegian Government. (71.)
 5937. Milford Haven. South Wales. Wm. Stimpson.
 5700. ("*Motella vulgaris*, Cuv.") Europe. Bonaparte Collection.
 10095. ("*Motella vulgaris*, Cuv.") Europe. Bonaparte Collection.
 10378. Europe. Bonaparte Collection.

Motella maculata, (Risso) Günth.

12618. Europe. Bonaparte Collection. (447.)

Motella cimbria, Linn.

10058. Christiania, Norway. R. Collett.
 22058. Christiania, Norway. R. Collett.

Motella glauca, Jenyns.

22046. Stavanger, Norway. R. Collett.

Brosmius vulgaris, Flem.

17366. Bergen, Norway. Norwegian Government. (73.)

Lota vulgaris, Jenyns.

10096. Europe. Bonaparte Collection. (149.)
 10095. Europe. Bonaparte Collection. (152.)
 10098. Sweden.
 17333. Sweden. Swedish Centennial Commission. (29.)
 2200. Leeds, Eng. Henry Denny.
 21166. France. Mus. d'Hist. Nat. Paris. (66.)

Merluccius vulgaris, (Linn.) Flem.

17372. Bergen, Norway. Norwegian Government. (67.)
 7883. Madeira. Wm. Stimpson.
 10081. ("*Merluccius esculentus*, Risso.") Europe. Bonaparte Col-
 lection. (146.)
 10151. Europe. Bonaparte Collection. (143.)

Family, LYCODIDÆ.

Zoarces viviparus, (Linn.) Cuv.

10065. Kiel Bay. Dr. Karl Möbius.
 17294. Baltic, Sweden. Swedish Centennial Commission. (48.)
 17417. Bergen, Norway. B. Hansen.
 22027. Christiania, Norway. R. Collett.
 3533. Denmark. Sternberg.

Family, AMMODYTIDÆ.

Ammodytes tobianus, Linn.

10166. Europe. Bonaparte Collection. (357.)
 17365. Bergen, Norway. Norwegian Government.
 10044. Norway. R. Collett.

Ammodytes tau, ———.

10041. Norway. R. Collett.

Ammodytes teretissima, ———.

10094. Europe. Bonaparte Collection. (340.)

Family, STICHLÆIDÆ.

Stichæus punctatus, (Fabr.) Krøyer.

4588. Greenland. Danish Academy.

Leptoclinus aculeatus, (Reinh.) Gill.

22084. ("*Lumpenus lampetraformis*, (Walb.).") Lofoten, Norway.
 R. Collett.

By some mistake, a specimen of *Leptoclinus aculeatus* was sent with the number calling for *Lumpenus lampetraformis*.

Family, XIPHIDIONTIDÆ.

Centronotus gunellus, Bl. Schn.

10033. Norway. R. Collett.
 22051. Nordland, Norway. R. Collett.
 17418. Bergen, Norway. B. Hansen. (24.)
 2193. Leeds, England. Henry Denny.
 21125. ("*Gunellus vulgaris*, Flem.") Calais, France. Mus. d'Hist.
 Nat. Paris. (25.)
 4580. ("*Gunellus vulgaris*, Flem.") Kattegat. Danish Academy.
 3534. ("*Gunellus vulgaris*, Flem.") Denmark. Sternberg.

Family, ANARRHICHADIDÆ.

Anarrhichas lupus, Linn.

17419. Bergen, Norway. B. Hansen. (23.)

17506. Stuffed. Bergen, Norway. Norwegian Government. (4.)

Family, BLENNIIDÆ.

Blennius varus, Pall.

2292. Europe. Bonaparte Collection. (107.)

Blennius anticolus, Bon.

2293. Europe. Bonaparte Collection. (109.)

Blennius palmicornis, Cuv. & Val.

2287. Europe. Bonaparte Collection. (132.)

Blennius ocellaris, Linn.

2288. Europe. Bonaparte Collection. (133.)

Blennius galerita, Linn.

2291. Europe. Bonaparte Collection. (161.)

Blennius pholis, Risso.

21149. St. Malo, France. Mus. d'Hist. Nat. Paris. (49.)

Blennius trigloides, Cuv. & Val.

2289. Europe. Bonaparte Collection. (127.)

Blennius basilius, Cuv. & Val.

10173. Europe. Bonaparte Collection. (126.)

Carelophus Ascanii, (Walb.) Kr.

22074. Florö, Norway. R. Collett.

Clinus argentatus, Risso.

2294. Europe. Bonaparte Collection. (122.)

Family, URANOSCOPIDÆ.

Uranoscopus scaber, Linn.

2214. Europe. Bonaparte Collection. (475.)

21157. Nice. Mus. d'Hist. Nat. Paris. (57.)

Family, TRACHINIDÆ.

Trachinus draco, Linn.

22012. Europe. Bonaparte Collection. (473.)

21179. France. Mus. d'Hist. Nat. Paris. (79.)

10063. Kiel Bay. Dr. Karl Möbius.

17428. Bergen, Norway. B. Hansen. (13.)

3535. Denmark. Steruberg.

6036. Madeira. Wm. Stimpson.

Family, GOBIESOCIDÆ.

Lepadogaster ciliatus, Risso.

10104. Europe. Bonaparte Collection. (134.)

Lepadogaster biciliatus, Risso.

10172. Europe. Bonaparte Collection. (135.)

Family, LIPARIDIDÆ.

Liparis vulgaris, Flem.

22044. Christiania, Norway. Robert Collett.

22045. Finmarken, Norway. Robert Collett.

Liparis barbatus, Ekstr.

5338. Liverpool. Wm. Stimpson.

5339. Liverpool. Wm. Stimpson.

Liparis Montagui, (Donov.) Cuv.

10239. Bergen, Norway. Bergen Museum. (168.)

22036. Stavanger, Norway. R. Collett.

Family, CYCLOPTERIDÆ.

Cyclopterus lumpus, Linn.

10043. Norway. R. Collett.

10047. Norway. R. Collett.

22049. Nordland, Norway. R. Collett.

17420. Bergen, Norway. B. Hansen. (22.)

17508. Stuffed. Bergen, Norway. Norwegian Government. (3.)

17310. "The Sound," Sweden. Swedish Centennial Commission.
(49.)

Family, CALLIONYMIDÆ.

Callionymus lyra, Linn.

10047. Norway. R. Collett.

22047. Christiania, Norway. R. Collett.

17421. Bergen, Norway. B. Hansen. (21.)

Callionymus maculatus, (Raf.) Bon.

2295. Europe. Bonaparte Collection. (106)

Callionymus festivus, Pallas.

21161. ♀ (7 spec.). Nice, France. Mus. d'Hist. Nat. Paris. (61.)

21162. ♂ (3 spec.). Nice, France. Mus. d'Hist. Nat. Paris. (62.)

Callionymus Morrisonii, Risso.

2297. Europe. Bonaparte Collection. (119.)

Family, GOBIIDÆ.

Gobius niger, Linn.

12572. Europe. Brit. Mus. (449.)
 21148. St. Malo, France. Mus. d'Hist. Nat. Paris. (48.)
 22043. Christiania, Norway. R. Collett.

Gobius paganellus, Linn.

5385. Europe.

Gobius cruentatus, Gmel.

2282. Europe. Bonaparte Collection.

Gobius minutus, Gmel.

17426. Bergen, Norway. B. Hansen. (16.)
 22040. Christiania, Norway. R. Collett.

Gobius quadrimaculatus, Cuv. & Val.

2284. Europe. Bonaparte Collection. (10.)

Gobius ruthensparri, Euphr.

17423. Bergen, Norway. B. Hansen. (19.)
 22038. Christiania, Norway. R. Collett.

Gobius microps, Kröyer.

17424. Christiania, Norway. B. Hansen. (18.)
 22039. Christiania, Norway. R. Collett.

Gobius pictus, Malm.

17425. Christiania, Norway. B. Hansen. (17.)
 22037. Norway. R. Collett.

Latrunculus stuvitzii, (Düb. & Kor.).

17422. Christiania, Norway. B. Hansen. (20.)

Family, TRIGLIDÆ.

Dactylopterus volitans, (Linn.) Lac.

2226. Europe. Bonaparte Collection. (93.)

Trigla aspera, Cuv. & Val.

2219. Europe. Bonaparte Collection. (95.)

Trigla lineata, Gmelin.

2223. Europe. Bonaparte Collection. (102.)
 10218. Canaries. Vienna Museum. (42.)

Trigla hirundo, Bloch.

21158. Nice, France. Mus. d'Hist. Nat. Paris. (58.)

Trigla gurnardus, Linn.

17430. Bergen, Norway. B. Hansen. (11.)
 10055. Christiania, Norway. R. Collett.
 22063. Christiania, Norway. R. Collett.
 21176. France. Mus. d'Hist. Nat. Paris. (76.)

Trigla milvus, Lac.

2221. Europe. Bonaparte Collection. (91.)

Trigla lyra, Linn.

2224. Europe. Bonaparte Collection.
 21297. Madeira. Wm. Stimpson.

Trigla obscura, Linn.

2220. Europe. Bonaparte Collection. (96.)

Family, AGONIDÆ.

Agonus cataphractus, Linn.

3288. (3 spec.) Sweden. H. Denny.
 17429. Bergen, Norway. B. Hansen. (12.)
 21101. France. Mus. d'Hist. Nat. Paris. (1.)
 21159. Nice, France. Mus. d'Hist. Nat. Paris. (59.)
 22065. Christiania, Norway. R. Collett.

Peristedion cataphractum, (L. Gm.) Cuv. & Val.

2225. Europe. Bonaparte Collection. (92.)
 2224. Europe. Bonaparte Collection. (91.)

Family, COTTIDÆ.

Cottus gobio, Linn.

2229. Europe. Bonaparte Collection. (104.)
 3286. Nürnberg.
 21106. Paris. Mus. d'Hist. Nat. Paris. (6.)
 21128. Paris. Mus. d'Hist. Nat. Paris. (28.)

Cottus pœcilopus, Heckel.

3287. Sweden.
 22059. Mjosen, Norway. R. Collett.

Cottus scorpius, Linn.

3285. Sweden. H. Denny.
 17433. Bergen, Norway. B. Hansen. (8.)
 22060. Christiania, Norway. R. Collett.

Cottus bubalis, Euphr.

2192. Leeds, Eng. H. Denny.
 3289. Sweden.
 17432. Bergen, Norway. B. Hansen.

Cottus colneus, ———.

8129. ———. Rudolph B. Hitz.

Cottus quadricornis, Linn.

3290. Baltic Sea.

17295. Sweden. Swedish Centennial Commission. (44.)

Phobctor ventralis, Cuv. & Val.

17431. Christiania, Norway. B. Hansen. (10.)

Icelus hamatus, Kröyer.

22085. Hammerfest, Norway. R. Collett.

Centridermichthys uncinatus, (Reinh.) Günth.

22064. Finmarken, Norway. R. Collett.

Family, SCORPÆNIDÆ.

Sebastes norvegicus, (Linn.) Cuv.

10046. Norway. R. Collett.

17435. Bergen, Norway. B. Hansen. (6.)

17436. Bergen, Norway. B. Hansen. (5.)

Sebastes imperialis, Cuv.

17434. Bergen, Norway. B. Hansen.

Sebastes Kuhlii, (Bowd.) Lowe.

8018. Madeira.

10194. Portugal. Vienna Museum. (30.)

Scorpæna porcus, Linn.

10130. Constantinople.

12584. British Museum. (361.)

21110. Marseilles. Mus. d'Hist. Nat. Paris. (10.)

Scorpæna scrofa, Linn.

2231. Europe. Bonaparte Collection. (89.)

10181. Gibraltar. (46.)

Family, LABRIDÆ.

Labrus maculatus, Bloch.

10060. Christiania, Norway. Robert Collett.

17414. Bergen, Norway. B. Hansen. (27.)

17415. Bergen, Norway. B. Hansen. (26.)

Labrus turdus, Linn.

21126. France. Mus. d'Hist. Nat. Paris. (26.)

Labrus mixtus, Linn.

10062. Christiania, Norway. Robert Collett.
 10236. Bergen, Norway. Bergen Museum. (84.)
 17412. Bergen, Norway. Bergen Museum. (29.)
 17413. Bergen, Norway. Bergen Museum. (28.)

Labrus melops, Linn.

10059. Christiania, Norway. Robert Collett.
 22061. Christiania, Norway. Robert Collett.
 12630. ("*Crenilabrus melops*."). Europe. British Museum.
 17411. ("*Crenilabrus melops*."). Bergen, Norway. Bergen Museum.
 (30.)

Ctenolabrus rupestris, (Linn.) Cuv. & Val.

17410. Bergen, Norway. Bergen Museum. (31.)
 22072. Christiania, Norway. Robert Collett.
 22073. Christiania, Norway. Robert Collett.

Ctenolabrus iris, Cuv. & Val.

10164. Europe. Bonaparte Collection. (308.)

Acantholabrus exoletus, Cuv. & Val.

17408. Bergen, Norway. Bergen Museum.
 17409. Bergen, Norway. Bergen Museum. (32.)
 22062. Christiania, Norway. Robert Collett.

Crenilabrus quinque maculatus, (Bloch) Günth.

10281. Europe. Bonaparte Collection. (321.)

Crenilabrus griseus, (L. Gm.) Günth.

12595. Europe. British Museum.

Crenilabrus ocellatus, (Forsk.) Cuv. & Val.

10152. Europe. Bonaparte Collection. (317.)

Crenilabrus roissali, Risso.

10286. Europe. Bonaparte Collection. (322.)

Crenilabrus sicculus, ———.

10156. Europe. Bonaparte Collection. (410.)

Crenilabrus lapina, Risso.

10285. Europe. Bonaparte Collection. (320.)

Coricus virescens, Risso.

10087. Europe. Bonaparte Collection. (307.)

Julis pavo, Cuv. & Val.

10210. Canaries. Vienna Museum. (4.)

Julis mediterranea, Risso.

10283. Europe. Bonaparte Collection. (310.)

Julis Geoffroyii, Quoy & Gaim.

10282. Europe. Bonaparte Collection. (385.)

Julis turcica, Risso.

10284. Europe. Bonaparte Collection. (326.)

Family, POMACENTRIDÆ.

Glyphidodon sparoides, Cuv. & Val.

21150. Madagascar. Mus. d'Hist. Nat. Paris. (50.)

Heliastes chromis, (Linn.) Günth.

21160. Nice. Mus. d'Hist. Nat. Paris. (60.)

Family, OSPHROMENIDÆ.

Trichopus trichopterus, (Pallas) Lacép.

21167. Cochin China. Mus. d'Hist. Nat. Paris. (67.)

Trichopus parvipinnis, Sauvage.

21168. (Type.) Laos. Mus. d'Hist. Nat. Paris. (68.)

Family; CHÆTODONTIDÆ.

Chætoodon vittatus, (Bl.) Schn.

21170. Sandwich. Mus. d'Hist. Nat. Paris. (70.)

Family, SCOMBRIDÆ.

Scomber scombrus, Linn.

5379. Europe.

5380. Europe.

10037. Norway. Robert Collett.

16773. England. Liverpool Free Public Museum.

16774. England. Liverpool Free Public Museum.

17312. Sweden. Swedish Centennial Commission. (46.)

17427. Bergen, Norway. B. Hansen.

Scomber pneumatophorus, De la Roche.

10182. Canaries. Vienna Museum. (29.)

Pelamys sarda, (Bl.) Cuv. & Val.

5378. Europe.

Family, CARANGIDÆ.

Trachurus trachurus, (Linn.) Günth.

3524. Malaga, Mediterranean.

3563. Europe.

2270. (" *Caranx trachurus*.") Europe. Bonaparte Collection. (377.)

22067. (" *Caranx trachurus*.") Christiania, Norway. R. Collett.

Decapterus Jacobæus, (Cuv. & Val.).

21260. Madeira. Wm. Stimpson.

Caranx dentex, Cuv. & Val.

10207. Canaries. Vienna Museum. (47.)

Argyreiosus setipinnis, (Mitch.) Günth.

12583. Atlantic. British Museum. (98.)

Naucrates ductor, (Bl.) Cuv. & Val.

2276. Europe. Bonaparte Collection. (366.)

Psettus sebæ, Cuv. & Val.

4105. Cape Palmas, Africa. R. H. Steele.

Family, STROMATEIDÆ.

Stromateus microchirus (Bonelli) Bon.

2273. Europe. Bonaparte Collection. (382.)

Family, ZENIDÆ.

Zeus faber, Linn.

2271. Europe. Bonaparte Collection. (494.)

21191. France. Mus. d'Hist. Nat. Paris. (91.)

Family, CAPRIDÆ.

Capros aper, (Linn.) Lacép.

2279. Europe. Bonaparte Collection. (33.)

Family, MULLIDÆ.

Mullus surmuletus, Linn.

2217. Europe. Bonaparte Collection. (101.)

Family, BERYCIDÆ.

Beryx splendens, Lowe.

10213. Canaries. Vienna Museum. (10.)

Family, SPARIDÆ.

Cantharus lineatus, (Montagu) White.

10214. Canaries. Vienna Museum. (116.)

21183. France. Mus. d'Hist. Nat. Paris. (83.)

Cantharus ranuda, Risso.

10377. Europe. Bonaparte Collection. (56.)

Box vulgaris, Cuv. & Val.

10180. Canaries. Vienna Museum. (43.)

21120. Morea, Turkey. Mus. d'Hist. Nat. Paris. (20.)

Box salpa, (Linn.) Cuv. & Val.

2254. Europe. Bonaparte Collection. (20.)
 10203. Spain. Vienna Museum. (37.)
 21111. Algeria. Mus. d'Hist. Nat. Paris. (11.)

Oblata melanura, (Linn.) Cuv. & Val.

2255. Europe. Bonaparte Collection. (19.)
 21104. Naples. Mus. d'Hist. Nat. Paris. (4.)

Sargus vulgaris, Geoffr.

12581. Europe. British Museum. (362.)

Sargus Salviani, Cuv. & Val.

21109. Algeria. Mus. d'Hist. Nat. Paris. (9.)

Sargus Rondeletii, Cuv. & Val.

2241. Europe. Bonaparte Collection. (46.)

Sargus annularis, (L. Gm.) Geoffr.

2240. Europe. Bonaparte Collection. (44.)
 10219. Canaries. Vienna Museum. (19.)

Sargus fasciatus, Cuv. & Val.

21107. Algeria. Mus. d'Hist. Nat. Paris. (7.)
 21108. Algeria. Mus. d'Hist. Nat. Paris. (8.)

Sargus Juliani, ———.

2242. Europe. Bonaparte Collection. (45.)

Pagellus erythrinus, (Linn.) Cuv. & Val.

2245. Europe. Bonaparte Collection. (48.)
 10200. Spain. Vienna Museum. (51.)

Pagellus centrodonatus, (De la Roche) C. & V.

2247. Europe. Bonaparte Collection. (50.)
 10216. Spain. Vienna Museum. (36.)
 17437. ("*Sparus centrodonatus*." Bergen, Norway. B. Hansen. (4.)

Pagellus acarne, (Cuv.) Cuv. & Val.

10185. Spain. Vienna Museum. (39.)
 21102. Algeria. Mus. d'Hist. Nat. Paris. (2.)

Pagellus mormyrus, (Linn.) Cuv. & Val.

21103. Algeria. Mus. d'Hist. Nat. Paris. (3.)

Sparus auratus, Linn.

2244. Europe. Bonaparte Collection. (43.)

Family, MÆNIDIDÆ.

Mæna vomerina, Cuv. & Val.

2260. Europe. Bonaparte Collection. (23.)

Mæna Osbeckii, (Lacép.) Cuv. & Val.

2259. Europe. Bonaparte Collection. (22.)

Family, PRISTIPOMATIDÆ.

Pristipoma Bennettii, Lowe.

10211. Canaries. Vienna Museum. (22.)

Dentex vulgaris, Cuv. & Val.

5900. Europe. Bonaparte Collection.

Datnioides polota, Bleek.

21173. Siam. Mus. d'Hist. Nat. Paris. (73.)

Smaris vulgaris, Cuv. & Val.

2261. Europe. Bonaparte Collection. (26.)

5384. Mediterranean.

Smaris alcedo, (Risso) Cuv. & Val.

2263. Europe. Bonaparte Collection. (29.)

Smaris Maurii, Bon.

6053. Europe.

Smaris gracilis, Bon.

2267. Europe. Bonaparte Collection. (25.)

Smaris insidiator, Cuv. & Val.

2262. Europe. Bonaparte Collection. (31.)

Family, SERRANIDÆ.

Serranus scriba, (Linn.) Cuv. & Val.

10222. Spain. Vienna Museum. (3.)

Serranus cabrilla, (Linn.) Cuv. & Val.

2204. Europe. Bonaparte Collection. (70.)

Serranus hepatus, Cuv. & Val.

21105. Algeria. Mus. d'Hist. Nat. Paris. (5.)

Polyprion cernium, Val.

5749. Europe. Bonaparte Collection.

Anthias sacer, Bloch.

2206. Europe. Bonaparte Collection. (77.)

Family, PERCIDÆ.

Perca fluviatilis, Linn.

2191. Leeds, Eng. Henry Denny.

10229. Danube. Vienna Museum. (19.)

12691. Sweden.

17322. Sweden. Swedish Centennial Commission. (43.)

21143. Paris. Mus. d'Hist. Nat. Paris. (43.)

Perca Schrenki, Kessl.

21592. Sassyk ala Kul, Siberia. Dr. O. Finsch. (103.)

21593. Sassyk ala Kul, Siberia. Dr. O. Finsch. (133.)

21594. Sassyk ala Kul, Siberia. Dr. O. Finsch. (342.)

Acerina Schrätzeri, (Linn.) Cuv. & Val.

2209. Europe. Bonaparte Collection. (60.)

10188. Danube. Vienna Museum. (13.)

10247. ("Aspro schratzer.") Europe. R. Hessel.

Acerina cernua, (Linn.) Günth.

12694. Switzerland.

21131. Paris. Mus. d'Hist. Nat. Paris. (31.)

Acerina vulgaris, Cuv. & Val.

10197. Danube. Vienna Museum. (9.)

Lucioperca sandra, Cuv.

10243. Danube. Rudolph Hessel.

17326. Sweden. Swedish Government. (47.)

Lucioperca volgensis, Cuv. & Val.

10184. Danube. Vienna Museum. (12.)

Aspro Zingel, (Linn.) Cuv. & Val.

10720. Europe. R. Hessel.

Aspro vulgaris, Cuv.

10248. Europe. R. Hessel.

Family, LABRACIDÆ.

Labrax lupus, (Lacép.) Cuv.

5712. Europe. Bonaparte Collection.

17501. (Stuffed.) Bergen, Norway. Bergen Museum. (2.)

21171. France. Mus. d'Hist. Nat. Paris. (71.)

Lates colonorum, Günth.

12680. ———. British Museum. (14.)

Family, CHILODIPTERIDÆ.

Apogon rex-mullorum, Cuv. & Val.

2216. Europe. Bonaparte Collection. (19.)

21916. Europe. Bonaparte Collection.

10225. Canaries. Vienna Museum. (5.)

Family, SPHYRÆNIDÆ.

Sphyræna vulgaris, Cuv. & Val.

10190. Canaries. Vienna Museum. (19.)

12591. ———. British Museum. (379.)

Sphyræna spet, Lacép.

21251. Europe. Bonaparte Collection.

Family, ECHENEIDIDÆ.

Echeneis remora, Linn.

5822. ———. (477 B.)

21127. France. Mus. d'Hist. Nat. Paris. (27.)

Family, CEPOLIDÆ.

Cepola rubescens, Linn.

10138. Europe. Bonaparte Collection. (479.)

21156. Nice. Mus. d'Hist. Nat. Paris. (56.)

Family, ATHERINIDÆ.

Atherina presbyter, Cuv.

21130. France. Mus. d'Hist. Nat. Paris. (30.)

Atherina hepsetus, Linn.

10157. Europe. Bonaparte Collection. (470.)

Atherina Boyeri, Risso.

10160. Europe. Bonaparte Collection. (469.)

Atherina Rissoi, Cuv. & Val.

2943. Europe. Bonaparte Collection. (343.)

Family, MUGILIDÆ.

Mugil cephalus, Cuv.

2299. Europe. Bonaparte Collection. (86.)

Mugil capito, Cuv.

5383. Europe.

21172. Mediterranean. Mus. d'Hist. Nat. Paris. (72.)

Mugil saliens, Risso.

2936. Europe. Bonaparte Collection. (82.)

Mugil labeo, Cuv.

2938. Europe. Bonaparte Collection. (141.)

Mugil septentrionalis, Günth.

17416. Bergen, Norway. B. Hansen.

Mugil chelo, Cuv.

2937. Europe. Bonaparte Collection. (84.)

10186. Canaries. Vienna Museum. (1.)

Family, CENTRISCIDÆ.

Centiscus scolopax, Linn.

7547. Europe. Bonaparte Collection.

Family, GASTEROSTEIDÆ.

Gasterosteus aculeatus, Linn.

17439. Bergen, Norway. Bergen Museum. (2.)

22042. Romsdal, Norway. Robert Collett.

Gasterosteus gymnurus, Cuv.22041. ("*G. aculeatus* var. *gymnurus*.") Tromsö, Norway. Robert Collett.

17303. (Part.) Sweden. Swedish Centennial Commission. (45.)

21138. ("*G. leiurus*.") Paris. Mus. d'Hist. Nat. Paris. (38.)**Gasterosteus semiarmatus**, Cuv. & Val.

17303. (Part.) Sweden. Swedish Centennial Commission. (45.)

Gasterosteus trachurus, Cuv. & Val.

21137. Caen, France. Mus. d'Hist. Nat. Paris. (37.)

Gasterosteus pungitius, Linn.

22015. Christiania, Norway. Robert Collett.

Gasterosteus spinachia, Linn.17438. ("*Spinachia vulgaris*, Flem.") Bergen, Norway. B. Hansen. (3.)21129. ("*Gastron spinachia*.") La Rochelle. Mus. d'Hist. Nat. Paris. (29.)22021. ("*Spinachia vulgaris*, Flem.") Christiania, Norway. Robert Collett.**Gasterosteus argentatissimus**, Blanchard.

21140. (Type.) Avignon, France. Mus. d'Hist. Nat. Paris. (40.)

Gasterosteus Blanchardi, Sauvage.

21139. (Type.) Boston, U. S. Mus. d'Hist. Nat. Paris. (39.)

This species is identical with the common many-spined Stickleback of the East Coast of North America (*Pygosteus occidentalis*, [C. & V.] Brevoort), and the latter is identical with the *Gasterosteus pungitius* of Linné.—BEAN.

Family, BELONIDÆ.

Belone vulgaris, Flem.

10045. Norway. Robert Collett.

17464. Bergen, Norway. Bergen Museum. (106.)

22086. Stavanger, Norway. Robert Collett.

Belone longirostris, ———.

10107. Kiel Bay. Dr. Möbius.

Family, ESOCIDÆ.

Esox lucius, Linn.

2199. Leeds, Eng. Henry Denny.
 10205. Danube. Vienna Museum. (31.)
 17345. Sweden. Swedish Centennial Commission. (60.)
 17463. Bergen, Norway. Bergen Museum. (105.)
 21153. Paris. Mus. d'Hist. Nat. Paris. (53.)
 21606. Obi River, Siberia. Dr. Otto Finsch. (18.)

Family, CYPRINODONTIDÆ.

Cyprinodon calaritanus, Cuv. & Val.

5002. Europe. Bonaparte Collection.

Lebias ibericus, Steind.

10226. Valencia, Spain. Vienna Museum. (20.)

Family, STERNOPTYCHIDÆ.

Sternoptyx mediterranea, Cocco.

10143. Europe. Bonaparte Collection. (455.)

Maurolicus borealis, Nilss.

22048. Finmarken, Norway. Robert Collett.

Family, SCOPELIDÆ.

Chlorophthalmus Agassizii, Bon.

10161. Europe. Bonaparte Collection. (81.)

Scopelus Benoiti, Cocco.

10163. Europe. Bonaparte Collection. (461.)

Scopelus Humboldtii, Risso.

10170. Europe. Bonaparte Collection. (463.)

Scopelus dellachiaji, ———.

10168. Europe. Bonaparte Collection. (458.)

Family, SYNODONTIDÆ.

Saurus griseus, Lowe.

12627. ———. British Museum. (89.)

Family, MICROSTOMIDÆ.

Mallotus villosus, (Müll.) Cuv. & Val.

17457. Finmarken, Norway. Bergen Museum. (99.)
 10237. ("Osmerus arcticus," Nilss.) Finmarken, Norway. Bergen
 Museum.

Osmerus eperlanus, (Linn.) Lacép.

16715. England. Liverpool Free Public Museum.
 20932. Sweden. (90 and 91.)
 21136. France. Mus. d'Hist. Nat. Paris. (36.)
 22077. Mjosen, Norway. Robert Collett.

Argentina silus, (Ascan.) Nilss.

17462. Bergen, Norway. Bergen Museum.

Argentina sphyræna, Linn.

10082. Europe. Bonaparte Collection. (332.)
 17461. Christiania, Norway. Bergen Museum.
 22076. Christiania, Norway. Robert Collett.
 10083. Europe. Bonaparte Collection. (331.)

Argentina hebridica, Yar. & Nilss.

10052. Christiania, Norway. Robert Collett.

Family, COREGONIDÆ.

Thymallus vulgaris, Nilss.

2198. Leeds, Eng. Henry Denny.
 10244. Europe. Rudolph Hessel.
 17341. Sweden. Swedish Centennial Commission. (62.)
 17460. Christiania, Norway. Bergen Museum.

Coregonus oxyrhynchus, (Linn.) Krøyer.

17291. Lake Vettern, Sweden. Swedish Centennial Commission.
 (10.)
 17301. Lake Venern, Sweden. Swedish Centennial Commission.
 (12.)
 17458. Christiania, Norway. Bergen Museum.
 21192. Holland. Mus. d'Hist. Nat. Paris. (92.)

Coregonus lavaretus, Linn.

17300. Lake Venern, Sweden. Swedish Centennial Commission.
 (14.)
 17353. Augermanelfren River, Sweden. Swedish Centennial Com-
 mission. (15.)
 22078. Jæderen, Norway. Robert Collett.

Coregonus fera, Cuv. & Val.

10245. Europe. Rudolph Hessel.

Coregonus fera, Widegren.

17314. Sweden. Swedish Centennial Commission. (11.)
 17327. Sweden. Swedish Centennial Commission. (13.)

Coregonus maræna, Nilss.

10240. Pomerania. Rudolph Hessel.
12676. Pomerania. Rudolph Hessel.

Coregonus Nilssoni, Cuv. & Val.

17344. Lake Ringsjön, Sweden. Swedish Centennial Commission.
(16.)

Coregonus albula, Linn.

10572. Lake Malaren, Sweden.
17297. Sweden. Swedish Centennial Commission. (64.)
17459. Christiania, Norway. Bergen Museum. (101.)

Coregonus Merkkii, Günth.

21604. Obi River, Siberia. Dr. Otto Finsch. (59.)

Coregonus syrok, Cuv.

21602. Obi River, Siberia. Dr. Otto Finsch. (36.)
21603. Obi River, Siberia. Dr. Otto Finsch. (37.)

Family, SALMONIDÆ.

Salmo salar, Linn.

3576. Sweden.
10242. Rhine River. Rudolph Hessel.
10675. Rhine River. Rudolph Hessel.
17342. Nisswan River. Swedish Government. (4.)
17440. Bergen, Norway. B. Hansen. (88.)

Salmo trutta, Nilss.

10108. Kiel Bay. Dr. Möbius.
17296. (Sterile.) Augermanelfren River, Sweden. Swedish Centennial Commission. (6.)
17347. Augermanelfren River, Sweden. Swedish Centennial Commission. (3.)
17349. Augermanelfren River, Sweden. Swedish Centennial Commission. (2.)
17343. ♂ and ♀. Sweden. Swedish Government. (5.)
17441. One year old. Bergen, Norway. B. Hansen. (89.)
17442. Ten months old. Bergen, Norway. B. Hansen.
17346. (Var. "lacustris.") Lake Vettern, Sweden. Swedish Centennial Commission.

Salmo eriox, Kröyer.

22079. Christiania, Norway. Robert Collett.
10053. Norway. Robert Collett.
22080. (Formerly "fario.") Dramen, Norway. Robert Collett.
22081. (Formerly "fario.") Dramen, Norway. Robert Collett.
22082. (Formerly "fario.") Dramen, Norway. Robert Collett.

Salmo fario, Linn.

1735. Neufchatel. Prof. L. Agassiz.
 16721. Adult. England. Liverpool Free Public Museum.
 16722. Young. England. Liverpool Free Public Museum.
 16723. Young. England. Liverpool Free Public Museum.
 21165. ("Trutta fario.") France. Mus. d'Hist. Nat. Paris. (65.)
 10228. ("Trutta fario.") Spain. Vienna Museum. (35.)

Salmo punctatus, Nilss.

17443. Bergen, Norway. B. Hansen. (91.)

Salmo lacustris, Linn.

10557. Lake Constance, Switzerland. Rudolph Hessel.

Salmo salvelinus, Linn.

10249. Europe. Rudolph Hessel.
 17351. Sweden. Swedish Centennial Commission. (8.)

Salmo alpinus, Linn.

3571. Sweden. Swedish Academy. (107.)
 3572. Sweden. Swedish Academy.
 17299. Sweden. Swedish Academy. (9.)
 17456. Bergen, Norway. Bergen Museum.

Salmo hucho, Linn.

10725. Danube River. Rudolph Hessel.

Salmo ocla, Nilss.

3573. ♂. Sweden. Swedish Academy.

Salmo pallidus, Nilss.

7575. Lake Vettern, Sweden. Swedish Academy. (109.)

Bastards.

17453. (One year.) *Salmo fario*, pater. *Salmo alpinus*, mater. Stavanger, Norway. C. B. Hansen. (97a.)
 17454. (One year.) *Salmo fario*, mater. *Salmo alpinus*, pater. Stavanger, Norway. C. B. Hansen. (97b.)
 17452. (Two years.) *Salmo fario*, mater. *Salmo alpinus*, pater. Stavanger, Norway. C. B. Hansen. (96.)
 17450. (Three years.) *Salmo fario*, pater. *Salmo alpinus*, mater. Stavanger, Norway. C. B. Hansen. (95a.)
 17451. (Three years.) *Salmo fario*, mater. *Salmo alpinus*, pater. Stavanger, Norway. C. B. Hansen. (95b.)
 17448. (Four years.) *Salmo fario*, pater. *Salmo alpinus*, mater. Stavanger, Norway. C. B. Hansen. (94a.)
 17449. (Four years.) *Salmo fario*, mater. *Salmo alpinus*, pater. Stavanger, Norway. C. B. Hansen. (94b.)

17447. (Five years.) *Salmo fario, mater. Salmo alpinus, pater.* Stavanger, Norway. C. B. Hansen. (93b.)
 17446. (Five years.) *Salmo fario, mater. Salmo alpinus, pater.* Stavanger, Norway. C. B. Hansen.
 17444. (Six years.) *Salmo fario, pater. Salmo alpinus, mater.* Stavanger, Norway. C. B. Hansen. (92a.)
 17445. (Six years.) *Salmo fario, mater. Salmo alpinus, pater.* Stavanger, Norway. C. B. Hansen. (92b.)

Family, CLUPEIDÆ.

Alosa finta, Yarrell.

10146. Europe. Bonaparte Collection. (350.)

Clupea pilchardus, Walb.

10192. ("Alausa pilchardus, C. & V.") Gibraltar. Vienna Museum. (45.)

Clupea harengus, Linn.

10039. Norway. Robert Collett.
 10040. Norway. Robert Collett.
 10049. Norway. Robert Collett.
 10280. Christiania, Norway. Axel Boeck.
 17336. Sweden. Swedish Centennial Commission. (17.)
 17339. Kivik, Sweden. Swedish Centennial Commission. (19.)
 17340. Malmö, Sweden. Swedish Centennial Commission. (18.)
 17469. Bødö, Norway. Bergen Museum.
 17470. Bergen, Norway. Bergen Museum.
 17471. Bergen, Norway. Bergen Museum.
 17472. Bergen, Norway. Bergen Museum.
 17473. Bergen, Norway. Bergen Museum.
 17474. Bergen, Norway. Bergen Museum.
 17475. Bergen, Norway. Bergen Museum.
 17476. Bergen, Norway. Bergen Museum. (118.)
 17477. Bergen, Norway. Bergen Museum. (119.)
 17478. Bergen, Norway. Bergen Museum. (120.)
 17485. ("Prius May.") Christiania, Norway. Bergen Museum. (127.)
 22068. Christiania, Norway. Robert Collett.
 22069. Nordland, Norway. Robert Collett.
 22070. Nordland, Norway. Robert Collett.
 17484. (About 1 month old.) Norway. Bergen Museum. (126.)
 17483. (About 2½ months old.) Norway. Bergen Museum. (125.)
 17482. (About 3 months old.) Norway. Bergen Museum. (124.)
 17481. (About 4 months old.) Norway. Bergen Museum. (123.)
 17480. (About 5 months old.) Norway. Bergen Museum. (122.)
 17479. (About 7 months old.) Norway. Bergen Museum. (121.)

17311. ("Var. *membras.*") Off Stockholm, Sweden. Swedish Centennial Commission. (20.)
 17315. ("Var. *membras.*") Gulf of Bothnia, Sweden. Swedish Centennial Commission. (21.)

Clupea sprattus, Linn.

10048. Norway. Robert Collett.
 10064. Kiel Bay. Dr. Karl Möbins.
 17298. West coast of Sweden. Swedish Centennial Commission. (22.)
 17486. Bergen, Norway. Bergen Museum. (128.)
 22071. Christiania, Norway. Robert Collett.

Clupea sardina, Cuv.

10041. Europe. Bonaparte Collection. (450.)

Family, ENGRAULIDIDÆ.

Engraulis encrasicolus, (Linn.) Cuv.

10153. Europe. Bonaparte Collection. (454.)
 22075. Christiania, Norway. Robert Collett.

Family, CYPRINIDÆ.

Cyprinus carpio, Linn.

2194. Leeds, Eng. Henry Denny.
 14861. Europe.
 21152. Paris. Mus. d'Hist. Nat. Paris. (52.)
 21188. "Carpe à mirori." Troyes, France. Mus. d'Hist. Nat. Paris. (88.)
 21190. "Carpe à mirori." Troyes, France. Mus. d'Hist. Nat. Paris. (90.)
 10565. "*Cyprinus cyprinorum.*" Europe. Rudolph Hessel.

Cyprinus regina, Bon.

10144. Europe. Bonaparte Collection. (425.)

Carassius vulgaris, (Linn.) Nilss.

10150. Europe. Bonaparte Collection. (430.)
 10196. Danube. Vienna Museum. (28.)

Carassius gibelio, (Bloch) Nilss.

3487. Sweden.
 17465. Norway. Bergen Museum. (107.)
 21189. ("*Cyprinopsis gibelio.*") Troyes, France. Mus. d'Hist. Nat. Paris. (89.)

Carassius linnai, Bon.

3486. Sweden.

Barbus plebejus, Val.

10079. Europe. Bonaparte Collection. (284.)
 10149. Europe. Bonaparte Collection. (726.)

Barbus eques, (Heckel) Kner.

10103. Europe. Bonaparte Collection. (283.)

Barbus fluviatilis, Ag.

3523. Nürnberg.
 10189. Danube. Vienna Museum. (2.)
 20542. France. Goldsmith.
 21154. Paris. Mus. d'Hist. Nat. Paris. (54.)

Barbus Bocagii, Steind.

10187. Spain. Vienna Museum. (15.)

Barbus comiza, Steind.

10198. Madrid. Vienna Museum. (6.)

Schizothorax orientalis, Kessl.

21597. Sassyk ali Kul, Siberia. Dr. Otto Finsch. (246.)

Diptychus Dybowski, Kessl.

21598. ♀. Dschelonasch River, Siberia. Dr. Otto Finsch. (195.)
 21599. ♂. Dschelonasch River, Siberia. Dr. Otto Finsch. (158.)
 21600. *Jur.* Bulenka River, near Sepra, Siberia. Dr. Otto Finsch.
 (280.)

Gobio fluviatilis, Flem.

3490. Nürnberg.
 3489. Leeds, Eng. Henry Denny.
 1737. Neufchatel. Agassiz.
 10127. Europe. Bonaparte Collection. (115.)
 10224. Danube. Vienna Museum. (38.)
 21135. Paris. Mus. d'Hist. Nat. Paris. (35.)
 21607. Alpine lake, 5,000 feet high, Siberia. Dr. Otto Finsch.
 10167. ("*Gobio lutescens*," De Filippi.) Europe. Bonaparte Col-
 lection. (280.)

Gobio uranoscopus, (Ag.) Cuv. & Val.

10142. Europe. Bonaparte Collection. (277.)

Leuciscus rutilus, (Linn.) Flem.

2195. Leeds, Eng. Henry Denny.
 17317. Sweden. Swedish Centennial Commission. (54.)
 17466. Norway. Bergen Museum. (108.)
 21146. Paris. Mus. d'Hist. Nat. Paris. (46.)
 21605. Obi River, Siberia. Dr. Otto Finsch. (63.)
 3596. ("*Gardonus rutilus*,") Europe.

Leuciscus grislagine, (Linn.) Nilss.

17309. Sweden. Swedish Centennial Commission. (51.)
 21596. ("*Squalius grislagine*.") Siberia. Dr. Otto Finsch.
 3497. ["*Gardonus (Cephalus) grislagine*."] Sweden.

Leuciscus rodens, (Heckel) Ag.

1728. Neufchatel. Agassiz.

Leuciscus idus, Linn.

17319. Sweden. Swedish Centennial Commission. (52.)
 10250. ("*Idus melanotus*.") Danube. Rudolph Hessel.
 21595. ("*Idus melanotus*.") Obi River, Siberia. Dr. Otto Finsch.
 (41.)

Leuciscus erythrophthalmus, (Linn.) Flem.

1726. Europe. Agassiz.
 17325. Sweden. Swedish Centennial Commission. (53.)
 3499. ("*Scardinius erythrophthalmus*.") Sweden.
 21185. Troyes, France. Mus. d'Hist. Nat. Paris. (85.)

Leuciscus phoxinus, (Linn.) Flem.

17304. Sweden. Swedish Academy. (55.)
 3494. ("*Phoxinus levis*.") Nürnberg.
 3495. ("*Phoxinus levis*.") Leeds, Eng.
 10140. ("*Phoxinus levis*.") Europe. Bonaparte Collection. (303.)
 21180. ("*Phoxinus levis*.") Perm, Russia. Mus. d'Hist. Nat.
 Paris. (80.)

Phoxinus aphyia, (Linn.) Kröyer.

17455. Christiania, Norway. Bergen Museum. (114.)
 22050. Girdbrandsdal, Norway. Robert Collett.

Phoxinellus croaticus, Steind.

10193. Croatia. Vienna Museum. (56.)

Leuciscus cephalus, (Linn.) Flem.

17467. Southeastern Norway. Bergen Museum. (109.)
 3498. ("*Squalius dobula*.") Nürnberg.
 21145. ("*Squalius cephalus*.") Paris. Mus. d'Hist. Nat. Paris. (45.)
 10139. ("*Leuciscus parati*," Bon.) Europe. Bonaparte Collection.
 (307.)

Squalius leuciscus, Heckel.

21187. Troyes, France. Mus. d'Hist. Nat. Paris. (87.)

Telestes Savignyi, (Bon.).

2887. Europe. Bonaparte Collection. (300.)

Tinca vulgaris, Cuv.

3492. Sweden.
 10246. Europe. Rudolph Hessel.
 17292. Sweden. Swedish Centennial Commission. (50.)
 21151. Paris. Mus. d'Hist. Nat. Paris. (51.)

Tinca chrysitis, Ag.

10159. Europe. Bonaparte Collection. (275.)

Chondrostoma nasus, (Linn.) Ag.

3522. Nürnberg.
 21144. Paris. Mus. d'Hist. Nat. Paris. (44.)

Chondrostoma polylepis, Steind.

10183. Spain. Vienna Museum. (33.)

Rhodeus amarus, (Bloch) Ag.

3488. Nürnberg.
 21132. Paris. Mus. d'Hist. Nat. Paris. (32.)

Abramis brama, (Linn.) Flem.

3516. Nürnberg.
 17306. Sweden. Swedish Centennial Commission. (57.)
 17468. Southeastern Norway. Bergen Museum.
 20553. France. Goldsmith.
 21147. Paris. Mus. d'Hist. Nat. Paris. (47.)
 21186. Troyes, France. Mus. d'Hist. Nat. Paris. (86.)

Abramis vimba, (Linn.) Cuv. & Val.

10206. Danube. Vienna Museum. (16.)
 10408. Vienna Museum.
 17289. Sweden. Swedish Centennial Commission. (56.)

Abramis blicca, (Bloch) Cuv.

1734. Neufchatel. Agassiz.

Abramis björkna, (L.) Nilss.

3518. ("*Blicca björkna*." Sweden.
 10199. ("*Blicca argyroleuca*." Danube. Vienna Museum. (41.)
 17338. ("*Blicca björkna*." Sweden. Swedish Centennial Commission. (58.)

Abramis ballerus, (L.) Cuv. & Val.

3519. Sweden.

Aspius alburnus, Agassiz.

17302. Sweden. Swedish Centennial Commission. (59.)

Alburnus lucidus, Heck. & Kner.

3521. Nürnberg.
 21155. Paris. Mus. d'Hist. Nat. Paris. (55.)
 21184. Troyes, France. Mus. d'Hist. Nat. Paris. (84.)

Alburnus alborella, (De Fillipi).

10155. Europe. Bonaparte Collection. (289.)

Pelecus cultratus, (Linn.) Ag.

10215. Danube. Vienna Museum. (7.)
 10149. Europe. Bonaparte Collection. (726.)

Family, COBITIDÆ.

Diplophysa labiata, Kessl.

21601. Bulenka River, Siberia. Dr. Otto Finsch. (320.)
 21608. Bulenka River, Siberia. Dr. Otto Finsch. (136.)

Misgurnus fossilis, (Linn.) Lacép.

3482. Nürnberg. Thomas Rainey.
 10089. Europe. Bonaparte Collection. (157.)
 21142. Germany. Mus. d'Hist. Nat. Paris. (42.)

Cobitis barbatula, Linn.

3483. Nürnberg. Thomas Rainey.
 10201. Danube. Vienna Museum. (49.)
 21141. Paris. Mus. d'Hist. Nat. Paris. (41.)

Cobitis tænia, Linn.

3484. Nürnberg. Thomas Rainey.
 3485. Nürnberg. Thomas Rainey.
 10162. ("*Acanthopsis tænia*." Europe. Bonaparte Collection.
 (158.)

Order, NEMATOGNATHI.

Family, SILURIDÆ.

Silurus glanis, Linn.

10191. Danube. Vienna Museum. (53.)
 17293. Sweden. Swedish Centennial Commission. (61.)

Order, APODES.

Family, CONGRIDÆ.

Conger vulgaris, Cuv.

17488. Bergen, Norway. Bergen Museum. (130.)
 17507. (Stuffed.) Bergen, Norway. Bergen Museum. (8.)

Family, ANGUILLIDÆ.

Anguilla vulgaris, Turton.

17321. Sweden. Swedish Academy. (39.)
 17331. Sweden. Swedish Academy. (67.)
 17487. Bergen, Norway. Bergen Museum. (129.)
 21181. Paris. Mus. d'Hist. Nat. Paris. (81.)
 22025. Stavanger, Norway. Robert Collett.
 10042. ("*Murana anguilla*," Linn.) Norway. Robert Collett.

Order, GLANIOSTOMI.

Family, ACIPENSERIDÆ.

Acipenser sturio, Linn.

2174. (22003.) Europe. Bonaparte Collection.
 17505. (Stuffed.) Bergen, Norway. Bergen Museum. (9.)

Acipenser ruthenus, Linn.

10195. Danube. Vienna Museum. (17.)

Acipenser naccarii, Bon.

2175. (22004.) Europe. Bonaparte Collection.

Class, ELASMOBRANCHII.

Order, HOLOCEPHALI.

Family, CHIMERIDÆ.

Chimaera monstrosa, Linn.

10233. ♂. Bergen, Norway. Bergen Museum. (37.)
 10234. ♀. Bergen, Norway. Bergen Museum. (74.)
 17492. ♂. Bergen, Norway. Bergen Museum.
 17493. ♀. Bergen, Norway. Bergen Museum. (135.)

Order, RALÆ.

Family, TORPEDINIDÆ.

Torpedo Galvanii, Risso.

10221. Spain. Vienna Museum.

Family, RAIDÆ.

Raia radiata, Donovan.

17318. Sweden. Swedish Centennial Commission. (40.)
 17497. Bergen, Norway. Bergen Museum. (139.)

Order, SQUALI.

Family, LAMNIDÆ.

Lamna cornubica, (Gm.) Flem.

17509. (Stuffed.) Bergen, Norway. Bergen Museum. (10.)

Family, SCYLLIDÆ.

Scyllium catulus, (Linn.).

10220. Cadiz, Spain. Vienna Museum. (52.)

Pristiurus melanostomus, (Raf.) Bon.

17494. ♂. Bergen, Norway. Bergen Museum. (136.)

Family, SPINACIDÆ.

Acanthias vulgaris, Risso.

17495. ♀ *juv.* Bergen, Norway. Bergen Museum. (137.)

21178. France. Mus. d'Hist. Nat. Paris. (78.)

Spinax niger, Bon.

10051. Christiania, Norway. Robert Collett.

10235. Bergen, Norway. Bergen Museum. (28.)

17496. Bergen, Norway. Bergen Museum. (138.)

Class, MARSIPOBRANCHII.

Order, HYPEROARTIA.

Family, PETROMYZONTIDÆ.

Petromyzon marinus, Linn.

17498. Bergen, Norway. Bergen Museum. (140.)

Petromyzon fluviatilis, Linn.

21133. France. Mus. d'Hist. Nat. Paris. (33.)

22010. Sweden. (86.)

Petromyzon Planeri, Bloch.

22005. Sweden. (88.)

22006. Sweden. (89.)

22011. Nürnberg.

22026. ("Petromyzon branchialis.") Ostendalen, Norway. Robert Collett.

Petromyzon sp.

17334. Sweden. Swedish Centennial Commission. (41.)

Ammocetes sp.

17307. (*Juv.*) Sweden. Swedish Centennial Commission. (42.)

Order, HYPEROTRETI.

Family, MYXINIDÆ.

Myxine glutinosa, Linn.

4584. Kattogat. Danish Academy.

17499. Bergen, Norway. Bergen Museum. (141.)

Class, LEPTOCARDII.

Order, CIRROSTOMI.

Family, BRANCHIOSTOMIDÆ.

Branchiostoma lanceolatum, (Pallas) Gray.

22083. Stavanger, Norway. Robert Collett.

DESCRIPTION OF A SPECIES OF LYCODES (*L. PAXILLUS*) OBTAINED BY THE UNITED STATES FISH COMMISSION.

By G. BROWN GOODE and TABLETON H. BEAN.

A single specimen of an apparently undescribed species of *Lycodes* was obtained by Capt. Joseph W. Collins and the crew of the schooner Marion of Gloucester, from the gully between Le Have and Sable Island Banks, in latitude 42° 48' N., longitude 63° 07' W., and presented to the United States Fish Commission for the National Museum. The specimen, which is 14 $\frac{3}{8}$ inches in length, is in a dilapidated condition, and was apparently taken from the stomach of a fish, probably a halibut. Fishing in this locality is carried on exclusively with trawls or long-lines at a depth of 1,200 to 2,400 feet.

The form of *Lycodes paxillus* is rounder and more terete than that of any other described species. It is also easily distinguished by its very short head, by the peculiar curvature of the strong jaw, and by the enormous development of the muscles of the cheek. In the small number of pectoral rays it resembles *L. polaris* Sabine; *L. muræna* Collett, and *L. Verrillii* Goode & Bean.

DESCRIPTION.—Body elongate, rounded throughout its entire length; its greatest height (.06) equaling its greatest width (.06); the height behind the pectorals (.05 $\frac{1}{2}$) very slightly greater than the width behind the pectorals (.05 $\frac{1}{3}$); the width at the anus (.04 $\frac{2}{3}$) exceeding two-thirds of the height (.05 $\frac{2}{3}$) at the same place; midway from the anus to the tail the width (.03) equals three-fourths of the height (.04 $\frac{1}{3}$). The greatest height is contained over sixteen times in the total length, and equals slightly more than one-fifth of the distance from the snout to the origin of the anal fin. The width of the body at the anus is about one-third of the length of the head.

The head much resembles in general form that of the common rattle-

snake (*Crotalus horridus*), having a broad flat top and an abrupt, almost overhanging, profile at the snout; the upper jaw extending far beyond the lower ($1\frac{1}{2}$ hundredths of length), the intermaxillary teeth being visible from below when the jaws are closed. This character, common to all species of *Lycodes*, is extraordinarily prominent in *L. parillus*. The end of the maxilla extends behind the perpendicular from the posterior margin of the orbit, and the tip of the upper jaw curves strongly downward. The length of the upper jaw (.083) is contained twelve times in the length of the body, and is greater than the postorbital length of the head. The tip of the under jaw curves strongly upward, and is received entirely within the upper jaw. The distance from the tip of the snout to the articulation of the mandible (.10) equals one-third of the distance from the snout to the anal, and one-tenth of total length. The muscles of the cheeks are enormously developed and protuberant, the width of the head in this region (.08) equaling the length of its postorbital portion. The width of the interorbital area (.015) is less than half the diameter of the orbit (.035), which is equal to half the length of the pectoral fin (.07). The eyes are placed high, their upper margins approaching closely to the line of its upper profile, their diameter included about four times in the length of the head. The nostrils are situated nearly midway between the orbit and the tip of the snout.

Intermaxillary teeth in a single series; a few teeth in a second line behind the others, near the symphysis. Mandibular teeth in a single series, except at the symphysis, where there are a few (about 9) teeth in front of the main series. A few teeth clustered at the head of the vomer. On the palatines a single series, about six on each side. The teeth throughout are stouter than is usual in this genus, recurved and sharply pointed.

Dorsal fin inserted at a point less than one-fourth of the distance from the snout to the end of the tail, and very slightly behind the perpendicular from the tip of the extended pectoral.

Anal fin inserted in the perpendicular from the twelfth dorsal ray, at a point three-tenths of the distance from the snout to the end of the tail. The vent is in the vertical from the tenth dorsal ray, its distance from the snout equaling about four times the length of the pectoral.

The pectoral is inserted at a distance from the snout about equal to twice its own length.

The ventral is inserted at a distance from the snout equal to six times its own length, its tip extending back to the line of insertion of the pectoral.

Scales covering the whole body and extending far out on the bases of the dorsal and anal fins; head and pectoral fins scaleless.

The color was probably light brown in life.

Radial formula:—D. (including half of caudal), 116–117. A. (including half of caudal), 100. P., 16. V., 3.

Table of Measurements.

Current number of specimen	22, 177.	
Locality	} Lat. 42° 48' N. Lon. 63° 07' W.	
	Millime- tres.	100ths of length.
Extreme length	363	.....
Length to end of middle caudal rays	363	.....
Body:		
Greatest height		52
Greatest width		5½
Greatest circumference		17½
Height at ventrals		5½
Head:		
Greatest length		14½
Greatest width		8½
Width of interorbital area		1½
Length of snout		3½
Length of postorbital portion of head		8
Length of upper jaw		8½
Length of mandible		9
Diameter of orbit		3½
Extent of gill-opening		4½
Dorsal:		
Distance from snout		22
Anus from snout		26½
Anal:		
Distance from snout		30
Pectoral:		
Distance from snout		14½
Length		7
Ventral:		
Distance from snout		12
Length		2
Dorsal	116-117	.....
Anal	100	.....
Pectoral	16	.....
Ventral	3	.....

WASHINGTON, March 21, 1879.

DESCRIPTION OF A NEW SPECIES OF LIPARIS (L. RANULA) OBTAINED BY THE UNITED STATES FISH COMMISSION OFF HALIFAX, NOVA SCOTIA.

By G. BROWN GOODE and TARLETON H. BEAN.

An apparently undescribed species of *Liparis* was taken in the large trawl-net by the collecting party on the United States steamer *Speedwell*, September 24, 1877, off the mouth of Halifax Harbor (Station 117, 8½ miles southeast from Chebucto Head). The depth at which it was found was 52 fathoms, the temperature at the bottom 35° F. The bottom was of fine sand and mud, and in the same haul of the net were taken the following species: *Glyptocephalus cynoglossus*, *Hippoglossoides platessoides*, *Sebastes marinus* (young), *Phycis chuss*, *Aspidophoroides monopterygius*, *Triglops Pingelii*, *Centridermichthys ucinatus*, and *Raia radiata*.

The species resembles, in the shape of its head, the *Liparis Fabricii* of Kröyer, but is easily distinguished by its less elongate body and the greater number of rays in the dorsal and anal fins. When first taken

it was colorless, almost translucent, and was covered with a thick tough integument. The following description is less complete than would seem desirable, owing to the fact that the unique specimen (No. 22,310, U. S. Nat. Mus. Cat.) was too soft and tender to admit of the requisite manipulation. The specimen, which is 56 millimetres in total length (caudal included), is a mature female, having in the abdominal cavity many large eggs.

DESCRIPTION.—The body is thick, subcylindrical anteriorly, rapidly tapering to the tail, covered with a thick lax integument; its greatest height (.25) equals the length of the head and is one-fourth of the total length of the body without caudal.

The head is somewhat tumescent at the nape; its height (over the ventral disc and eyes) contained something over six times in the length of the body; its greatest width (.18) very slightly greater and equaling twice the width of the ventral disc. The snout is broad, with prominent vertical profile; its length about one-fourth that of the head. The cleft of the mouth is horizontal, and does not extend to the perpendicular from the anterior margin of the orbit. The lips are covered with thick lax skin, the upper jaw extending beyond the lower.

The length of the upper jaw is about one-third of the length of the head; that of the mandible slightly greater than the length of the ventral disc. Each jaw armed with a band of villiform teeth. The tongue is thick, obtuse. The eye is lateral, not interfering with the upper profile of the head; its diameter (.07) more than one-fourth of the length of the head, and contained about fourteen times in the length of the body. The width of the interorbital area is contained two and one-half times in the length of the head. The nostril is close to the eye. The gill-opening is a vertical slit, extending upon the upper part of the root of the pectoral.

The dorsal fin is inserted at a distance from the snout equal to one-third of the length of the body. It contains about 48 rays, though to count them is almost impossible. The anal fin originates at a distance from the snout equal to two-fifths of the length of the body, and in the perpendicular from the eighth dorsal ray. It contains at least 48 rays. The pectoral fin is moderately broad, with 15 long rays and 12 or 13 shorter ones. The long rays are twice as long as the ventral disc and extend nearly or quite to the perpendicular from the vent.

The ventral disc is slightly longer (.10) than its distance from the snout (.09), which precisely equals its width. It has fourteen papillæ.

The color is uniform whitish, almost colorless, and translucent in life.

Table of Measurements.

Current number of specimen.....	22,310.	
Locality.....	Station 117, off Halifax.	
	Millime- tres.	100ths of length.
Length to origin of middle caudal rays.....	52	.....
Body:		
Greatest height.....		25
Height at ventral disc.....		17
Head:		
Greatest length.....		25
Greatest width.....		18
Width of interorbital area.....		10
Length of snout.....		6
Length of upper jaw.....		8
Length of mandible.....		11
Diameter of orbit.....		7
Dorsal:		
Distance from snout.....		32
Anal:		
Distance from snout.....		40
Caudal:		
Length of middle rays.....		(8)
Pectoral:		
Distance from snout.....		23
Length.....		20
Ventral:		
Distance of disc from snout.....		9
Length of disc.....		10
Width of disc.....		9
Dorsal.....	48	.....
Anal.....	(48)	.....
Pectoral.....	15+12 or 13	.....
Ventral (number of papillæ in disc).....	14	.....

WASHINGTON, March 22, 1879.

DESCRIPTION OF A NEW SPECIES OF AMBER FISH (*Seriola Stearnsii*) OBTAINED NEAR PENSACOLA, FLORIDA, BY MR. SILAS STEARNS.

By G. BROWN GOODE and TARLETON H. BEAN.

The National Museum has recently received, from Mr. Silas Stearns, of Pensacola, several species of fishes hitherto unrecorded from the Gulf of Mexico. Among them we recognize *Seriola bonariensis*, Cuv. & Val., previously observed only on the coast of Brazil, which is represented by an individual of 890 millimetres, catalogue-number 22258; also a second species of the same genus, which, though closely related to two Cuban species, has characters which distinguish it from them, or, at least, which do not harmonize with the published descriptions. This form may in the future prove to be identical with *Seriola gigas* or *Seriola dubia*; it appears to be as distinct from either of these species as they from each other. It is therefore fully described as a new species under the name *Seriola Stearnsii*. We prefer thus to place the Pensacola specimen on record as a provisional new species rather than to identify it on insufficient grounds with an already-named species, of which the published descriptions are incomplete. A study of a large series of specimens will doubtless largely reduce the number of species in this genus.

Seriola Stearnsii, sp. nov.

A *Seriola* with slightly compressed body, the height of which (.248) is equal to one-fourth of its total length to the end of the middle caudal rays, its width (.14) about one-seventh of the same. (The height of the body is contained about $4\frac{2}{3}$ times in the length to the end of the middle caudal rays.) Its shape sub-fusiform, with greatest height at the origin of the second dorsal fin, whence its dorsal and ventral profiles slope gently and gracefully, with about the same curve, to the snout and the base of the caudal, which are nearly equidistant from the point referred to; the circumference of the body (.64) nearly two-thirds of its total length; its height at the ventrals (.22) about five times the length of the third dorsal spine; its least height at the tail (.04) equal to one-sixth its greatest height; the distance from the end of the base of the second dorsal to the base of the superior caudal lobe (.07) one-half of the greatest width of the body. The caudal peduncle is somewhat depressed and has prominent transverse grooves above and below and moderate lateral carinæ, the length of the prominent part of which is somewhat less than the length of the pectoral.

The length of the head (.28) is contained slightly more than $3\frac{1}{2}$ times in the length of the body and equals twice its own width (.14). The length of the snout (.10) is slightly greater than width of interorbital area (.095). Length of operculum (.07) slightly greater than half that of the upper jaw (.13) and slightly less than that of mandible (.15). The maxillary extends to the vertical through the middle of the eye, the mandible to that from its posterior margin. Diameter of eye ($.04\frac{1}{2}$) contained about three times in the length of the upper jaw and about $6\frac{1}{3}$ times in the length of the head (diameter of iris 7 times in length of head). The distance of the eye below the dorsal profile equals about two-thirds of its own vertical diameter, which is the same as the greatest width of the posterior flange of the maxillary bone. (The centre of the eye is situated at a distance below the dorsal profile (.04) contained less than four times in the height of the head ($.14\frac{1}{2}$) at that point. Compare with *S. gigas*.)

Intermaxillary teeth in a villiform band, broadest at the symphysis and decreasing in width to the end of the intermaxillary, which extends back nearly as far as the maxillary. Palatine teeth in a club-shaped patch, villiform. Vomerine teeth villiform, in an arrow-shaped patch, the length of which equals the short diameter of the eye, and its shape resembles that of the vomerine patch in *Rhomboplites*. Mandibular teeth similar to those on the intermaxillaries in form and arrangement. On the tongue a median and two lateral patches of villiform teeth.

The distance of the first dorsal from the snout (.35) is slightly more than one-third of the length of the body; the length of its base about twice the length of its third spine. Its insertion is over the middle of the base of the ventral. The origin of the second dorsal is slightly in advance of the middle of the body, or about equidistant from the snout

and the grooves on the top of the caudal peduncle; its length of base (.42) exceeds twice that of the anal (.20). The first and last dorsal spines are extremely inconspicuous, hidden beneath the skin, so that the fish at first appears to have only five spines. The length of the largest (third) spine is about equal to the diameter of the eye, and does not exceed one-fifth of the height of the body. The height of the second dorsal at its longest ray (.10) equals the length of the snout.

The insertion of the anal is under the middle of the second dorsal, and is distant from the snout somewhat more than four times the length of the mandible; its greatest height (.09) is slightly less than the width of the interorbital area; the length of its base (.20) twice that of the snout; the length of the last rays (.063) is one-tenth of the distance of the snout from the insertion of the fin.

The caudal is broad, the lobes slender, falcate, equal; their length (.21) about twice the distance from the termination of the median rays to the notches on the caudal peduncle (.11).

The insertion of the pectoral is posterior to the vertical from the origin of the first dorsal; its extremity reaches to the vertical from the posterior termination of the first dorsal; its length (.13) is contained less than eight times in that of the body and nearly nine times in the distance from the snout to the end of the caudal.

The ventrals are inserted under the origin of the first dorsal, at a distance from the snout (.295) equal to twice the length of the mandible; the length of the fin (.13) equal to that of the pectoral, its extremity reaching to the vertical from the insertion of the second dorsal, and to a distance in front of the anal equal to the diameter of the eye.

Radial formula: B. VII; D. VII, 1, 36; A. II, 1, 19; P. 19; V. 6.

Scales small, as in other members of the genus, present upon the cheeks, but not upon the limb of the preoperculum or the remainder of the head. Lateral line with many curves, straight upon the tail.

Color bluish above, whitish beneath, a band of greenish yellow as wide as the eye extending from the preopercle to the extremity of the tail. Fins greenish; traces of bands on the operculum.

The specimen sent by Mr. Stearns (No. 22325) measures 568 millimetres (20½ inches) to the end of the middle caudal rays, and weighs 6½ pounds. Concerning the species, Mr. Stearns writes: "No. 116 is called here by the fishermen 'Amber fish,' and is quite common along this coast in the deeper waters, but as they do not bite freely, not many are taken. Those that are caught are taken near the surface, as the hook is descending. Throughout the year they are found near the coast, where they probably breed. The specimen sent is rather below the average size. By most people it is considered a fine food fish."

The name "Amber fish" is applied to the fishes of this genus by English-speaking colonies the world over. It alludes to the amber-colored stripe upon the side.

Table of Measurements.

Current number of specimen	22,325.	
Locality	Pensacola, Fla.	
	Millime- tres.	100ths of length.
Length to end of middle caudal rays	568	
Body:		
Greatest height		24.6
Greatest width		14
Greatest circumference		64
Height at ventrals		22
Least height of tail		4
Length of caudal peduncle		7
Head:		
Greatest length		28
Greatest width		14
Width of interorbital area		9.5
Length of snout		10
Length of operculum		7
Length of upper jaw		13
Length of mandible		15
Height of head through eye		14.5
Diameter of eye		4.5
Dorsal (spinous):		
Distance from snout		35
Length of base		8
Length of first spine		2.7
Length of second spine		3.9
Length of third spine		4.3
Length of fourth spine		3.2
Length of fifth spine		2.0
Dorsal (soft):		
Length of base		42
Length of first ray		4
Length of longest ray		10
Length of last ray		6
Anal:		
Distance from snout		63
Length of base		20
Length of longest ray		9
Length of last ray		6.3
Caudal:		
Length from notch on peduncle to end of middle rays		11
Length of external rays		21
Pectoral:		
Distance from snout		38.3
Length		13
Ventral:		
Distance from snout		29.5
Length		13
Branchiostegals		VII
Dorsal	VII, 1, 36	
Anal	II, 1, 19	
Pectoral	19	
Ventral	6	

WASHINGTON, April 1, 1879.

ON THE BIRDS OF HELIGOLAND.

By H. GÄTKE.

HELIGOLAND, March 8, 1879.

Professor S. F. BAIRD,

Secretary Smithsonian Institution:

DEAR SIR: I have delayed answering your very kind communication till I might be able to inform you of the receipt of the box despatched

for me. It arrived two days ago, and many, many thanks for the contents thereof, which to me are very valuable indeed.

By this mail I shall send off a small box with skins, all I had, and, as I fear, of very little value to you. Perhaps the suite of *Sylvia succica*, Linn., may interest you, as the females and male in winter dress are perfectly reliable. The other form, *S. leucocyanea*, Brehm, comes very rarely so far north as Heligoland, and the few instances it has turned up from four to six weeks earlier than the *succica* in spring. I have sent for your examination a skin of *Lanius major*, Pall., with the alar white mark extending over the bases of primaries only, and which I suppose, from what I see in Richardson and Swainson's "Faun. Bor. Amer.," is coincident with their *Lan. borealis*.* Perhaps we have here to deal with a case similar to that of *Alauda alpestris*, viz, a gradual extension westward from an originally American home. Up to October, 1847, *A. alpestris* was here an excessively rare appearance, known only to a very few sportsmen; but at the fall of that year there was a very great influx of birds from the east (*Xema sabinii* may be counted among the rest), and with these *A. alpestris* appeared in such numbers that one young man succeeded in shooting above a score during one afternoon. Ever since, this species has been a numerous and regular bird of passage during October and November of each successive year. I have packed for you a male and female, which, as coming from the westernmost point almost of their now regular line of migration, may be of some interest for the sake of comparing with the original stock.† I saw once a skin from America, an old male bird, which was of a rather intense brick-red color round the shoulders and wing-coverts, whereas these parts with our birds are always of a pinkish, vinaceous tinge. If the above coloration with your birds be the prevalent one I should like much the possession of such an old male specimen.‡ Amongst the Pipit suite there is one *Anthus richardi*, a regular autumnal visitant here, from the far east of Asia (Daouria),§ and if of interest to you I will next fall try to procure some more skins for you.

I am greatly gratified at finding that many points of your observations|| form already a part of my manuscript. Your remark that "if

* This specimen is not *L. borealis*, but seems referable to the *L. excubitor* of Europe.—R. RIDGWAY.

† The examples sent by Mr. Gätke resemble very closely in their robust build and dark colors the specimens usually obtained in eastern North America in winter, but have the yellow of the head more extended, this color in fact invading even the whole pileum. They can easily be matched, however, even in this respect from a large series.—R. RIDGWAY.

‡ The specimen here alluded to was very likely the var. *chrysolama* of California and Mexico, which has, at all seasons, the vinaceous tints of the northern forms replaced by a rusty cinnamon color. (*Conf. Hist. N. Am. B.*, II, pp. 1411-44.)—R. RIDGWAY.

§ Do not these east Asiatic species cross over the Pacific from Kamtchatka via the Aleutian Islands?

|| *Conf.* "The Distribution and Migrations of North American Birds." *Am. Jour. Science & Arts*, XLI, 1866, 78-90, 184-192, 337-347.

a region be deprived of its spring birds" proves very strikingly the fact that over a wide range of latitude each individual resorts for propagation to the latitude where it was hatched; that birds quit their winter-quarters in succession as their individually more northerly home becomes habitable,—naturally the most northerly latest; and that, consequently, Middendorf's calculation of the rate of migration-flight must be fallacious, because the individuals he observed earlier in spring at a lower latitude were not the same he saw later not thirty degrees higher north, but were such as passed *over* the former, whilst they perhaps were beginning to construct their nests; therefore, the period that lay between observing the two could not be made use of as a measure whereby to determine their pace of flight or advance during a day.

That the direction of the course of wandering birds should be influenced by river courses or mountain chains, is a point which I do not agree to, at least so far as Europe comes under contemplation. Here during the fall, the route of miscellaneous species is so varied that the two principal hosts cross each other at right angles; one great mass progressing due west from the farthest east of Asia (e. g., *Anthus richardi*, *Sylvia superciliosa*), and continue their course to Heligoland, England, France, and Spain. Besides these, all the rare autumnal visitors come here from the far east of Asia, which proves that there must be with birds of these regions a strong inherent tendency to a western migration, even in species whose real winter-quarters are in the south of India down to the Sunda Isles, as, for instance, the two named above. This line of flight diverges abruptly to the north when approaching the Atlantic in England, Western France, and Spain; *vide* the immense numbers crossing the Straits of Gibraltar.

This westerly current is cut at right angles by another host coming simultaneously down from the extreme north of Europe and Asia, and steering due south for their winter-quarters, viz: The Willow Warblers, *Phylloscopus trochilus* and *rufus*, which go from the North Cape of Scandinavia to the Cape of Good Hope; *P. tristis* and *borealis*, from Northern European and Asiatic Russia down to the south of India and China. The latter, together with *Falco rufipes*, *Motacilla citreola*, *Anthus cervinus*, *Emberiza aureola*, and *Limosa cinerea*, all plentifully breeding so close to Heligoland as the Onega Dvina, Megin, and Petchora districts, but still never, or very rarely, turning up here during their autumnal flights, proves in itself their southern course—without the least western inclination—even if they were not observed down the Ural, the Black Sea, Turkestan, &c. The most striking instance of such a move is seen in *Sylvia philomela*, which breeds in the south of Sweden, and, nevertheless, has been observed here but once during the last forty years!

A few can be pointed out as going from northeast to southwest, namely, *Sylvia succica* and the *Alauda alpestris*. These, and all the others enumerated, joined by hosts of the more common "million" which are spread far and wide over the entire northern Palaearctic Region.

What, under such circumstances, becomes of the routes of birds by river courses or mountains? How many great rivers has *Anthus richardi* to cross, almost all at right angles, during his autumnal flight from Daouria to France and Spain?

I maintain that the migratorial movement, particularly the vernal one, when in normal progress, is performed by the great majority of birds far beyond the perception of man, and that what we see of the same are but the irregularities and interruptions thereof—brought about by atmospheric agencies.

Your opinion that the spring line of flight is widely different from that of the fall, I most completely participate in. All the different routes enumerated in the foregoing are dropped, and a more or less direct course toward the polar regions adopted. The wide front of the winter-quarters, extending from the west of Africa to the east of China, the Philippines, Borneo, &c., concentrating during this northerly passage to less than half its original stretch.

A proof of this latter assertion is rendered by the fact that of all the eastern birds which visit Heligoland during their autumnal migration, none appear during their return journey, the track to the south which terminated their western flight having brought them to far lower latitudes; while in spring, as they pursue a direct course to their northern breeding-grounds, they leave all these western countries to their left.

While the "rare birds" here during autumn are, without exception, eastern species, those of the spring are as uniformly from the southeast—Greece, Asia Minor, Turkestan, &c. Singular it is, that almost no exceptional bird has come here from the south or west, *i. e.*, so far as the Old World is concerned. In what eminent manner the "far west" is represented, I have told you at an earlier period.

And this leads me to the route which American birds follow to Europe. I do not much lean to the supposition that storms have in any considerable degree to do with such extra tours, and why Newton and others advance so strongly the Greenland, Iceland, &c., route, I cannot comprehend. I fancy they never contemplated the possibility of a bird coming in a direct line from Newfoundland to Ireland; in other words, that a bird might be able to sustain an uninterrupted flight sufficient to carry it across the Atlantic. My researches have led me to the belief that such is not alone far from being impossible, but that the probability of such a fact, wonderful as it may appear, is borne out by good evidence.

For instance, these old spring birds of these *Sylvia succica* which I send you, have wintered in the middle or north of Africa. During their vernal migration, the first point north thereof where they are regularly found in considerable numbers is Heligoland, whilst during this time they are of the utmost rarity in all countries intervening between the

Mediterranean and the North Sea, upper Germany not excepted. This fact incontestably proves that these birds cross this distance in one uninterrupted flight, and during one short spring night, viz, in 9 to 10 hours, which gives a rate of locomotion of 40 geographical miles per hour. Wonderful, incomprehensible, I admit, but still remaining a fact. The slow clumsy Royston Crow (*Corvus cornix*) crosses from here due west* over to England, at a rate of 27 geographical miles an hour, and results of 25 miles have been furnished by the semi-domesticated Carrier-pigeon. The distance from the north of Africa to Heligoland is equivalent to that from Newfoundland to Iceland, and therefore no objection whatever can be raised against your birds crossing over to us direct.

All this with plenty of evidence, and a great many points besides, is ready in manuscript sufficient to cover from fifty to sixty pages octavo print, and by the end of May I shall be ready for the press altogether.

I greatly count on your lenience, my dear sir, whilst allowing my pen to run on at such an unpardonable length, but perceiving from your contribution that you, like myself, have studied the grand theme of the migration in nature, which is quite a different matter from all learned treatises thereon worked out by the lamp of the studio, my hobby felt so comfortable in your genial company that it bolted off with this unresisting tide.

Begging once more to pardon my having ventured on your time and patience at such unpardonable length, in more or less objectionable English thereto,

I remain, dear sir, yours, very truly,

H. GÄTKE.

DESCRIPTION OF ALEPOCEPHALUS BAIRDII, A NEW SPECIES OF FISH FROM THE DEEP-SEA FAUNA OF THE WESTERN ATLANTIC.

By G. BROWN GOODE and TARLETON H. BEAN.

The National Museum has recently received from Mr. Christian Johnson, of the schooner William Thompson of Gloucester, a single specimen of an undescribed species of *Alepocephalus* taken on the Grand Banks, at a depth of 200 fathoms. The only other known representative of this genus is the *Alepocephalus rostratus* Risso, a member of the

* During the fall this line of migration, so far as it comes under observation here, day or night, is from due east to west, sometimes perhaps with the declination of a point to the south.

Mediterranean fauna. The species is dedicated to the distinguished Secretary of the Smithsonian Institution.

DIAGNOSIS.—Body comparatively elongate, somewhat compressed, its greatest height, at a point midway between pectorals and ventral insertions, contained $5\frac{1}{3}$ times in its length to the origin of the middle caudal rays, its greatest width equal to one-tenth of total length, the least height of tail contained 11 times in length of body.

Scales large, thin, oblong, triangular at the free end, those at the base of the anal fin having the free end more produced than the others. Sixty-five scales in the lateral line, seven rows between it and the origin of the dorsal, eleven between that of the anal and the lateral line. Scales extend for a short distance upon the bases of the dorsal and anal fins.

Head moderately compressed, snout subconical, the lower jaw included within the upper when the mouth is closed. The length of the head is contained $4\frac{1}{3}$ times in length of body, slightly exceeding twice the length of the lower jaw. Width of the head equal to the length of the operculum and very slightly less than that of the upper jaw. Width of interorbital area half of the least height of tail. Length of snout half that of the mandible, which is one-ninth of the total length. Diameter of orbit equal to length of snout.

Dorsal inserted directly above the vent, slightly in advance of the anal and at a distance from the snout nearly equal to two-thirds of the total length of the body.

Length of longest ray of dorsal one-half that of the postorbital portion of the head. The distance of the anal from the snout is almost three times the length of the head, its first ray being about under the fourth ray of the dorsal. Its length of base is greater than that of the dorsal by one-fifth of the length of the latter; its longest ray slightly exceeds the longest of the dorsal.

Middle caudal rays equal in length to longest ray of anal, the external rays somewhat more than twice as long.

Distance of pectoral from snout three times as great as the least height of the tail; its length one-tenth of total length and equal to width of body, reaching to ninth row of scales.

Distance of ventral from snout equal to twice the length of the head, its length slightly greater than that of middle caudal rays.

Radial formula: B. VI. D. 22. A. 25. C. 19. P. 12. V. 1, 9. Cæc. Pyl. 15.

Teeth on the intermaxillaries, mandible, and palatines.

Color.—Uniform indigo-blue, this color extending to the inside of the mouth and the gill-membranes.

Table of Measurements.

Current number of specimen.....	22,468.	
	Milli- metres.	100ths of length.
Length to origin of middle caudal rays.....	610	.....
Body:		
Greatest height.....		19
Greatest width.....		10
Height at ventrals.....		18½
Least height of tail.....		9
Head:		
Greatest length.....		22½
Greatest width.....		8½
Width of interorbital area.....		4½
Length of snout.....		5½
Length of operculum.....		8½
Length of upper jaw.....		8½
Length of mandible.....		11
Distance from snout to orbit.....		5½
Diameter of eye.....		5½
Dorsal (spinous):		
Distance from snout.....		65
Length of base.....		15½
Length of longest ray.....		6
Anal:		
Distance from snout.....		68½
Length of base.....		18½
Length of longest ray.....		6½
Caudal:		
Length of middle rays.....		6½
Length of external rays.....		14
Pectoral:		
Distance from snout.....		27
Length.....		10
Ventral:		
Distance from snout.....		48
Length.....		6½
Branchiostegals.....	VI	.....
Dorsal.....	22	.....
Anal.....	25	.....
Caudal.....	19	.....
Pectoral.....	12	.....
Ventral.....	1, 9	.....
Number of scales in lateral line.....	65	.....
Number of transverse rows above lateral line.....	7	.....
Number of transverse rows below lateral line from origin of ventral.....	11	.....
Number of caecal appendages.....	15	.....
Vent:		
Distance from snout.....		65

WASHINGTON, April 25, 1879.

ON THE SPECIES OF *ASTROSCOPUS* OF THE EASTERN UNITED STATES.

By TARLETON H. BEAN.

The family *Uranoscopidae* of Gill has two representatives on the east coast of the United States, *Astroscopus y-gracum* (C. & V.) Gill, and *A. anoplus* (C. & V.) Brevoort. The former was described from the Caribbean Sea, and is now for the first time recorded in our waters. *A. anoplus* was founded upon young individuals sent by Professor LeConte, and the immaturity of the specimens has led to considerable confusion in the diagnoses of genera. Cuvier and Valenciennes supposed the species to be scaleless. Drs. Gill and Günther both employed this as one of the characters separating it from *Uranoscopus*, the latter in 1860* assigning the *U. anoplus* of Cuvier and Valenciennes to his new genus,

* Cat. Fish. Brit. Mus. ii, 1860, p. 229.

Agnus, with the distinguishing characters of a naked body and the absence of a filament in the mouth. Dr. Gill, in 1861,* used the same characters in transferring the same species from *Uranoscopus* to *Astroscopus* of Brevoort, adding some particulars as to the mauling of the head and the armature of the preoperculum. The species, in fact, is covered with scales, which in the young are inconspicuous, but in the adult may be readily counted. The genus *Astroscopus*, however, is well separated from *Uranoscopus*, and may be thus defined:

ASTROSCOPUS Brevoert.

Uranoscopus sp. CUV. & VAL., Hist. Nat. Poiss., viii, 1831, p. 493.

Astroscopus BREVOORT, Proc. Phila. Acad. Nat. Sci., Jan. 1860, p. 20.—GILL, op. cit., 1861, p. 113.

Agnus GÜNTHER, Cat. Fish. Brit. Mus., ii, 1860, p. 229.

Upsclonphorus GILL, op. et loc. cit.

Head above with its crown covered with a bony plate, from the middle of the anterior margin of which arises a y-shaped apophysis, the limbs of which extend to the orbits. Postocular region covered only with skin.

Preoperculum with two blunt processes † generally radiating from the angle of its anterior limb, one of which is directed downwards and forwards. Humeral spine inconspicuous. Lower jaw entire beneath. Lips furnished with numerous filaments. No spines before the ventrals. ‡ No intralabial filament. Head and belly without scales; the rest of the body covered with small scales. Two dorsal fins; the first composed of four short spines, the second about equal to the anal.

1. *Astroscopus y-græcum* (Cuv. & Val.) Gill.

Uranoscopus y-græcum CUV. & VAL., Hist. Nat. Poiss., iii, 1829, p. 308.—GÜNTHER, Cat. Fish. Brit. Mus., ii, 1860, p. 229.

Astroscopus y-græcum GILL, Proc. Acad. Nat. Sci. Phila., xii, 1860, p. 21.

Upsclonphorus y-græcum GILL, op. cit., xiii, 1861, p. 113.

There are now two specimens of this species in the National Museum, one (No. 18044) taken in the Saint John's River, Florida, by Prof. S. F. Baird, April 2, 1877; the other (No. 18029) collected in the Matanzas River Inlet, Florida, by Mr. Joseph C. Willetts, in February, 1877. In a collection of color-sketches of fishes made for Prof. Louis Agassiz, and now lent by the Museum of Comparative Zoölogy to the National Museum, are illustrations of *A. y-græcum* from Hampton Roads, Va., Charleston, S. C., and Pensacola, Fla.

DESCRIPTION.—The greatest height of the body (.26) equals twice the length of the operculum (.13). Its greatest width (.24) equals the height at the ventrals (.24), and the distance of the ventrals from the snout (.24). The least height of the tail (.10) is contained 10 times in the total length, and equals the distance between the eyes (.10). The length of the caudal peduncle (.08) equals that of the last anal ray (.08), and is contained $12\frac{1}{2}$ times in the total length.

* Proc. Phila. Acad. Nat. Sci., 1861, p. 113.

† More marked in *A. anoplus* than in *A. y-græcum*.

‡ These are present in *Uranoscopus scaber* and *U. asper*, and probably in all species of *Uranoscopus*. I am not aware that this has been previously mentioned.

The greatest length of the head (.37) slightly exceeds the distance of the spinous dorsal from the snout (.36). The length of the postocular depression (.11) equals more than 3 times the length of the snout (.03½), and is contained about 9 times in the total length. The width of this depression (.07½) equals about $\frac{2}{3}$ of its length. The greatest width of the head (.28) equals 4 times the length of the second dorsal spine (.07). The jaws are shorter than in *A. anoplus*. The length of the upper (.15½) equals half the length of the anal base (.31), and is contained 6½ times in the total length (less than 6 times in *A. anoplus*). The length of the mandible (.21) is contained 4½ times in the total length. The maxilla extends to a perpendicular, drawn at a distance behind the eye equal to the short diameter of the eye, and the mandible ends in the same vertical. The long diameter of the eye (.03) equals half the length of the last ray of the second dorsal (.06).

The distance of the spinous dorsal from the snout (.36) is a little less than the greatest length of the head (.37). The length of its base (.11) is contained 9 times in the total length, and equals the length of the postocular depression. The spines are all longer than in *A. anoplus*. The length of the first (.07½) is nearly $\frac{1}{2}$ the length of the upper jaw, and slightly exceeds that of the second (.07), which equals $\frac{1}{3}$ of the length of the mandible. The last spine (.02½) is $\frac{1}{3}$ as long as the first. The length of the base of the second dorsal (.30) is contained 3½ times in the total length, and equals 3 times the distance between the eyes. Its longest ray (.19½) equals somewhat more than half the length of the head (much less than half in *A. anoplus*). The length of the last ray (.06) equals the distance from the snout to the orbit (.06).

The distance of the anal from the snout (.57) equals nearly 3 times the length of the longest dorsal ray. Its length of base (.31) is almost equal to that of the second dorsal. The first ray (.04) is half as long as the last (.08); the longest (.14½) is contained nearly 4 times in the distance from the snout to the origin of the anal, and nearly 7 times in the total length.

The length of the middle caudal rays (.25) equals $\frac{1}{4}$ of the total length. The length of the external rays (.23) equals that of the ventral (.23).

The distance of the pectoral from the snout (.35½) equals 5 times the length of the second dorsal spine. Its length (.30½) equals 5 times that of the last dorsal ray. It extends to the fourth anal ray.

The distance of the ventral from the snout (.24) does not greatly exceed its length (.23), and is equal to the height of the body at the ventrals (.24). The ventral extends to about the origin of the spinous dorsal. The vent is under the anterior rays of the second dorsal.

Radial formula: B. VI; D. IV, 14; A. 13; P. 19-20; V. 6. L. lat. ca. 80.

COLOR.—*Astroscopus y-gracum* has, on the upper parts, numerous white spots, some of which are as long as the short diameter of the eye.

NOTE—In the tables of measurements the unit of length is the length of body to the origin of the middle caudal rays.

Table of Measurements.

Species, *Astroscopeus y-gracum*.

Current number of specimen	18,029.		18,044.		Aver- ages.
	Matanzas River Inlet, Florida.		Saint John's River, Florida.		
Locality	Milli- metres.	100ths of length.	Milli- metres.	100ths of length.	100ths of length.
Extreme length	318		165		
Length to origin of middle caudal rays	253		131		
Body:					
Greatest height		24½		28	26
Greatest width		24		24½	24
Height at ventrals		24		24½	24
Least height of tail		10		10½	10
Length of caudal peduncle		7½		8	8
Head:					
Greatest length		37		37½	37
Length of occipital depression		12		10½	11
Width of occipital depression		6½		8½	7½
Greatest width		27½		28	28
Width of interorbital area		10		9½	10
Length of snout		3½		3½	3½
Length of operculum		12½		13	13
Length of maxillary		15		16	15½
Length of mandible		21		21½	21
Distance from snout to orbit		6		6	..
Diameter of orbit		2½		3½	3
Dorsal (spinous):					
Distance from snout		35		37	36
Length of base		10½		11	11
Length of first spine		7½		7½	7½
Length of second spine		7		7	7
Length of last spine		2		3	2½
Dorsal (soft):					
Length of base		30		30½	30
Length of first ray		7			
Length of longest ray		18		21	19½
Length of last ray		6		6	6
Anal:					
Distance from snout		58½		55	57
Length of base		31½		30	31
Length of first ray		4		4	4
Length of longest ray		14		15	14½
Length of last ray		8½		7	8
Caudal:					
Length of middle rays		24½		26	25
Length of external rays		23½		22	23
Pectoral:					
Distance from snout		35		36	35½
Length		32		29	30½
Ventral:					
Distance from snout		25		23	24
Length		22½		23	23
Branchiostegals		VI		VI	
Dorsal		IV, 14		IV, 14	
Anal		13		13	
Caudal		16			
Pectoral		20		19	
Ventral		6		6	
Number of scales in lateral line		ca. 80			

2. *Astroscopeus anoplus* (C. & V.) Brevoort.

Uranoscopus anoplus CUV. & VAL., Hist. Nat. Poiss., viii, 1851, p. 493, (described from young specimens sent by Prof. LeConte): DEKAY, Nat. Hist. N. Y., Fishes, 1842, p. 37, pl. xxii, fig. 65: STORER, Syn. Fishes N. A., 1843, p. 46 ("South Carolina, LeConte"); Mem. Amer. Acad., ii, p. 298.

Astroscopeus anoplus GILL ex BREVOORT MSS., Proc. Acad. Nat. Sci. Phila., xii, Jan. 1860, p. 20; xiii, May, 1861, p. 114; Cat. Fishes E. Coast N. A., 1861, p. 43; Rep. U. S. Com. Fish., 1873, p. 798: YARROW, Proc. Acad. Nat. Sci. Phila., 1877, p. 207: JORDAN & GILBERT, Proc. U. S. Nat. Mus., i, 1879, p. 372.

Agnus anoplus GÜNTHER, Cat. Fish. Brit. Mus., ii, 1860, p. 229.

Astroscopus guttatus ABBOTT, Proc. Acad. Nat. Sci. Phila., xii, 1860, p. 335, pl. vii; GILL, Cat. Fish. E. Coast N. A., Jan. 1861, p. 43.

Upsclonphorus guttatus GILL, Proc. Acad. Nat. Sci. Phila., xiii, 1861, p. 113.

The U. S. National Museum has specimens of *A. anoplus* from Tompkinsville, N. Y., Norfolk, Va., and from an unknown locality. The list is as follows:

19761	Young....	Tompkinsville, N. Y. .	Charles Copley.
4622 a	Adult.....	Norfolk, Va	
4622 b	...do .....	.....do	
7304	(7 specs.)..	United States?.....	

DESCRIPTION.—The shape of the body is similar to that of *Uranoscopus scaber*. Its greatest height (.29), which is at the origin of the spinous dorsal, is contained 4 times in its length in the young and $3\frac{1}{4}$ times in the adult. The greatest width of body (.24 $\frac{1}{2}$) is nearly $\frac{1}{4}$ of the length, and equals the length of the ventral (.24 $\frac{1}{2}$). The height at the ventrals (.27) equals three times the distance from the snout to the centre of the eye (.09). The least height of the tail (.11) equals the width of the interorbital area (.11), and is contained 9 times in the total length.

The length of the head (.39) equals 3 times the length of the operculum (.13). There are two postocular depressions, whose length (.07 $\frac{1}{2}$) equals their width (.07 $\frac{1}{2}$), or slightly less than twice the length of the snout (.04). The greatest width of the head (.31) equals nearly 3 times the least height of the tail. The length of the upper jaw (.17) is contained nearly 6 times, and of the mandible (.23) $4\frac{1}{3}$ times in the total length. The long diameter of the eye (.03 $\frac{1}{2}$) equals $\frac{1}{4}$ the length of the longest anal ray (.14), and $\frac{1}{11}$ of the length of the head.

The distance of the spinous dorsal from the snout is about $\frac{3}{8}$ of the total length. The length of its base (.12) equals twice the length of its first spine (.06). The spines are all shorter than in *A. y-gracum*. The second spine equals the first, and 3 times the last (.02). The length of the base of the second dorsal (.30) equals 6 times the length of its last ray (.05). The first ray equals the first spine in length. The longest ray (.16 $\frac{1}{2}$) is contained 6 times in the total length.

The distance of the anal from the snout (.60) equals twice the length of the second dorsal base (.30), and nearly twice the length of the anal base (.31). The first anal ray (.04) equals the snout in length. The longest (.14) slightly exceeds in length the operculum, while the last (.07 $\frac{1}{3}$) about equals the length of the postocular depression.

The length of the middle caudal rays (.23 $\frac{1}{2}$) is usually a little less than that of the ventral (.24 $\frac{1}{2}$).

The distance of the pectoral from the snout (.36) equals 3 times the length of the base of the spinous dorsal. The length of the pectoral (.29) exceeds the length of the ventral (.24 $\frac{1}{2}$) by about $\frac{1}{6}$ of the length of the latter, and is contained nearly $3\frac{1}{2}$ times in the total length. It extends to the 5th anal ray.

The distance of the ventral from the snout ($.25\frac{1}{2}$) slightly exceeds its length. The ventral extends to a vertical through the anterior part of the first dorsal.

Radial formula: B. VI; D. IV-V, 13-14; A. 12-13; C. 16-18; V. 6. L. lat. ca. 113.

The lateral line begins about the middle of the operculum, ascends backward to near the upper outline of the body, under the anterior half of the first dorsal, follows the upper outline close to the bases of the rays as far as the end of the second dorsal, from which point it curves downward to the origin of the middle caudal rays, and thence follows the origin of the bases of the lower caudal rays.

COLOR.—*Astroscopus anoplus* is minutely spotted with white on the upper parts.

NOTE.—In the measurement tables the unit of comparison is the length to the origin of the middle caudal rays.

Table of Measurements.

Species, *Astroscopus anoplus*.

Current number of specimen.....	10,761.		"Guttatus," 4,622 a.		"Guttatus," 4,622 b.		Aver- ages.
	Tompkinsville, N. Y.		Norfolk, Va.		Norfolk, Va.		
Locality.....	Milli- metres.	100ths of length.	Milli- metres.	100ths of length.	Milli- metres.	100ths of length.	100ths of length.
Extreme length.....	112		273		275		
Length to origin of middle caudal rays.....	91		221		220		
Body:							
Height at first dorsal.....		25		31		31	29
Greatest width.....		23		25		25 $\frac{1}{2}$	24 $\frac{1}{2}$
Height at ventrals.....		26		28		27	27
Least height of tail.....		11		11		11	11
Length of caudal peduncle.....		7		11		11	
Head:							
Greatest length.....		38		39		39	39
Length of occipital depression.....		7		8		7 $\frac{1}{2}$	7 $\frac{1}{2}$
Width of occipital depression.....		7		8		7 $\frac{1}{2}$	7 $\frac{1}{2}$
Greatest width.....		30		31		32	31
Width of interorbital area.....		10		11		11 $\frac{1}{2}$	11
Length of snout.....		4		4		4	4
Length of operculum.....		13		13		13	13
Length of maxillary.....		17		17		16 $\frac{1}{2}$	17
Length of mandible.....		23		22		23	23
Distance from snout to centre of orbit.....		9		9		9	9
Diameter of orbit.....		4		3		3 $\frac{1}{2}$	3 $\frac{1}{2}$
Dorsal (spinous):							
Distance from snout.....		38		36		38	37
Length of base.....		11		12		12	12
Length of first spine.....		6		6		6	6
Length of second spine.....		6		6		*5 $\frac{1}{2}$	6
Length of last spine.....		2		1 $\frac{1}{2}$		1 $\frac{1}{2}$	2
Dorsal (soft):							
Length of base.....		31		30		30	30
Length of first ray.....		5		6		6 $\frac{1}{2}$	6
Length of longest ray.....		17		16		16 $\frac{1}{2}$	16 $\frac{1}{2}$
Length of last ray.....		5		5		5	5
Anal:							
Distance from snout.....		58		60		62	60
Length of base.....		29		33		30	31
Length of first ray.....		4		4		5	4
Length of longest ray.....		14		13		14	14
Length of last ray.....		6		8		8	7 $\frac{1}{2}$
Caudal:							
Length of middle rays.....		23		23		24 $\frac{1}{2}$	23 $\frac{1}{2}$

* Broken.

Table of Measurements—Continued.

Current number of specimen.....	10,761.		"Guttatus," 4,622 a.		"Guttatus," 4,622 b.		Aver- ages.
Locality.....	Tompkinsville, N. Y.		Norfolk, Va.		Norfolk, Va.		
	Milli- metres.	100ths of length.	Milli- metres.	100ths of length.	Milli- metres.	100ths of length.	100ths of length.
Pectoral:							
Distance from snout.....		34		37		37	36
Length.....		29		28		29	29
Ventral:							
Distance from snout.....		24		27		25½	25½
Length.....		25		24		24½	24½
Branchiostegals.....	VI		VI		VI		
Dorsal.....	IV, 14		V, 13		V, 14		
Anal.....	12		13		13		
Caudal.....	16-17		18		18		
Pectoral.....	19		20		20		
Ventral.....	6		6		6		
Number of scales in lateral line.....			113+				

WASHINGTON, May 6, 1879.

ON THE OCCURRENCE OF HIPPOGLOSSUS VULGARIS, FLEM., AT UNALASHKA AND ST. MICHAEL'S, ALASKA.

By TARLETON H. BEAN.

No one has yet positively identified the halibut of the Pacific coast of North America with the *Hippoglossus vulgaris* of Fleming, so far as I can learn. Ayres, in 1854,* writing of the species observed in the market of San Francisco, says: "The great *Hippoglossus vulgaris*, universally known as the 'halibut,' the fishermen have assured me is sometimes caught near the Farallon Islands. Most of those sold in our market, however, if not all, are brought from the coast further north." In volume 2 of the same Proceedings (1859, p. 30), he writes: "Another species, in which the eyes are on the right side, is occasionally taken near the Farallon Islands, opposite the mouth of the Bay, which I do not feel warranted in separating from *H. vulgaris*, without a direct comparison of the two. Its fin-rays are D. 102, A. 73, P. 16, V. 6, C. 4, 1, 7, 8, 1, 4.

"It appears to be seldom quite as large as *H. californicus*."

The number of anal rays in this enumeration is smaller than usual, but not improbable.

Lord† gives a graphic account of the Indian mode of fishing for halibut, and remarks as to the species: "I believe the species to be the *Pleuronectes hippoglossus* of Linnæus, but of this I am by no means perfectly clear, as I had only an opportunity of examining this single specimen, that I estimated as weighing over 300 lbs.; and it was quite impossible to investigate its specific character," &c.

* Proc. Cal. Acad. Sci., i, 1854, 1st ed., p. 41, and 2d ed., p. 40.

† Naturalist in Vancouver Island and British Columbia, i, 1863, p. 149.

Dr. Cooper, in mentioning the Pleuronectoids of California, says:* "The two first are species of Halibut, one closely resembling the Atlantic fish, and grow over 4 feet long, the latter (No. 105, *H. vulgaris?*) sometimes weighing five hundred or six hundred pounds. Both are caught near San Francisco."

Mr. William H. Dall, in his work on "Alaska and its Resources," 1870, p. 484, states, that "The halibut are smaller than those of the eastern fisheries, but near Sitka and along the coast they have been taken from three to five hundred pounds in weight. They are not found north of the ice line in Bering sea, except, perhaps, in summer." In the report for 1870 of the Commissioner of Agriculture, p. 381, the same author employs the name "*Hippoglossus vulgaris?*" in connection with the paragraph on the halibut, and states that "Their range is from the Aleutian Islands southwest to Cape Flattery. . . . They extend westward into the Ochotsk sea with the cod and already form an article of commerce among the west-coast fishermen. They are said to surpass the eastern halibut in flavor when properly cured."

Mr. Henry W. Elliott, special agent of the Treasury Department, speaks thus of the halibut in a Report upon the Condition of Affairs in the Territory of Alaska, Washington, 1875, p. 167:

"Found throughout the territory on soundings south of the 60th parallel of north latitude. Halibut are quite abundant and of excellent quality, but the climate is such that the fishermen cannot properly dry or cure them for exportation even in small cargoes. They are, however, not abundant enough for exportation, and must therefore be regarded as only of local importance."

In a report upon the Customs District, Public Service, and Resources of Alaska Territory by William Gouverneur Morris, special agent of the Treasury Department, 1879, p. 115, is found the following information:

"While I was at Klawack, they were testing the boiler, new machinery, and other apparatus, and were trying the experiment of canning clams and halibut, both of which are so plenteous in that neighborhood as to be a perfect drug. I have since seen the result of this, and can pronounce the clams the very best so treated on the whole Pacific coast, and the halibut is of superior quality, preserving its flavor better than any yet produced from any other locality. The supply of these two articles of commerce alone, from this particular place, is only to be regulated by the demand."

The only examples of the Pacific halibut in the United States National Museum are those collected by Mr. W. H. Dall and Mr. Lucien M. Turner. Mr. Dall's is the single available one for comparison, and that lacks the caudal fin, which is fortunately present in the other. Although both specimens are in very poor condition, there is no difficulty in perceiving their identity with the Atlantic halibut. The individual forwarded by Mr. Dall (collector's number 1098, museum number 22466)

* Cronise's Nat. Wealth Cal., 1868, p. 493.

was taken at Unalashka, September 13, 1873, in 50 or 60 fathoms. Mr. Dall informed me that Dr. Steindachner saw it in San Francisco, and considered it identical with the *Hippoglossus vulgaris*. I have compared it carefully with Atlantic halibut from Eastport, Me., and fail to see any means of separating the two. The Alaska individuals are a little thicker; but that may be accounted for by the differences in the food supply. It is very desirable to have perfect specimens of the Pacific fish for examination; but, in the absence of such material, I have endeavored to make the most of what the museum has, and it is believed that the table of measurements will serve to confirm the views of those who regard the halibut of the Pacific identical with that of the Atlantic.

DESCRIPTION OF THE UNALASHKA SPECIMEN.

The museum catalogue number is 22466, and the collector's number 1098. The length of the fish to the origin of the middle caudal rays is 463 millimetres. The different proportions of the body are given in hundredths of this length.

The greatest height of the body (.32) is 4 times the length of the operculum (.08); its height at the ventrals (.25) is contained 4 times in the total length, and equals the distance of the pectoral from the snout (.25). The least height of the tail (.07½) is nearly equal to the length of the operculum (.08), and to the distance of the dorsal from the snout (.08). The length of the caudal peduncle (.12) equals that of the longest anal ray (.12). The lateral line follows the same course as in Eastern specimens.

The greatest length of the head (.25½) is contained nearly 4 times in the total length. The distance between the eyes (.03) equals ½ the distance from the snout to the orbit (.06). The length of the snout (.04½) equals almost ½ the length of the upper jaw (.09½). The length of the upper jaw is not quite equal to that of the pectoral of the blind side (.10). The maxilla extends to the vertical through the middle of the lower eye.

The length of the mandible (.11½) is contained 2¼ times in the length of the head. It extends to the vertical through the posterior margin of the lower eye.

The long diameter of the upper eye (.05) is contained 5 times in the length of the head, and twice in that of the pectoral of the blind side. The teeth agree perfectly in all respects with those of the Eastport individuals, that is, they are arranged in two series in the upper jaw, the outer being the stronger, and in a single series in the lower jaw.

The distance of the dorsal from the snout (.08) equals the length of the operculum. Its longest ray (.11⅓) does not quite equal the longest of the anal (.12). The 37th and 38th dorsal rays are the longest.

The distance of the anal from the snout (.34) equals ⅔ of the head's length. Its longest ray, the 17th, (.12) is contained 8½ times in the total length.

The tail is wanting in this individual, but present in that forwarded by Mr. Turner. It is of the usual *vulgaris* type.

The distance of the pectoral from the snout (.25) equals twice the length of the pectoral of the eyed side (.12½) and 2½ times that of the blind side (.10).

The distance of the ventral from the snout (.25) is contained 4 times in the total length. The length of the ventral (.05½) is contained 4½ times in that of the head.

The fin-rays are: D. 96. A. 77. P. II, 15. V. 6.

The radial formulæ of all the specimens are here summarized:

22436. Unalashka.	D. 96; A. 77; P. II, 15; V. 6; C. ———.
22467. St. Michael's.	D. 100+; A. 78; P. II, 16; V. 6; C. + 16 +.
10439. Eastport, Me.	D. 103; A. 78; P. II, 14; V. 6; C. + 16 +.
14622. Eastport, Me.	D. 103; A. broken; P. II, 14; V. 6; C. + 16 +.

Table of Measurements.

Current number of specimen.....	22,466.		10,439.		14,622.		22,467.
Locality.....	Unalashka, Sept. 13, 1873.		Eastport, Maine.		Eastport, Maine.		Saint Michael's, Alaska.
	Milli-metres.	100ths of length.	Milli-metres.	100ths of length.	Milli-metres.	100ths of length.	Milli-metres.
Extreme length			427		428		
Length to origin of middle caudal rays.....	463		365		370		
Body:							
Greatest height		32		34		36	
Greatest width		8½		7		7½	
Height at ventrals		23		28		29	168
Least height of tail		7½		7½		8	
Length of caudal peduncle		12		12½		13	
Head:							
Greatest length		25½		27		26½	167
Greatest width							45
Width of interorbital area		3		3		ca. 3	15
Length of snout		4½		4½		4¾	26
Length of operculum		8		8		8	48
Length of upper jaw		9½		10		9½	59
Length of mandible		11½		12½		11½	74
Distance from snout to orbit		6		5½		5¾	
Diameter of upper eye		5		5½		5½	23
Dorsal:							
Distance from snout		8		7½		7½	46
Length of longest ray		11½		11		10½	68
Anal:							
Distance from snout		34		34		36	
Length of longest ray		12		11		11	70
Caudal:							
Length of middle rays				12½		12½	68
Length of external rays				18½		18½	115
Pectoral:							
Distance from snout		25		25½		25	
Length, eyed side		12½		13½		11½	77
Length, blind side		10		10		10	
Ventral:							
Distance from snout		25		26		26	
Length		5½		6		5½	
Dorsal	96		103		103		100+
Anal	77		78		(Broken.)		78
Caudal			+ 16 +		+ 16 +		II, 16, II
Pectoral	II, 15		II, 14		II, 14		II, 16
Ventral	6		6		6		
Length of pectoral of blind side							62

DESCRIPTION OF AN APPARENTLY NEW SPECIES OF GASTEROSTEUS (*G. ATKINSII*) FROM THE SCHOODIC LAKES, MAINE.

By TABLETON H. BEAN.

In a large collection of fishes sent to the United States National Museum, in 1878, by Mr. C. G. Atkins, an assistant of the United States Fish Commission, were six specimens of a stickleback which appears to be undescribed, and for which I propose the name given above, as a slight recognition of Mr. Atkins's services as a collector and as an original investigator into the reproductive habits of important fishes.

Gasterosteus Atkinsii resembles in form and coloration *G. pungitius* rather than the perhaps more closely related *G. aculeatus*. It may be at once distinguished from all the other eastern American species by (1) the presence of about fifteen lateral plates, which rapidly diminish in size after the fourth, and (2) its long ventral spines, which nearly or quite reach the vent. The plates are quite unlike those of *G. semiarmatus*, being so thin and posteriorly so small that they are inconspicuous.

For the purpose of description I have selected the individual whose catalogue-number is 22492 *a* (collector's number, 3013). The extreme length of this specimen is 35 millimetres, and its length to the origin of the middle caudal rays is 30 millimetres, which is the basis of comparison for all the other measurements.

The height of the body at the ventrals (.21) equals 3 times the length of the upper jaw (.07), and 3 times the distance between the eyes (.07). Its greatest width (.11) equals the long diameter of the orbit (.11). The least height of the tail (.04) equals the length of the antecedent anal spine (.04) and one-half the length of the snout (.08). The length of the caudal peduncle (.13) somewhat exceeds the width of the head (.12).

The length of the head (.31) equals 3 times the length of the mandible (.10). The length of the snout equals that of the operculum (.08). The length of the upper jaw (.07) equals the distance between the eyes and one-half the length of the post-pectoral plate (.14). The length of the mandible (.10) is contained 10 times in the total length and equals twice the length of the antecedent spine of the second dorsal (.05). The long diameter of the orbit is contained $2\frac{3}{4}$ times in the length of the head and 9 times in the total length.

The teeth are as in the other members of the family.

The spinous dorsal has two spines of equal length. Its distance from the snout (.37) equals slightly more than twice the length of the pectoral (.18). The length of the two spines (.12) equals that of the first and longest ray of the second dorsal (.12) and of the anal (.12). The spines are in a straight line, and with each is connected a delicate membrane.

The distance of the anal from the snout (.66) equals 6 times the long diameter of the orbit. Its length of base (.18) equals $2\frac{1}{4}$ times the length of the operculum. The length of the antecedent anal spine (.04) is contained 3 times in that of the first and longest ray (.12).

The length of the middle caudal rays (.16 $\frac{2}{3}$) is contained 6 times in the total length.

The caudal is slightly forked, almost truncate when expanded.

The pectoral is composed of ten rays. Its distance from the snout (.34) is a little less than twice its length (.18). It extends to the middle of the interval between the two dorsals. The length of the post-pectoral plate (.14) equals twice that of the upper jaw, and its width (.04) equals the length of the antecedent anal spine.

The ventral consists of one spine and one ray. Its distance from the snout (.45) equals 4 $\frac{1}{2}$ times the length of the lower jaw. The spine extends beyond the end of the pubic bones, reaching almost or quite to the vent. Its length (.19) exceeds that of the pectoral (.18). It is very strongly serrated on its outer and finely on its inner margin. The origin of the ventral is slightly in advance of the perpendicular let fall from the second dorsal spine.

Radial formula: B. III; D. II, I, 10-12; A. I, 8-9; C. + 12 +; P. 10; V. I, 1.

Color.—Dark bands cross the body just as in *G. pungitius*, which it strongly resembles. The ground-color of the body in the alcoholic specimens is almost flesh-color; the major part of the head is silvery, as are the breast and the belly.

Table of Measurements.

Current number of specimen.....		22,492 a.	
Locality		Schoolie Lakes, Me.	
		Millime- tres.	100ths of length.
Extreme length.....		35	.....
Length to origin of middle caudal rays.....		30	.....
Body:			
Greatest height.....			21
Greatest width.....			11
Height at ventrals.....			21
Least height of tail.....			4
Length of caudal peduncle.....			13
Head:			
Greatest length.....			31
Greatest width.....			12
Width of interorbital area.....			7
Length of snout.....			8
Length of operculum.....			8
Length of upper jaw.....			7
Length of mandible.....			10
Distance from snout to orbit.....			8
Diameter of orbit.....			11
Dorsal (spinous):			
Distance from snout.....			37
Length of first spine.....			12
Length of second spine.....			12
Dorsal (soft):			
Length of antecedent spine.....			5
Length of first ray.....			12
Anal:			
Distance from snout.....			66
Length of base.....			18
Length of first spine.....			4
Length of first ray.....			12
Length of longest ray.....			12
Caudal:			
Length of middle rays.....			16 $\frac{2}{3}$

Table of Measurements—Continued.

Current number of specimen	22,492 a.	
Locality	Schoolic Lakes, Me.	
	Millime- tres.	100ths of length.
Pectoral:		
Distance from snout		34
Length		18
Length of post-pectoral plate		14
Width of post-pectoral plate		4
Ventral:		
Distance from snout		45
Length		19
Branchiostegals	III	
Dorsal	II, I, 12	
Anal	I, 9	
Caudal	+ 12 +	
Pectoral	10	
Ventral	I, 1	
Number of plates in lateral line	15	

Additional Radial Formulae.

Current number of specimen	22,492 b.	22,492 c.	22,492 d.	22,492 e.	22,492 f.
Locality	Schoolic Lakes, Maine.				
	Millime- tres.	Millime- tres.	Millime- tres.	Millime- tres.	Millime- tres.
Extreme length	36	33	31	30	30
Length to origin of middle caudal rays	31½	28	27	26	26
Dorsal	II, I, 12	II, I, 12	II, I, 11	II, I, 10	II, I, 11
Anal	I, 9		1, 8	1, 8	I, 8
Caudal	12	12			
Pectoral	10	10			
Ventral	I, 1	I, 1	I, 1	I, 1	I, 1

WASHINGTON, May 14, 1879.

REVIEW OF THE PLEURONECTIDÆ OF SAN FRANCISCO.

By W. N. LOCKINGTON.

The *Pleuronectidæ* of the Pacific Coast have been described by Girard (Proc. Acad. Nat. Sci. Phil. VII, 1854; VIII, 1856; and Pac. Rail. Rep. Vol. X, 145-156), by Ayres (Proc. Cal. Acad. Sci. 1855, Vol. I, 40, and Vol. II, 1859, 29-30), by Günther (Cat. Fish. Brit. Mus. Vol. IV, 1862, pp. 399-457), and by Gill (Proc. Ac. Nat. Sci. Phil. 1862, 280-281; 1864, 194-199; and 1865, 177). The greater number of the species was characterized by the first of these authors; but as the materials at hand were insufficient for thorough description, consisting usually of single or immature examples, the descriptions were necessarily incomplete. Dr. W. O. Ayres, among the many valuable additions to our ichthyological knowledge made by him during his residence on this coast, added two valid species to the list of our flounders. Dr. A. Günther enumerates the species described by Girard and Ayres, but collocates some of them

in different genera from those in which they were placed by their original describers, and, misled apparently by Girard's insufficient descriptions, characterizes two additional species from specimens which really belonged to forms described by that author. Finally, Prof. T. Gill reviews the labors of his predecessors, reclassifies the entire group, arranging them on a more definite system, and mentions in all seventeen species, including the *Pleuronectes quadrituberculatus* and *Pleuronectes cicatricosus* of Pallas, the *Pleuronectes glacialis* of Richardson (= *franklinii* Günther), and two supposed new species, both of which, however, are apparently synonymous with two of Girard's species; *Parophrys hubbardi* with *Parophrys vetulus* Gir., and *Metoponops cooperi* with the *Psettichthys sordidus* of the same author. It will thus be perceived that considerable confusion existed among our flat-fishes; and in the endeavor to identify the various species described by these authors among the examples in the Mus. Cal. Acad. Sci., and to pick them out among the fresh fishes, as they lay, exposed for sale, in the markets of San Francisco, I soon found that the descriptions of external characters already published needed revision and amplification, and that the task of identification was rendered difficult by the great variation in the number of the dorsal and anal fin-rays, in the width of the interocular space, and in the length of the pectorals, in fishes which evidently belonged to the same species.

A new and abundant species, with constant characters by which it could readily be distinguished from the one with which it had probably been hitherto confounded, was also discovered. It was at that time my intention only to take a few additional notes upon the known species, and publish them together with a description of the new form; but, at the suggestion of Prof. D. S. Jordan, of Indiana University, Bloomington, Ind., who is at this time preparing an ichthyology of the United States, which will include all the Pacific Coast species, I undertook the task of redescribing and more thoroughly characterizing all the known forms belonging to the family that occur in the markets of San Francisco.

By repeated visits to the markets, extending over a period of six months, I have verified the occurrence here of all the species hitherto described from this coast, with the exception of the more northern *Pleuronectes franklinii*, and the possible exception of the Pallasian species *quadrituberculatus* and *cicatricosus*. Two new species of rare occurrence, and belonging to a group not hitherto known to be found in our waters, have also been added to the fauna; but as five nominal species are eliminated, the total number of valid forms occurring here is only thirteen.

My method of procedure has been to write a full description from the specimens in the possession of the California Academy of Sciences, and then to incorporate with it the results of notes taken from fresh individuals, altering and adding so as to include the range of variation. The descriptions are not, therefore, from types, but from an examination of several specimens, and a comparison of these with several others. To the descriptions measurements of several specimens (except in the case of

one rare species) are appended; those taken from the preserved specimens and from the fresh individuals in my possession being supplemented by others taken from individuals as they lay on the stalls. The measurements are followed by remarks upon the variation of individuals, by the enumeration of two or three obvious distinguishing characters, and by such notes upon the localities, comparative abundance, &c., of the various forms as I have been able to collect. I greatly regret my inability to do much at present toward the elucidation of the habits, food, and distribution of the several species. The classification adopted is, with one or two exceptions, that which will be followed by Professors Jordan and Gilbert in their forthcoming work;* and I take this occasion to thank them for the valuable aid they have rendered me by sending me a copy of that portion of their manuscript, and on various occasions tendering me valuable information.

To conclude, I have taken every care to guard against error, but I am aware that it is possible that some of my conclusions may be open to criticism.

I have avoided burdening my descriptions with full synonymy and references, contenting myself with the already given enumeration of the works in which earlier descriptions will be found, and with the mention of the original name of each species.

SYNOPSIS OF THE GENERA AND SPECIES.

* Mouth large, the broad flat maxillary extending to below the eye; teeth nearly equal on both sides of the jaws.

a. Ventral fins both lateral, neither of them on the ridge of the abdomen. (HIPPOGLOSSINÆ.)

b. Body dextral, eyes and color on the right side.

c. Lateral line with a semicircular arch in front; dentition strong; lower pharyngeal teeth in two rows. HIPPOGLOSSUS.

1. *vulgaris* ?

cc. Lateral line nearly straight; teeth rather small; scales moderate, ciliated.

x. No accessory lateral line; dorsal commencing over eye. HIPPOGLOSSOIDES.

2. Eyes large; lower jaw scarcely projecting *jordani*.
 xx. An accessory lateral line; dorsal commencing before the eye.

PSETTICHTHYS.

3. Anterior rays of dorsal produced; eyes small *melanostictus*.

bb. Body sometimes sinistral, sometimes dextral; dentition strong; lateral line with a semicircular arch in front. PARALICHTHYS.

4. Accessory scales numerous; scales ciliate. *maculosus*.

aa. Ventral fin of the colored side inserted on the ridge of the abdomen; body sinistral (RHOMBINÆ.)

Lateral line nearly straight; no vomerine teeth; dorsal rays all simple CITIARICHTHYS.

5. Scales almost membranous; interocular space concave. *sordidus*.

** Mouth small, the short narrow maxillary rarely reaching before the front of the eye; teeth mostly on the blind side; body dextral.

(PLEURONECTINÆ.)

*A Synopsis of the Fishes of the United States. = Bulletin XVI of the United States National Museum.

d. Lateral line simple, nearly straight.

f. Dorsal fin very long, of more than ninety rays; body elongate; scales smooth.....GLYPTOCEPHALUS.

6. Teeth forming a sharp cutting edge, not developed at all on colored side; pectoral of colored side not produced.....*pacificus*.

7. Teeth forming a blunt edge, continued more than half-way along colored side; pectoral of colored side produced.....*zachirus*.

ff. Dorsal fin moderate; scales developed as scattered stellate tubercles.

PLATICHTHYS.

8. Eyes and color sometimes on right, sometimes on left side.

stellatus.

dd. Lateral line with an accessory dorsal branch.

e. Teeth slender, acute, in several series; lateral line nearly straight; body deep, short; lips thick.....PLEURONICHTHYS.

9. Interocular space rather narrow, smooth, without ridges...*guttulatus*.

10. Lips plicate; dorsal continued downwards on blind side of head; interocular space very narrow, forming a raised tubercular ridge.

caenosus.

ee. Teeth straight, blunt, in a close row, chiefly developed on blind side.

g. Scales cycloid, those on cheeks similar; lateral line nearly straight.

PAROPHYRYS.

11. Snout narrow; upper eye diverted obliquely upwards.....*vetulus*.

gg. Scales rough; lateral line arched; form oval.....LEPIDOPSETTA.

12. Scales on cheeks etenoid.....*umbrosa*.

13. Scales on cheeks tuberculate.....*bilineata*.

All the species that I have examined have seven branchiostegals on each side, and the lateral line continued to the end of the caudal on both blind and colored sides. As I am not familiar with the Atlantic species, I cannot be certain whether these are to be considered as family characters; they are not mentioned in Günther's diagnosis of the *Pleuronectida*.

HIPPOGLOSSUS Cuvier.

Mouth large, the large broad maxillary one-third, or not much more than one-third, of the length of the head. Teeth of upper jaw in a double series. Eyes and color on the right side. Gill-rakers short, compressed, widely set. Lower pharyngeal teeth in two rows; branchiostegals seven. Ventrals lateral; caudal emarginate, the outer rays produced. Scales very small, not ciliated. Lateral line with a semicircular arch in front.

HIPPOGLOSSUS VULGARIS Cuvier (?).

(*Hippoglossus vulgaris*? Ayres.)

D. 102. A. 73. P. 16. V. 6.

The fin-formula given above is that of Ayres. The species is of rare occurrence on this part of the coast, but is occasionally brought to market. As I have as yet only seen one specimen, or rather a part of one, as the greater part of the body had been cut away and sold when I saw it, I cannot pronounce as to its specific identity with *H. vulgaris*. The only notes I could make were as follows: Teeth in a double row in both

jaws, with a few irregular teeth between the rows, about equally developed on both sides, strong, numerous. Branchiostegals seven. Interocular space wider than the length of the eye. Caudal with about 20 rays, the principal rays each several times bifurcate, the posterior margin nearly straight. Weight between 40 and 50 pounds. I am told that this fish will probably be of more common occurrence as the season advances. Toward the northern parts of our Pacific seaboard, at Vancouver's Island and along the shores of British Columbia, the halibut is said to be quite common, and to attain a weight of 70 to 100 pounds, or even more. Specimens from Alaska, I am told, have been identified by Dr. Bean with the Atlantic *H. vulgaris*.

HIPPOGLOSSOIDES Gottsche.

Mouth large; maxillary broad, flat, extending nearly to the centre of the eye; teeth nearly equal on both sides of the jaws, rather small, conical. No teeth on vomer or palatines. Eyes and color on the right side. Anterior nostrils on colored side with a short tube, on blind side with a raised margin; lower pharyngeal teeth in a single row. Dorsal commencing over the upper eye; ventrals both lateral; caudal entire, its middle rays produced. Scales of moderate size, more or less strongly ciliated; lateral line nearly straight, simple. Branchiostegals seven.

HIPPOGLOSSOIDES JORDANI sp. nov.

D. 90-94. A. 71-75. C. 2-15-2. P. 13. A. 6.

Dorsal and abdominal outlines equally and regularly curved from the line of the centre of the eyes to the caudal peduncle; upper outline of snout strongly curved, almost a quadrant, the junction of this curve with the dorsal outline forming a concavity over the anterior half of the upper eye. Peduncle of tail widening posteriorly, in its narrowest part from about $\frac{2}{5}$ to $\frac{2}{7}$ of the greatest depth of the body, which is a little over $\frac{1}{3}$ to $\frac{2}{5}$ of the total length; length of the head from $\frac{4}{15}$ to less than $\frac{1}{4}$ of the total length; eye contained about $4\frac{1}{2}$ times; snout (measured from a line joining the anterior margins of the orbits to the tip of the upper jaw) $5\frac{1}{2}$ to 6 times in the length of the head. Posterior nostrils of both sides situated on a line joining the front margins of the orbits; anterior nostrils on both sides with a raised margin, prolonged posteriorly into a linguiform flap; the posterior sub-elliptical, simple. Lower jaw not, or scarcely, projecting in the closed mouth; its lower straight border forming an obtuse angle with the abdominal outline, and its prominent posterior extremity below the centre of the eye; a knob at the symphysis. Cleft of mouth oblique, the tip of the premaxillaries on a horizontal line with the upper margin of the lower eye, and the posterior broad end of the maxillaries extending to nearly the centre of the lower border of the same. Dentition consisting of numerous sharp, slender, conical recurved teeth, in an irregular single row in the man-

dible, but forming a double row in the intermaxillaries. Front teeth largest in both jaws. The outer row in the intermaxillaries much larger than the inner, which is formed of very small teeth; but most of the outer row smaller than those of the mandible. The teeth on the colored side of the upper jaw are most numerous and smallest. Upper pharyngeals each with two irregular rows of teeth, the hinder largest, conical, sharp, recurved. Lower pharyngeals each with a single row of similar teeth. Eyes rather large, lateral, equal in front. Interorbital space rather narrow, equal in adults to about one-third of the longitudinal diameter of the eye. Gill-rakers long and slender, those of the first branchial arch about equal in length to the width of the interorbital space. Pectoral of the colored side scarcely $\frac{1}{2}$ of the total length, or slightly more than half the length of the head, inserted level with the lower eye, and consisting of 13 rays, the first two simple, the others once or twice bifurcate; the third ray longest, lower rays diminishing regularly. Pectoral of the blind side equal in width to that of colored side, but only about $\frac{2}{3}$ as long. Dorsal commencing on the dorsal ridge immediately over the anterior margin of the pupil, all the rays simple, except the two or three last, which (at least in most examples) are once bifurcate; the rays from the 37th to the 50th highest. Anal preceded by a horizontal spine, the first ray immediately behind a vertical from the posterior axil of the pectoral; all its rays simple, the three last excepted, coterminous with the dorsal, rays from 30th to 40th highest. Posterior margin of caudal entire, slightly convex, rays twice or thrice bifurcate. In large individuals, both the central and the outer rays are slightly produced, the central most. Ventrals small, inserted in advance of the pectorals, the distance between the posterior axil of the former and the anterior axil of the latter less than half the width of the pectoral base; their tips extending backwards beyond the anus nearly to the anal spine; the first two rays simple, the others once or twice bifurcate. Lateral line without abrupt arch, curving gently downwards from its origin to the median line of the side of the body, which it reaches at a vertical from the tip of the pectoral; thence straight to the end of the caudal. Number of scales in lateral line about 96 in a specimen $9\frac{3}{8}$ in. long. No accessory lateral line, but a row of pores across cheek and round the lower eye. Scales of colored side longer than wide, rather small, distinctly ciliate on their posterior margins, somewhat deciduous; uniform over the whole of the body opercles and cheeks, and continued forwards on the interorbital space to the anterior margin of the eye. Jaws and snout scaleless; scales of blind side not ciliated. A row of small ciliated scales along each ray of the dorsal and anal on the colored side, extending almost or quite to the tips of the rays; none on the first four dorsal rays; caudal with small scales on colored side; color almost uniform gray. Each scale has two transverse bands of black points, divided by a spotless light-colored band; the ciliated tip is also light, with a few black points. Fins nearly the same tint as the body, the

membrane between the rays of dorsal and anal becoming slightly darker towards the tips of the rays.

Dimensions.	No. 1.	No. 2.	No. 3.	No. 4.
Total length, in inches.....	9 $\frac{3}{4}$	10 $\frac{1}{4}$	17 $\frac{1}{2}$	14 $\frac{3}{8}$
Length without caudal.....	8	8 $\frac{5}{8}$	.....	12 $\frac{3}{4}$
Greatest depth of body.....	3 $\frac{5}{16}$	3 $\frac{13}{16}$	6 $\frac{3}{4}$	5 $\frac{5}{8}$
Length of head.....	2 $\frac{1}{2}$	2 $\frac{5}{8}$	4 $\frac{1}{2}$	3 $\frac{1}{2}$
Width from tip of dorsal to tip of anal.....	.....	.....	10 $\frac{1}{8}$	8 $\frac{3}{8}$
Longitudinal diameter of eye.....	$\frac{9}{16}$	$\frac{13}{16}$	$\frac{7}{8}$	$\frac{3}{4}$
Length of snout, from a line joining the front margins of orbits.....	$\frac{1}{2}$	$\frac{11}{16}$	$\frac{1}{4}$	$\frac{3}{8}$
Interocular space.....	$\frac{1}{8}$	.....	$\frac{3}{16}$	$\frac{1}{4}$
Length of pectoral, colored side (probably maimed).....	1 $\frac{5}{16}$	1 $\frac{7}{16}$	2 $\frac{3}{8}$	1 $\frac{3}{4}$
Length of pectoral, blind side.....	$\frac{7}{8}$	1	1 $\frac{5}{8}$	1 $\frac{1}{2}$
Length of ventral.....	$\frac{1}{2}$	.....	1 $\frac{1}{8}$	1
Origin of anal to lateral line.....	2	.....	4 $\frac{3}{8}$	3 $\frac{1}{2}$
Greatest distance from anal to straight part of lateral.....	2 $\frac{3}{8}$	.....	4	3 $\frac{1}{8}$
Width of peduncle of tail, narrowest part.....	$\frac{3}{16}$	$\frac{1}{8}$	.....	.....
Height of centre rays of dorsal.....	$\frac{1}{16}$	.....	.....	.....
Length of lower jaw.....	1 $\frac{7}{16}$	.....	.....	1 $\frac{1}{8}$

Although this species is of quite common occurrence in the markets of San Francisco, it appears to have hitherto escaped description, probably on account of its external resemblance to Girard's *Psettichthys melanostictus*, from which it is not distinguished by the dealers, who are able to discriminate between most of the other species. With several other kinds, it is sold under the name of "Sole." From *melanostictus* it may be known by the more backward origin of the dorsal fin, the first rays of which are lower than those next following; by the larger eyes and rather narrower interocular space; the absence of an accessory dorsal branch to the lateral line, and the want of conspicuous black dots on the colored side. The surface is decidedly less rough than that of *melanostictus*, although the scales are ciliated. The number of scales in the lateral line is rather difficult to count, but there are about fourteen to an inch in an example 14 $\frac{3}{8}$ long (caudal included).

No. 1 had 90 dorsal and 71 anal rays; No. 2, D. 94, A. 72; and No. 4, D. 93, A. 75.

In the stomach of No. 2 were three half-digested anchovies (*Engraulis ringens*) and a shrimp-like crustacean (*Hippolyte*).

No. 2 had about 42 teeth in the mandible, and at least 62 in the intermaxillaries, those on the colored side most numerous and smallest; while in No. 4 the mandible had 14 teeth on the blind, and 11 on the colored side, the intermaxillaries about 14 on the blind, and numerous (ca. 50) small teeth on the colored side, without counting the inner row of still smaller teeth.

From *H. limandoides = dentatus*, of the Atlantic, the present species differs in having more dorsal and anal rays, and in the presence of an anal spine.

I have taken the liberty to name this species after my friend Prof. D. S. Jordan, in acknowledgment of the assistance and advice I have received from him.

PSETTICHTHYS Girard.

Mouth large; maxillary broad, flat, extending to the front of the pupil; teeth well developed on both sides of the jaws, irregular. No teeth on vomer or palatines. Eyes and color on the right side; anterior nostril on colored side tubular, that on blind side with a flap. Lower pharyngeal teeth in a single row. Dorsal commencing in advance of the upper eye; ventrals lateral; caudal entire. An accessory lateral line on both sides of the body; lateral line nearly straight. Scales ciliated. Branchiostegals seven.

The only one of Girard's original characters which remains to distinguish this genus from *Hippoglossoides* is the more anterior commencement of the dorsal; as a thorough examination of specimens larger than those described by that author ($4\frac{3}{4}$ in. long) proves that ciliated scales are common to both genera. The presence of an accessory lateral line is, however, a character which appears sufficient to warrant the separation of this form as a genus or sub-genus, since it is used as a generic character in the *Pleuronectinae*.

PSETTICHTHYS MELANOSTICTUS Girard.

D. 78-88. A. 58-62. C. 3-6-6-3. P. 11. V. 6.

Body elongated, narrow; dorsal and abdominal outlines regularly curved and nearly equal from nape and ventrals to caudal peduncle; curve of snout joining that of nape over the anterior half of the upper eye; abdominal outline from posterior end of mandible to ventrals nearly straight. Greatest depth contained in the total length from about three to a little more than two and a half times; head four to five times in the same. Eyes small, contained seven to eight times; snout (measured from orbit of upper eye to tip of intermaxillaries) about five times in the length of the head; peduncle of tail from three and a half to four times in the greatest depth. Anterior nostril on colored side with a short tube, the opening wide and anterior; that on blind side with a raised margin or short tube, prolonged posteriorly; posterior nostril on both sides without flap, its posterior border in advance of the anterior border of the orbit. Eyes equal in front, lateral; interocular space smooth, not elevated, of variable width. Mouth large, oblique; lower jaw considerably the longer, its tip, in the closed mouth, level with the lower margin of the upper eye; a prominent symphysial knob; mandible joining the abdominal outline at an obtuse angle. Posterior extremity of the maxillary extending to a vertical drawn from the front of the pupil. Teeth rather small, in a single row on both sides of both jaws, conical, sharp, recurved, those in front much the largest in both jaws, and those in the mandible larger than those in the intermaxillaries (ex-

cept three or four large canines in front of the latter). Teeth on colored side of upper jaw very small, numerous. In adults about 33 teeth in the mandible, 43-50 in the intermaxillaries. A single row of six or seven sharp, conical, recurved teeth on each upper pharyngeal; lower pharyngeals very slender, each armed with a row of about twelve slender, sharp, recurved teeth. Gill-rakers of first branchial arch about half the length of the eyes, flexible, those of the other arches similar, but shorter. Origin of dorsal a little in advance of the anterior margin of the upper eye, and immediately above the posterior nostril of the blind side; its anterior rays over the eyes and on the occiput higher than those immediately behind them, but not quite equal to the longest rays of the central portion of the fin, which are from about the thirtieth to the fortieth rays. The first ray is twisted to the left, toward the nostril. From the central rays the fin declines regularly to its termination opposite to that of the anal, and distant from the caudal about half the depth of its peduncle. Anal with an acute horizontal spine, its origin opposite the centre of the length of the pectoral, and its longest rays opposite to those of the dorsal. Peduncle of caudal very slightly dilated at the base of that fin, the posterior margin of which is convex, and the principal rays once or twice bifurcate, the first bifurcation at about one-third of their length from the base. Pectoral of colored side with eleven rays, the rays, except the first two, once bifurcate; that of the blind side nearly equal in size and similarly bifurcate. Ventrals inserted with their posterior axil about half the width of the pectoral base in advance of the anterior axil of that fin; their rays once or twice bifurcate, and their extremity falling short of the vent. Lateral line very slightly raised above the pectorals, about 107-118 scales between its origin and that of the caudal in a specimen eleven inches long. An accessory lateral line along the base of the dorsal, ending about under the 24th dorsal ray on the colored side, and under the 17th-20th on the blind side. A branch from this accessory line to the main lateral line at back of head; a line of pores, indistinct in small specimens, more distinct in larger, can be traced from the lateral line across the cheek to the lower margin of the upper eye; and a little behind the end of this a row of pores branches downwards around the lower eye, ending opposite the posterior margin of the pupil. Scales very small, imbricate, ciliate, extending over head and gill-covers; snout and lower jaw scaleless. Free end of each scale truncate. A single row of small scales along each ray of the dorsal and anal on the colored side, except on about the first third of the dorsal and the first two or three rays of the anal. Caudal covered with small ciliated scales on the colored side almost to the tip of the rays, and with smooth scales on the colored side. Scales of blind side smooth, a few scales on the bases of the central rays of the dorsal and anal on this side. Color of right side ash-gray, interspersed with crowded black dots just large enough to be perceptible with the naked eye; numerous black points on the exposed part of each scale. When

fresh the ground-tint is lighter, and the black points much less distinct than after exposure to the air. Left side uniform white.

Dimensions.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.	No. 8.
Total length, in inches.....	6½	10½	11	14½	15	15½	17	17½
Greatest depth of body.....	2½	4	3½	5½	4½	5½	6	6½
Distance from tip of lower jaw to origin of anal, in a straight line.....		3½	3½					
Length of head.....	1½	2½	2½	3½	3½	3½	3½	3½
Width of interocular space.....		⅜	⅞	⅞		⅝		⅞
Longitudinal diameter of lower eye.....		⅞		⅞		⅝		⅝
Length of snout, from orbit of upper eye.....				⅞		1½		⅞
Length of pectoral, colored side.....		1½	1½	1½		1½		
Length of pectoral, blind side.....			1	1½		1½		
Length of ventrals.....			¾					
Height of longest dorsal rays.....		1½	1½	1½		1½		1½
Height of longest anal rays.....			1½			1½		1½
Height of first dorsal ray.....				1½		1		1½
Length of lower jaw.....				1½		1½		1½
Width of peduncle of tail.....		⅞	1½			1½		1½
Greatest distance from anal to straight part of lateral line.....			1½	2½		3½	3½	
Number of rays in dorsal.....	82	88	82			81		84
Number of rays in anal.....	62	60	60			58		60

As will be seen by the foregoing figures, the width of the interocular space, the length of the pectorals, that of the caudal peduncle, and the number of rays in the dorsal, are very variable.

In the stomach of an example 7½ inches in length were the half-digested remains of two anchovies (*Engraulis ringens*) each about three inches long.

This is the most common of the species sold as "Sole" in the markets of this city. Most of the individuals brought to market are from ten to twelve inches in length; but many reach sixteen or even eighteen inches. The black dots over the upper side, the long anterior dorsal rays, inserted more in advance than is usual, and the small eyes, render this fish easy to recognize.

PARALICHTHYS Girard.

Mouth large, the broad, flat maxillary reaching to the posterior margin of the lower eye; teeth in a single row on both sides of both jaws; eyes and color usually sinistral. Lower pharyngeals covered with villiform teeth; villiform teeth on the first pair of upper pharyngeals; also a row of larger teeth. Remainder of upper pharyngeal teeth like the larger of the first pair. Gill-rakers long. Anterior nostrils on both sides with a flap. Dorsal commencing above eye; anal without a spine; caudal sinuous on its posterior border; ventrals both lateral. Lateral line with a semicircular arch in front; no accessory lateral line. Scales ciliate; numerous accessory scales on their posterior margins.

PARALICHTHYS MACULOSUS Girard.

Tropsetta californica Gill, 1864.*Hippoglossus californicus* Ayres.

D. 69-76. A. 53-60. C. 3-12-3. P. 10-12. V. 6.

Body elongated, dorsal outline forming a low regular curve from the junction of the snout to the caudal peduncle; snout rather long, a slight depression over the anterior part of the upper eye, where it joins the dorsal outline. Abdominal outline from the extremity of the mandible to the caudal peduncle forming a curve corresponding to that of the dorsal outline. Greatest depth a little less than $\frac{3}{8}$; length of head about $\frac{7}{32}$ of the entire length; eye about $\frac{1}{8}$ - $\frac{1}{7}$, snout $\frac{3}{4}$ of the length of the head; interocular space $\frac{1}{10}$ - $\frac{1}{7}$ of the same; width of caudal peduncle about $\frac{1}{4}$ of the greatest depth; greatest distance from anal to straight portion of lateral line less than the length of the head. Anterior nostrils of both sides with a tongue-like flap on their posterior border; posterior nostrils patulous, small, slightly in advance of the orbit. Eyes equal in front, small, the upper well below the dorsal ridge, yet somewhat directed upwards. Interocular space smooth, flat, not elevated, a scarcely perceptible ridge from origin of lateral line to upper eye, where it divides, forming a raised margin to the posterior portion of that eye; a short ridge over the anterior part of the upper margin of the lower eye; in large individuals the width of the interocular space exceeds the length of the eye. Mouth large; maxillary reaching to a vertical from the posterior margin of the lower eye, and to a distance below that eye exceeding its longitudinal diameter. Mandible about $\frac{9}{10}$ of the length of the head, its tip level with the upper margin of the lower eye; its straight lower border forming a very obtuse angle with the abdominal outline; a slight symphysial prominence. Teeth in both jaws slender, acute, slightly recurved, about 15 in the upper and 8 in the lower jaw in individuals under 12" long, besides numerous rasp-like teeth in the hinder part of the intermaxillary. The front teeth in the mandible are longer and more recurved than those farther back. First pair of upper pharyngeals a cushion of villiform teeth, with a row of about 12 larger recurved ones; second and third harpygeals united, with three or four irregular rows of teeth like the larger of the first pair; lower pharyngeals covered with villiform teeth. Gill-rakers of first pair of branchial arches slender, flexible, nearly as long as the eye. Dorsal commencing over the front margin of the upper eye; the first ray slightly twisted to the left; the length of the rays increasing but slightly to its greatest height in the centre of its length, and thence diminishing very slowly, forming a low arch; the distance between its termination and the origin of the caudal about equal to the depth of the caudal peduncle; dorsal and anal coterminous. A few of the posterior rays of the dorsal and anal are bifurcate. Anal without spine, its origin very slightly behind the vertical from the anterior axil of the pectorals, and forming a low arch similar to that fin, the longest rays equal in length to those of the dor-

sal. Caudal with an undulating posterior margin, the central rays and outer rays somewhat produced; all the principal rays three or more times bifurcate. The longest dorsal rays are about the 30th-38th; the longest anal rays about the 15th-23d. Pectoral of the colored side about half the length of the head, and contained in the total length between nine and ten times; its rays once or twice bifurcate, the first two excepted; the third ray longest, the twelfth about half its length; pectoral of the blind side considerably shorter than that of colored side; its rays simple or some of them once bifurcate. Ventrals inserted more than the width of the base of the pectoral in front of that fin, their tips reaching nearly to the fourth anal ray; their length about half, or a little more than half, that of the pectoral of the colored side; the four posterior rays once bifurcate. Scales of body small, very finely ciliate on their free margin, covering the whole of the body and the head to the middle of the length of the interorbital space, and extending up the dorsal and anal rays nearly to their tips. Some on the broad end of the maxillary. Along the free margin of each of the principal scales is ranged a variable number of much elongated, narrow, accessory scales, easily rubbed off. Numerous similar supernumerary scales on the dorsal and anal rays. Scales of blind side smaller than those of colored side, smooth, with accessory scales as on colored side. Caudal covered with scales on both blind and colored sides; some in front of the central rays of dorsal and anal on blind side. Lateral line, in small individuals, containing about 100 scales between its origin and that of the caudal, and raised above the pectoral into a bold arch of a diameter exceeding the length of the pectoral, and a height about equal to the length of the ventral. Color dark reddish brown to slaty gray above, whitish below; usually five small light bluish spots along the dorsal region, and four along the abdominal. In large individuals, the spots are obsolescent or wanting.

Dimensions.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Total length, in inches	10	9 $\frac{2}{3}$	12 $\frac{1}{2}$	11 $\frac{1}{2}$	21 $\frac{7}{8}$
Length without caudal	8 $\frac{5}{8}$	8 $\frac{7}{16}$	10 $\frac{3}{8}$	9 $\frac{1}{2}$	18 $\frac{3}{8}$
Greatest depth of body	3 $\frac{5}{8}$	3 $\frac{5}{16}$	4 $\frac{5}{16}$	4	7 $\frac{1}{4}$
Length of head	2 $\frac{3}{8}$	2	2 $\frac{1}{2}$	2 $\frac{1}{2}$	4 $\frac{1}{8}$
Greatest distance of anal to straight part of lateral line	1 $\frac{7}{8}$	1 $\frac{1}{2}$	2 $\frac{1}{4}$	2 $\frac{1}{2}$	.....
Tip of lower jaw to origin of anal	2 $\frac{1}{4}$	2 $\frac{1}{2}$	2 $\frac{11}{16}$	2 $\frac{13}{16}$	5 $\frac{1}{4}$
Longitudinal diameter of eye	$\frac{1}{8}$	$\frac{3}{16}$	$\frac{1}{2}$	$\frac{3}{8}$	$\frac{1}{8}$
Interocular width	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{1}{4}$	$\frac{1}{8}$	$\frac{3}{8}$
Length of snout from upper eye	$\frac{3}{8}$	$\frac{7}{16}$	$\frac{1}{8}$	$\frac{1}{8}$	1
Length of lower jaw	1 $\frac{1}{2}$	1 $\frac{1}{2}$	1 $\frac{3}{8}$	1 $\frac{5}{8}$	2 $\frac{1}{2}$
Length of pectoral of colored side	1	1	1 $\frac{1}{4}$	1 $\frac{1}{8}$	2 $\frac{1}{4}$
Length of pectoral of blind side	$\frac{1}{2}$	$\frac{5}{8}$	$\frac{1}{8}$	$\frac{7}{8}$	1 $\frac{1}{8}$
Length of ventrals	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{3}{4}$	$\frac{1}{2}$	1 $\frac{1}{8}$
Length of arch of lateral line	1 $\frac{1}{2}$	1 $\frac{1}{2}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	3
Rise of arch of lateral line	$\frac{3}{8}$	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{8}$	1
Width of caudal peduncle	1 $\frac{1}{2}$	$\frac{7}{8}$	1 $\frac{1}{2}$	1	.....
Longest dorsal ray .....	.....	.....	.....	.....	1 $\frac{1}{8}$
Longest anal ray .....	.....	.....	.....	.....	1 $\frac{1}{2}$

This is not of very frequent occurrence in our markets, although it can scarcely be called rare. It attains a larger size than any other of our species except the true *Hippoglossus*, and it is probably this circumstance, together with its elongated form, that has led the fishermen to name it the "Bastard Halibut." Large specimens are sold under this name, but immature individuals are retailed as "Turbot." The largest I have yet seen weighed, respectively, 43 and 58 pounds, and the latter measured about 4 feet 10 inches in length when entire. It is very seldom taken in the bay, and is said to be of more frequent occurrence southwards than northwards, but I cannot at present ascertain its southern range. From its occurrence at Monterey it is often called the Monterey halibut. It is said to be a tough, coarse fish. It is taken as far north as Tomales Bay. Nos. 1, 2, 3, and 4 (of which the dimensions are given) are young alcoholic specimens in the Museum of the Cal. Acad. Sci., and their dorsal and anal fin-rays were, respectively, D. 76, A. 60; D. 70, A. 55; D. 70, A. 55; and D. 71, A. 53. No. 5 had 69 dorsal and 53 anal rays. Some specimens have a few pores on the occiput behind and above the horizon of the upper eye, running downwards and backwards towards the lateral line. The number of scales in the lateral line is very difficult to count. From all the other Californian species with large jaws, it may be known by its elongate form and boldly arched lateral line.

I have for some time suspected that *Uropsetta californica* (Ayres) Gill, and *Paralichthys maculosus* Girard, were identical, and I think that I can now demonstrate their identity beyond reasonable doubt. My suspicion arose as follows: The large specimens of the Monterey halibut, weighing 40–50 pounds, are considered by all the dealers to be of the same species as the small specimens, and, from their general similarity, no doubt as to their identity with each other and with *Uropsetta californica* arose in my mind until, on critically comparing a small individual with Girard's description of *P. maculosus*, I found that it agreed with the latter in every particular except in its sinistral eyes and color. Now arose two questions: 1st. Were the large individuals really specifically identical with the small ones? 2d. Was there a dextral form, and, if so, was the dextral form a distinct species?

I have not yet had the opportunity to take full measurements of a full-grown individual, as all the large ones I have seen were cut up before I examined them, but I have the following reasons to give for including all under one species:

1st. The form of the caudal fin and the outline of the posterior part of the body are alike in large and small sinistral individuals; the former having the sinuous posterior margin, with the central and external rays produced, described by Girard as characteristic of *P. maculosus*.

2d. The smaller sinistral individuals agree with Ayres's description of *Hippoglossus (Uropsetta) californicus*, except in the form of the tail, which is shown as slightly concave in Ayres's figure (Proc. Cal. Acad.

ii, 1860, fig. 10). The figure is but a sketch, and is inaccurate in many respects.

3d. The larger individuals are always sold as "halibut," attain the dimensions of the true halibut, and are evidently identical with Ayres's species.

4th. The small sinistral individuals have all the characters of *Paralichthys maculosus* Gir., except the position of the eyes and color, and some difference in the color of the spots.

These reasons, although they point strongly towards identity, do not prove it; but I have lately procured an individual (No. 5) which has the characteristics of Ayres's species, yet is *dextral*, thus agreeing exactly with that of Girard; so that I can now add to my reasons—

5th. A specimen of dimensions intermediate between that of Girard (7' long) and the large individuals before mentioned has the characters of *U. californica*, but is *dextral*, as stated by Girard in his description of *P. maculosus*. In this specimen, the interorbital area is proportionally much wider than in the smaller examples, exceeding the longitudinal diameter of the eye; and the row of spots along the dorsal and abdominal outlines, so evident in the small individuals, is almost obsolete, traces of one or two of the posterior ones being all that is left of them. The principal caudal rays are many times dichotomized, the base of the fin is fleshy, and its scaly covering is very conspicuous; some of the rays of the right pectoral are twice bifurcate; about eight of the posterior rays of the dorsal and anal are bifurcate; each ray of the dorsal and anal (except the most anterior and posterior) is seen to have, upon its anterior face, a row of principal scales, and numerous accessory scales, all resembling those of the body, but smaller; each scale of the body is seen to be followed by several supernumerary scales arranged around its posterior margin; and the pectoral of the colored side has only ten rays; that of the blind side eleven. As this is the only *dextral* example out of about ten individuals that have come under my observation, I am inclined to believe that *dextral* specimens are comparatively rare, at least on this part of the coast. As the generic name *Paralichthys* has precedence over that of *Uropsetta*, it must be retained for the species, which must henceforth be known as *Paralichthys maculosus*.

CITHARICHTHYS Bleeker.

Mouth large, the broad, flat maxillary more than one-third the length of the head, and extending to below the pupil. Eyes and color on the left side. Teeth in both jaws in a single series, unequal in size, nearly equally developed on both sides of the jaws; no vomerine or palatine teeth. Lower pharyngeal bones with a single row of teeth. Gill-rakers lanceolate. Branchiostegals seven. Dorsal fin commencing on the snout; dorsal and anal rays simple; ventral fin of colored side inserted on the ridge of the abdomen. Lateral line nearly straight. Scales moderate.

Metoponops Gill is evidently identical with *Citharichthys*. All the characters usually considered generic agree; and the specific characters given (Proc. Acad. Nat. Sci. Phil. 1864, 198) are those which properly belong to *Citharichthys sordidus* Girard. Girard's description, taken from an immature individual $5\frac{1}{2}$ in. long, is in many respects defective; that of Gill approaches much nearer to completeness, but, as it was taken from a single sun-dried specimen, it shows characters which arise from the drying.

CITHARICHTHYS SORDIDUS (Girard) Günther.

Psettichthys sordidus Girard.

D. 92-99. A. 72-81. C. 3-11-3. P. 13. V. 6.

Outline of body sub-ellipsoid, but the dorsal and abdominal outlines not correspondent, the highest point of the former situated over the tip of the pectoral, while the lowest point of the latter is below the base of the same fin. Snout almost continuous with the dorsal outline, which rises rapidly to the highest point in a bold curve, and thence falls with a gently sigmoid curvature to the caudal peduncle. Abdominal outline almost straight to the ventrals, thence with a slight sigmoid curve around the lowest point to the caudal peduncle. Thus the hinder part of the body tapers gradually in a line which becomes slightly concave, both above and below, as it approaches the caudal peduncle. Greatest depth of body contained $2\frac{3}{4}$ times; length of the head $4\frac{1}{2}$ times in the greatest length; longitudinal diameter of eye about $\frac{1}{3}$, snout (measured from the lower eye) about $\frac{1}{6}$ of the length of the side of the head. Distance from origin of anal to lateral line slightly in excess of the length of the head; peduncle of tail short, about $\frac{1}{5}$ of the greatest width, slightly widening toward caudal. Eyes elliptical, large, the upper turned somewhat upward, the lower lateral, and about $\frac{1}{5}$ of its longitudinal diameter in advance of the upper; interocular space equal to about half the transverse diameter of the eye, and made to appear narrower by an elevated ridge, which, commencing on the cheeks, passes along the posterior lower margin of the upper eye, descends obliquely to the upper margin of the lower orbit, and continues to the intermaxillary. A less prominent ridge along the lower margin of the upper eye, merging in the principal ridge where it commences to descend. Thus the anterior and larger portion of the interocular area is concave. Nostrils of colored side in a line with the upper margin of the lower eye; anterior nostrils of both sides with a long narrow flap in front; posterior simple. The anterior nostril of the colored side has also a raised margin, prolonged somewhat posteriorly. Mouth large, oblique; extremity of the mandible slightly projecting, and on a level with the upper margin of the pupil of the lower eye when the mouth is closed. The lower border of the mandible almost in a straight line with the anterior part of the abdominal outline. Posterior extremity of the maxillary extending to a vertical drawn midway between the

centre and the front of the pupil of the lower eye. Teeth slender, acute, incurved, closely set at regular distances from each other, gradually increasing in size forwards; about equal in size on both sides of both jaws, and extending the full length of the gape on both sides. Upper pharyngeals each with a single row of 6-8 slender, rather long, sharp, recurved teeth; lower pharyngeals each with a single functional row of similar teeth, all but some of the most anterior buried in the gum almost to their points; lower pharyngeal bones separate. Gill-rakers of 1st pair of branchial arches about equal in length to the width of the interocular space, rather stiff; those of the other arches gradually diminishing to the fourth; spinulose on their upper edge. Dorsal arising a little before the anterior rim of the upper orbit, close behind the posterior nostril of the blind side; gradually increasing in height to about the 38th-48th rays, which are behind the highest point of the dorsal outline, and thence rapidly decreasing; the last rays small and closely set. Anal arising vertical with the posterior axil of the base of the pectorals; its longest rays (23d-27th) somewhat deeper than those of the dorsal are high. From these rays the depth of the fin diminishes rapidly to its termination opposite that of the dorsal; the posterior rays, like those of that fin, very small and closely set. No anal spine visible externally. Posterior margin of caudal almost straight when closed, but slightly wedge-shaped; the centre rays longest, when opened out; principal rays bifurcate three times. Pectoral of left or colored side about $\frac{1}{5}$ of the total length, and consisting of thirteen rays, all, except the first three, once bifurcate; fourth ray longest. Pectoral of right side $\frac{3}{5}$ - $\frac{2}{3}$ of the length of that of the colored side; rays simple. Ventrals short, but broad at base and broadly rounded when opened, their tips extending beyond the third anal ray, and the posterior margin of their base situated a little anterior to the anterior axil of the pectoral. Ventral of the colored side on the abdominal ridge; rays simple. Lateral line almost straight, yet rising somewhat anteriorly; very distinct; tubes simple. Number of scales between base of caudal and head 65-70. No lines of pores on head. Scales rather large, very thin and flexible, deciduous, almost membranous, smooth; the free end truncate, each pocket of the dermis bordered by a delicate membrane of darker color than the scale, and often broken up into tags; engaged portion of scale with slight radiating striae. Those of the anterior portion are as deep as long, or even deeper; those of the posterior part of the body and of the caudal peduncle are more or less elongated. The scales vary much in size and shape; the largest are on the abdominal region behind and below the pectoral; the smallest around the eyes and on the interorbital space, snout, and lower jaw; the two latter only partially covered with scales. Dorsal and anal with a row of small scales along each ray on the colored side. Caudal scaly at the base, and with the membrane between the rays covered with scales on both sides. Scales of blind side similar to those of colored. Color dull reddish yellow; the outline of each scale rendered distinct by the margin of darker membrane behind each scale;

vertical fins of a uniform dark slaty tint. Color of blind side uniform creamy.

Dimensions.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Total length, in inches	9 $\frac{3}{4}$	12	11	10 $\frac{1}{4}$	9 $\frac{1}{2}$
Length without caudal				8 $\frac{1}{2}$	8 $\frac{1}{2}$
Greatest distance from origin of anal to lateral line.....	2 $\frac{5}{16}$	3	2 $\frac{5}{8}$	2 $\frac{3}{8}$	2 $\frac{3}{8}$
Greatest depth of body.....	3 $\frac{3}{8}$	4 $\frac{5}{8}$	4	3 $\frac{1}{2}$	3 $\frac{7}{8}$
Length of head	2 $\frac{1}{4}$	2 $\frac{1}{4}$	2 $\frac{9}{16}$	2 $\frac{3}{8}$	2 $\frac{5}{16}$
Length of pectoral, colored side	1 $\frac{1}{16}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$
Length of pectoral, blind side		1 $\frac{3}{16}$	1 $\frac{5}{16}$	1 $\frac{3}{8}$	1 $\frac{5}{16}$
Length of ventrals	$\frac{9}{16}$	$\frac{7}{8}$	$\frac{7}{8}$	1 $\frac{1}{16}$	1 $\frac{1}{8}$
Longitudinal diameter of eye	$\frac{9}{16}$	$\frac{8}{8}$	$\frac{4}{4}$	1 $\frac{1}{8}$	1 $\frac{1}{8}$
Length of snout, from lower eye			$\frac{7}{8}$	1 $\frac{1}{8}$	$\frac{7}{16}$
Width of interocular space, about.....	$\frac{5}{32}$	$\frac{1}{4}$	$\frac{1}{4}$	$\frac{5}{16}$	$\frac{5}{16}$
Longest dorsal ray			1 $\frac{1}{2}$		
Length of lower jaw			1 $\frac{1}{16}$	1 $\frac{1}{32}$	1 $\frac{1}{32}$
Width of peduncle of tail, narrowest part.....			1 $\frac{1}{8}$		1 $\frac{1}{8}$
Number of dorsal rays			92	92	99
Number of anal rays			76	75	81

Three other specimens, the fin-rays of which were counted, had respectively D. 95, A. 72; D. 93, A. 76, and D. 98.

Girard gives the number of dorsal rays as 82, while none of the specimens which I have examined have less than 92. As the range in number of dorsal and anal fin-rays is considerable in the individuals I have examined, it is quite possible that some may have as few as 82 dorsal rays; but the close agreement in the number of anal rays found by Girard and by myself leads me to suppose that the number 82 is a typographical error.

This is a tolerably common species in our markets, but is usually taken outside of the bay. I have not yet seen any exceeding 12-14 inches in length.

From No. 5 was taken a specimen of *Engraulis ringens*, which it had only partially swallowed when caught; the tail hanging out of the mouth.

The *Engraulis* thus appears to be a favorite article of food with at least three of our large-mouthed flat-fishes. This species may be readily recognized by its sinistral coloration and eyes, its smooth scales, dirty yellow color, and the gradual tapering of the body into the caudal peduncle, with a concave curve on both dorsal and abdominal outlines. Unlike *Platichthys stellatus* and *Paralichthys maculosus*, this species appears to be invariably sinistral.

GLYPTOCEPHALUS Gottsche.

Form extremely elongated; mouth small, the short, narrow maxillary scarcely reaching the front margin of the eye; teeth most developed on the blind side, incisor-like, broad, equal, forming a continuous cutting edge. No vomerine or palatine teeth. Upper pharyngeal bones each with an obliquely transverse row of about nine bluntly conical teeth; lower pharyngeals with a single row of similar teeth. Branchiostegals seven. Eyes and color on the right side. - Anterior nostrils with a short

tube, prolonged posteriorly. No accessory lateral line; lateral line very nearly straight. Dorsal fin very long, of more than ninety rays; scales smooth. Anal with or without a spine; caudal convex on posterior margin.

The following two species are separated by well-marked characters from each other; but I have not considered it necessary to use a different generic name for *G. zachirus*, in which the anal is preceded by a spine, and the teeth are continued farther on the blind side.

GLYPTOCEPHALUS PACIFICUS sp. nov.

D. 99-104. A. 80-87. P. 10-12. V. 6. C. 3-8-8-3.

Form elongate ellipsoid, dorsal and abdominal outlines curving regularly and similarly from head to caudal peduncle, which slightly increases in width posteriorly. Snout continuous with dorsal outline, but slightly more curved; lower margin of head straight. Greatest width contained about $3\frac{3}{4}$, head more than 5 times in the total length, or the former about $3\frac{1}{4}$ and the latter about $4\frac{1}{2}$ times in the length without the caudal. Eyes about $\frac{1}{4}$ - $\frac{2}{7}$; snout (measured from the lower eye) $\frac{1}{3}$ - $\frac{1}{7}$ of the length of the head. Anterior nostril on both sides tubular, the tube short, its posterior margin produced into a flap; posterior without flap. Nostrils small; hinder margin of posterior nostril about vertical with the anterior margin of the upper orbit. Lower eye somewhat in advance of the upper, which reaches the dorsal profile at its anterior extremity. Interorbital space a very narrow, smooth, somewhat elevated ridge of bone. Cleft of mouth nearly equal on both sides, very small, oblique; the maxillary reaching but little beyond a vertical from the anterior margin of the lower eye, and scarce so far as a vertical from that of the upper. Tip of mandible level with the centre of the lower eye, and scarcely projecting in the closed mouth. Lips tolerably well developed. Teeth broad, thin, incisor-like, forming a continuous sharp cutting edge along the blind side of both jaws, but in both ending rather abruptly before reaching the colored side. Twelve teeth in the lower and nine or ten in the upper jaw; those at the anterior commencement of the row slightly smaller than the others. Upper pharyngeal bones with 5-9 sharp conical teeth on each, the anterior with the greatest number; lower pharyngeal teeth in two rows, sharp, conical, those of the inner row larger than those of the outer, except in front, where there are a few larger teeth; equal in size in both rows. Gill-rakers short, slender, flexible, lanceolate. Dorsal and anal long and low, similar, coterminous, fleshy at base; the rays simple, their tips free. Dorsal commencing opposite the centre of the pupil of the upper eye, the longest rays a little behind the centre of the length of the fin, and about $\frac{1}{4}$ of the width of the body in length. No spine before anal, the first ray of which is only a little posterior to the hinder pectoral axil, and its longest rays opposite and equal to those of the dorsal. Distance from the end of the dorsal and anal fins to the caudal equal to about half the depth of the caudal peduncle. Caudal with three or four accessory rays on each side, not very wide; posterior

margin slightly convex when opened, the principal rays twice bifurcate. Pectorals small; that of colored side contained about $8\frac{1}{2}$ times in the total length; rays twelve in number, once bifurcate. Pectoral of blind side scarcely three-fourths as long as that of the colored side; rays nine or ten, some of them bifurcate. Ventrals very small, inserted about the width of the pectoral base in advance of the anterior axil of that fin; their length contained more than five times in that of the head. Lateral line straight, passing along the median line of the side of the body and of the caudal, about 140 scales from its origin to the base of that fin. Scales very small, smooth, becoming smaller along the dorsal and abdominal margins; smaller scales continuing for some distance upwards and downwards on the bases of both the dorsal and anal, upon both blind and colored sides, especially upon the latter, where scales cover the whole surface between as well as upon the rays. The bases of the pectorals and caudal are also covered with scales on both sides. On the fore part of the anal, the scales reach to the tips of the rays. The scales upon the fins are much smaller than those upon the body. Scales on blind side smooth; snout scaleless. Color nearly uniform dark blackish gray; the scales covered on their exposed portion with black points, which cannot be distinguished by the naked eye. Blind side opaque white, with numerous small black dots evenly distributed. Fins on colored side with the membrane light slate-color, sprinkled with small black dots; the rays and scales of the same color as the body. Distal margins of all the fins considerably darker. The black dots extend to the interior of the mouth, covering the hyoid surfaces, and the pharyngeal teeth are tipped with reddish orange.

Dimensions.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Total length to tip of caudal, in inches	$8\frac{10}{16}$	$8\frac{8}{16}$	$10\frac{3}{16}$	$8\frac{7}{16}$	$8\frac{1}{2}$
Length without caudal, about	$7\frac{4}{16}$	$7\frac{3}{16}$	$8\frac{7}{16}$	$7\frac{1}{16}$	$6\frac{7}{16}$
Greatest depth, about	$2\frac{1}{4}$	$2\frac{5}{16}$	$3\frac{1}{8}$	$2\frac{3}{8}$	$2\frac{3}{8}$
Length of head	$1\frac{11}{16}$	$1\frac{8}{16}$	$1\frac{11}{16}$	$1\frac{1}{16}$	$1\frac{8}{16}$
Length of pectoral, blind side	$1\frac{1}{16}$	$1\frac{1}{16}$	$1\frac{1}{16}$	$\frac{3}{8}$	$\frac{1}{16}$
Length of pectoral, colored side	1	$3\frac{1}{16}$	$1\frac{1}{16}$	$1\frac{1}{16}$	1
Length of ventrals		$\frac{1}{16}$	(*)	$\frac{3}{8}$	$\frac{1}{16}$
Diameter (longitudinal) of eye		$\frac{1}{16}$	$\frac{1}{8}$	$\frac{1}{16}$	$\frac{1}{16}$
Width of interorbital space		$\frac{1}{16}$	$\frac{1}{8}$ †	$\frac{1}{16}$	$\frac{1}{16}$
Length of snout, horizontal, from lower eye		$\frac{1}{2}$	$\frac{5}{16}$		
Distance from tip of mandible to origin of anal	2	$1\frac{1}{16}$		$1\frac{1}{8}$	$1\frac{1}{4}$
Width from tip of highest rays of dorsal to tips of ditto of anal	$3\frac{1}{16}$	$3\frac{1}{16}$	4		
Width of caudal peduncle in narrowest part			$1\frac{1}{8}$	$3\frac{1}{8}$	$5\frac{1}{8}$
Length of snout from lower eye		$\frac{1}{2}$	$\frac{5}{16}$		
Distance from tip of mandible to origin of anal	2	$1\frac{1}{16}$		$1\frac{1}{8}$	$1\frac{1}{4}$
Length without caudal, about	$7\frac{3}{16}$	$7\frac{3}{16}$	$8\frac{7}{16}$	$7\frac{1}{16}$	$6\frac{7}{16}$
Width from tip of dorsal to tip of anal rays	$3\frac{1}{16}$	$3\frac{1}{16}$	4		
Width of caudal peduncle			$1\frac{1}{8}$	$3\frac{1}{8}$	$5\frac{1}{8}$
Length of lower jaw			$\frac{1}{16}$	$\frac{1}{8}$	$\frac{1}{2}$
Origin of anal to lateral line			$1\frac{1}{8}$	$1\frac{1}{16}$	$1\frac{1}{4}$
Number of dorsal rays	104	102	90		101
Number of anal rays	87	84	80		86

* Damaged.

† Scarcely.

The scales upon the body and fins are highly deciduous, and the lateral line is much less distinctly pronounced than in the succeeding species. Although the lowest pair of branchiostegals is not easy to make out, I have no doubt that seven is the correct number. The individual $10\frac{3}{16}$ in length, No. 3, is the largest I have yet seen, and is probably adult. In flavor this fish is inferior to *G. zachirus*. This species was certainly not brought to market during the winter months. I first saw it March 15, and from that date to the end of April a few have usually been exposed for sale, but it cannot be said to be abundant. It is not taken within the bay.

The dark color, elongated form, and correspondingly long dorsal and anal fins render this species easy to distinguish from every other except *G. zachirus*, from which it can be known by its short pectoral, entire want of teeth on colored side, and more pointed form of the front part of the head, as well as by the absence of an anal spine. *G. pacificus* differs from *G. cynoglossus* of the Atlantic in the greater relative length of the head, the smaller number of teeth in the upper jaw, and the smaller number of dorsal and anal rays.

GLYPTOCEPHALUS ZACHIRUS sp. nov.

D. 94-106. A. 79-89. C. 5-6-7-4. P. 11-13. V. 6.

Body elongate-ovate, the anterior portion of the oval shorter than the posterior; snout declivous, almost vertical, its tip level with the upper margin of the lower eye, and its curve uniting without sensible depression with that of the nape; dorsal outline rising with a regular gentle curve from the snout to about the twenty-second dorsal ray, thence declining very gradually and regularly with but slight curvature to the caudal peduncle. The abdominal outline is almost straight from the knob of the mandible to the ventral; from thence to the end of the anal curved in the same manner as the dorsal outline. Peduncle of tail slightly expanded towards the caudal, its least width about one-fourth of the greatest depth of the body. The greatest width of the body is contained from $3\frac{1}{3}$ to $3\frac{1}{2}$ times, and the length of the head from about $5\frac{1}{3}$ to $5\frac{1}{2}$ times in the total length; the eye about $3\frac{1}{3}$ times, and the snout about 8 times in the length of the head. The greatest distance from the anal to the lateral line is less than the length of the head. Eyes large, elliptical, lateral, the lower in advance of the upper about half the length of the pupil, and scarcely reaching the dorsal profile anteriorly. Interocular space very narrow, about $\frac{1}{8}$ of the longitudinal diameter of the eye, smooth, not raised above the eye in a fresh fish. A slight ridge rises at its posterior part, forms the lower posterior margin of the upper eye, and dies out on the cheek. Nostrils of right side level with the upper margin of the lower eye; the anterior with a short tube, the posterior with a raised margin, and vertical with the front margin of the lower orbit. Posterior nostril of blind side in advance of the eye; anterior nostril nearly as on colored side.

The nostrils are small and inconspicuous. Gape of mouth very small on colored side, considerably larger on the blind side. On the colored side the cleft is nearer vertical than horizontal; the posterior end of the maxillary reaches very little behind the anterior margin of the orbit of the lower eye, and the symphysis of the intermaxillaries is about level with the upper edge of the orbit. Mandible projecting in the closed mouth, short, not passing a vertical from the front margin of the pupil, with a prominent knob below the symphysis, and a smaller one at its posterior extremity. Teeth on both sides of the jaws throughout the full length of the gape, in a single row, broad, but thick, forming a blunt continuous edge, about thirty-four in the lower jaw and rather fewer in the upper in an individual $11\frac{3}{16}$ ' long. In an example $14\frac{5}{8}$ ' long there were 14 teeth on the colored and 26 on the blind side of the mandible, the latter the larger; in the intermaxillaries, 13 on the colored and 23 on the blind side. Each lower pharyngeal with a double row of teeth, the inner larger than the outer; the four anterior teeth of the outer row conspicuously larger than those following. About 12 teeth in each inner row. Upper pharyngeals each with a close-set row of 6-7 blunt conical teeth. Branchiostegals seven; gill-rakers few, flexible, very short. Dorsal commencing between the front of the orbit and the pupil, considerably behind the nostrils, long and low, forming a continuous arch of slightly greater curvature than the dorsal outline, the longest rays in the central portion, and ending opposite to the anal at about two-thirds of the width of the caudal peduncle from the origin of the caudal. Anal with a horizontal spine, the first ray rather distant from the visible portion of the spine, and nearly the length of the ventral behind the pectoral base; similar to the dorsal. Almost all the rays of dorsal and anal directed backwards. Caudal convex on posterior margin, rather narrow, the rays once bifurcate, sometimes bifurcate again near the tips. Pectoral of colored side exceedingly long and lanceolate, about one-fourth of the total length of the fish; the first five rays simple, the others once bifurcate. Fourth ray longest, fifth nearly equal, sixth a little longer than the third, thence diminishing rapidly. Usual proportion of the first four rays 3-8-10-12. Pectoral of blind side lanceolate, rather more than one-third of the length of that of the colored side, and formed of the same number of rays, the first four simple, the others once forked; fourth and fifth rays longest. Ventrals inserted so that their hinder axil is vertical with, or a little posterior to, the anterior axil of the pectoral; their tips reaching to the first anal ray; the four posterior rays once bifurcate. Lateral line almost straight, rising very slightly anteriorly, formed of a double row of tubes, about 138 in number, excluding those upon the caudal. A row of similar pores commencing at the ridge under the upper eye, and continuing around the lower eye almost to its front margin. Scales small, smooth, uniform over the body, and extending over the head to the snout, on which they are smaller. Intermaxillaries and mandibles scaleless. Scales of blind side similar. Caudal scaly on both sides;

no scales on the other fins. Color uniform brownish or cinereous; fins darker. The color formed by minute dark spots on the scales. Membrane between fin-rays closely set with dark points. Blind side whitish, the ground tint clouded with numerous black points.

Dimensions.	No. 1.	No. 2.	No. 3.	No. 4.
Greatest length, in inches	11 $\frac{2}{16}$	12 $\frac{3}{8}$	12 $\frac{1}{2}$	14 $\frac{3}{8}$
Length without caudal	9 $\frac{3}{8}$	.....	10 $\frac{1}{2}$	12 $\frac{1}{2}$
Greatest depth of body	3 $\frac{1}{2}$	3 $\frac{3}{8}$	3 $\frac{3}{8}$	4 $\frac{1}{2}$
Greatest depth over dorsal and anal fins .....	.....	5 $\frac{1}{2}$	.....	.....
Length of head	2 $\frac{1}{16}$	2 $\frac{1}{8}$	2 $\frac{1}{4}$	2 $\frac{5}{8}$
Longitudinal diameter of lower orbit	$\frac{5}{8}$	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{3}{4}$
Width of interocular space .....	.....	$\frac{3}{16}$	$\frac{3}{16}$	$\frac{3}{16}$
Length of snout, from lower eye	$\frac{1}{4}$	.....	$\frac{3}{16}$	$\frac{3}{8}$
Length of pectoral, colored side	3 $\frac{1}{2}$	2 $\frac{1}{16}$	3 $\frac{1}{2}$	3 $\frac{1}{16}$
Length of pectoral, blind side	1	1	1 $\frac{5}{16}$	1 $\frac{3}{8}$
Length of ventrals	2 $\frac{1}{8}$	.....	$\frac{1}{2}$	$\frac{1}{2}$
Width of caudal peduncle	$\frac{3}{4}$	.....	$\frac{3}{4}$	1
Distance from tip of lower jaw to first ray of anal	2 $\frac{1}{4}$	.....	3 $\frac{1}{16}$	.....
Greatest distance from anal to lateral line	1 $\frac{1}{16}$	.....	2 $\frac{1}{8}$	2 $\frac{3}{8}$
Length of lower jaw .....	.....	$\frac{1}{2}$	.....	$\frac{3}{4}$
Length of longest dorsal ray .....	.....	1 $\frac{3}{16}$	1 $\frac{1}{8}$	1 $\frac{1}{16}$
Length of snout, from upper eye	$\frac{1}{16}$	.....	$\frac{1}{16}$	$\frac{1}{8}$
Number of dorsal rays	97	94	106	98
Number of anal rays	80	79	89	81

Two other specimens had respectively D. 94, A. 80, and D. 94, A. 82. The length of the pectoral, as might be expected in so long and narrow a fin, varies somewhat; and the proportional length of the first five rays is not constant. No. 4 was measured while perfectly fresh; the others after a few days' immersion in alcohol. In the fresh fish, the interocular space is not raised above the eyes, and the upper boundary of the orbit is hard to define; but, in alcoholic specimens, the interocular space stands out as a narrow ridge of bone. Like the preceding species, *G. zachirus* is of rare occurrence in the markets, and is not taken in the Bay of San Francisco.

During the six months previous to March none were taken; but the dealers assure me that it usually makes its appearance, in limited quantities, in the spring months. Most of the dealers, however, do not distinguish between this fish and the preceding one, and sell both as "Sole."

One dealer, who evidently knew the fish, describing it by its long pectoral, assured me that its flavor was superior to that of any other of our species; I mention this because I had myself previously come to the same conclusion. Its flesh is very firm and white, and its flavor approaches that of the true sole. No. 4 is the largest I have seen, and from the answers I obtain to enquiries, I believe it is beyond the average size. The long pectoral, bluff snout, and presence of teeth on the colored side of the mouth at once distinguish this species from the preceding, as well as from every other species. The nostrils in this and the pre-

ceding species are similar, the anterior having a short tube or funnel, produced posteriorly into a flap; but the flap is shorter in this species than in the other.

PLATICHTHYS Girard.

Form broad; mouth small; maxillary short, not reaching to the pupil of the lower eye; teeth blunt, in a single row, most developed on the blind side of both jaws. Eyes sometimes on the right, sometimes on the left side. Anterior nostril of colored side tubular; that of blind side with a posterior flap. Dorsal not in advance of the eye; anal with a horizontal spine; caudal with the central rays most produced posteriorly. Lateral line slightly arched anteriorly; no accessory dorsal branch. Scales developed as scattered stellate tubercles, forming a regular series along the dorsal and abdominal outlines, and on each side of the lateral line. Branchiostegals seven; gill-rakers short; pharyngeal teeth tubercular.

PLATICHTHYS STELLATUS (Pallas) Girard.

(*Platichthys rugosus* Girard.)

D. 54-61. A. 42-44. C. 3-6-6-3. P. 11-12. V. 6.

Form broad and short; outline, including dorsal and anal, broadly rhombic; dorsal and abdominal outlines of the body boldly and regularly curved; snout less declivous than the dorsal outline, which it joins over the centre of the eye; caudal peduncle long, the sides straight for some distance behind the end of the dorsal and anal fins. Greatest height of the body contained $2\frac{1}{6}$ - $2\frac{1}{2}$ times, head rather more than 4 times in the greatest length; eye about 6 times, snout (measured horizontally from the lower eye) about 6 times in the length of the head; caudal peduncle about 5 times in the greatest depth of the body. Nostrils of colored side in a depression in a line with the centre of the interocular space, the anterior tubular; anterior nostril of blind side with a posterior flap and a raised margin, posterior without flap. Eyes equal in front, or nearly so, the lower sometimes very slightly in advance, the upper eye looking obliquely upwards. Interocular space less than half the longitudinal diameter of the eye; a low prominence running upwards and backwards from the anterior upper margin of the lower eye to the posterior lower border of the upper eye, and thence backwards to the origin of the lateral line; above the operculum this rises into a prominent tubercle. Mouth small; mandible projecting somewhat in the closed mouth, its tip level with the upper margin of the lower eye, and its lower margin forming a very slight angle with that of the head; posterior end of the maxillary reaching a vertical slightly in advance of the lower eye. Teeth short, broad, forming an irregular cutting edge, in a single row in both jaws, most developed on the blind side, but extending more than half-way along the colored side. Upper pharyngeal bones each with an irregular series of tubercular teeth, sometimes more or

less broken into smaller rows; lower pharyngeal bones broad, covered with tubercular teeth. Gill-rakers short, broadly conical at base, about as long as the interocular is wide, flexible, widely separated. Dorsal commencing above the middle of the eye, highest in the centre, about the 31st-32d ray, thence diminishing regularly and in nearly a straight line to its termination at a distance from the caudal equal to the depth of the caudal peduncle. The longest rays are about $\frac{2}{3}$ of the length of the head, and placed a little behind the broadest part of the body. Anal with a more or less conspicuous spine, similar in shape to the dorsal, and coterminous with it. Sixteenth ray longest, the rays behind this diminishing in nearly a straight line to the end of the fin; the longest anal rays shorter than those of the dorsal. Caudal rather large, its rays once bifurcate; posterior margin with the central rays more or less produced. Pectoral of colored side contained about twice in the length of the head; the rays from the third to the ninth once bifurcate. Pectoral of blind side rather shorter than that of colored; its first five rays simple. Ventrals of six simple rays, a vertical from the posterior margin of their base touching the anterior axil of the pectoral base, their tips reaching the anal spine, but falling short of the first ray of that fin. Scales of body formed of scattered, stellate, tuberculate bodies, irregularly disposed on both blind and colored sides, but smaller upon the former, and closer together on the cheeks and interocular space than on the body. A few on the snout; front part of snout and greater part of lower jaw scaleless. A regular row of rather larger scales accompanies the lateral line on both sides, above and below. Scales on caudal peduncle elongate, subimbriate, rough on their posterior edges only. A bare space on the operculum, and another on the cheek, of the blind side. A regular row of large, stellate, irregularly shaped, rough scales between the bases of the dorsal and anal fin-rays, one between each pair of rays; these scales larger than those of the rest of the body. No scales on dorsal or anal; caudal rough, with very small scales on the base and outer rays of the colored side, and to a less extent on those of the blind side. Lateral line with a slight curve above the pectoral; the rise much less than the width of the base of that fin; the anterior extremity nearly horizontal. A row of pores from a little above the lower margin of the upper eye around the lower to front of pupil. No scales on lateral line; pores tubular; about 83 between base of caudal and head in an individual $9\frac{3}{4}$ in length. Color olivaceous, with areas of citrine when fresh; the blind side white. Dorsal and anal fins with four, caudal with three, black bands running in the direction of the rays, the lighter portions of these fins reddish brown or olivaceous. Individuals colored on both sides, except on a small portion of the blind side, and others having nearly the whole of the eyed side white are occasionally brought to market.

Localities.—Kamtschatka, Behring's Straits, Vancouver Island, Fraser River, (*vide* Günther); Humboldt Bay, San Francisco.

In 1862, Prof. Gill and Dr. A. Günther identified this species with the *Pleuronectes stellatus* of Pallas.

Dimensions.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Total length, in inches.....	8 $\frac{1}{16}$	9 $\frac{3}{8}$	14 $\frac{1}{8}$	22 $\frac{3}{8}$	13 $\frac{1}{16}$
Length without caudal.....	6 $\frac{1}{16}$	.....	11 $\frac{1}{8}$	.....	11 $\frac{1}{8}$
Greatest height of body.....	3 $\frac{1}{16}$	3 $\frac{1}{16}$	6 $\frac{1}{4}$	10 $\frac{1}{8}$	6 $\frac{1}{16}$
Height from tip of dorsal to tip of anal.....	.....	.....	.....	.....	9
Distance from tip of lower jaw to origin of anal.....	2 $\frac{1}{16}$	3 $\frac{3}{8}$	.....	.....	4 $\frac{7}{16}$
Length of head.....	1 $\frac{1}{16}$	2 $\frac{3}{16}$	3 $\frac{1}{2}$	5 $\frac{1}{2}$	3 $\frac{3}{8}$
Longitudinal diameter of eye.....	$\frac{1}{16}$	$\frac{3}{8}$	.....	.....	$\frac{1}{16}$
Width of interocular space.....	$\frac{3}{32}$	$\frac{5}{32}$	$\frac{5}{16}$	.....	$\frac{7}{32}$
Length of snout, from lower eye.....	$\frac{3}{32}$	$\frac{3}{8}$	$\frac{9}{16}$	.....	$\frac{1}{16}$
Length of longest ray of dorsal.....	$\frac{7}{8}$	1 $\frac{5}{16}$	.....	3 $\frac{1}{4}$	1 $\frac{3}{8}$
Length of longest ray of anal.....	$\frac{7}{8}$	1 $\frac{1}{2}$	.....	3 $\frac{1}{4}$	1 $\frac{3}{8}$
Length of pectoral of colored side.....	1 $\frac{1}{2}$	1 $\frac{1}{16}$	1 $\frac{1}{2}$	.....	1 $\frac{3}{8}$
Length of pectoral of blind side.....	$\frac{3}{4}$	1 $\frac{1}{16}$	1 $\frac{7}{16}$	.....	1 $\frac{3}{8}$
Length of ventral.....	1 $\frac{7}{16}$	$\frac{3}{8}$	.....	.....	1 $\frac{1}{2}$
Width of caudal peduncle where narrowest.....	$\frac{3}{32}$	$\frac{3}{16}$	.....	2	1 $\frac{5}{16}$
Distance from end of dorsal to caudal fin.....	$\frac{3}{4}$	$\frac{7}{8}$	.....	2	1 $\frac{1}{2}$
Greatest distance from anal to straight portion of lateral line.....	1 $\frac{1}{16}$	2 $\frac{1}{16}$	3 $\frac{1}{2}$	.....	3 $\frac{3}{8}$
Length of caudal.....	.....	.....	.....	4	2 $\frac{7}{16}$

The formulæ of the fin-rays of dorsal and anal in these specimens were as follows: No. 1, D. 61, A. 42; No. 2, D. 60, A. 43; No. 3, D. 59, A. 42; No. 4, D. 58, A. 43; No. 5, D. 59, A. 44. Nos. 1 and 2 are alcoholic specimens, and have both eyes and color upon the right side.

This is the most abundant of all the flat-fishes brought to our markets, and attains a larger size than any other except the Bastard Halibut (*Paralichthys maculosus*) and the Hippoglossus. Those taken in San Francisco Bay attain a weight of eight, ten, or even twelve pounds, while still larger individuals are brought from Humboldt Bay. Those brought from the latter locality are, however, very coarse and comparatively poor in flesh, so that they do not fetch by far so high a price as those taken near San Francisco. It is sold under the name of "Flounder," which here appears to be limited strictly to this species. Its broad rhombic form, elevated dorsal, deep anal, long caudal peduncle, stellate scales, and the bands of color which adorn the vertical fins, give this fish an unmistakable *facies*. The eyes and color are sometimes upon the right and sometimes upon the left side. Out of sixty-five individuals, which I counted as they lay upon the stall, thirty-two were colored upon the right and thirty-three upon the left side. On another occasion I counted seventy-five sinistral and fifty-eight dextral individuals, and on a third thirty-eight dextral and forty-eight sinistral. Is it not possible that the difference of color may be a sexual one? This is the idea of the more intelligent dealers, but it has not been verified by dissection. Individuals occasionally occur with both sides olivaceous, some white blotches alone marking the usually uncolored side; on the other hand, I have seen one example which had both sides white, except along the dorsal and abdominal outlines and head of the eyed side.

PLEURONICHTHYS Girard.

Form broad; eyes and color on the right side. Mouth small; maxillary narrow, short; teeth in several series, slender, acute, most developed on the blind side. No teeth on vomer or palate. Lips more or less thick. Lower pharyngeals with a double row of teeth. Gill-rakers short, flexible. Anterior nostrils on both sides with a flap; posterior patulous. Dorsal of less than eighty rays. Anal preceded by a spine; dorsal and anal rays simple. Branchiostegals seven; no free preopercular margin.

PLEURONICHTHYS GUTTULATUS Girard.

Hypsopsetta guttulata Gill.

Parophrys ayresii Günther.

D. 66-72. A. 47-54. P. 11-13. C. 3-12-3. V. 6.

Form broadly oval; the dorsal outline regularly curved from the snout to the peduncle of the tail. Curve of snout meeting that of dorsal outline over the centre of the eye, forming a slight concavity. Abdominal outline running downwards and backwards in a straight line to the origin of the anal, thence to the caudal peduncle curved like the dorsal. Form, including dorsal and anal fins, broadly rhombic. Height of body nearly to quite half of the total length from the tip of the snout to that of the caudal; length of head nearly to rather more than $\frac{1}{3}$ of the same; caudal peduncle $\frac{1}{4}$ - $\frac{1}{8}$ of greatest depth. Snout short, about $\frac{2}{3}$ of the diameter of the orbit. Nostrils on a line with the upper margin of the lower eye; anterior nostril on both eyed and blind side with a flap behind; posterior patulous. Eyes about $\frac{1}{3}$ of the length of the head, the lower slightly in advance of the upper, which is slightly directed upwards. Interocular space narrow, smooth, elevated, about $\frac{1}{3}$ of the longitudinal diameter of the eye. Mouth small, very oblique, lower jaw scarcely projecting, the tip of the mandible about level with the top of the pupil of the lower eye; maxillary reaching a little beyond the front margin of the lower orbit. Lips rather thick. A broad band of villiform teeth in front in both jaws; continued also along the blind side in the intermaxillary and the mandible, but along the colored side in the mandible only. Pharyngeal teeth cardiform, in two or three irregular rows on each upper pharyngeal bone, and in a double row on each of the lower. Gill-rakers very short, blunt, flexible, distant. No free margin to preoperculum, the skin covering and uniting that bone to the other opercular bones. Dorsal commencing a little in front of the centre of the eye, highest about the 37th ray, which is about half the length of the head. Dorsal and anal forming an obtuse rounded angle, giving the fish a rhombic form. Anal usually with a spine, its longest rays opposite and equal in length to those of dorsal; its origin very slightly behind a vertical from the posterior axil of the pectoral. Anal and dorsal coter-

minimal at about $\frac{1}{3}$ of the depth of the caudal peduncle from the caudal fin. Caudal slightly and regularly convex on its posterior margin, its rays thrice bifurcate. Pectoral of colored side narrow; the rays, except the first two, bifurcate; its length equal to the distance of the lower eye from the tip of the operculum, or about $\frac{2}{17}$ of the total length; the fifth ray longest. Pectoral of blind side about $\frac{3}{4}$ of the length of that of colored side, its rays once bifurcate, the first four excepted. Ventrals about half the length of the pectoral of the colored side; their posterior axil vertical with the anterior angle of the pectorals, and their four posterior rays bifurcate. Lateral line very gently curved above the pectoral, and contained 83 pores in specimens 10 inches long. Accessory lateral line variable in length, ending from the 30th to the 59th dorsal ray in different individuals, usually about equally developed on the blind side. Scales rather small, cycloid, subcircular; those of the anterior portion of the body not imbricated, but entirely surrounded by skin; those of the posterior part imbricated. Scales of the abdominal region smaller than those on the rest of the body; those upon the head narrow, much elongate, separate. Scales of the blind side similar in character to those on the colored side; those on the head like those on colored side of head. Snout, interocular space, and lower jaw scaleless. Dorsal and anal with three rows of small, narrow, elongate scales along each ray of their central portion, a few upon the blind side of those fins. Caudal covered with scales similar to those of the other vertical fins, but covering both rays and membrane on both sides of the body. Color of the eyed side dark olive-green, deepening almost to black on exposure to the air, and often blotched with whitish. Each of the body-scales tipped with black. Blind side opaque-white; a margin of yellow around the head from origin of dorsal to anus.

Dimensions.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.
Total length, in inches.....	9 $\frac{5}{8}$	12 $\frac{1}{2}$	10 $\frac{1}{10}$	7 $\frac{7}{8}$	13 $\frac{1}{2}$	11 $\frac{7}{8}$	10
Total length without caudal.....	8 $\frac{1}{2}$						8 $\frac{1}{2}$
Greatest depth of body.....	4 $\frac{1}{10}$	5 $\frac{1}{10}$	5 $\frac{1}{10}$	3 $\frac{3}{4}$	6 $\frac{1}{2}$	5 $\frac{7}{8}$	4 $\frac{3}{8}$
Length of head.....	2 $\frac{1}{10}$	2 $\frac{3}{8}$	2 $\frac{1}{8}$	1 $\frac{7}{8}$	2 $\frac{1}{2}$	2 $\frac{3}{8}$	2 $\frac{1}{2}$
Longitudinal diameter of eye.....		$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$
Width of interocular space.....			$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$
Length of snout.....		$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{10}$		$\frac{1}{10}$
Length of pectoral, colored side.....	1 $\frac{3}{8}$	1 $\frac{3}{8}$	1 $\frac{1}{4}$	1 $\frac{1}{8}$	1 $\frac{1}{2}$	1 $\frac{3}{8}$	1 $\frac{1}{10}$
Length of pectoral, blind side.....	1	1 $\frac{1}{10}$	1 $\frac{1}{10}$		1 $\frac{1}{2}$	1 $\frac{1}{2}$	$\frac{7}{8}$
Length of ventrals.....	$\frac{1}{10}$	$\frac{5}{8}$	$\frac{5}{8}$				$\frac{1}{10}$
Length of longest ray of dorsal.....	1 $\frac{1}{10}$	1 $\frac{1}{10}$				1 $\frac{3}{8}$	1
Distance in a straight line from tip of lower jaw to origin of anal.....	2 $\frac{7}{8}$		2 $\frac{7}{8}$	2 $\frac{1}{2}$			2 $\frac{7}{8}$
Distance from tip to tip of longest rays of dorsal and anal.....	6 $\frac{7}{8}$	8 $\frac{1}{10}$					
Length of lower jaw.....	$\frac{1}{10}$	$\frac{3}{8}$	$\frac{1}{10}$				$\frac{3}{8}$
Width of peduncle of tail, narrowest part.....	1 $\frac{1}{4}$	1 $\frac{1}{2}$	1 $\frac{1}{10}$		1 $\frac{1}{4}$		1 $\frac{1}{2}$
Greatest distance from anal to straight part of lateral line.....		3 $\frac{1}{2}$				3 $\frac{1}{2}$	2 $\frac{7}{8}$

The interocular space in this species is narrow, perfectly smooth, and without ridge or concavity. No. 7 is an anomalous individual, colored similarly on both sides, except upon the cheeks and opercular apparatus of the blind side, which were yellow when fresh, but have faded to white in alcohol. In this fish, the upper eye is less lateral than usual, and, as if to give it more scope of upward vision, the dorsal outline and fin do not curve downwards to meet the curve of the snout, but end in a point about $\frac{1}{4}$ " above the eye; the outline from the back of the eye to the point taking the form of a hollow or "scotia."

Girard first described this form in Proc. Ac. Nat. Sci. Phil. 1856, p. 137, and afterwards in the U. S. Pac. R. R. Rep. x, 152. His specimens came from Tomales Bay, an inland harbor similar to that of San Francisco, but smaller, and situated within the range of the fishing-vessels which supply the markets of San Francisco. Dr. Günther, writing in 1862, places *guttulatus* in the genus *Pleuronectes*, and quotes Girard's description, at the same time describing, under the name of *Parophrys ayresii*, a form that is evidently the one common in this market. In a note he states that "it appears to us specifically distinct from *P. ænosa*," but makes no comparison between it and *P. guttulatus*.

A careful comparison of Girard's description of *guttulatus* with Günther's of *ayresii* reveals no differences except in the proportions, which are variable in most of our flat-fishes, and in the color, which is described by the latter as "uniform brownish lead-colored," by the former as "greyish or lead, sprinkled all over with black dots and whitish spots." In the only form which I have seen, the whitish spots are of frequent occurrence. The greatest discrepancy between the two descriptions is in the size of the eyes, which Girard states are "contained three times in the length of the side of the head," but which Günther gives as one-fifth of the length of the head. All the specimens I have seen agree in this respect, as also in other proportions, more closely with Günther's *ayresii*.

Gill (P. A. N. S. Phil. 1864, p. 196) queries the distinctness of *P. ayresii*, and his query tends to confirm the impression of the identity of the two species that I had formed before perusing his paper.

Most of the smaller specimens that I have examined have the number of rays of the dorsal and anal fins as given by Günther for *P. ayresii* (D. 66, A. 47), which differs from that given by Girard for *guttulatus* only in the absence of one dorsal ray; but larger examples have a much larger number of rays: No. 2 ($12\frac{1}{4}$ " long) had 72 dorsal, 54 anal, and 13 pectoral rays; another specimen, $12\frac{3}{4}$ " long, had D. 70, A. 48; and No. 5 had D. 71, A. 49. This species is very abundant, and is occasionally taken inside, but usually outside, the bay; it is called by the dealers "Turbot," and attains occasionally a length of 18", and a weight of about 5 pounds. It can be readily recognized by its broad form, convex caudal, the dark dull color of the eyed side, and the yellow margin round the head on the blind side. I am informed that the greater portion of the turbot brought here are taken in the vicinity of Tomales Bay.

PLEURONICHTHYS CENOSUS Girard.

D. 72-76. A. 46-54. C. 3-14-3. P. 10-13. V. 6.

Body broad, comparatively thick; nape almost continuous with snout, and much less curved than the part of the dorsal outline immediately behind it. At the seventeenth dorsal ray the dorsal outline commences to rise rapidly, forming a bold and regular sweep from thence to the end of the dorsal. Abdominal outline nearly a straight line to the ventrals, thence curved like the dorsal. Greatest depth of body $\frac{4}{9}$, length of head about $\frac{2}{3}$, of the total length; longitudinal diameter of orbit nearly $\frac{1}{3}$ of the length of the head; width from tip to tip of expanded dorsal and anal fins nearly $\frac{2}{3}$ of the total length. Caudal peduncle usually about $\frac{1}{3}$ as wide as the greatest depth of the body, widening considerably toward the caudal base. Snout extremely short and bluff, its length less than $\frac{1}{4}$ of the diameter of the orbit, and its profile cut off from that of the nape by the projection of the upper orbital margin. Nostrils of right side in a depression on the horizon of the upper margin of the lower eye, those of the blind side on the dorsal ridge slightly behind the front margin of the orbit; both anterior nostrils with a flap; posterior patulous. Eyes elliptical, very large, even in front, the upper directed obliquely upwards, the upper bony ridge of its orbit raised above the dorsal ridge. Interocular space a very narrow bony ridge, its extremities raised into prominences, and scarcely $\frac{1}{16}$ " wide in a specimen $9\frac{1}{8}$ " long. This ridge continues forward round the anterior margin of the upper eye to its raised upper margin; on the posterior margin of the upper eye there are also two almost spinous prominences. Mouth small, extremely oblique, nearer vertical than horizontal; the end of the maxillary, in consequence of this obliquity, scarcely reaching the front margin of the orbit; mandible not projecting in the closed mouth. Lips thick, fleshy, and plicate. Teeth very small, acute, in a broad band in the mandible on the blind side and for about two-thirds of the length of the colored side. On the intermaxillaries a much narrower band on the blind side, scarcely reaching to the symphysis; none on the colored side of these bones. Teeth of the blind side of the mandible very slender, much recurved. Each upper pharyngeal with a row of about eight conical, sharp, recurved teeth; lower pharyngeals with a double row of very small teeth. All the teeth buried deeply in the gum, only their points visible. The lower pharyngeal bones are very small and slender. A prominent short ridge between the origin of the lateral line and the tubercles of the hinder margin of the upper eye; from the anterior end of this a long low prominence runs downwards across the opercular bones, slightly inclining forwards, and ending level with the row of pores under the eye. Margin of the preoperculum united by the skin to the other opercular bones. Gill-rakers very short, flexible, wide apart. Dorsal fin twisted over to the left side at a point over the centre of the eye (about ten rays from its origin) and continued downwards in a curved line to a little below the posterior extremity of the maxillary on that side, the first rays

higher than those immediately following. The rays again increase to about the forty-fifth, where the fin forms almost an angle, the rays rapidly diminishing to its termination opposite that of the anal, at about half the depth of the peduncle from the caudal. Anal commencing a little behind the base of the pectoral, similar to the dorsal, its longest rays about the 23d-25th, where the fin forms a rounded angle similar to that of the dorsal, the rays diminishing thence regularly and rapidly. Longest rays of dorsal and anal about $\frac{2}{3}$ of the length of the head. Anal usually with a small spine; all the rays of dorsal and anal simple; those behind the longest rays inclined forwards. Caudal rather broad, its rays twice bifurcate; the first bifurcation at about the middle, the second at three-fourths of their length from the base; posterior margin regularly convex. Pectoral rather short; that of colored side contained $7\frac{1}{2}$ - $8\frac{1}{2}$ times in the total length, about $1\frac{2}{3}$ times in that of head; that of blind side much shorter, about $\frac{9}{22}$ of the length of the head. Rays of pectoral of colored side once bifurcate, the two uppermost excepted; those of the blind side undivided. Ventrals $\frac{4}{5}$ of the length of the head, their rays undivided, and the tips of the fins extending beyond the origin of the anal; their base very broad, its posterior portion below the anterior portion of the pectoral base. Lateral line median on the caudal peduncle, and thence forwards to nearly the tip of the pectorals, where it commences to rise slightly, with very small curvature, to its origin. Accessory lateral line ending below the 45th-53d ray of the dorsal; that of the blind side rather shorter. A line of pores commences at the tubercles on the posterior margin of the upper eye, is continued behind the lower eye at some distance from it, and thence along the suborbitals to a line with the front of the pupil—about sixteen tubular pores. Scales rather small, smooth, not imbricated, except on the caudal peduncle, but imbedded in the skin; those on cheeks and opercles smaller, and those of the left side considerably smaller than those of the right. Snout, interocular space, and lower jaw scaleless. Several rows of extremely small scales on dorsal and anal rays; caudal rays with very small scales on both sides. Color of a fresh individual dark chocolate-brown, becoming reddish on the lower part of the head; after exposure to alcohol the color becomes duller, and the scales show distinctly lighter than the surrounding skin. Others are olivaceous. All are much lighter when covered with mucus. Blind side creamy white, in some spotless, in others with three or four large, and several smaller, dark-brown blotches on the anterior portion of the body. Dorsal and anal fins clouded with dark and light olivaceous; pectoral of colored side dark.

Dimensions.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Total length, in inches	12 $\frac{3}{8}$	11 $\frac{5}{16}$	10 $\frac{7}{8}$	9 $\frac{1}{2}$	6 $\frac{1}{2}$
Length without caudal	10 $\frac{1}{4}$	9 $\frac{3}{16}$	8 $\frac{3}{4}$	7 $\frac{1}{2}$	4 $\frac{1}{2}$
Length of head	2 $\frac{3}{4}$	2 $\frac{1}{2}$	2 $\frac{3}{8}$	1 $\frac{1}{2}$	1 $\frac{1}{4}$
Greatest depth of body	5 $\frac{3}{8}$	5 $\frac{1}{2}$	4 $\frac{3}{8}$	4 $\frac{1}{2}$	2 $\frac{1}{2}$
Depth from tip of dorsal to that of anal	8 $\frac{1}{2}$	.....	.....	.....	.....
Length of lower jaw .....	.....	$\frac{3}{4}$	.....	.....	$\frac{7}{16}$
Distance from tip of lower jaw to origin of anal .....	.....	2 $\frac{3}{8}$	.....	.....	1 $\frac{1}{2}$
Width of caudal peduncle	1 $\frac{1}{2}$	1 $\frac{1}{32}$	.....	$\frac{3}{8}$	$\frac{1}{2}$
Longitudinal diameter of lower eye-ball	1 $\frac{1}{8}$	1 $\frac{1}{8}$	$\frac{3}{8}$	$\frac{1}{2}$	1 $\frac{1}{8}$
Length of pectoral, colored side	1 $\frac{5}{8}$	.....	1 $\frac{1}{4}$	1 $\frac{1}{16}$	$\frac{3}{8}$
Length of pectoral, blind side	1 $\frac{1}{8}$	.....	1	$\frac{1}{8}$	$\frac{7}{16}$
Length of ventrals .....	.....	1 $\frac{1}{8}$	.....	$\frac{3}{8}$	.....
Length of snout, from a line joining the orbits	$\frac{7}{16}$	.....	$\frac{1}{8}$	$\frac{5}{16}$	$\frac{1}{2}$
Distance from origin of anal to lateral line .....	.....	2 $\frac{3}{8}$	2 $\frac{7}{16}$	2 $\frac{1}{16}$	1 $\frac{1}{8}$
Number of dorsal rays	76	72	72	72	76
Number of anal rays	52	50	49	51	46

Another specimen had 73 dorsal and 53 anal rays. In consequence of the height and size of the prominences round the upper eye, the upper orbit is larger than the lower. The species appears to be rare; Girard saw only one specimen, and as yet I have only seen about twelve. It is taken outside the bay in deep water, probably near the Farallone Islands. The large eyeballs, protruding through the diminution of the pressure consequent on the removal of the fish to the surface, and overhanging, as it were, the short, snub snout, together with the bright brown tint, give this fish an unmistakable physiognomy even when viewed from above; and the curious prolongation of the dorsal on the left side, together with the brown markings, render it still more easy to identify when the blind side is exposed to view.

Is *Pleuronectes quadrituberculatus* Pall. (Zoog. Ross.-As. iii, p. 423, teste Günther) identical with the foregoing? The two "approximate, anteriorly situated" tubercles may very well be the prominent extremities of the interocular ridge; there is another "at the hinder margin of the upper orbit" (with, however, a second above it), and that above the opercle is large and prominent. The fin-rays, lateral line, and scales agree perfectly well with this species; but the proportion of depth to length is smaller, and "anal spine hidden" does not apply to the specimens of *carnosus* brought to this market. Yet the proportion of the body is within the range of variation of some of our other flat-fishes, and the anal spine is not prominent. It is also a suspicious circumstance that no one has ever identified Pallas's species.

If my surmise should prove correct, *carnosus* must of course sink into a synonym, and the name of the species will be *Pleuronichthys quadrituberculatus*.

In No. 4, the dorsal fin was not continued downwards nearly so far as in the others, agreeing thus more closely with Girard's description; the first ray was about level with the top of the upper lip, and only four

rays arose upon the blind side. In the same individual, no anal spine was discoverable outside of the skin; and the rays of the pectoral on the blind side were only ten, and on the colored side twelve.

In No. 5, no scales were discoverable on the vertical fins. One individual examined had three tubercles in a vertical line along the posterior margin of the upper eye.

PAROPHRYS Girard.

Eyes and color on the right side. Form elongate-rhombic; anterior part of head narrow; snout conic. Eyes contiguous, nearly even, the upper looking obliquely upwards. Nostrils on horizon of superior margin of each orbit, anterior subtubular, posterior with anterior flap. Mouth unequal, little oblique; maxillary bones of colored side extending little beyond anterior margin of orbit, much shorter than that of blind side. Lips rather thin and simple. Teeth most developed on the blind side, in a single series, contiguous. An accessory lateral line. Lateral line with a very slight arch, almost straight, but somewhat raised in front. Scales cycloid, those on the cheeks similar. A recumbent spine before the anal. Caudal almost straight on posterior margin. Branchiostegals seven. Lower pharyngeals with a double row of teeth.

PAROPHRYS VETULUS Girard.

Parophrys hubbardi Gill.

Pleuronectes digrammys Günther.

Parophrys vetulus Gill.

Parophrys vetulus Günther.

D. 74-86. A. 54-68. C. 3-6-1-5-3=18. P. 1-11. V. 6.

Body elongated, tapering posteriorly, less so anteriorly; the greatest width about a third of the total length; head one-fourth of the same, or rather less. Peduncle of tail rather slender, rather more than one-fifth of the greatest width. Outlines of posterior portion of body only very slightly curved; snout about $\frac{2}{3}$ of length of eye, narrow, its convexity meeting that of the anterior part of the dorsal outline above the centre of the pupil of the upper eye. Eyes from rather less to rather more than $\frac{1}{4}$ of the length of the head, elliptical, the lower in advance of the upper by a distance equal to about $\frac{2}{3}$ of the depth of the pupil; upper eye almost on a plane with the dorsal outline. Interocular space narrow, ridge-like, elevated, the ridge continued backwards and obliquely upwards round the posterior border of the upper eye, and then to the lateral line above the opercle. A short raised ridge along the anterior margin of the lower orbit. Nostrils of both sides in a slight depression; anterior of right side tubular, that of left side with a posterior linguiform flap. Mouth small, its cleft much longer on the blind side than on the colored; maxillary of the colored side scarcely passing the front margin of the orbit; mandible projecting in the closed mouth, its tip

level with the upper margin of the lower eye. Both intermaxillaries and mandibles are distorted, their symphyses bent round toward the colored side. Teeth small, short, broad, nearly equal, closely set, forming a nearly continuous cutting edge on the blind side in both jaws; about 40 teeth in the intermaxillary and 45 in the mandible on the blind side, and 2-3 on the colored side of each jaw, in a specimen $12\frac{3}{4}$ " long. Pharyngeal teeth blunt, broad, similar to those of jaws; each upper pharyngeal bone with about 12 teeth; each lower pharyngeal bone with a double row of teeth. Lower pharyngeals stout, separate. Gill-rakers of first arch rather slender, about one-fourth as long as the eye, the others decreasing regularly to the fourth arch, on which they are almost tubercular. Dorsal commencing over the centre of the pupil of the upper eye, considerably behind the posterior nostril of blind side; the number of rays very variable, the longest (39th-40th about) more than $\frac{1}{4}$ of the length of the head. Anal with a horizontal spine, its first ray arising at a vertical about the width of the pectoral base behind the posterior pectoral axil; the number of rays very variable; the longest (C. 18-20) opposite to those of the dorsal. Dorsal and anal coterminous at a distance from the caudal exceeding the depth of the caudal peduncle. Caudal truncated posteriorly, the outermost principal rays only very slightly longer than the central ones when closed, so that the fin when opened is slightly convex, the rays once bifurcate only. Pectoral of colored side usually about $\frac{1}{3}$ of the total length; the rays mostly once bifurcate, the two first excepted. Pectoral of blind side usually considerably shorter than that of the colored side; rays bifurcate, except the first three. Ventrals inserted with their posterior axil nearly in a line with the anterior axil of the base of the pectorals, their posterior extremity extending about to the anal spine; the posterior four rays bifurcate once or twice. Scales very small, smooth, extending over the head to the nostrils and over the base of the caudal, but not on the dorsal or anal. Snout and lower jaw scaleless. Scales of blind side similar. Each scale is sub-elliptical, longer than deep. Lateral line raised anteriorly, and with a very slight arch over the pectoral, thence straight to the end of the caudal; about 103-108 scales (in specimens $11\frac{1}{2}$ - $13\frac{3}{8}$ long) from base of caudal to head. Accessory lateral line ending at from the 26th to the 28th ray of the dorsal; an accessory line on the blind side also of about the same length. Color of body uniform reddish brown, sometimes spotted darker when fresh, especially in small specimens. Left side uniform whitish. Smaller specimens lighter in tint than larger.

Dimensions of several specimens.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.	No. 6.	No. 7.
Total length, to tip of caudal, in inches	$8\frac{5}{16}$	$9\frac{5}{16}$	$10\frac{1}{2}$	$11\frac{1}{2}$	$12\frac{3}{4}$	$13\frac{3}{8}$	$14\frac{5}{8}$
Greatest width of body	$2\frac{1}{16}$	$3\frac{1}{8}$	$3\frac{1}{8}$	$3\frac{1}{8}$	$4\frac{1}{4}$	$4\frac{1}{2}$	.....
Length of head	$1\frac{1}{16}$	$2\frac{1}{16}$	$2\frac{1}{16}$	$2\frac{1}{16}$	$3\frac{1}{8}$	$3\frac{3}{8}$	$3\frac{1}{2}$
Distance from tip of lower jaw to anal, in a straight line	$2\frac{5}{8}$	$2\frac{7}{8}$	.....	$3\frac{1}{8}$	$4\frac{1}{16}$	$4\frac{5}{8}$	.....
Length of pectoral, colored side	$1\frac{1}{16}$	$1\frac{1}{8}$	.....	$1\frac{7}{16}$	$1\frac{1}{2}$	$1\frac{1}{2}$	$1\frac{1}{2}$
Length of pectoral, blind side	$\frac{1}{16}$	$\frac{3}{4}$	.....	$\frac{7}{8}$	$1\frac{3}{16}$	$1\frac{1}{4}$	$1\frac{1}{4}$
Length of ventrals	$\frac{9}{16}$	$\frac{5}{8}$	.....	$\frac{3}{4}$	$\frac{1}{2}$	$\frac{1}{2}$	1
Length of orbit	$\frac{1}{2}$	$\frac{9}{16}$	.....	$\frac{1}{16}$	$\frac{3}{2}$	$\frac{3}{4}$	$\frac{2}{3}$
Approximate width of interocular space	$\frac{3}{32}$	$\frac{1}{8}$	.....	$\frac{5}{32}$	$\frac{3}{32}$	$\frac{1}{8}$	$\frac{5}{32}$
Width of peduncle of tail .....	.....	.....	.....	.....	.....	$\frac{1}{16}$	$\frac{1}{16}$
Length of lower jaw .....	.....	.....	.....	.....	.....	$1\frac{1}{8}$	.....
Length of snout	$\frac{1}{2}$	$\frac{3}{8}$	.....	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$	.....
Origin of anal to lateral line .....	.....	.....	.....	.....	.....	.....	3
Number of rays in dorsal	78	81	79	81	85	86	80
Number of rays in anal	60	61	60	68	65	68	61

In other specimens, the formulæ of these fins were as follows: D. 77, A. 60; D. 74, A. 57; D. 75; A. c. 54. Thus the number of rays in the dorsal and anal fins is very variable, and is usually largest in the largest individuals, but not invariably so; the head also becomes slightly longer in proportion to the body as the size increases; and the largest specimens are the most slender. After close examination of several individuals, and comparison of many fresh specimens as they lay upon the stalls, exposed for sale, I have been forced to the conclusion that there is only one species of *Parophrys*, and that the *P. hubbardi* of Gill and the *P. digrammus* of Günther must sink to the rank of synonyms. *Parophrys retulus* is of common occurrence in the markets, where it is present daily in greater or less abundance. Large specimens are equal in length to those of *Psettichthys melanostictus*. This species can be readily recognized by its narrow form, combined with the straight tapering lines of the posterior portion of the body, by the narrow anterior portion of the head, and by the smooth scales.

LEPIDOPSETTA Gill.

Form oval; eyes and color on the right side. Mouth small, the narrow maxillary reaching but little behind the anterior margin of the orbit of the lower eye; teeth in a single row, straight, forming a blunt continuous edge, most developed on the blind side. Anterior nostril of colored side tubular; that of blind side with a linguiform flap. Branchiostegals seven. Dorsal not extending in advance of the orbit; anal with a spine. Scales rough, usually ctenoid, sometimes sub-spinosely tuberculate on the cheeks. Lateral line arched anteriorly; an accessory dorsal branch.

LEPIDOPSETTA BILINEATA (Ayres) Gill.

Platessa bilineata Ayres.

D. 71-84. A. 55-63. C. 3-12-3. P. 11. V. 6. L. lat. 82-86.

Form oval; dorsal profile regularly curved from the front margin of the upper eye to the caudal peduncle. Abdominal outline also a regular curve from the lower jaw, but less arched than the dorsal. Curve of snout uniting with that of nape over the anterior margin of the upper eye, forming a concavity. Height of body about $\frac{2}{3}$; length of head rather more than $\frac{1}{4}$ of the total length; greatest distance from anal to straight part of lateral line nearly equal to the length of the head. Snout projecting slightly, and considerably shorter than the eye. Eyes rather large, elliptical, their longitudinal diameter about $\frac{2}{5}$ of the length of the head, nearly even in front; the upper eye looking obliquely upwards. Interorbital space a very narrow, elevated, bony ridge, dividing anteriorly, and forming a raised ridge round the anterior margin of each eye. Nostrils of colored side in a depression about equidistant from the front margins of the two orbits; anterior tubular; posterior patulous; anterior nostril of blind side with a posterior tongue-like flap. Mouth very oblique; tip of mandible level with the upper margin of the lower eye, projecting when the mouth is closed, with a prominent symphysial knob. Length of mandible contained about $2\frac{2}{3}$ times in that of head. Maxillary reaching but little behind the anterior margin of the orbit of the lower eye, and about $\frac{1}{3}$ of its transverse diameter below its lower margin. A single, rather irregular, tolerably closely set row of strong, blunt, conical teeth in each jaw, shorter and less developed on the colored side than on the blind. Teeth of intermaxillary not reaching above half-way along that bone on the colored side; those of mandible extending along $\frac{2}{3}$ of the exposed portion of that bone on the same side. About 34 teeth in the intermaxillaries, and about 32 in the mandible. Inferior pharyngeal teeth like those of jaws, but stouter, in a double row on each pharyngeal bone, the outer row rather the smaller; about 12 teeth in the inner row; superior similar, in a single row of about 7 on each pharyngeal bone. Inferior pharyngeal bones entirely separate, stout, broadest in the centre of their length, where the rows of teeth are farthest apart. Dorsal commencing immediately behind the anterior margin of the orbit; its first ray twisted toward the left, increasing regularly to about the 38th-40th rays, which are about $\frac{1}{5}$ of the length of the head, thence diminishing regularly to its termination opposite to that of the anal and distant from the caudal about half the width of its peduncle. Anal with a spine, its origin a little behind the base of the pectoral, its longest rays opposite to and equal in length to those of the dorsal; behind the longest rays the depth of the fin diminishes regularly. Narrowest part of caudal peduncle rather more than $\frac{1}{5}$ of the greatest depth, thence widening to the caudal without the intervention of a straight portion. Principal rays of caudal once bifurcate; its posterior margin slightly

convex. Pectorals pointed; that of colored side with 11-12 rays, the longest about $\frac{5}{11}$ of the length of the head; all the rays, except the first two, once bifurcate. Pectoral of blind side with 10-11 rays, the longest about $\frac{2}{3}$ as long as those of the colored side; the three or four lowest rays once bifurcate. Ventrals more than half their length in advance of the pectorals (reckoning from the front margins of both fins), contained about $3\frac{1}{4}$ times in the length of the head; the three posterior rays bifurcate. Gill-rakers short, very flexible, few, and widely separated. Scales of the anterior part of the body separate and almost circular, but towards the central portion they slightly overlap, and on the posterior portion are strongly imbricated. By far the larger portion of the scales on the anterior portion of the body and along the dorsal and abdominal regions, almost all those on the sub- and inter-opercula, a large proportion of those on operculum, and some of those on the suborbital region smooth, subcircular. On the central portion of the length, especially near the lateral line, scales with two or three spinules appear, and these become more numerous and more decidedly ctenoid farther backwards, extending quite across the body on its posterior third. Scales of cheeks not imbricated, similar in shape to those of body; the posterior portion of their surface covered with numerous spinules (number variable) directed upwards. Near the interorbital space these spinules cover the greater portion of each scale. These spinulose scales extend upwards level with the upper margin of the upper eye; and there are numerous scales of a similar character on the operculum, and sometimes a few upon the sub- and inter-opercula. A few isolated scales below the pectoral resemble those on the cheeks. Each of the scales on the cheeks with a distinct pit, producing a punctate appearance. In some specimens spinulose scales are scattered over the anterior parts. Scales of blind side smooth; preoperculum scaleless. Accessory lateral line of variable length, connected with the main lateral line by a branch and sometimes with a short separate row of pores above; accessory lateral line of blind side shorter. Lateral line with a bold curve, six scales high (in an oblique row) above pectoral, anteriorly decurrent to nearly its former direction. A row of pores round the lower eye. Rays of the caudal covered with scales on both blind and colored sides. A row of scales along the greater portion of the length of the central rays of the dorsal on the colored side and on a portion of the anal, but no scales upon the anterior or posterior rays of either fin on that side, nor on either dorsal or anal on the blind side. The scales of the body are largest on the posterior portion and on the caudal peduncle, where they are elongated, and measure about $\frac{5}{3\frac{1}{2}}$ in length. Color light grayish, yellowish, or reddish brown, with irregularly placed blotches of whitish on the body; often with five large light blotches along the dorsal and five along the abdominal margin. Blind side white. Dorsal fin sometimes with blotches on colored side.

Dimensions.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Total length, in inches.....	13 $\frac{3}{16}$	14 $\frac{1}{2}$	14 $\frac{5}{8}$	13 $\frac{1}{2}$	14 $\frac{1}{16}$
Greatest depth of body.....	5 $\frac{1}{4}$	5 $\frac{1}{4}$	5 $\frac{3}{8}$	5 $\frac{5}{8}$	5 $\frac{1}{4}$
Length of head.....	3 $\frac{7}{16}$	3 $\frac{1}{8}$	3 $\frac{5}{8}$	3 $\frac{3}{8}$	3 $\frac{3}{8}$
Length of snout, from a line joining the front margins of the orbits.....	$\frac{9}{16}$	$\frac{9}{16}$	$\frac{9}{8}$	$\frac{9}{8}$	$\frac{9}{8}$
Longitudinal diameter of lower orbit.....	$\frac{13}{16}$	.....	$\frac{1}{16}$	$\frac{3}{16}$	$\frac{3}{16}$
Interocular width.....	$\frac{1}{16}$	$\frac{1}{16}$	.....	$\frac{3}{16}$	$\frac{3}{16}$
Length of mandible.....	.....	.....	1 $\frac{3}{8}$	1 $\frac{1}{4}$	1 $\frac{1}{4}$
Length of pectoral, colored side.....	1 $\frac{9}{16}$	1 $\frac{3}{4}$	1 $\frac{1}{4}$	1 $\frac{9}{16}$	1 $\frac{3}{8}$
Length of pectoral, blind side.....	1 $\frac{1}{8}$	1 $\frac{1}{4}$	1 $\frac{1}{16}$	1	1
Length of ventrals.....	1 $\frac{1}{16}$	1 $\frac{1}{8}$	1 $\frac{1}{4}$	1 $\frac{1}{16}$	1 $\frac{1}{16}$
Tip of snout to origin of anal.....	4 $\frac{5}{8}$	4 $\frac{7}{8}$	5	4 $\frac{1}{2}$	4 $\frac{5}{16}$
Length of longest rays of dorsal.....	1 $\frac{1}{4}$	1 $\frac{9}{16}$	1 $\frac{9}{16}$	1 $\frac{7}{16}$	1 $\frac{7}{16}$
Width of caudal peduncle.....	1 $\frac{1}{8}$	1 $\frac{1}{16}$	1 $\frac{3}{8}$	1 $\frac{1}{4}$	1 $\frac{1}{8}$
Greatest distance from anal to straight part of lateral line.....	.....	.....	3 $\frac{3}{8}$	3 $\frac{1}{4}$	3

The accessory lateral line varies considerably. In No. 1, it can be traced to below the fortieth dorsal ray; the portion anterior to the branch connecting it with the main lateral line runs obliquely upwards to immediately below the sixth dorsal ray; and there is a short line of about eleven pores above the principal accessory lateral line, commencing at the tenth dorsal ray and continuing to the fifteenth. In No. 2, there is no second accessory row of pores, and the accessory lateral line terminates between the fifteenth and sixteenth dorsal rays. Anteriorly this line divides and again unites, surrounding a small space, and then again divides into two branches, the lower of which receives the connecting branch from the main lateral line. In No. 3, the accessory lateral line ends just behind the sixteenth dorsal ray, and has two branches inclined upward, the anterior surrounding a space. On the blind side of No. 4, I could only find ten pectoral rays. On the blind side of Nos. 4 and 5, the accessory lateral line, which ends under the 14th dorsal ray, curves boldly downwards and then backwards to meet the main lateral line, and sends a short branch obliquely forwards. On the colored side the arrangement is similar in No. 5; but in No. 4 a space is surrounded by the pores at the junction of the dorsal accessory with the branch leading to the lateral line.

This large mottled "Sole" (as it is called) is taken outside of the bay, usually, if I am rightly informed, in the vicinity of the Farallones, and is rather rare. Those brought in are usually of tolerably large size, the specimens measured being of about average dimensions. It is reputed of delicate flavor. It may be readily recognized by its light yellow tint, with white markings, its regularly oval form, and its extremely narrow interocular space.

The formulæ of the dorsal and anal in the individuals measured were as follows: No. 1, D. 78, A. 57; No. 2, D. 76, A. 61; No. 3, D. 71, A. 55; No. 4, D. 76, A. 61; No. 5, D. 84, A. 63.

In No. 4, the last two or three rays of the dorsal and anal were once bifurcate; and in both No. 4 and No. 5, those rays of the dorsal and anal

which inclined forwards (about 25 in No. 4 and about 30 in No. 5) were without scales. In Nos. 4-5, the length of the arch of the lateral line was two inches, its rise half an inch, and the number of pores between caudal and head 82 and 86 respectively.

LEPIDOPSETTA UMBROSA (Grd.) Gill.

Platichthys umbrosus Girard.

D. 85-90. A. 66-68. C. 3-12-3. P. 11-12. V. 6. L. lat. 82-86.

Body ellipsoid, regularly and about equally curved on dorsal and abdominal profiles; snout strongly curved, its curve meeting that of the dorsal outline at a considerable angle opposite the front margin of the upper orbit; lower margin of head and that of mandible almost in the same line. Greatest depth of body contained $2\frac{4}{7}$ - $2\frac{2}{3}$ times, that of head $4\frac{1}{5}$ - $4\frac{3}{4}$, in the total length; eye about 6 times, snout (measured from a line joining the anterior margins of the orbits) about $5\frac{1}{2}$ times, in the length of the head; caudal peduncle $4\frac{1}{2}$ times in the greatest depth of the body. Nostrils of colored side in a horizontal line with the centre of the interocular space, anterior tubular, posterior patulous; anterior nostril of blind side with a posterior linguiform flap. Eyes small, lateral, even in front, the upper anterior part of the orbit of the upper eye nearly reaching the dorsal outline at the point of its junction with the snout. Interocular space equal in width to about $\frac{1}{3}$ the longitudinal diameter of the eye; the surface flat, not elevated, without ridges or tubercles. Mouth small, its cleft oblique; lower jaw projecting in the closed mouth, and level with the upper margin of the lower eye; maxillary ending about half-way between the front margin of the orbit and that of the pupil. Teeth in a single row on both sides of both jaws; about 14 on the colored and 23 on the blind side of the mandible, and 20 on the colored and 23 on the blind side of the intermaxillaries in a specimen a little over 9" long. Teeth conical, rather short and stout; the largest in front of both jaws, the smallest on the colored side of the intermaxillary. Upper pharyngeal teeth in a single row of 6-8 teeth similar to those in jaws; lower pharyngeals separate, each with a double row of similar teeth. Gill-rakers short, flexible; branchiostegals seven. Dorsal commencing above anterior margin of eye; the first ray slightly turned to the left at its origin; the longest rays (about the 38th-48th) about equal in length to the pectoral of the right side, thence decreasing regularly to its termination, opposite to that of anal, at a distance from the caudal equal to about half the depth of the peduncle. Anal with a more or less conspicuous spine, very slowly increasing in height to the 30th-33th rays, which are equal in length and opposite to the longest dorsal rays. By far the larger portion of the rays of the dorsal and anal are directed backwards. Origin of anal considerably behind the pectoral base. Greatest depth between anal and straight portion of lateral line somewhat less than the length of the head. Caudal peduncle slightly wedge-shaped; caudal convex posteriorly, the central rays considerably longest; outer ray about $\frac{1}{3}$, second ray about $\frac{2}{3}$, the length

of the third ray on each side; rays usually only once bifurcate. Ventrals small; their posterior axil about half the width of the pectoral base in advance of the anterior axil of that fin, their tips extending beyond the anus; four lower rays bifurcate. Pectoral of colored side lanceolate, about half the length of the head; third ray longest, second slightly shorter; all the rays but the three uppermost once bifurcate. Pectoral of blind side shorter, the central rays longest; most of the rays once bifurcate. Scales of body and cheeks etenoid, the spines well developed, those on the cheeks similar; no stellate or rugose scales on any part. Small etenoid scales on interorbital area; snout and lower jaw scaleless. A row of etenoid scales along each ray of dorsal and anal fins on the colored side, except upon a few of the anterior rays and those posterior ones which incline forwards. The scales extend to the tips of the rays. Similar scales upon the colored side of the caudal for the greater portion of the length, and some on the outside of the pectoral. Scales of blind side smooth; preopercular bone scaleless; the other opercular bones partially so. A row of smooth scales along the front edge of each ray of the central portion of dorsal and anal on the blind side, not extending above $\frac{1}{3}$ of the length. Lateral line with about 82-86 scales; a more or less conspicuous arch above the pectoral, in most cases rising about two scales high. Accessory lateral line ending below the 23d-27th dorsal ray on the colored side, and below the 16th-24th ray on the blind side. A branch from the main lateral line joins the accessory line a little posterior to its origin, the accessory line forming an obtuse angle, or sometimes branching, at the junction. Color nearly uniform grayish brown on the colored side; blind side white. Each scale of colored side with a dark band behind the spines, then a light area. Fins on colored side nearly the same color as the body.

Dimensions.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
Total length, in inches	$9\frac{5}{8}$	$10\frac{3}{4}$	$9\frac{5}{8}$	$9\frac{5}{8}$	$8\frac{7}{8}$
Length without caudal	$9\frac{5}{8}$	9	$7\frac{1}{2}$	$7\frac{1}{2}$	7
Greatest depth of body	$3\frac{1}{2}$	$4\frac{1}{2}$	$3\frac{5}{8}$	$3\frac{3}{8}$	3
Greatest distance between anal and straight portion of lateral line	$1\frac{1}{2}$	.....	$2\frac{1}{8}$	$2\frac{1}{2}$	$1\frac{1}{2}$
Tip of lower jaw to origin of anal	$2\frac{1}{4}$	$3\frac{1}{2}$	$2\frac{1}{2}$	$2\frac{1}{4}$	$2\frac{3}{8}$
Length of head	2	$2\frac{5}{8}$	2	$2\frac{1}{2}$	$1\frac{3}{4}$
Length of snout, from upper eye	$\frac{11}{16}$	$\frac{3}{2}$	.....	.....	$\frac{1}{2}$
Longitudinal diameter of eye	$\frac{3}{8}$	$\frac{7}{16}$	$\frac{3}{8}$	$\frac{3}{8}$	$\frac{5}{16}$
Width of interocular space .....	.....	.....	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
Length of lower jaw .....	.....	.....	$\frac{3}{2}$	2	$\frac{5}{8}$
Length of pectoral, colored side	1	$1\frac{5}{8}$	$\frac{3}{2}$	$1\frac{3}{8}$	1
Length of pectoral, blind side	$\frac{3}{4}$	$1\frac{1}{2}$	$\frac{1}{2}$	$\frac{3}{4}$	$1\frac{1}{2}$
Length of ventrals .....	.....	.....	$\frac{1}{2}$	$\frac{1}{2}$	$\frac{1}{2}$
Width of caudal peduncle	$\frac{3}{2}$	$\frac{7}{8}$	$\frac{3}{2}$	$\frac{3}{2}$	$\frac{3}{2}$
Length of longest dorsal rays .....	.....	.....	$\frac{3}{2}$	$1\frac{1}{2}$	.....
Length of longest anal rays .....	.....	.....	$\frac{3}{2}$	$1\frac{1}{2}$	.....
Number of dorsal rays	88	85	90	90	85
Number of anal rays	68	66	68	67	66
Lateral line .....	.....	ca. 86	ca. 84	ca. 82	.....

This species is not brought to market in large numbers, and is sold under the name of "Sole." Those I have seen on the stalls average about the same size as those of which the measurements are given. In No. 5, the lateral line is almost straight. It is easily distinguished by its highly ctenoid scales of uniform character, its small eyes, and dull gray color.

It is evident from the dimensions of the various species given in the preceding pages, that the number of dorsal and anal fin-rays and the proportional width of the interocular space are subject to great variation in all the species. I am inclined to believe that, as a rule, the interocular space increases in proportional width with the age of the fish, since, although two fishes of the same size may differ in this respect, or the smaller of two not greatly differing in size may have the wider interorbital area, yet very large specimens invariably have this space relatively wider than very small ones. The number of pectoral rays is also inconstant.

I much regret that, as I have only seen one specimen of the *Hippoglossus* of this coast, I am at present unable to settle the question of its identity with the European species; but I expect to be able to do this before many months have passed.

In conclusion, I have to thank Mr. W. G. W. Harford, the Director of the Museum of the California Academy of Sciences, for his courtesy and his assistance in many ways.

MAY 14, 1879.

A PRELIMINARY CATALOGUE OF THE FISHES OF THE ST. JOHN'S RIVER AND THE EAST COAST OF FLORIDA, WITH DESCRIPTIONS OF A NEW GENUS AND THREE NEW SPECIES.

By G. BROWN GOODE.

In the following list are enumerated the species of fishes known, or supposed to occur, in the waters of East Florida. Those which have not been observed by the writer, or by other recent explorers, are marked by asterisks. The occurrence of all these species is almost absolutely certain, for, with one or two exceptions, they have been taken on the Atlantic coast north of Florida, and to the south and west in the Gulf of Mexico or the Antilles. Any information regarding the occurrence of these or other species in East Florida is solicited.

In a more extended paper, now almost ready for the press, the habits, geographical distribution, and economical history of these species will be discussed. Of the 223 species here catalogued, 33 only have been taken north of Cape Cod.

SMITHSONIAN INSTITUTION, May 23, 1879.

MALTHEIDÆ.

1. *Malthe cubifrons*, Richardson.
St. Augustine.
2. *Haliutichthys aculeatus*, (Mitchill) Goode.*
Described by Mitchill from the Bahama Straits in 1815.

ANTENNARIIDÆ.

3. *Pterophryne histrio*, (Linn.) Gill.
St. Augustine; mouth of St. John's.
4. *Antennarius pleurophthalmus*, Gill.*
Described from Key West.
5. *Antennarius annulatus*, Gill.*
Described from Garden Key.

ORTHAGORISCIDÆ.

6. *Mola rotunda*, Cuvier.—*Sun-fish*.
Mouth of St. John's.

DIODONTIDÆ.

7. *Chilomycterus geometricus*, (Schneider) Kaup.—*Toad-fish*; *Porgy*.
Mouth of St. John's, Indian River.
8. *Diodon hystrix*, Linn.*

TETRODONTIDÆ.

9. *Lagocephalus lævigatus*, (Linn.) Gill.—*Rabbit-fish*.
Mouth of St. John's.
10. *Cirrisomus turgidus*, (Mitchill) Jordan & Gilbert.
Mouth of St. John's.
11. *Cirrisomus testudineus*, (Linn.) Jordan & Gilbert.*—*Globe-fish*.
12. *Cirrisomus Spengleri*, (Bloch) Jordan & Gilbert.*

OSTRACIONTIDÆ.

13. *Ostracion trigonus*, Linn.
St. Augustine; Matanzas; Cumberland Island, Ga.
14. *Ostracion quadricornis*, Linn.*

BALISTIDÆ.

15. *Alutera Schœpfi*, (Walbaum) Goode & Bean
16. *Alutera scripta*, (Osbeck) Bleeker.*
17. *Monacanthus occidentalis*, Günther.
18. *Balistes capriscus*, Linn.*
19. *Balistes vetula*, Linn.*

SYNGNATHIDÆ.

20. *Syngnathus fuscus*, Storer.
St. John's River.

HIPPOCAMPIDÆ.

21. *Hippocampus antiquorum*, Linn.
St. John's River.

SOLEIDÆ.

22. *Achirus lineatus*, (Linn.) Cuvier.—*Choke-fish*.
St. John's River.
23. *Aphoristia plagiusa*, (Linn.) Jordan & Gilbert.*

PLEURONECTIDÆ.

24. *Pseudorhombus dentatus*, (Linn.) Günther.—*Flounder*.
St. John's River; St. Augustine.
25. *Pseudorhombus quadrocellatus*, (Gill) Jordan & Gilbert.*
Pensacola; Charleston.
26. *Citharichthys spilopterus*, Günther.
Mouth of St. John's.

OPHIIDIIDÆ.

27. *Leptophidum profundorum*, Gill.
Described from Gulf Stream off coast of Florida.

BLENNIIDÆ.

28. *Labrosomus nuchipinnis*, (Quoy & Gaimard) Poey.*
The Museum has specimens from South Carolina.

BATRACHIDÆ.

29. *Batrachus tau*, (Linn.) Cuv.
Mouth of St. John's.

URANOSCOPIDÆ.

30. *Uranoscopus y-græcum*, Cuv. & Val.
New Berlin; St. Augustine.
31. *Astroscopus anoplus*, (Cuv. & Val.) Brevoort.*

GOBIIDÆ.

32. ? *Gobius carolinensis*, Gill.
Arlington.
33. *Gobiosoma alepidotum*, (Schneider) Girard.*
34. *Dormitator lineatus*, Gill.*

TRIGLIDÆ.

35. *Dactylopterus volitans*, (Linn.) Cuv.
 St. Augustine; mouth of St. John's.
36. *Prionotus punctatus*, (Bloch) Cuv.*
37. *Prionotus tribulus*, Cuv. & Val.
 St. Augustine.

LABRIDÆ.

38. *Chærojulis grandisquamis*, Gill.*
 Described from Cape Hatteras, and known from no other locality.
39. *Xyrichtys lineatus*, (Gmelin) Cuv. & Val.

POMACENTRIDÆ.

40. *Glyphidodon saxatilis*, (Linn.) Cuvier.*

CHÆTODONTIDÆ.

41. *Holocanthus ciliaris*, (Linn.).*

XIPHIIDÆ.

42. *Xiphias gladius*, Linn.—*Sword-fish*
 Off mouth of St. John's.
43. *Tetrapturus albidus*, Poey.*
44. *Tetrapturus amplus*, Poey.*
45. *Histiophorus gladius*, (Brouss.).
 Between Savannah and Indian River, April, 1879.

TRICHIURIDÆ

46. *Trichiurus lepturus*, Linn.
 Jacksonville and elsewhere.

SCOMBRIDÆ.

47. *Orcynus alliteratus*, (Rafinesque) Gill.*
48. *Sarda pelamys*, (Linn.) Cuv.*
49. *Cybium maculatum*, (Mitchill) Agassiz.—*Spanish Mackerel*.
50. *Cybium regale*, (Bloch) Cuvier.—*King-fish*.
51. *Cybium caballa*, Cuv. & Val.—*King-fish*.

CARANGIDÆ.

52. *Vomer setipinnis*, (Mitchill) Ayres.*
53. *Selene geometrica*, (Mitchill) Goode.*
54. *Argyreus vomer*, (Linn.) Cuv. & Val.
 St. John's River, at Jacksonville.
55. *Decapterus punctatus*, (Agassiz) Gill.*
56. *Decapterus macarellus*, (Cuv. & Val.) Poey.*
57. *Trachurops crumenophthalmus*, (Bloch) Gill.*

58. *Paratractus pisquetus*, (Cuv. & Val.) Gill.*
 59. *Carangus hippos*, (Linn.) Gill.—*Crerallé*.
 Mouth of St. John's River.
 60. *Carangus fallax*, (Cuv. & Val.) Girard.*
 61. *Carangus chrysos*, (Mitchill) Girard.
 St. John's River, near its mouth.
 62. *Carangops falcatus*, (Holbrook) Gill.*
 63. *Carangoides cibi*, Poey.*
 64. *Blepharis crinitus*, (Akerly) DeKay.*
 65. *Chloroscombrus chrysurus*, (Linn.) Gill.
 St. John's River, at Arlington.
 66. *Trachynotus carolinus*, (Linn.) Gill.—*Pompano*; *Jack* (St. Augustine).
 Frequently taken at the mouth of the St. John's.
 67. *Trachynotus ovatus*, (Linn.) Günther.*
 68. *Trachynotus glaucus*, (Bloch) Cuv. & Val.*
 69. *Trachynotus goreensis*, Cuv. & Val.*
 70. *Naucrates ductor*, (Linn.) Rafinesque.—*Pilot-fish*.
 71. *Seriola fasciatus*, (Bloch) Cuv. & Val.*
 72. *Seriola zonata*, (Mitchill) Cuv. & Val.*
 73. *Seriola Boscii*, Cuv. & Val.*
 Originally described from South Carolina. It should be looked for.

STROMATEIDÆ.

74. *Peprilus alepidotus*, (Linn.) Cuvier.
 Fernandina.

BRAMIDÆ.

75. *Pteraclis carolinus*, Cuv. & Val.*
 Originally described from the Carolinas. To be looked for.

BERYCIDÆ.

76. *Holocentrum rufum*, (Walbaum) Goode.*

SCLENIDÆ.

77. *Cynoscion carolinensis*, (Cuv. & Val.) Gill.—*Sea Trout*.
 Very common.
 78. *Cynoscion regalis*, (Schneider) Gill.*
 The occurrence of this species needs confirmation.
 79. *Cynoscion nothus*, (Holbrook) Gill.—*Shad Trout*.
 Mouth of the St. John's and St. Augustine.
 80. *Cynoscion thalassinus*, (Holbrook) Gill.
 A species of doubtful permanence.
 81. *Pogonias chromis*, (Linn.) Cuvier.—*Drum*.
 Very common.
 82. *Liostomus xanthurus*, Lacépède.*
 Doubtfully distinct from *L. philadelphicus*.

83. *Liostomus philadelphicus*, (Linn.) Goode.—*Bezuga* or *Masooka*; *Oldwife* or *Spot*.
Very common.
84. *Stelliferus lanceolatus*, (Holbrook) Gill.
Matanzas River Inlet.
85. *Bairdiella argyroleuca*, (Mitchill) Gill.—*Yellow-tail*.
Very common.
86. *Sciænops ocellatus*, (Linn.) Gill.—*Channel Bass*; *Red-fish*; *Red Horse*.
Very common.
87. *Menticirrus alburnus*, (Linn.) Gill.—*Whiting*
Very common.
88. *Menticirrus nebulosus*, (Mitchill) Gill.
The southern range of this species needs determination.
89. *Menticirrus littoralis*, (Holbrook) Gill.*
No specimens observed.
90. *Micropogon undulatus*, (Linn.) Cuv. & Val.—*Croaker*.
Very common.
91. *Larimus fasciatus*, Holbrook.*
The southern range of this species needs determination.

GERRIDÆ.

92. *Eucinostomus argenteus*, B. & G.*

PIMELEPTERIDÆ.

93. *Pimelepterus Boscii*, Cuv. & Val.*

SPARIDÆ.

94. *Lagodon rhomboides*, (Linn.) Holbrook.—*Sailor's Choice*.
Very common.
95. *Archosargus probatocephalus*, (Walbaum) Gill.—*Sheephead*.
Very common.
96. *Stenotomus argyrops*, (Linn.) Gill.*
The southern limit of this species needs determination.
97. *Sparus chrysops*, Linn.,* (= *Sparus aculeatus*).
98. *Sargus Holbrookii*, Bean.*
Charleston.
99. *Pagrus argenteus*, Schneider.*
Charleston.

PRESTIPOMATIDÆ.

100. *Hæmulon arcuatum*, Cuv. & Val.—*Squirrel-fish*?
St. Augustine.
101. *Hæmulon formosum*, (Linn.) Cuvier.*—Probably the *Pig-fish* or *Grunt* of Indian River.
102. *Hæmulon chrysopterum*, (Linn.) Cuvier.—Probably the *Flannel-mouth Porgy* of the Mayport fishermen.
103. *Pristipoma fulvomaculatum*, (Mitchill) Günther.*
Proc. Nat. Mus. 79—8 **Sept. 19, 1879.**

104. *Anisotremus virginicus*, (Linn.) Gill.*
 105. *Rhomboplites aurorubens*, (Cuv. & Val.) Gill.*
 106. *Lutjanus Blackfordii*, Goode & Bean.—*Red Snapper*.
 St. John's Bar.

107. *Lutjanus caxis*, (Schneider) Pöey.*—*Gray Snapper*.

The occurrence of this species on east coast of Florida is probable, yet not demonstrable.

108. *Ocyurus melanurus*, (Linn.) Goode.*
 Occurs at the Bahamas.

APHODODERIDÆ.

109. *Aphododerus Sayanus*, (Gilliams) DeKay.*

CENTRARCHIDÆ.

110. *Chænobryttus viridis*, (Cuv. & Val.) Jordan.—*War-mouth Perch*.
 St. John's and tributaries.

111. *Ambloplites rupestris*, (Raf.) Gill.*

112. *Lepiopomus mystacalis*, (Cope) Jordan.
 Attributed to Florida by Jordan.

113. *Lepiopomus apiatus*, Cope.—*Chinquapiu Perch*.
 Arlington and Jacksonville.

114. *Lepiopomus elongatus*, (Holbrook) Gill & Jordan.
 Not seen. Described from St. John's by Holbrook.

115. *Lepiopomus auritus*, (Linn.) Raf.—*Red-bellied Perch*.
 St. John's and tributaries.

116. *Lepiopomus incisor*, (Cuv. & Val.) Goode & Bean.—*Copperhead Bream*.
 St. John's and all fresh and brackish waters in Florida.

117. *Xystroplites gillii*, Jordan.*
 Described from Key West.

118. *Xystroplites longimanus*, Cope.
 Described from "Florida."

119. *Xenotis marginatus*, (Holbr.) Jordan.
 Not seen; described from St. John's.

120. *Eupomotis aureus*, (Walbaum) Gill & Jordan.—*Bream*.
 Common in all fresh waters of Florida.

121. *Eupomotis speciosus*, (Holbrook) Gill & Jordan.—*Bream*.
 Common in St. John's.

122. *Enneacanthus obesus*, (Girard) Gill.
 Not seen; identified by Jordan with *Bryttus fasciatus* Holbrook, described from the St. John's.

123. *Enneacanthus gloriosus*, (Holbr.) Jordan.
 Florida, *fidè* Jordan.

124. *Enneacanthus milnerianus*, Cope.
 Florida, *fidè* Cope.

125. *Pomoxys nigromaculatus*, (Les.) Girard.—*Speckled Perch*.
 St. John's and tributaries.

126. *Micropterus pallidus*, (Raf.) Gill & Jordan.—*Trout*.
Common in all fresh and brackish water.

SERRANIDÆ.

127. *Promicropterus maculatus*, (Holbrook) Gill.*
128. *Epinephelus morio*, (Cuv. & Val.) Gill.—*Brown Snapper*.
St. John's Bar, etc.; Indian River.
129. *Epinephelus nigritus*, (Holbrook) Gill.—*Black Grouper*; *Warsaw* (West Florida).
Indian River.
130. *Epinephelus niveatus*, Val.*
131. *Epinephelus Drummond-Hayi*, Goode & Bean.
132. *Trisotropis brunneus*, Poey.*
133. *Centropristis atrarius*, (Linn.) Barnev.—*Black-fish*.
Entire eastern coast.
134. *Promicrops guasa*, (Poey) Gill.
New Berlin, etc.
135. *Triloburus trifurcus*, (Linn.) Gill.*
Has this species been observed since the days of Linnæus and Garden?
136. *Diplectrum fasciculare*, (Cuv. & Val.) Holbrook.*
137. *Dules auriga*, Cuv. & Val.*

CENTROPOMIDÆ.

138. ? *Centropomus undecimalis*, Cuv. & Val.
Jupiter Inlet.

LABRACIDÆ.

139. *Roccus lineatus*, (Bloch) Gill.—*Rock-fish*.
St. John's River.

EPHIPPIIDÆ.

140. *Parephippus quadratus*, (Gmel.) Gill.*
141. *Parephippus faber*, (Cuv.) Gill.*

LOBOTIDÆ.

142. *Lobotes surinamensis*, (Bloch) Cuvier.—*Grouper*.
St. John's River, at Arlington.

POMATOMIDÆ.

143. *Pomatomus saltatrix*, (Linn.) Gill.—*Skip-jack*; *Saltwater-jack*.

ELACATIDÆ.

144. *Elacate canadus*, (Linn.) Gill.—*Sergeant-fish* (Indian River); *Cobia* (Brunswick, Ga.).
Indian River (S. C. Clarke). Brunswick, Ga.

CHILODIPTERIDÆ.

145. *Apogonichthys americanus*, Castelnau.*

PRIACANTHIDÆ.

146. *Priacanthus macrophthalmus*, Cuv.*

ECHENEIDIDÆ.

147. *Echeneis naucrateoides*, Zuiew.*
 148. *Echeneis naucrates*, Linn.
 Mouth of St. John's.
 149. *Rhombochirus osteochir*, (Cuv.) Gill.*
 150. *Remora brachyptera*, (Lowe).*
 151. *Remora jacobæa*, (Lowe) Gill.*

SPHYRÆNIDÆ.

152. *Sphyræna picuda*, Schn.*
 South Florida (Blackford).

MUGILIDÆ.

153. *Mugil albula*, Linn.—*Striped Mullet*.
 St. John's River and coast.
 154. *Mugil brasiliensis*, Agassiz.—*White Mullet*.

ATHERINIDÆ.

155. *Chirostoma peninsulæ*, Goode & Bean.*
 Lake Monroe.
 156. *Chirostoma vagrans*, Goode & Bean.*

BELONIDÆ.

157. *Belone longirostris*, (Mitchill) Gill.
 St. John's River.
 158. *Belone hians*, Cuv. & Val.*
 159. *Belone latimanus*, Poey.*
 160. *Belone notata*, Poey.*

SCOMBERESOCIDÆ.

161. *Exocætus*, sp.
 162. *Hemorhamphus unifasciatus*, Ranzani.*
 163. *Euleptorhamphus longirostris*, (Cuv. & Val.) Gill.*
 164. *Scombresox saurus*, (Walb.) Günther.*
 The southern limit of this species should be made out.

* For descriptions of these two species see paper following this, "Catalogue of a Collection of Fishes sent from Pensacola, Florida, and Vicinity, by Mr. Silas Stearns, with Descriptions of Six New Species."

ESOCIDÆ.

165. *Esox phaleratus*, Say. (Doubtful species.)

Described from a locality between Tokoi and St. Augustine.

166. *Esox reticulatus*, Le Sueur?—*Jack*.

167. *Esox Ravenelii*, Holbrook.*

CYPRINODONTIDÆ.

168. *Cyprinodon variegatus*, Lacépède.

St. Augustine; Lake Monroe.

169. *Jordanella floridae*, gen. et sp. nov., Goode & Bean.

Three specimens, of a remarkable type, allied to *Cyprinodon*, were collected in Lake Monroe, Florida, by Professor Baird (No. 18062), associated with *C. variegatus*. The species appears to be generically distinct from *Cyprinodon*, and the genus, for which the name *Jordanella* is proposed, in honor of Prof. D. S. Jordan, is characterized by its long dorsal and anal fins, the dorsal having 16 rays, preceded by a stout, thick spine, the anal I, 12 or 13, and by the position of the ventrals, which are situated in advance of the dorsal, and also by the advanced position of the anal, the posterior end of which is in advance of that of the dorsal. In other respects it agrees with *Cyprinodon*.

The species may be characterized as follows:

Diagnosis.—Height of body contained $2\frac{1}{4}$ to $2\frac{1}{2}$ times in total length without caudal ($2\frac{1}{2}$ to $2\frac{3}{4}$ times with caudal). Humeral scale behind gill-opening equal to or little larger than the others. Snout as in *Cyprinodon variegatus*. Diameter of eyes contained $3\frac{1}{2}$ times in length of head, and equal to $\frac{2}{3}$ of the width of the interorbital space. Origin of dorsal midway between end of snout and base of caudal, and above the ninth or tenth scale of the lateral line, and is behind the vertical from the root of the ventrals. Pectoral as long as the caudal, and $\frac{2}{3}$ as long as the head. The ventral reaches to the vent, its length equal to half that of the head. The origin of the anal is under the fifth dorsal ray, and its posterior ray is in advance of the last dorsal ray. Mandible about as long as the eye. The sexual characters cannot be made out from the series of specimens studied by us. Color olivaceous above, yellowish brown below, with traces of vertical bands of blackish brown, and with longitudinal lines upon each series of scales, resembling those in *Mollienesia*, but less conspicuous. A blackish blotch upon the side, under the origin of the dorsal, and about as large as the eye; a smaller one on the posterior limb of the dorsal.

D. I, 16; A. I, 12-13. L. lat. 25-26; L. transv. 12.

170. *Zygonectes chrysotus*, (Günther) Jordan.

St. Augustine; Arlington.

171. *Fundulus seminolis*, Girard.

Lake Monroe. (Described from Palatka.)

172. *Fundulus floridensis*, Le Sueur.

Described from "Charlotte Bay" (*sic*), Florida.

173. *Fundulus confluentus*, sp. nov., Goode & Bean.

A single specimen (No. 18065) obtained by Professor Baird in Lake Monroe.

Height of body a little less than four times in total length (without caudal); length of head two-sevenths. Head low, flat. Snout not produced, its length equal to that of the eye. Mandible equal to the eye. Width of interorbital space half that of the head. Diameter of eye contained four times in length of head, and twice in width of interorbital space. Origin of the dorsal midway between the tip of the caudal and the middle of the eye. First anal ray under second dorsal ray. Anal higher than long. Yellowish gray, with longitudinal lines down the center of each dorsal and lateral row of scales, and with fourteen or more distinct, irregular, vertical bands. In general appearance it resembles *Hydrargyra majalis*. The scales are much crowded, there being at least 45 transverse rows of scales. There appear to be only five branchiostegals, though this point is not certainly ascertained, the specimen being imperfect.

D. 10; A. 10; V. 6.

174. *Fundulus heteroclitus*, (Linn.) Gill.

And other species?

175. *Hydrargyra swampina*, Lac.*

Described from Florida.

176. *Hydrargyra majalis*, (Walb.) Val.

Mouth of St. John's.

177. *Gambusia arlingtonia*, sp. nov., Goode & Bean.

Numerous specimens (No. 21308) obtained in the Arlington River.

Height of body contained four times in total length, without caudal; the length of the head three and one-third. Snout broad, lower jaw projecting. Diameter of eye much greater than length of snout (double in young), one-third to two-fifths (in young) of that of the head, and two-thirds the width of the interorbital space. My specimens appear to be both females. In them the origin of the dorsal is midway between the tip of the tail and the posterior margin of the eye and opposite the sixth anal ray. The pectoral fins extend to the vertical from the insertion of the ventrals, which terminate at the vent and in front of the anal; length of base of anal equal to half its distance from the insertion of the caudal. Color uniform brownish olive. In the smaller specimens two or three series of blackish dots on the dorsal and anal fins.

D. 9; A. 11; V. 6. L. lat. 33; L. transv. 11.

178. *Gambusia Holbrooki*, (Agassiz) Girard.

Described from Palatka.

179. *Mollinesia latipinna*, Le Sueur.
 St. Augustine.
180. *Girardinus formosus*, Agassiz.
 Specimens obtained in Florida by Mr. T. Glover.

SYNODONTIDÆ.

181. *Trachinocephalus myops*, (Schneider) Gill.*
182. *Synodus fœtens*, (Linn.) Gill.*

ALBULIDÆ.

183. *Albula vulpes*, (Linn.) Goode.*

ELOPIDÆ

184. *Megalops cyprinoides*, (Bloch).—*Tarpum*; *Jew-fish*.
185. *Elops saurus*, Linn.*

CLUPEIDÆ.

186. *Brevoortia tyrannus*, (Latrobe) Goode.—*Fat-back*.
 St. John's and coast.
187. *Alosa sapidissima*, (Wilson) Linsley.—*White Shad*.
 St. John's and coast.
188. *Opisthonema thrissa*, (Linn.) Gill.*
189. *Pomolobus æstivalis*, (Mitch.) Goode & Bean.—*Herring*.
 St. John's.
190. *Pomolobus mediocris*, (Mitchill) Gill.—*Hickory Shad*.
 St. John's.
191. *Dorosoma Cepedianum*, (Lacépède) Gill.—*Stink Shad*.
 St. John's.

CYPRINIDÆ.

192. *Notemigonus americanus*, (Linn.) Jordan.—*Silver-fish*.
193. *Erimyzon Goodei*, Jordan, sp. nov.—“*Goode's Sucker*.”
194. Unknown species.
 Arlington.
195. Unknown species.
 Arlington.

SILURIDÆ.

196. *Ichthælorus punctatus*, (Raf.) Jordan.—*Channel Cat*; *Small-mouth Cat*.
 St. John's.
197. *Amiurus erebennus*, Jordan.—“*Goode's Cat-fish*.”
 St. John's and Arlington River.
198. *Amiurus nigricans*, (Les.) Gill.—*Mud Cat*.
 St. John's.
199. *Ælurichthys marinus*, (Mitchill) B. & G.—*Sea Cat-fish*; *Gaff-top-sail*.
 St. John's.
200. *Ariopsis felis*, (Linn.) Gill & Jordan.
 Coast.

ANGUILLIDÆ.

201. *Anguilla vulgaris*, Turton.

CONGRIDÆ.

202. *Conger oceanica*, (Mitch.) Gill.

ACIPENSERIDÆ.

203. *Acipenser*, sp.
Common in St. John's.

LEPIDOSTEIDÆ.

204. *Lepidosteus osseus*, (Linn.) Ag.—*Gar Pike*.
St. John's.
205. *Lepidosteus platystomus*, Raf.—*Alligator Gar*.
St. John's.

AMIIDÆ.

206. *Amia calva*, Linn.—*Mud-fish*.

CEPHALOPTERIDÆ.

207. *Ceratoptera birostris*, (Walbaum) Goode.—*Devil-fish*.
Coasts.

MYLIOBATIDÆ.

208. *Myliobatis Fremenvillei*, (Les.) Stover.
209. *Rhinoptera quadriloba*, (Le Sueur) Cuvier.—*Clam-cracker*.
St. John's.
210. *Ætobatis narinari*, M. & H.*

TRYGONIDÆ.

211. *Pteroplatea maclura*, Müll. & Henle.—*Sun-fish*.
Indian River.
212. *Trygon sabina*, Le Sueur.—*Stingaree*.
St. John's River.

RAIIDÆ.

213. *Raia Desmarestia*, Le Sueur, (= *R. eglanteria*?).
Described from Florida.

PRISTIDÆ.

214. *Pristis antiquorum*, (Linn.) Lath.

ALOPECHIDÆ.

215. *Alopias vulpes*, (Linn.) Bon.*

SPHYRNIDÆ.

216. *Sphyrna zygaena*, (Linn.) Müll. & Henle.
Indian River.
217. *Reniceps tiburo*, (Linn.) Gill.

GALEORHINIDÆ.

218. *Isogomphodon maculipinnis*, Poey.*
219. *Galeocerdo tigrinus*, Müll. & Henle.*
220. *Eulamia Milberti*, (Müll. & Henle) Gill.
Indian River.

GINGLYMOSTOMATIDÆ.

221. *Ginglymostoma cirratum*, (Gmel.) M. & H.

PETROMYZONTIDÆ.

222. *Petromyzon marinus*, Linn.—*Lamper-eel*.

BRANCHIOSTOMIDÆ.

223. *Branchiostoma lubricum*, Costa.

CATALOGUE OF A COLLECTION OF FISHES SENT FROM PENSACOLA, FLORIDA, AND VICINITY, BY MR. SILAS STEARNS, WITH DESCRIPTIONS OF SIX NEW SPECIES.

By G. BROWN GOODE and TARLETON H. BEAN.

The publication of the following list of fishes, collected by Mr. Stearns in the vicinity of Pensacola, Florida, is a preliminary step to the work of identifying and describing the large collections from the Gulf of Mexico now in the possession of the National Museum.

The fishes enumerated below were obtained in the winters of 1877-8 and 1878-9 by Mr. Stearns in the leisure hours of an active business life. Many of the larger species were forwarded to Washington in ice, and casts of them have been made in plaster. Mr. Stearns has usually sent interesting notes with each specimen, relating to the life-history of the species. We have refrained from publishing these, hoping that he will himself give them to science in a more complete form.

The common names published are those in use at Pensacola. The numbers in parentheses following the Museum catalogue numbers refer to Mr. Stearns's collecting record.

SMITHSONIAN INSTITUTION, *Washington, May 27, 1879.*

1. MALTHEIDÆ.

1. *Malthe cubifrons* Richardson.

A single specimen, No. 22,833, was sent by Mr. Stearns. The Museum has other specimens from West Florida—Nos. 21,467, 5,768, and 20,485. The radial formula in all is D. 4; A. 4; V. I, 5; P. 13. No. 21,467 is 12½ inches long, an enormous size for this fish.

2. DIODONTIDÆ.

2. *Chilomycterus geometricus* (Linn.) Kamp.—*Puff-fish*.

Two specimens, No. 21,492 (61), in alcohol, each about 6 inches in length, were sent; also a beach-dried specimen, No. 21,334 (19), somewhat longer. The coloration of the alcoholic specimen is peculiar, and it might at first sight be thought to belong to variety γ as defined by Günther. The ground-color is very dark, but a close examination reveals the irregularly parallel longitudinal lines characteristic of the species in its typical form.

3. TETRODONTIDÆ.

3. *Cirrisomus turgidus* (Mitch.) Jordan & Gilbert.—*Toad-fish*.

A single specimen, No. 21,495 (51), $5\frac{3}{4}$ inches in length.

4. *Lagocephalus lævigatus* (Linn.) Gill.

A single specimen, 19 inches in length, No. 22,807. D. 14; A. 12; P. 16. Caudal deeply forked. Spines 4-rooted. Length of head less than its distance from dorsal, and contained $3\frac{2}{3}$ times in length without caudal.

4. OSTRACIONTIDÆ.

5. *Ostracion quadricornis* Linn.—*Cow-fish*.

A single specimen, No. 21,310.

5. BALISTIDÆ.

6. *Alutera Schœpffi* (Walb.) Goode & Bean.

A specimen, No. 6,068, 16 inches in length, was sent from Cedar Keys, Fla., by Judge Steele, about 1864. D. 32; A. 35; P. 12; C. 12.

7. *Monacanthus occidentalis* Günther.

A bottle, No. 9,686, containing numerous specimens of this species, is labelled "Cedar Key, West Florida," and another, No. 5,868, contains two specimens from Charlotte Harbor, collected by C. B. Baker. This species doubtless occurs at Pensacola.

No. 5,868 (*a*). D. 31; A. 29.

No. 5,868 (*b*). D. 35; A. 32.

Monacanthus spilonotus, described by Cope* from the Gulf of Mexico, should also be looked for in this region.

8. *Balistes capriscus* Linn.—*Leather Jacket*.

A fine specimen, No. 21,220 (4), 21 inches in length.

* Trans. Amer. Philos. Soc. 1870, p. 476.

6. HIPPOCAMPIDÆ.

9. *Hippocampus antiquorum* Linn.—*Sea Horse*.

A single specimen was received from Mr. Stearns, No. 21,335 (15). The Museum possesses another, No. 6,933, from Pensacola, received from an unknown contributor.

In No. 6,933, a female, the head is contained $5\frac{1}{2}$ times in total length. There are 12 body rings and 34 caudal rings.

No. 21,335, a female, is a dried specimen in bad order, which appears to agree essentially with No. 6,933. It has 12 body rings and 33 caudal rings, and 19 rays in the dorsal.

7. SYNGNATHIDÆ.

10. *Syngnathus* sp.

A single individual, too young for identification, was sent by Mr. Stearns.

8. SOLEIDÆ.

11. *Achirus lineatus* (Linn.) Cuvier.—*Flounder*."

Two specimens were received. These are remarkable in the fact that the ventral surfaces are immaculate, while all specimens of this species from the Eastern and Middle States are strongly maculated with black or brown, except a few from the Potomac River. Others from the Potomac are maculated. How is it with the species on the South Atlantic coast?

No. 21,496 (a). D. 54; A. 43; P. 0; V. 4; C. 16. L. lat. 78.

No. 21,496 (b). D. 58; A. 43; P. 0; V. 4. L. lat. 76.

9. PLEURONECTIDÆ.

12. *Citharichthys spilopterus* Günther.

?? *Citharichthys microstomus* GILL, Proc. Acad. Nat. Sci. Phila. 1864, p. 223.

An individual, No. 21,500, from Pensacola, Fla., Silas Stearns, 5 inches in length. D. 78; A. 54; P. I, 10; C. 17; V. 6. L. lat. 47; L. trans. $\frac{1}{5}$.

No. 18,054, an individual $3\frac{3}{4}$ inches long, was received from mouth of St. John's River, Fla., through Prof. S. F. Baird. D. 81; A. 64; P. I, 8; C. 17; V. 6. L. lat. 47; L. trans. $\frac{1}{5}$.

Günther's types, from Bahia, Santo Domingo, New Orleans, Jamaica, and West Africa, had the following radial formulæ: D. 76-78; A. 60-63; L. lat. 47-50. Gill's type, from Beesley's Point, had the following: D. 81; A. 58; C. 18; P. 10; V. 6. L. lat. 42; L. trans. $\frac{1}{4}$??.

Our specimens agree very satisfactorily with both diagnoses, except in the number of transverse rows of scales, as given by Gill.

13. *Pseudorhombus dentatus* (Linn.) Günther.—*Flounder*.

Two specimens, No. 21,340 (21), were received. That the Flounder of the South cannot be distinguished from the supposed different species

Table of Measurements—Continued.

Current number of specimen	9,388 b.		19,052.		19,049.		21,279 b.	
Locality	Indianola, Texas.		St. John's River, Florida.		St. John's River, Florida.		Florida.	
	Milli-metres.	100ths of length.	Milli-metres.	100ths of length.	Milli-metres.	100ths of length.	Milli-metres.	100ths of length.
Extreme length (without caudal) ..	236	.....	156	.....	170	.....	237	.....
Body:								
Greatest height		44						
Least height of tail		10						
Head:								
Greatest length		26½				28		28
Width of interorbital area		4						
Length of snout		7						
Length of upper jaw		14		13		14½		14
Length of mandible		17		16		17		17
Diameter of orbit		4						
Dorsal:								
Distance from snout		5						
Length of longest ray		11		12		12		
Anal:								
Length of longest ray		12		12½		13		
Caudal:								
Length of middle rays				23				
Dorsal	87	.....	89	.....	85	.....	86	.....
Anal	66	.....	67	.....	68	.....	68	.....
Current number of specimen	9,388.		4,887.		19,476 a.		19,476 b.	
Locality	Indianola, Texas.		"albigutta," type.		Eastern Shore of Virginia.		Eastern Shore of Virginia.	
	Milli-metres.	100ths of length.	Milli-metres.	100ths of length.	Milli-metres.	100ths of length.	Milli-metres.	100ths of length.
Extreme length (without caudal) ..	174	.....	123	.....	136	.....	111	.....
Length to end of middle caudal rays.	209	.....	147	.....	166	.....	
Body:								
Greatest height		42		43		44		43
Height at ventrals		30		33		32		
Least height of tail		10		11		11		
Head:								
Greatest length		27		29½		28		27
Width of interorbital area		3		2		3		
Length of snout		6		6		5½		
Length of upper jaw		14		15		13		13
Length of mandible		16		17		15		15
Diameter of orbit		4½		6				
Dorsal:								
Distance from snout		7		7				
Length of longest ray		10½		12		12		12½
Anal:								
Distance from snout		32		33				
Length of longest ray		10		13½		12		13
Caudal:								
Length of middle rays		20		21		22		
Length of external rays		15		17				
Pectoral:								
Distance from snout		27		31				
Length				15				
Ventral:								
Distance from snout		25		28				
Length		8		10				
Dorsal	83	.....	76	.....	88	.....	84	.....
Anal	64	.....	60	.....	68	.....	65	.....

Table of Measurements—Continued.

Current number of specimen	17,121.		17,122.		17,115.	
	Charleston, South Carolina.		Charleston, South Carolina.		Charleston, South Carolina.	
Locality	Milli- metres.	100ths of length.	Milli- metres.	100ths of length.	Milli- metres.	100ths of length.
Extreme length (without caudal)	172	.....	171	.....	188	.....
Head:						
Greatest length		26				29½
Length of upper jaw		11½		12½		14
Length of mandible		14½		15		17½
Dorsal:						
Length of longest ray		12				
Anal:						
Length of longest ray		13				
Dorsal	88	.....			90	.....
Anal	67	.....			70	.....
Current number of specimen	21,279.		18,048.		8,436.	
Locality	St. John's River, Florida.		Florida.		Paraguay.	
	Milli- metres.	100ths of length.	Milli- metres.	100ths of length.	Milli- metres.	100ths of length.
Extreme length (without caudal)	405	.....	178	.....	256	.....
Length to end of middle caudal rays	486	.....	218	.....	315	.....
Body:						
Greatest height		46		44		46
Height at ventrals		32		33		31
Least height of tail		11		12		12
Length of caudal peduncle (end of dorsal to origin of middle caudal rays)		10		10½		11
Head:						
Greatest length		28		27		28
Width of interorbital area		4½		2½		2½
Length of snout		6		6		6
Length of operculum		8		7		
Length of upper jaw		13½		12½		13
Length of mandible		16½		15		16
Diameter of orbit		3½		5½		4½
Dorsal:						
Distance from snout		6½		5		7
Length of longest ray		11		11½		11
Anal:						
Distance from snout		33		30		29
Length of longest ray		11½		11		10½
Caudal:						
Length of middle rays		20		22		23
Length of external rays		17½		18		19
Pectoral:						
Distance from snout		27		26		27½
Length		13½		13½		13
Ventral:						
Distance from snout		26½		24½		25
Length		8½		8		8
Dorsal	85	.....	79	.....	74	.....
Anal	68	.....	60	.....	57	.....
Pectoral	II, 10	.....			
Ventral	6	.....			
Number of scales in lateral line	101	.....			100	.....

14. *Pseudorhombus quadrocellatus* (Gill) Jordan.*Ancylopssetta quadrocellata* GILL, Proc. Acad. Nat. Sci. Phila. 1864, p. 224.

This species was originally described from specimens obtained at Pensacola.

10. BATRACHIDÆ.

15. *Batrachus tau* Linn.—“*Sarpo*”; *Sea Robin*.

A specimen of this species, No. 21,477 (27), corresponds closely in coloration with the southern specimens referred to by Günther.

Other individuals were obtained, which had grown to the size of 12 or 15 inches, and which, if coloration were accepted as a mark of specific rank, would surely be entitled to description as new species. The ground-color is gray or yellowish white, covered with large irregular blotches and small roundish spots of brown. The type of coloration is very different from that described by Günther from southern specimens in the British Museum. A fuller description of these specimens with measurements will be given hereafter.

11. GOBIIDÆ.

16. *Gobius soporator* Cuv. & Val.

A single specimen, No. 22,852, $2\frac{1}{4}$ inches in length, of a species of *Gobius*, was sent by Mr. Stearns. It is so shrivelled up from immersion in too strong alcohol that its characters are not very clearly to be made out. It agrees very well with the descriptions of *Gobius soporator*, and is very like specimens of that species from the Bermudas, except that the fins are blackish, and, unlike the Bermuda specimens, show no spots.

17. *Eleotris gyrinus* Cuv. & Val.

A single specimen, No. 22,853, of an *Eleotris*, agrees essentially with the descriptions of *E. gyrinus* and with specimens sent under this name from Cuba by Professor Poey.

12. TRIGLIDÆ.

18. *Dactylopterus volitans* (Linn.) Lac.

A single specimen, $6\frac{1}{2}$ inches in length, and measuring between the tips of the extended fins $8\frac{1}{2}$ inches. D. I, IV, I, 8; A. 6; P. 6, 22; V. 7; C. 5, 4.

In the young, the proportional length of the preopercular spines is greater than in the adult, equalling the greatest width of the head. The scales upon the flanks are conspicuously carinate, in the first and fourth rows from the abdominal flat surface showing a tendency to form strong ridges upon the sides of the body. The first and second rays of the first dorsal are separated from the other rays of this fin, and when the fin is closed and resting in the dorsal groove the first ray falls back upon the dorsal surface upon the right-hand side, the second upon the left embracing the fin. These rays resemble filaments, and it seems probable that they have independent motion, like the filaments of *Lophius*. They are never received into the dorsal groove. The fins are

dark, and show no traces of the circular blue spots often seen in individuals of this species. The colors are dull and little conspicuous.

19. *Prionotus tribulus* Cuv. & Val.

A single individual, No. 22,820, $5\frac{2}{5}$ inches in length. D. X, 12; A. 10; P. 13 + 3; V. I, 5; C. 4 + 11 + 3.

13. POLYNEMIDÆ.

20. *Polynemus octonemus* Girard.

Several specimens of this interesting species were obtained, notes upon which are given below.

No. 22,821 (70). Length $4\frac{1}{5}$ inches. D. II, VI, I, 12; A. II, 12; P. filaments 8; V. I, 5.

No. 22,822 (71). Two specimens, $3\frac{2}{5}$ inches and $3\frac{3}{10}$ inches in length. D. II, VI, I, 12; P. filaments 8; A. II, 12; V. I, 5. L. lat. 62.

No. 22,822. D. II, VI, I, 11; A. II, 13; P. filaments 8; V. I, 5. L. lat. 58.

No. 22,823. Length $4\frac{1}{10}$ inches. D. II, VI, 12; A. II, 13; P. filaments 8; V. I, 5. L. lat. 60.

14. TRICHIURIDÆ.

21. *Trichiurus lepturus* Linn.

Two specimens, No. 22,802 (102), $22\frac{1}{2}$ inches long, and No. 22,817 (112), 20 inches long.

22,802. D. 130; P. 11.

22,817. D. 118; P. 11.

15. SCOMBRIDÆ.

22. *Orcynus alliteratus* (Raf.) Gill.

A single specimen, No. 22,815 (92), 13 inches long, weighing $\frac{3}{4}$ of a pound, was sent by Mr. Stearns.

This specimen is interesting as being the only young individual taken on this side of the Atlantic.

A few irregularly distributed dark spots about the size of the pupil of the eye occur on the sides of the body below the pectoral.

23. *Cybium maculatum* (Mitchill) Cuvier.—*Spanish Mackerel*.

A single specimen, No. 21,333 (35), $14\frac{1}{2}$ inches in length, was sent by Mr. Stearns. There are about fifteen large spots between the branchial opening and the base of the caudal. D. 18 + 17, VII; A. 16, IX; P. 18; V. 6. Teeth, $\frac{16-14}{11-7+}$.

A young specimen, No. 7,310, $9\frac{1}{2}$ inches long, was sent from West Florida by C. B. Baker.

16. CARANGIDÆ.

24. *Decapterus punctatus* (Mitch.) Gill.

A single specimen, No. 22,819, was sent by Mr. Stearns. D. VIII, I, 27+1, 25+1; P. II, 18; V. I, 5. L. lat. 85.

25. *Paratractus pisquetus* (Cuv. & Val.) Gill.—*Hard Tail*.

An individual of 11 inches, No. 21,257, was sent. D. VIII, 25; A. 22; P. 21; V. 1, 5. Lateral scales: to curve, 50; in front of curve about 47.

26. *Carangus hippos* (Linn.) Gill.—*Crevallé*.

A magnificent specimen, 30 inches in length.

27. *Trachynotus carolinus* (Linn.) Gill.—*Pompano*.

A large individual, No. 21,309, 15 inches long. D. VI, I, 25; A. II, 22; P. II, 17; V. I, 5.

Also an individual, No. 22,824 (69), 2 $\frac{3}{5}$ inches in length. D. VI, I, 23; A. II, I, 21; V. I, 5; P. 17.

Also several very minute individuals (Coll. No. 72), not three-quarters of an inch in length.

28. *Trachynotus goreensis* Cuv. & Val.

A skin of this species, obtained in West Florida by Dr. J. W. Velie, has been sent for identification. Mr. Blackford sent another large specimen, No. 22,089, of this species, from Jupiter Inlet, Florida, in January, 1879; weight, 16 pounds; length, 34 inches.

29. *Seriola Stearnsii* Goode & Bean.—*Amber-fish*.

The description of this beautiful new species obtained at Pensacola by Mr. Stearns is given on page 48 of the present volume of the Proceedings of the National Museum.

A single specimen, No. 21,325 (116), has been received.

30. *Seriola bonariensis* Cuv. & Val.—*Rock Sabuon*.

A magnificent specimen, No. 22,258, 890 millimetres long, of this species, hitherto known only from the coast of Brazil, was sent by Mr. Stearns. Detailed measurements are given below.

Table of Measurements.

Current number of specimen	22,258.	
Locality	Pensacola, Fla.	
	Millime- tres.	100ths of length.
Extreme length.....	890	.....
Length to end of middle caudal rays.....	800	.....
Body:		
Greatest height.....	216	27
Greatest width.....	99	12 $\frac{3}{4}$
Height at ventrals.....	197	24 $\frac{3}{4}$
Least height of tail.....	35	4 $\frac{3}{4}$
Length of caudal peduncle.....	57	7

Table of Measurements—Continued.

Current number of specimen	22,258.	
Locality	Pensacola, Fla.	
	Millime- tres.	100ths of length.
Head:		
Greatest length	199	25
Height at posterior margin of preoperculum	173	21 $\frac{3}{4}$
Height at posterior margin of operculum	190	23 $\frac{3}{4}$
Greatest width	95	12
Width of interorbital area	65	8
Length of snout	65	8
Length of operculum	53	6 $\frac{5}{8}$
Length of upper jaw	80	10
Length of mandible	100	12 $\frac{1}{2}$
Distance from snout to orbit	80	10
Diameter of orbit	35	4 $\frac{3}{8}$
Dorsal (spinous):		
Distance from snout	274	34
Length of base	77	9 $\frac{5}{8}$
Length of first spine	14	1 $\frac{3}{4}$
Length of second spine	22	2 $\frac{3}{4}$
Length of third spine	32	4
Length of fourth spine	33	4
Length of fifth spine	18	2 $\frac{1}{4}$
Length of sixth spine	13	1 $\frac{3}{8}$
Length of seventh spine	5	$\frac{3}{8}$
Dorsal (soft):		
Length of base	335	42
Length of antecedent spine	45	5 $\frac{5}{8}$
Length of first ray	128	16
Length of longest ray	140	17 $\frac{1}{2}$
Length of last ray	49	6
Anal:		
Distance from snout	450	56 $\frac{1}{2}$
Length of base	229	28 $\frac{3}{8}$
Length of first spine	3	$\frac{3}{8}$
Length of second spine	6	$\frac{3}{4}$
Length of third spine	27	3 $\frac{3}{8}$
Length of first ray	105	13
Length of longest ray		
Length of last ray	45	5 $\frac{5}{8}$
Caudal:		
Length of middle rays	35	4 $\frac{3}{8}$
Length of external rays	150	18 $\frac{3}{4}$
Pectoral:		
Distance from snout	209	26
Length	106	13 $\frac{1}{4}$
Ventral:		
Distance from snout	235	29 $\frac{5}{8}$
Length	120	15
Branchiostegals.	VII	.....
Dorsal	VII, I, 29	.....
Anal	II, I, 21	.....
Pectoral	I, I, 20	.....
Ventral	I, 5	.....
Number of scales in lateral line	ca. 131	.....
Number of transverse rows above lateral line	ca. 22	.....
Number of transverse rows below lateral line	ca. 36	.....

31. Elagatis pinnulatus Poey.*Sciola pinnulata* POEY, Mem. Hist. Nat. Cuba, II, p. 233.*Decapterus pinnulatus* POEY, op. cit. p. 374.*Elagatis pinnulatus* POEY, Rep. Fis. Nat. Cuba, II, 1868, p. 378.

Several specimens of this species were obtained by Mr. Würdemann in West Florida.

17. STROMATEIDÆ.

32. Peprilus alepidotus (Linn.) Cuvier.—*Moon-fish*.

A single specimen, No. 21,475 (9), 7 $\frac{1}{2}$ inches in length. D. IV, 42; A. IV, 42; P. 19.

18. LATILIDÆ.

33. *Caulolatilus microps* Goode & Bean.

The Smithsonian Institution received, March 22, 1878, this fish from Mr. Stearns. It was taken March 18, 1878, on the Snapper Bank, off Pensacola, in 35 fathoms of water. It is now a fine alcoholic specimen, No. 20,971 of the Fish Catalogue.

Caulolatilus microps is related to the Brazilian form *Caulolatilus chrysops* (Cuvier and Valenciennes) Gill, and the Cuban form *Caulolatilus cyanops* Poey, described in 1867.* Of the former, two specimens only are recorded: one, the type of the original description, one foot long, collected on the coast of Brazil by M. Gay, and probably now in the museum in Paris; a second, in the British Museum, a stuffed specimen, purporting to have been collected in the West Indies. Of Poey's *C. cyanops*, the National Museum possesses a fine specimen (Cat. No. 4,750), 15 inches long, collected and presented by Professor Poey.

The Pensacola specimen is 2 feet and 3 inches long, weighing 9¼ pounds. Its color has faded, but a yellow blotch is still visible under the eye, similar to that mentioned in *C. chrysops*. A dark blotch is visible in and above the axilla of the pectoral.

For diagnosis see Proceedings U. S. National Museum, I, 1879, p. 43.

19. SCIÆNIDÆ.

34. *Cynoscion carolinensis* (Cuv. & Val.) Gill.—*Spotted Trout*.

A single specimen, No. 22,811 (100), 12½ inches in length. D. IX, 24; A. I, 9; P. 16; V. I, 5; C. 9+8. L. lat. ca. 88.

35. *Cynoscion nothus* (Holbrook) Gill.—*White Trout*.

A single individual, No. 21,480 (60), 9½ inches long. D. X, 27; A. II, 11; P. 16; V. I, 5; C. 1+9+8+2. L. lat. 57.

36. *Pogonias cromis* (Linn.) Cuvier.—*Drum*.

An individual, No. 22,806, 20¼ inches long, weighing 4¼ pounds. D. X, I, 21; A. II, 6; P. 18; V. I, 5; C. 19. L. lat. 48; L. trans. 6, 15.

37. *Liostomus philadelphicus* (Linn.) Goode.—*Spot*; *Chopa Blanca*.

Perca philadelphia LINNÆUS, Syst. Nat. ed. x, 1758, i, p. 291; ed. xii, 1766, i, p. 484.

Liostomus philadelphicus GOODE, Fishes of East Florida (*vide supra*).

Liostomus obliquus DEKAY, and subsequent authors.

A single specimen, No. 21,478 (38), 6½ inches. D. X, I, 29; A. II, 12; P. 19; V. I, 5; C. 9+8. Transverse rows of scales about 54.

38. *Bairdiella argyroleuca* (Mitchill) Gill.—*Mademoiselle*.

A specimen, No. 21,499 (25), 7½ inches long. D. XI, 19½; A. II, 8½; P. 15; V. I, 5; C. 9+8. L. lat. 50; L. trans. ⅘.

A young individual, No. 22,849, 4½ inches in length. D. XI, I, 21; A. II, 9. L. lat. 49; L. trans. ⅘.

* Repertorio Físico-Natural de la Isla de Cuba, i, p. 312.

39. *Sciænopis ocellatus* (Linn.) Gill.—*Red Horse; Channel Bass.*

A single specimen, No. 21,774, 15½ inches long. D. X, I, 24; A. II, 7; P. II, 14; V. I, 5; C. 17. L. lat. 46; L. trans. $\frac{5}{12}$. Four black spots on the right side; two on the left.

40. *Menticirrus alburnus* (Linn.) Gill.—*Whiting.*

A single specimen, No. 21,332 (34), 15 inches long, in color silvery white immaculate, with bluish reflections upon back and body, white upon the belly.

In coloration, this specimen agrees with the *Menticirrus littoralis* of Holbrook, but seems to have no definite characters by which it may be distinguished.

D. X, I, 24; A. I, 6½; P. 20; V. 6; C. 17. L. lat. about 60; L. trans. $\frac{10}{18}$.

Another specimen, No. 22,832, 9½ inches long, agrees in proportions with the above. Its color is, however, very dusky, and the cloudings are blackish.

D. IX, I, 24; A. I, 7; P. 19; V. I, 5. L. lat. 70; L. trans. $\frac{11}{18}$.

41. *Micropogon undulatus* (Linn.) Cuv. & Val.—*Croaker.*

A single specimen, No. 21,479 (37), about 5 inches long. D. IX, I, 28; A. II, 7½; P. 18; V. I, 5; C. 9 + 8. L. lat. 72 or 73; L. trans. $\frac{10}{18}$.

20. GERRIDÆ.

42. *Eucinostomus harengulus* sp. nov. Goode & Bean.

There are in the collection two specimens of an undescribed *Eucinostomus* collected in West Florida by Kaiser and Martin. The catalogue number of the specimens is 5145. The largest is 120 millimetres in length to the origin of the middle caudal rays; the smaller, 87 millimetres. The species may be briefly characterized as follows: D. IX, 10; A. III, 7; P. 15; V. I, 5; C. +17+. L. lat. 44; L. trans. $\frac{5}{10}$.

The height of the body is contained 3 to 3½ times in the total length without caudal; the length of the head, 3⅓ to 3½ times; the diameter of the eye exceeds the length of the snout, and is contained 3 times in the length of the head, and equals the width of the interorbital space. The groove for the processes of the intermaxillaries is naked, and extends to the vertical through the anterior third of the eye. The free portion of the tail is longer than high. The least height of tail equals the length of the 6th dorsal spine. The 3d dorsal spine is the longest, its length being contained twice in the height of the body, and equals the length of the head without the postorbital portion; the last dorsal spine equals in length the 2d anal, and about equals the length of the snout, and is about $\frac{2}{3}$ as long as the 3d. The 1st dorsal ray is fully 1½ times as long as the 1st dorsal spine. The 2d anal spine is stronger and shorter than the 3d, its length being contained 3⅔ times in the length of the head. The 3d anal spine is contained 3⅓ times in the length of the head. The caudal is forked, its length slightly less

than the length of the head, and very little greater than the length of the pectoral. The pectoral reaches to the perpendicular through the origin of the soft dorsal. The ventral is half as long as the head. The vent is under the 2d ray of the soft dorsal.

21. SPARIDÆ.

43. *Lagodon rhomboides* (Linn.) Holbrook.

This species evidently breeds in the vicinity of Pensacola, as well as many other points on the Southern coast. Young specimens, No. 21,488, ranging from 2 to 4 inches in length, were received from Mr. Stearns.

The Museum has also specimens, No. 3,112, collected at Charlotte Harbor, West Florida, by C. B. Baker.

No. 21,344. D. XII, 11; A. III, 10; P. 16; V. I, 5; C. 17. L. lat. 60?; L. trans. $\frac{9}{15}$.

44. *Archosargus probatocephalus* (Walbaum) Gill.—*Sheep's-head*.

A single specimen, No. 22,803, 13 $\frac{2}{5}$ inches long. D. XI, 11 $\frac{1}{2}$; A. III, 8 $\frac{1}{2}$; P. 16; V. I, 5; C. 9 + 8. L. lat. 43; L. trans. $\frac{9}{18}$.

45. *Pagrus argenteus* Schneider.—*Porgy*.

Pagrus vulgaris CUVIER & VALENCIENNES, Hist. Nat. Poiss. vi, p. 142, pl. cxlvii.—GÜNTHER, Cat. Fish. Brit. Mus. i, p. 466.

We have examined several specimens of a species of *Pagrus* obtained at Charleston, S. C., in April, 1878, by Mr. Goode, and also a specimen, No. 21,339, sent from Pensacola by Mr. Stearns. We are unable to discover any differences between this species and *P. argenteus* of Europe, and provisionally identify them with it. The discovery of this European form in the Western Atlantic is particularly interesting.

Table of Measurements.

Current number of specimen	21,339.		20,981 a, ♀.		20,981 b.	
	Pensacola, Fla. {		Charleston, S. C., {		Charleston, S. C., {	
Locality			G. Brown Goode.		G. Brown Goode.	
	Millime- tres.	100ths of length.	Millime- tres.	100ths of length.	Millime- tres.	100ths of length.
Extreme length	435		398		473	
Length to origin of middle caudal rays	346		317		381	
Body:						
Greatest height		37 $\frac{1}{2}$		38		36
Greatest width		15 $\frac{1}{2}$		14		13
Height at ventrals		37 $\frac{1}{2}$		38		36
Least height of tail		9 $\frac{1}{2}$		9 $\frac{1}{2}$		9 $\frac{1}{2}$
Length of caudal peduncle		18 $\frac{3}{8}$		19		19 $\frac{1}{2}$
Head:						
Greatest length		33		33		33
Distance from snout to nape		17		17		16
Greatest width		16 $\frac{1}{2}$		15		14 $\frac{3}{8}$
Width of interorbital area		9 $\frac{1}{2}$		9 $\frac{1}{2}$		8 $\frac{1}{2}$
Length of snout		11 $\frac{1}{2}$		12		12
Length of operculum		9		9		9
Length of upper jaw		13 $\frac{1}{2}$		13		13
Length of mandible		14		13 $\frac{1}{2}$		13 $\frac{1}{2}$
Distance from snout to orbit		15 $\frac{1}{2}$		15		15
Long diameter of eye		7 $\frac{1}{2}$		7 $\frac{1}{2}$		7 $\frac{1}{2}$

Table of Measurements—Continued.

Current number of specimen.....	21,339.		20,981 a, ♀.		20,981 b.	
Locality	Pensacola, Fla. }		Charleston, S. C., G. Brown Goode.		Charleston, S. C., G. Brown Goode.	
	Millime- tres.	100ths of length.	Millime- tres.	100ths of length.	Millime- tres.	100ths of length.
Dorsal (spinous):						
Distance from snout		42 $\frac{1}{2}$		43		42
Length of base		31 $\frac{1}{2}$		31 $\frac{1}{2}$		
Length of longest spine		12 $\frac{1}{2}$		12 $\frac{1}{2}$		13
Length of first spine		5 $\frac{3}{4}$		5 $\frac{3}{4}$		6 $\frac{3}{4}$
Length of second spine		7 $\frac{1}{2}$ +		10		
Length of third spine		7 $\frac{1}{2}$		8 $\frac{1}{2}$		8 $\frac{1}{2}$
Dorsal (soft):						
Length of base		19 $\frac{1}{2}$		19 $\frac{1}{2}$		
Length of first ray		8 $\frac{1}{2}$				
Length of longest ray		11		9 $\frac{3}{4}$		10 $\frac{3}{4}$
Length of last ray		11		9 $\frac{3}{4}$		10
Anal:						
Distance from snout		66 $\frac{1}{2}$		64		64 $\frac{1}{2}$
Length of base		19		19		18 $\frac{1}{2}$
Length of first spine		3 $\frac{1}{2}$		4		4
Length of second spine		7 $\frac{1}{2}$		8		8
Length of third spine		7 $\frac{1}{2}$		8 $\frac{3}{4}$		8 $\frac{1}{2}$
Length of first ray		8 $\frac{1}{2}$ +		9+		
Length of longest ray		10				
Length of last ray		10		9		9 $\frac{1}{2}$
Caudal:						
Length of middle rays		12		13		11 $\frac{1}{2}$
Length of external rays		27		28 $\frac{1}{2}$		28
Pectoral:						
Distance from snout		34		34 $\frac{1}{2}$		34 $\frac{1}{2}$
Length		35 $\frac{1}{2}$		34 $\frac{1}{2}$		36+
Ventral:						
Distance from snout		37		38		37
Length		20 $\frac{1}{2}$		19		20
Branchiostegals.....		VI		VI		VI
Dorsal		XII, 10		XII, 10		XII, 10
Anal		III, 8		III, 8		III, 8
Caudal		IV, 15, VI		IV, 15, V		VI, 15, VI
Pectoral		II, 14		II, 14		II, 14
Ventral		I, 5		I, 5		I, 5
Number of scales in lateral line		56		56		56
Number of transverse rows above lateral line		6		7		6
Number of transverse rows below lateral line		13*		14		14
Air-bladder		Simple				
Number of caecal appendages		4				

46. *Pagellus Milneri* sp. nov. Goode & Bean.

Two specimens of an undescribed species of *Pagellus*, No. 6,134, were sent from Charlotte Harbor, Florida, in 1863, by C. B. Baker. The length of the smaller specimen to the origin of the middle caudal rays is 146^{mm}; of the larger, 156^{mm}. The species is dedicated to our friend Mr. James W. Milner, for eight years Deputy U. S. Commissioner of Fisheries, whose important services to the United States in the department of Fish Culture have been supplemented by much thorough natural history exploration, and who at this time is collecting the fishes of West Florida.

Diagnosis.—The height of the body is $2\frac{2}{3}$ in total length, caudal included; $2\frac{1}{4}$ in its length without caudal. Length of head $4\frac{1}{4}$ times with caudal, $3\frac{1}{4}$ without, and equal to length of pectoral. Diameter of eye equals length of operculum; width of interorbital space equals least height of

* To the abdominal outline; there are 16 to the median line of the belly.

tail, which is half the length of the ventral. Diameter of eye in length of head almost 4 times, and less than $1\frac{1}{2}$ times in snout. Preorbital nearly as high as it is long, with maxillary edge nearly straight. There are five series of scales between the preorbital and the angle of the preoperculum. Three series of molars in upper jaw, two in lower. Posterior nostril linear. In life this species is banded vertically with brown. In form of body it resembles the Scuppaug (*Stenotomus argyrops*). Radial formula: B. VI; D. XII, 12; A. III, 10; C. 5 + 8 + 7 + 5; P. I, 14; V. I, 5. L. lat. 47-48; L. trans. $\frac{7}{14}$.

Table of Measurements.

Current number of specimen.....	6,134 a.		6,134 b.	
Locality	Charlotte Harbor, Fla.		Charlotte Harbor, Fla.	
	Millimetres.	100ths of length.	Millimetres.	100ths of length.
Length to origin of middle caudal rays.....	146		156	
Body:				
Greatest height (at ventrals).....		45 $\frac{1}{2}$		46
Least height of tail.....		10		10
Head:				
Greatest length.....		31		31
Width of interorbital area.....		10		10
Length of snout.....		11 $\frac{1}{2}$		11 $\frac{1}{2}$
Length of operculum.....		8		8
Length of upper jaw.....		12		12
Length of mandible.....		13		13
Distance from snout to orbit.....		17 $\frac{1}{2}$		17
Diameter of orbit.....		8		8
Dorsal (spinous):				
Distance from snout.....		46		46
Length of base.....		34		33
Length of first spine.....		4 $\frac{1}{2}$		4 $\frac{1}{2}$
Length of second spine.....		Broken.		Broken.
Length of third spine.....		11		10+
Length of fourth spine.....		11		12
Length of fifth spine.....				12
Dorsal (soft):				
Length of base.....		20		20
Length of first ray.....		0		Broken.
Length of longest ray.....		0		Broken.
Length of last ray.....		7		Broken.
Anal:				
Distance from snout.....		67		65
Length of base.....		22		22
Length of first spine.....		4 $\frac{1}{2}$		4
Length of second spine.....		7 $\frac{1}{2}$		7
Length of third spine.....		7+		8
Length of first ray (longest).....		8 $\frac{1}{2}$		Broken.
Length of last ray.....		7		Broken.
Caudal:				
Length of middle rays.....		13		12 $\frac{1}{2}$
Length of external rays.....		29		32
{ superior.....		28		30
{ inferior.....				
Pectoral:				
Distance from snout.....		32		31
Length.....		31		31
Ventral:				
Distance from snout.....		39		37
Length.....		29		30 $\frac{1}{2}$
Length of axillary appendage.....		10		10
Branchiostegals.....	VI		VI	
Dorsal.....	XII, 12		XII, 12	
Anal.....	III, 10		III, 10	
Caudal.....	V+8+7+V		VI+8+7+V	
Pectoral.....	1, 14		1, 14	
Ventral.....	1, 5		1, 5	
Number of scales in lateral line.....	48		47	
Number of transverse rows above lateral line.....	7		7	
Number of transverse rows below lateral line.....	14		14	

22. PRISTIPOMATIDÆ.

47. *Pristipoma fulvomaculatum* (Mitch.) Günther.—*Pig-fish*.

A single specimen, No. 21,490, $8\frac{3}{4}$ inches in length. D. XII, $15\frac{1}{2}$; A. III, $11\frac{1}{2}$; P. 18; V. I, 5; C. 9 + 8. L. lat. 55 or 56; L. trans. $\frac{12}{10}$.

Another specimen, No. 3,113, was sent from Charlotte Harbor in 1864 by C. B. Baker. D. XII, 16; A. III, 13; P. 19; V. I, 5; C. 9 + 9. L. lat. 54; L. trans. $\frac{11}{10}$.

48. *Rhomboplites aurorubens* (Cuv. & Val.) Gill.—*Bastard Snapper*.

Several specimens of this beautiful species were obtained in Charleston, S. C., in the spring of 1878. They are often brought to Charleston market, where they are called "Mangrove Snappers." They are obtained chiefly from the Savannah Bank.

Another specimen, No. 21,338 (42), $15\frac{1}{2}$ inches long, was subsequently sent from Pensacola by Mr. Stearus. D. XII, 11; A. III, 8; P. I, 16; V. I, 5; C. 9 + 8. L. lat. 52; L. trans. $\frac{9}{10}$.

Table of Measurements.

Current number of specimen	21,224 a.		21,224 b.		21,338.	
Locality	Savannah Bank, Charleston, S. C.		Savannah Bank, Charleston, S. C.		Pensacola, Fla.	
	Milli- metres.	100ths of length.	Milli- metres.	100ths of length.	Milli- metres.	100ths of length.
Extreme length to origin of middle caudal rays.....	340	.....	360	.....	306	.....
Length to end of middle caudal rays	393	.....	412	.....	393	.....
Body:						
Greatest height		32.5		33.2		32
Greatest width		14.5		15.0		12.5
Height at ventrals		32.0		32.6		30
Least height of tail		10.5		10.2		10.5
Length of caudal peduncle.....		17.2		16.5		17
Head:						
Greatest length		31.8		30.8		32
Greatest width		14.0		14.5		14
Width of interorbital area		9.2		9.5		8.5
Length of snout		10.7		10.8		8
Length of operculum .....		.....		.....		11
Length of upper jaw		10.7		10.8		11
Length of mandible		13.7		14.0		13
Distance from snout to centre of orbit.....		13.7		14.0		12.5
Long diameter of eye		6.7		6.7		7.5
Dorsal (spinous):						
Distance from snout		36.0		36.7		35
Length of base		33.5		34.5		33
Length of first spine .....		.....		4.6		5
Length of second spine		10.0		8.5		9.5
Length of last spine		8.0		7.5		.....
Length of longest spine .....		.....		.....		12.5
Dorsal (soft):						
Length of base		18.5		.....		20
Length of first ray		8.0		7.5		9.5
Length of longest ray		9.8		9.2		9.5
Length of last ray		7.5		7.0		7
Anal:						
Distance from snout.....		68.0		69.0		68
Length of base		15.3		15.5		14.5
Length of first spine		3.5		3.5		2.6
Length of second spine		7.2		6.8		7
Length of third spine		7.6		8.0		8
Length of first ray		10.7		8.5		10.5
Length of longest ray		10.7		8.5		10.5
Length of last ray		8.2		6.3		7

Table of Measurements—Continued.

Current number of specimen	21,224 a.		21,224 b.		21,338.	
Locality	Savannah Bank, Charleston, S. C.		Savannah Bank, Charleston, S. C.		Pensacola, Fla.	
	Milli- metres.	100ths of length.	Milli- metres.	100ths of length.	Milli- metres.	100ths of length.
Caudal:						
Length of middle rays		15.2		14.2		16
Length of external rays	{ superior	25.0+		24.2		30
	{ inferior	25.0+				29.5
Pectoral:						
Distance from snout		29.5		29.5		29
Length		24.2		22.5		26.3
Ventral:						
Distance from snout		35.6		35.8		35.5
Length	{ on left side					19.5
	{ on right side	19.6		19.4		21
Branchiostegals	VII		VII		VII	
Dorsal	XII, 11		XII, 11		XII, 11	
Anal	III, 8		III, 8		III, 8	
Caudal					+ 18 +	
Pectoral	II, 15		II, 16		II, 15	
Ventral	I, 5		I, 5		I, 5	
Number of scales in lateral line	54		55		54	
Number of transverse rows above lateral line	9		9		9	
Number of transverse rows below lateral line	19		20		20	

49. *Lutjanus caxis* (Schneider) Poey.

The Museum has a specimen, No. 5,138, collected in West Florida by Kaiser and Martin. Length 10 inches. D. X, 14; A. III, 8. L. lat. 41.

50. *Lutjanus Stearnsii* Goode & Bean.—*Mangrove Snapper*.

Lutjanus Stearnsii GOODE & BEAN, Proc. U. S. Nat. Mus. i, 1879, p. 179.

A single specimen, No. 21,337, 19 $\frac{3}{4}$ inches, the type of the description of the species.

51. *Lutjanus Blackfordii* Goode & Bean.—*Red Snapper*.

Lutjanus Blackfordii GOODE & BEAN, Proc. U. S. Nat. Mus. i, 1879, p. 176.

A fine specimen, No. 21,330, 26 inches long, was sent from Pensacola by Mr. Stearns in May, 1878, which served as one of the types for the description of the species.

A young individual, No. 21,463, was also sent, which shows some interesting variations from the adult, as indicated in the following table of measurements.

The principal characters of the young as varying from the adult are (1) the greater length of the head, (2) the lesser length of the snout, (3) the greater diameter of the eyes, (4) the greater length of the paired fins, (5) the greater height of the azygos fins, (6) the stouter proportions of the caudal.

Table of Measurements.

Current number of specimen	21,463.	
Locality	Pensacola, Fla.	
	Millime- tres.	100ths of length.
Extreme length	241	.....
Length to origin of middle caudal rays	185	.....
Body:		
Height at ventrals		41 $\frac{1}{3}$
Least height of tail		13
Head:		
Greatest length		41
Greatest width		15
Width of interorbital area		7 $\frac{1}{2}$
Length of snout		12 $\frac{1}{2}$
Length of operculum		13 $\frac{1}{2}$
Length of upper jaw		15
Length of mandible		19
Distance from snout to orbit		14 $\frac{1}{2}$
Diameter of orbit		9
Dorsal (spinous):		
Distance from snout		44 $\frac{1}{2}$
Length of base		29 $\frac{1}{2}$
Length of first spine		5 $\frac{1}{2}$
Length of second spine		10 $\frac{1}{2}$
Length of fourth or longest spine		15
Length of last spine		10 $\frac{1}{2}$
Dorsal (soft):		
Length of base		22
Length of first ray		12
Length of longest ray		16
Length of last ray		9
Anal:		
Distance from snout		71
Length of base		16
Length of first spine		5 $\frac{1}{2}$
Length of second spine		10 $\frac{1}{2}$
Length of third spine		11 $\frac{1}{2}$
Length of first ray		15
Length of longest ray		19
Length of last ray		8 $\frac{1}{2}$
Caudal:		
Length of middle rays		21
Length of external rays		32
Pectoral:		
Distance from snout		36
Length		34
Ventral:		
Distance from snout		40
Length		25
Branchiostegals	VII	.....
Dorsal	X, 14	.....
Anal	III, 9	.....
Caudal	+17+	.....
Pectoral	II, 15	.....
Ventral	I, 5	.....
Number of scales in lateral line	50	.....
Number of transverse rows above lateral line	8	.....
Number of transverse rows below lateral line	16	.....

23. CENTRARCHIDÆ.

52. *Micropterus pallidus* (Rafinesque) Gill & Jordan.—*Black Bass*.

According to Mr. Stearns this species enters the brackish and salt waters of the Gulf of Mexico, whence he sends a specimen, No. 21,311, 12 inches in length. D. IX, I, 13; A. III, 10; P. II, 12; V. I, 5; C. +17+. L. lat. 65; L. trans. $\frac{7}{3}$

53. Lepiopomus incisor (Cuv. & Val.).—*Brim.*

Lepiopomus pallidus (not Mitchill) GILL & JORDAN, Annals N. Y. Lyc. Nat. Hist. ix, 1877, p. 316.

A single individual, No. 21,471 (50), $8\frac{1}{2}$ inches in length. D. X, 12; A. III, 11; P. I, 12; V. I, 5; C. III, 9. L. lat. 44; L. trans. $\frac{7}{16}$.

The description of *Bodianus pallidus* as given by Mitchill does not appear to us to apply to this species, and we cannot believe that our friend Prof. Jordan had the book before him when he made his final decision in the matter. Indeed, this is quite evident from the fact that he habitually quotes it in synonymy as *Labrus pallidus* Mitchill. It seems to us quite evident that Mitchill's species was *Bairdiella argyroleuca* (= *B. punctata* Gill), as was long ago demonstrated by Prof. Gill. It was a whitish, elongated fish, with "holes under the chin," yellow fins, 23 rays in the second dorsal fin, and 2 (not 3) spines in the anal. See Transactions of the Literary and Philosophical Society of New York, I, 1875, p. 420.

54. Eupomotis speciosus (Holbrook) Jordan?

A species represented by a single specimen, distinguished from the *Eupomotis speciosus* of the St. John's River solely by its slenderer body, slightly larger eyes, and the presence of only 9 dorsal spines. The markings are very similar to those of *Eupomotis speciosus*. The characters separating *E. speciosus* from *E. pallidus* appear to us of doubtful weight.

24. SERRANIDÆ.

55. Epinephelus morio (Cuv. & Val.) Gill.

A single specimen, No. 22,814 (75), 22 inches in length. D. XI, 17; A. III, 8; P. 17; V. I, 5; C. 16. L. lat. ca. 106.

56. Epinephelus Drummond-Hayi Goode & Bean.—*Hind.*

Epinephelus Drummond-Hayi GOODE & BEAN, Proc. U. S. Nat. Mus. i, 1879, p. 173.

A single specimen, No. 21,255, $16\frac{3}{4}$ inches in length, was received from Mr. Stearns, May, 1878, and was taken as one of the types of the description of the species. D. XI, 16; A. III, 9; C. 14; P. 16; V. I, 5; B. VII. L. lat. 125; L. trans. $\frac{3}{7}$.

The species occurs also in the waters of the Bermudas and South Florida.

57. Epinephelus nigritus (Holbrook) Gill.—*Jew-fish.*

A specimen, No. 21,329, measuring 29 inches in length, and weighing 16 pounds, was received from Mr. Stearns in May, 1878. For full description and measurements see Proceedings U. S. National Museum, I, 1879, p. 182. D. X, 15; A. III, 9; C. 17; P. II, 16; V. I, 5; B. VII. L. lat. 115; L. trans. $\frac{3}{5}$.

58. *Trisotropis falcatus* Poey.—*Scamp*.

The United States National Museum received, March 24, 1879, from Mr. Silas Stearns, of Pensacola, Fla., a fresh individual, No. 22,236, of a species of *Trisotropis*, called "Scamp" by the fishermen. The weight of the fish is $7\frac{1}{2}$ pounds.

Mr. Stearns's collecting number is 117. He states that it was captured in deep water, and is abundant "in spots." He has seen individuals three times as large as the present one.

Diagnosis.—A *Trisotropis* with the body moderately compressed, its greatest depth nearly equal to $\frac{1}{3}$ of its length without caudal, and exactly equal to twice the length of the pectoral; the length of the head equal to $\frac{2}{5}$ of the greatest depth of body, and to 4 times the length of the snout; the lower jaw projecting beyond the upper for a distance which equals $\frac{1}{3}$ of the long diameter of the eye; the 11th ray of the soft dorsal, the 5th and 6th rays of the anal, the external and 5 of the internal caudal rays produced; the vent in the vertical from the 10th dorsal spine; the pectoral reaching the vertical let fall from the 7th dorsal spine; the ventrals as long as the pectorals, and reaching to the vertical let fall from the 8th dorsal spine; the maxilla extending to and the mandible beyond the vertical through the posterior margin of the orbit; the distance of the eye from the upper profile of the head equal to $\frac{1}{3}$ of its short diameter; the long diameter of the eye contained twice in the length of the snout, and $9\frac{1}{2}$ times in the length of the head; the 6th dorsal spine longest, and equal to the distance from the border of the preoperculum to the end of the opercular flap; the 1st dorsal spine $\frac{2}{3}$ as long as the last and half as long as the 3d and 4th; the longest (11th) ray of the soft dorsal equal to the 1st ray of the anal; the longest (5th) anal ray slightly exceeding the length of the pectoral and ventral; 3 rays in the upper half, and 2 in the lower half of the caudal produced, the longest of these extending beyond the general outline of the rays for a distance equal to the 3d anal spine; the external caudal rays nearly twice as long as the middle rays; the 1st dorsal consisting of 11 spines, the 2d dorsal of 17 rays; the anal having 3 spines and 11 rays; the caudal, about 20 rays; the pectoral, 1 undivided ray; the ventral, 1 spine and 5 rays; the number of rows of scales between the upper angle of the operculum and the origin of the middle caudal rays 120; about 25 scales in a transverse series from the beginning of the spinous dorsal to the lateral line, and about 43 from thence to the lower profile of the body; the posterior nostril three times as long and twice as wide as the anterior, and scarcely its own length from the eye; the 3 opercular spines broad, flat and cleft at the free ends.

Teeth: Vomerines brush-like, in an angular patch; palatines similar and in a single series; intermaxillary teeth in a single series, with a short band at the symphysis; 4 canines; mandibular teeth in two series; several canines at the symphysis.

Table of Measurements.

Current number of specimen.....	22,326 (117).	
Locality.....	Pensacola, Fla.	
	Millime- tres.	100ths of length.
Extreme length.....	694	.....
Length to origin of middle caudal rays.....	539	.....
Body:		
Greatest height.....		32
Greatest width.....		14½
Height at ventrals.....		32
Least height of tail.....		11
Length of caudal peduncle.....		14
Head:		
Greatest length.....		36
Greatest width.....		14½
Width of interorbital area.....		7½
Length of snout.....		9
Length of operculum.....		12
Length of upper jaw.....		16½
Length of mandible.....		20
Distance from snout to orbit.....		10
Diameter of orbit.....		4½
Dorsal (spinous):		
Distance from snout.....		26½
Length of base.....		20
Length of first spine.....		5½
Length of second spine.....		10
Length of third spine.....		11
Length of fourth spine.....		11
Length of fifth spine.....		12
Length of sixth spine.....		11½
Length of seventh spine.....		10
Length of eighth spine.....		10
Length of ninth spine.....		Broken.
Length of tenth spine.....		Broken.
Length of eleventh spine.....		7½
Dorsal (soft):		
Length of base.....		25
Length of first ray.....		9½
Length of longest ray (eleventh).....		13½
Length of last ray.....		6
Anal:		
Distance from snout.....		65
Length of base.....		19½
Length of first spine.....		3
Length of second spine.....		6
Length of third spine.....		8½
Length of first ray.....		13
Length of longest ray (fifth).....		17
Length of last ray.....		6½
Caudal:		
Length of middle rays.....		17
Length of external rays.....		30
Pectoral:		
Distance from snout.....		32
Length.....		16
Ventral:		
Distance from snout.....		36
Length.....		16
Vent:		
Distance from snout.....		60
Distance from anal.....		5½
Branchiostegals.....	VII	.....
Dorsal.....	XI, 17	.....
Anal.....	III, 11	.....
Caudal.....	20	.....
Pectoral.....	I, 16	.....
Ventral.....	I, 5	.....
Number of scales in lateral line.....	120	.....
Number of transverse rows above lateral line.....	ca. 25	.....
Number of transverse rows below lateral line.....	ca. 43	.....

59. *Trisotropis microlepis* sp. nov. Goode & Bean.

Two individuals of an apparently undescribed species of *Trisotropis* were collected in West Florida in 1864 by Messrs. Kaiser and Martin.

They are closely related to that group of fishes known in Cuba by the common name "Abadejo" ("Codfish"), and represented by Poey's species *Trisotropis interstitialis* and *T. dimidiatus*. With the description of the former,* it corresponds except in the greater length of the head and the much greater number of the scales.

Diagnosis.—The length of the head is contained $2\frac{1}{2}$ to $2\frac{3}{4}$ times in the length to origin of middle caudal rays. Eye contained 6 to $6\frac{1}{2}$ times in the head. The maxilla extends to the perpendicular through posterior margin of orbit; upper jaw equals length of anal base; it is contained $2\frac{1}{4}$ times in the length of the head. The mandible extends beyond the perpendicular through the posterior margin of the orbit, and is slightly more than one-half the length of the head. Each jaw has two canines. The intermaxillaries have an inner band of villiform and an outer series of large, slender, conical teeth curved inward. At the symphysis are some long slender teeth pointing backwards and movable. The lower jaw has two series of slender conical teeth, the inner being the larger and movable. The head of the vomer is supplied with very small villiform teeth. A narrow band of similar teeth on the palatines. Preoperculum finely denticulated on its posterior margin and with coarser denticulations at the angle. The length of the intermaxillary is contained 3 times in that of the lower jaw. Pectoral extends to the 9th spine of 1st dorsal and the ventral as far. The distance from the ventral to the vent slightly exceeds that from the vent to the origin of the anal. The length of the 1st dorsal spine is slightly more than that of the 2d; the 3d and 4th are the longest; the last dorsal spine is slightly longer than the one preceding it. The 1st anal spine is about $\frac{1}{3}$ as long as the last, which is more slender and longer than the 2d. The tail seems to be truncate. The height of the body is contained $3\frac{1}{2}$ times in the length to the origin of the middle caudal rays.

Table of Measurements.

Current number of specimen	5,137 a.		5,137 b.	
	West Florida.		West Florida.	
Locality	Milli- metres.	100ths of length.	Milli- metres.	100ths of length.
Extreme length	355	.....	.....	.....
Length to origin of middle caudal rays	294	.....	260	.....
Body:				
Greatest height (at ventrals)		$29\frac{1}{2}$		$25\frac{1}{2}$
Least height of tail		$10\frac{1}{2}$		$10\frac{1}{2}$
Head:				
Greatest length		40		38
Greatest width		13		12
Width of interorbital area		6		6
Length of snout		$8\frac{1}{2}$		8
Length of operculum		$13\frac{1}{2}$		$12\frac{1}{2}$
Length of upper jaw		18		17
Length of mandible		$20\frac{1}{2}$		$20\frac{1}{2}$
Distance from snout to orbit		10		9 $\frac{1}{2}$
Diameter of orbit		6		$6\frac{1}{2}$
Nostril (posterior) from eye		2		$1\frac{1}{2}$

* Mem. Nat. Cuba, ii, 1868, p. 127, pl. xiii, fig. 7.

Table of Measurements—Continued.

Current number of specimen	5,137 a.		5,137 b.	
	West Florida.		West Florida.	
Locality	Milli- metres.	100ths of length.	Milli- metres.	100ths of length.
Dorsal (spinous):				
Distance from snout		37		37½
Length of base		26		27½
Length of first spine		5½		6
Length of second spine		10		10
Length of third spine		10½		10½
Length of last spine		8½		8½
Dorsal (soft):				
Length of base		24		23
Length of longest ray		13		13½
Length of last ray		6½		7½
Anal:				
Distance from snout		67		66½
Length of base		17		18
Length of first spine		2½		3
Length of second spine		6½		6½
Length of third spine		8		9
Length of first ray		14		14
Length of longest ray		16		15
Length of last ray		8		7
Caudal:				
Length of middle rays		20½		
Length of external rays		23+		
Pectoral:				
Distance from snout		36		35
Length		19		18
Ventral:				
Distance from snout		38		36
Length		16½		17
Vent from anal		6		6
Branchiostegals	VII		VII	
Dorsal	XI, 18		XI, 18	
Anal	III, 10		III, 11	
Caudal	+17+		+17+	
Pectoral	I, 16		I, 16	
Ventral	I, 5		I, 5	
Number of scales in lateral line	145		143	
Number of transverse rows above lateral line	30			
Number of transverse rows below lateral line	60			

60. *Trisotropis brunneus* Poey.—Black Grouper.

A single species of the genus *Trisotropis* is given in Professor Gill's Catalogue of the Fishes of the East Coast of North America (p. 28), the *Trisotropis acutirostris* (Cuvier & Valenciennes) Gill. Since there is no specimen of this species in the National Museum, and no record of the occurrence of this species on our coast, we challenge its right to a place among the fishes of our east coast. It was described from the coast of Brazil, and has not been satisfactorily identified since its first description, which was very inadequately written.

In Mr. Goode's "Catalogue of the Fishes of the Bermudas," the Bermuda Rock-fish is identified* as *Trisotropis undulosus* (Cuv.) Gill. A more extended study with comparisons shows that this name cannot fairly be retained for any Bermuda species. *T. undulosus* was originally described by Cuvier and Valenciennes from Brazil.† The only distinctive character recorded by those authors is the coloration; all others mentioned apply with equal force to any other member of the genus.

* Bulletin of the U. S. National Museum, No. 5, p. 55.

† Histoire Naturelle des Poissons, ii, 1829, p. 295.

Dr. Günther's characters for *T. undulosus* and Professor Poey's for *T. brunneus* are little better, since no diagnostic points are evident.

Since the Floridan and Cuban faunas are so similar, desiring to avoid a multiplication of specific names, we provisionally refer the Florida specimens before us to Poey's *T. brunneus* until we have an opportunity to compare them with specimens identified by that author. These had been hitherto identified with *T. acutirostris*.

We have studied three specimens, No. 15,462, sent by Mr. Blackford, from New York market, No. 16,902, obtained by Mr. J. H. Richard in Washington market, and No. 21,336 (32), sent by Mr. Stearns from Pensacola in 1878. Full measurements of these specimens are given below.

Table of Measurements.

Current number of specimen	21,336.		15,462.		16,902.	
	Pensacola, Fla.		Florida?		Florida.	
Locality.....	Milli- metres.	100ths of length.	Milli- metres.	100ths of length.	Milli- metres.	100ths of length.
Weight	7 $\frac{3}{4}$ lbs.		10 lbs. in alcohol.			
Extreme length	590		655		495	
Length to end of middle caudal rays	679	(26 $\frac{3}{4}$ in.)	754	(29 $\frac{1}{4}$ in.)	576	
Body:						
Greatest height (behind ventrals)		27 $\frac{1}{2}$		27 $\frac{1}{2}$		27 $\frac{1}{2}$
Height at ventrals		25 $\frac{1}{2}$		26		26
Least height of tail		9		9		10
Head:						
Greatest length		35 $\frac{3}{4}$		37 $\frac{1}{2}$		38
Width of interorbital area		6 $\frac{1}{2}$		6 $\frac{1}{2}$		6 $\frac{1}{2}$
Length of snout		10 $\frac{1}{2}$		10 $\frac{1}{2}$		10
Length of upper jaw		17		17		17 $\frac{1}{2}$
Length of mandible		20 $\frac{1}{2}$		21 $\frac{1}{2}$		21
Distance from snout to centre of orbit		13		13		12 $\frac{1}{2}$
Diameter of eye		4		4		4 $\frac{1}{2}$
Dorsal (spinous):						
Distance from snout		36 $\frac{1}{2}$		36		36
Length of first spine		3 $\frac{3}{4}$				5 $\frac{1}{2}$
Length of longest spine (third)		9				10 $\frac{1}{2}$
Length of last spine		6 $\frac{1}{2}$				7 $\frac{1}{2}$
Dorsal (soft):						
Length of first ray		8 $\frac{1}{2}$		8 $\frac{1}{2}$		9 $\frac{1}{2}$
Length of longest ray		(9th) 10		(9th) 10		(7th) 12
Length of last ray		6		5		6 $\frac{1}{2}$
Anal:						
Distance from snout		68		67		67
Length of first spine		2 $\frac{1}{2}$				3 $\frac{1}{2}$
Length of second spine		4 $\frac{1}{2}$				5 $\frac{1}{2}$
Length of third spine		7		6 $\frac{1}{2}$		7 $\frac{1}{2}$
Length of first ray		10		9		12
Length of longest ray		12		11		13
Length of last ray		6		6		7 $\frac{1}{2}$
Caudal:						
Length of middle rays		15		14 $\frac{3}{4}$		16 $\frac{1}{2}$
Length of external rays		17 $\frac{1}{2}$		17 $\frac{1}{2}$		20 $\frac{1}{2}$
Pectoral:						
Distance from snout		33		32		33
Length		16		15		16 $\frac{1}{2}$
Ventral:						
Distance from snout		35		35		35
Length		13 $\frac{1}{2}$		12 $\frac{1}{2}$		14 $\frac{1}{2}$
Branchiostegals	VII		VII		VII	
Dorsal	XI, 17		XI, 17		XI, 16	
Anal	III, 11		III, 11		III, 10	
Caudal	+ 17 +		+ 17 +		+ 17 +	
Pectoral	I, 16		I, 16		I, 16	
Ventral	I, 5		I, 5		I, 5	
Number of scales in lateral line	130 +		130 +		130	
Number of transverse rows above lateral line	(28)		(28)		27	
Number of transverse rows below lateral line	(60)		(61)		61	

61. *Centropristis atrarius* (Linn.) Barn.—*Sea Bass*.

A young specimen, about 5 inches long, No. 21,483 (47). D. X, 10 $\frac{1}{2}$; A. III, 6 $\frac{1}{2}$; P. 16; V. I, 5; C. 9 + 8. L. lat. 51; L. trans. $\frac{5\frac{1}{2}}{18}$.

This specimen and others from Florida show certain characters which, when studied more closely, may serve to separate the southern *Centropristis* from that of New England.

62. *Haliperca subligaria* (Cope) Goode & Bean.

Centropristis subligarius COPE, Proc. Acad. Nat. Sci. Phila. 186-, p. —.

Professor Cope has described, under the name *Centropristis subligarius*, a fish from Pensacola, which we refer provisionally to the genus *Haliperca*. "D. X, 14; A. III, 8. L. lat. 48; L. trans. $\frac{5\frac{1}{2}}{18}$."

25. LABRACIDÆ.

63. *Roccus lineatus* (Bl.) Gill.—*Striped Bass*.

A single specimen, No. 21,312, 17 inches in length. D. IX, 12; A. III, 10; V. I, 5; P. II, 15. L. lat. 66; L. trans. $\frac{11}{14}$.

26. EPHIPPIIDÆ.

64. *Parephippus faber* (Cuv.) Gill.

A single specimen, No. 21,474, 5 $\frac{3}{10}$ inches long. D. VII, I, 22; A. III, 19; V. I, 5; P. II, 15; C. VI, 15, V. L. lat. 66; L. trans. $\frac{1\frac{3}{4}}{10}$.

27. POMATOMIDÆ.

65. *Pomatomus saltatrix* (Linn.) Gill.—*Blue-fish*.

A specimen, No. 21,777, 19 inches long. D. VII, I, 26; A. I, 27; P. I, 16; V. I, 5; C. 10 + 9. L. lat. 105.

A smaller specimen, No. 21,256, 9 $\frac{1}{2}$ inches long, was also received.

28. ECHENEIDIDÆ.

66. *Echeneis naucrateoides* Zuiew.—*Sucker*.

A young individual, No. 21,482 (13), 6 inches in length, remarkable from the fact that the tip of the caudal fin is cuneate in outline. The coloration is much the same as in adult individuals of the species, except that the white on the dorsal, anal, and caudal fins is more conspicuous and occupies a wider area. The dorsal and anal fins are essentially white, with the spaces at the base of the fins and between each pair of rays of the same color with the darkest portion of the body. The white areas upon the high anterior portions of the dorsal and anal occupy more than half of the height of these fins. Upon the posterior portion of these fins, the white area is reduced to a marginal line. The white patches on the outer angles of the caudal fin are so arranged that the dark portion of this fin is outlined upon the white in a lanceolate form. The pectoral fins are lightly margined with white posteriorly. D. XXI, 35; A. 33.

29. SPHYRÆNIDÆ.

67. *Sphyræna picuda*.

We have made a preliminary study of the specimens of *Sphyræna* in the National Museum, which has convinced us that the number of scales in the lateral line is very variable, and must be used with caution as a specific character.

We recognize three species on our coast:

1. *Sphyræna picuda*, with comparatively large scales, 81 or more in the lateral line, and the dorsal inserted far in advance of the middle of the body, and in front of the vertical from the tip of the pectoral. We have seen this species from Cuba, the Bermudas, from West Florida (collected by Dr. J. W. Velie), and from South Florida (sent by Mr. E. G. Blackford), a large individual, $37\frac{1}{2}$ inches long.

2. *Sphyræna borealis*. We have examined numerous specimens of young *Sphyrænas* from Wood's Holl, the largest of which do not exceed 9 inches in length. We refer them provisionally to *S. borealis*. These specimens agree quite closely with specimens of *Sphyræna*, from the Mediterranean and the Bermudas, in shape of body, in position of fins, and in coloration. Others from the Canaries and from Europe belong to a totally different species. There are two European species which have been confused by recent writers, and united under the name *S. vulgaris*. We are not at present able to untangle the synonymy.

3. A species which we provisionally refer to *S. guaguancho*, which in the position of the fins resembles *S. picuda*, though the scales are much smaller, 107 to 115 in the lateral line. Besides the Pensacola specimen already mentioned, we have seen this species from Cuba and from Wood's Holl, where a specimen (No. 21,226) nearly 22 inches long was obtained by Vinal N. Edwards, in July, 1876.

68. *Sphyræna guaguancho* Poey.

A single specimen, No. 21,468, 18 inches long.

The height of the body is 7 times in the total length without caudal; length of head $3\frac{1}{2}$ to $3\frac{1}{4}$ times, greatest in young. Diameter of eye contained 6 times in adult, $5\frac{1}{2}$ in young; operculum with two points. Length of pectoral equal to the postorbital portion of the head, $8\frac{1}{2}$ times in total in young, 9 times in adult; its length greater than that of the ventrals, which are contained $3\frac{1}{2}$ in head. Spines of the ventrals almost as long as the rays and $\frac{1}{4}$ as long as the head. Origin of dorsal is far in front of the middle of the body, and in adults slightly, and in the young considerably, in advance of the perpendicular from the tip of the pectoral. The 5th dorsal spine is inserted exactly midway between the tip of the snout and the base of the middle caudal rays. The ventrals inserted in advance of the dorsal. The interspace between the dorsals is contained $5\frac{1}{2}$ to $5\frac{3}{4}$ times in the total without caudal. L. lat. 107 to 112; L. transv. 14 + 17. D. V, I, 9; A. II, 8; P. 16; C. 9 + 8.

The identification of this species was made from one of the types of Prof. Poey's original descriptions now preserved in the National Museum.

Table of Measurements.

Current number of specimen.....	21,226.		21,468.		4,725 a.		4,725 b.	
Locality	Wood's Holl, Massachusetts.		Pensacola, Fla.		Cuba.		Cuba.	
	Milli- metres.	100ths of length.	Milli- metres.	100ths of length.	Milli- metres.	100ths of length.	Milli- metres.	100ths of length.
Extreme length.....	541				255		225	
Length to origin of middle caudal rays	450		385		275			
Body:								
Greatest height.....		17		15		12.2		14.5
Greatest width.....		10		10				
Height at ventrals.....		14½		13¾				
Least height of tail.....		6¾		7½				
Length of caudal peduncle.....		21		21				
Head:								
Greatest length.....		30½		32		33.7		33.5
Greatest width.....		10		9½				
Width of interorbital area.....		5½		5½		5.8		5.5
Length of snout.....		12¾		13¾		15.5		15.7
Length of operculum.....		4		3¾				
Length of upper jaw.....		13		13¾		14.0		14.0
Length of mandible.....		18½		19		21.0		21.0
Distance from snout to orbit.....		12		13½				
Diameter of orbit.....		5		5½		5.8		5.6
Dorsal (spinous):								
Distance from snout.....		41		41		45.0		45.0
Length of base.....		10		9½		9.2		9.2
Length of first spine.....		8½		9½		9.0		10.6
Length of second spine.....		8½		9½		8.0		11.2
Length of last spine.....		4½		5½		5.5		6.0
Dorsal (soft):								
Distance from snout.....		70		69		72.3		71.0
Length of base.....		9¾		10		9.2		9.2
Length of antecedent spine.....		4½		5				5.0
Length of first ray.....				10¾		10.5		12.0
Length of longest ray.....				10¾		10.6		11.7
Length of last ray.....		4¾		6		6.5		7.0
Anal:								
Distance from snout.....		71½		72		75.0		74.2
Length of base.....		8		8¾		7.8		7.8
Length of first spine.....		1½		1½				2.4
Length of second spine.....		4½		4½				6.0
Length of first ray.....		7+		9½		10.0		11.0
Length of longest ray.....				9½				
Length of last ray.....		4¾		6		6.6		6.0
Caudal:								
Length of middle rays.....		7½		7½		7.6¾		9.8
Length of exter- } upper.....		21				20½		22.0
} lower.....		19				20½		20.0+
Pectoral:								
Distance from snout.....		30		30½		33¾		33.3
Length.....		10¾		11		12		12.2
Ventral:								
Distance from snout.....		38		38		41½		41
Length.....		9		9		9¾		10
Branchiostegals.....	VII		VII					
Dorsal.....	V, I, 9		V, I, 9		V, I, 9		V, I, 9	
Anal.....	II, 8		II, 8		II, 8		II, 8	
Caudal.....	IV, 17, IV							
Pectoral.....	I, 12		I, 12		I, 12		I, 12	
Ventral.....	I, 5		I, 5		I, 5		I, 5	
Number of scales in lateral line.....	112		106		115, 120		120	
Number of transverse rows above lateral line.....	15		15		18		17 or 18	
Number of transverse rows below lateral line.....	17		17		18		18	

30. MUGILIDÆ.

69. *Mugil albula* Linn.—*Mullett*.

A single specimen, No. 21,331 (36). D. IV, 8; A. III, 8; P. 16; V. I, 5; C. 7 + 7. L. lat. 42; L. trans. 13.

Several small individuals of this species, No. 21,491, were also received. The largest measured 6 inches in length; those of intermediate size, 4 inches; many others from an inch to an inch and a half.

Bottle No. 5,151 contains several specimens of this species collected in West Florida by Kaiser and Martin.

70. *Mugil brasiliensis* Agassiz.—*Silver Mullet*.

A single specimen, No. 21,498 (28), 11½ inches in length. D. IV, 9; A. III, 8; P. 17; V. I, 5; C. 14. L. lat. 38; L. trans. 12.

31. ATHERINIDÆ.

71. *Chiostoma peninsulæ* sp. nov. Goode & Bean.

Two specimens (Nos. 21,481 *a* and 21,481 *b*) were sent from Pensacola by Mr. Stearns. We also have numerous specimens, No. 21,870, collected in Lake Monroe, Fla., by Prof. Baird.

Diagnosis.—The origin of the anterior dorsal fin is far in advance of the anal fin and slightly in advance of the vent. The height of the body is contained 5 times in total length without caudal (6 times in total length); it is slightly less than the length of the head, and precisely equal to the length of the pectoral. The diameter of the eye is contained 3 to 3½ times in the length of the head; is about equal to the length of the snout and to the width of the interorbital space. Mouth very protractile. Lower jaw long, contained 11 times in length of body without caudal, more than one-third of the length of the head, which is contained in total length of body 4 to 4½ times. Silvery streak occupying the fourth and upper half of the fifth series of scales. Caudal deeply forked; lobes equal. D. V-VI, I, 8-9; A. I, 15-16; C. + 17 +; P. I, 12; V. I, 5. L. lat. 38-39; L. trans. 9½.

72. *Chiostoma vagrans* sp. nov. Goode & Bean.

One specimen of this undescribed species (No. 22,848) was sent from Pensacola by Mr. Stearns, and two (Nos. 22,864 *a* and 22,864 *b*) were sent from Virginia.

Diagnosis.—The origin of the anterior dorsal fin is situated behind a point midway between the origins of the ventral and anal fin and opposite the middle of the interspace between the anal fin and the vent. Height of the body contained 5½ to 6 times in length without caudal, and 6¾ in total length, considerably less than length of head and length of pectoral. Diameter of the eye contained 3 times in length of head, greater than length of snout, and less than width of interorbital space. Mouth slightly protractile. Lower jaw contained 15½ times in length

of body without caudal, and equal to diameter of eye, which is one-third the length of the head, which is contained in total length $4\frac{3}{4}$ times. Silvery streak occupying the lower two-thirds of the third and the upper third of the fourth series of scales. Caudal slightly forked; lobes equal. Vertical fins excessively scaly. Scales of body large. D. V, 1, 7; A. I, 18; C. + 17 +; P. I, 13; V. I-5. L. lat. 48; L. trans. 7.

The measurements of both species are here given.

Table of Measurements.

Species: *Chirostoma vagrans*.

Current number of specimen.....	22,848.		22,864 a.		22,864 b.	
	Pensacola, Fla.		Virginia.		Virginia.	
Locality	Milli- metres.	100ths of length.	Milli- metres.	100ths of length.	Milli- metres.	100ths of length.
Extreme length.....			117		101	
Length to origin of middle caudal rays.....	90		100		85	
Body:						
Greatest height.....		17		17		18
Greatest width.....		10		9		
Height at ventrals.....		17		17		
Least height of tail.....		8		8		
Head:						
Greatest length.....		21		21		21
Greatest width.....		10 $\frac{1}{2}$		9 $\frac{1}{2}$		10
Width of interorbital area.....		7 $\frac{1}{2}$		6 $\frac{1}{2}$		7
Length of snout.....		5		5 $\frac{1}{2}$		
Length of postorbital portion of head.....		9		9		
Length of upper jaw.....		5 $\frac{1}{2}$		5 $\frac{1}{2}$		
Length of mandible.....		6 $\frac{1}{2}$		6 $\frac{1}{2}$		
Diameter of orbit.....		6 $\frac{1}{2}$		6 $\frac{1}{2}$		6 $\frac{1}{2}$
Dorsal (spinous):						
Distance from snout.....		60		60		61
Length of longest spine.....		7		6		
Dorsal (soft):						
Distance from snout.....		76 $\frac{1}{2}$		76		75
Length of base.....		8		8		8
Length of antecedent spine.....		4		3 $\frac{1}{2}$		4 $\frac{1}{2}$
Length of first ray.....		9 $\frac{1}{2}$		8 $\frac{1}{2}$		
Length of longest ray.....		9 $\frac{1}{2}$		8 $\frac{1}{2}$		
Length of last ray.....		6		5 $\frac{1}{2}$		
Anal:						
Distance from snout.....		64		63		
Length of base.....		22		22		23
Length of first spine.....		5		4 $\frac{1}{2}$		5
Length of first ray.....		10+		9 $\frac{1}{2}$		
Length of longest ray.....				9 $\frac{1}{2}$		
Length of last ray.....				4		
Caudal:						
Length of middle rays.....		13		12		12
Length of external rays.....				18 $\frac{1}{2}$		20
Pectoral:						
Distance from snout.....		22		23		
Length.....		21 $\frac{1}{2}$		20		21
Ventral:						
Distance from snout.....		44		44		
Length.....		11		10		10
Branchiostegals.....		V 1				
Dorsal.....		V, I, 7		V, I, 7		V, I, 7
Anal.....		I, 18		I, -		I, 18
Caudal.....		+17+		+17+		+17+
Pectoral.....		I, 13		I, 13		I, 13
Ventral.....		I, 5		I, 5		I, 5
Number of scales in lateral line.....		48		48		48
Number of transverse rows of scales.....		7		7		7

Table of Measurements—Continued.

Species: *Chirostoma peninsule*.

Current number of specimen	21,481 a.		21,481 b.	
	Pensacola, Fla.		Pensacola, Fla.	
Locality	Milli- metres.	100ths of length.	Milli- metres.	100ths of length.
Extreme length	91		68	
Length to origin of middle caudal rays	76		56	
Body:				
Greatest height		19		19
Greatest width		10		10½
Height at ventrals		18		18
Least height of tail		9		8
Head:				
Greatest length		24		25
Greatest width		11½		11
Width of interorbital area		7½		7½
Length of snout		6		
Length of postorbital portion of head		10		
Length of upper jaw		6		
Length of mandible		9		
Diameter of orbit		7		8
Dorsal (spinous):				
Distance from snout		51		
Length of longest spine		9		
Dorsal (soft):				
Distance from snout		70		
Length of base		11		
Length of antecedent spine		5		
Length of first ray		13		
Length of longest ray		13		13
Length of last ray		6		
Anal:				
Distance from snout		64		
Length of base		20		
Length of first spine		5½		
Length of first ray		13		
Length of longest ray		13		14½
Length of last ray		7		
Caudal:				
Length of middle rays		11		13
Length of external rays		21		22
Pectoral:				
Distance from snout		24		
Length		19		19
Ventral:				
Distance from snout		43		
Length		12		13
Dorsal	V, I, 8		V, I, 9	
Anal	I, 16		I, 15	
Caudal	+17+		+17+	
Pectoral	I, 12		I, 12	
Ventral	I, 5		I, 5	
Number of scales in lateral line	38		39	
Number of transverse rows of scales	9		9	

32. BELONIDÆ.

73. *Belone longirostris* (Mitchell) Gill.—*Needle-fish*.

A single specimen, No. 21,469, 20¾ inches in length. D. 15; A. 18.

A specimen, No. 21,288, from the St. John's River, G. Brown Goode, has the following radial formula: D. 14; A. 18. Others from the same source have, No. 19,076: D. 16; A. 19; and No. 18,441: D. 16; A. 19.

Dr. Günther's statement that the number of dorsal and anal rays in southern specimens is less than in those from the north seems scarcely tenable.

74. *Belone notata* Poey.

Belone notata POEY, Mem. Hist. Nat. Cuba, ii, 1860, p. 293.

A single specimen of this species, not hitherto recorded from the coast of the United States, collected by Kaiser and Martin in West Florida, in 1864 or earlier.

This specimen, No. 5,147, is $15\frac{2}{3}$ inches in length. D. 13; A. 14; P. 11; V. 6; C. 15.

33. CYPRINODONTIDÆ.

75. *Cyprinodon variegatus* Lacépède.—*Minnow*.

Several very large specimens, No. 21,494 (49), were sent from Pensacola by Mr. Stearns.

76. *Mollinesia latipinna* Le Sueur.

The Museum has a bottle, No. 22,845, containing several large specimens of this species from Pensacola, Fla. Donor unknown. The largest specimens measure $3\frac{1}{4}$ inches in length, and one male has a dorsal fin one inch in length.

77. *Fundulus grandis* Baird & Girard.

Fundulus grandis B. & G., Proc. Acad. Nat. Sci. Phila. vi, 1853, p. 389.

An individual, No. 22,847, $5\frac{7}{16}$ inches in length, was sent from Pensacola by Mr. Stearns. D. 13; A. I, 10; V. I, 5; P. II, 16; C. V, 18, V. L. lat. 36; L. trans. 15.

This Cyprinodont corresponds completely with the *Fundulus grandis* of Baird and Girard. Concerning the identity of this species with the *Fundulus heteroclitus* of Linnæus or the *Fundulus pisculentus* of authors we are not prepared to express an opinion.

78. *Hydrargyra similis* Baird & Girard.—*Minnow*.

Hydrargyra similis B. & G., Proc. Acad. Nat. Sci. Phila. 1853, p. 389.

A female, No. 21,484, sent by Mr. Stearns from Pensacola, $5\frac{1}{2}$ inches long, agrees sufficiently well with Baird and Girard's *Hydrargyra similis*. D. 13; A. 11. L. lat 33; L. trans. 13.

A specimen, No. 22,850, D. 12; A. $8\frac{1}{4}$; P. I, 18; V. I, 5.

34. CLUPEIDÆ.

79. *Brevoortia patronus* Goode.—*Alewife*.

Numerous specimens of this species were obtained, the largest of which did not exceed 7 inches in length. Four specimens are included under catalogue No. 21,341; eleven under original No. 93, No. 22,808; six under No. 22,809, original No. 103; seven under No. 22,810, original No. 86. Specimens of this species were sent to the National Museum as early as 1864 by Kaiser and Martin, who collected in West Florida.

80. *Opisthonema thrissa* (Linn.) Gill.

A single specimen, No. 21,462 (63), $5\frac{1}{2}$ inches long. D. 12; A. 28.

81. *Pomolobus chrysochloris* Rafinesque.—“*Shad*.”

One of the most interesting facts brought to notice by this collection is the occurrence in the Gulf of Mexico of this species, hitherto thought to live only in fresh waters.

Three individuals, Nos. 21,778, 21,779, 21,780, were received, December 9, 1878, from the Pensacola Ice Company, the largest $15\frac{1}{2}$ inches in length.

82. *Harengula pensacolæ* sp. nov. Goode & Bean.—*Alewife*.

The species is by its form most closely associated with *Harengula macrophthalma*, while in other respects it resembles *Harengula clupeola* and *Harengula humeralis*.

The head is very short, its length contained 4 times in the length of the fish without caudal, and nearly 5 times in its extreme length, to line drawn between the tips of the caudal lobes. In *H. sardina* Poey (= *H. macrophthalma* Ranz., *fide* Günther), the head is contained $3\frac{1}{2}$ times in body-length; in *H. clupeola* Cuv. & Val. (as identified by Poey), a much more elongate species, $3\frac{1}{2}$ to $3\frac{3}{4}$; in *H. callolepis* sp. nov., Goode, MS., from the Bermudas, $3\frac{1}{2}$ to $3\frac{3}{4}$ times.

The body is high, with projecting belly, the contour resembling that of the Common Shad, *Alosa sapidissima*, its height at the posterior extremity of the operculum being greater than the distance from the tip of the lower jaw to the posterior extremity of the operculum: in the other species it is less, notably so in *H. callolepis*, in which the height at this point barely equals the distance from the tip of the lower jaw to the posterior edge of the preoperculum.

The height of the body is contained in its length (without caudal) $2\frac{3}{4}$ to 3 times (in *H. sardina* 3 times; in *H. clupeola* $3\frac{1}{2}$ times; in *H. callolepis* $3\frac{3}{4}$ to 4 times, being equal to the length of the head).

Scales of the back in front of dorsal with radiating striæ and sharply serrated edges, these features being less prominent in the one or two rows on each side next to the dorsal. Other scales smooth, with irregular, but unarmed free margins. When detached they show from three to seven parallel vertical lines, these lines being most numerous posteriorly; upon the nuchal scales these are scarcely present, and they are not visible when attached to the skin, as they are in *H. sardina* (in *H. clupeola* the striations of the nuchal scales are very evident, though the edges are not armed, and the lateral scales exhibit vertical ridges, but in smaller number, ranging from one or more anteriorly to three posteriorly; in *H. callolepis* the nuchal scales are smooth, unstriated, unarmed; the lateral scales from the anterior part of the body are marked with lines not even approximately parallel, and neither straight nor extending over the whole scale, as in the other: on the scales of the posterior part of the body, the markings are very irregular, sometimes showing as many as nine or ten irregular waving, approximately parallel, undulating lines, at others with the vertical lines coalescing

with irregularly undulating horizontal lines, to form a graceful, irregular network).

Scales arranged in 40 transverse and $11\frac{1}{2}$ longitudinal rows. In *H. sardina* 40 (38-42 according to Günther); in *H. callolepis* 38, as nearly as can be ascertained from specimens partly denuded of scales, and $10\frac{1}{2}$ longitudinal rows.

Lower jaw moderately long, its length included nearly 3 times in distance from snout to origin of dorsal, and equal to half the distance from tip of snout to the posterior margin of the operculum (in *H. clupeola* and in *H. sardina* equalling half length of head as measured above, in *H. callolepis* less than half; in *H. callolepis* contained about $2\frac{2}{3}$ times in distance from tip of snout to posterior margin of operculum, in *H. sardina* $2\frac{1}{2}$ times, in *H. pensacola* nearly 3 times).

The maxillary extends behind the front margin of the orbit, as in all species of the genus which have been examined.

Teeth very small, inconspicuous in the jaws. A large patch of asperities on the tongue nearly covering its upper surface (in *H. callolepis* this patch is much smaller, lanceolate in form); cheeks and opercula veined prominently. Gill-rakers fine, closely set, shorter than the eye, about 56 on one side of the first arch (in *H. callolepis* they are thick, stiff, wiry, not closely set, about 40 in number; in *H. sardina* they are much the same as in *H. callolepis* in shape and arrangement, and the number does not exceed 42; in *H. clupeola* they are somewhat shorter, and number at least 50).

Eye large, its diameter longer than snout, contained about 3 times in the length of the head (in *H. sardina* the length of the snout nearly equals the eye, and in *H. callolepis* this is also the case, the diameter of the eye, however, being still about $\frac{1}{3}$ of the length of the head).

Dorsal fin inserted midway between snout and base of caudal, the ventral also originating at a point equidistant from snout and origin of upper caudal lobe (in *H. clupeola* the ventral is placed midway, while the dorsal is very slightly nearer to the snout than to the base of the upper caudal lobe; in *H. callolepis* the ventral is midway, while the dorsal is nearer to the base of the upper caudal lobe by a distance nearly equal to the diameter of the pupil of the eye; in *H. sardina* the ventral is nearer to the snout, the dorsal nearer to the base of the superior caudal ray by a distance nearly equal to the diameter of the orbit).

There are 12 abdominal scutes behind the base of the ventral fin, as is the case also with *H. callolepis* and *H. sardina*, *H. clupeola* having 14.

A high shield of scales enclosing the base of the dorsal and anal fins.

D. 16; A. 17; V. 8; P. 15; C. 16 (*H. callolepis* was D. 17; A. 17; P. 16; C. 15).

Two specimens, No. 22,831 (29), were obtained by Mr. Stearns.

35. CYPRINIDÆ.

83. *Notemigonus americanus* (Linn.) Jordan.—*Roach*; *Sucker*.

A single specimen, No. 21,465 (55). D. II, 7; A. II, I, 13; P. I, 15; V. I, 7. L. lat. 47; L. trans. 15.

36. SILURIDÆ.

84. *Ariopsis felis* (Linn.) Gill & Jordan.—*Salt-water Catfish*.

A single specimen, No. 21,487 (58), $11\frac{2}{5}$ inches in length. D I, 7 + 1; A. 18; P. I, 10; V. 6.

37. ANGUILLIDÆ.

85. *Anguilla vulgaris* Turton.—*Eel*.

A single specimen, No. 22,813 (101), 22 inches in length. A stout and short-headed form, agreeing essentially with *A. bostoniensis* as defined by Günther, except that the distance between the origin of the dorsal and anal fins is considerably greater than the length of the head. The thick lips and shape of the body suggest Girard's *Anguilla tyrannus* from the Gulf of Mexico.

38. MURÆNIDÆ.

86. *Crotalopsis mordax* (Poey).

Conger mordax POEY, Mem. Hist. Nat. Cuba, ii, 1860, p. 319.

Macrodonophis mordax POEY, Rept. Fis.-Nat. Cuba, ii, 1868, p. 252, plate ii, fig. 9 (head).

This species is probably the *Crotalopsis punctifer* of Kaup,* and called by Günther *Ophichthys punctifer*. We have had no opportunity of examining the original description by Kaup, and Dr. Günther does not claim to have seen specimens of this species. We therefore provisionally adopt the name of Poey, being fully convinced that the specimen described by him is specifically identical with a specimen, No. 17,176, 33 inches in length, sent to the National Museum from Pensacola, Fla., by F. B. Stevenson, U. S. N.

A specimen, No. 22,844, was sent from West Florida by Kaiser and Martin in 1864.

87. *Gymnothorax ocellatus* Agassiz.

Gymnothorax ocellatus AGASSIZ, in Spix Pisc. Bras. 1829, p. 91, pl. L. b.

Muræna ocellata GÜNTHER, Cat. Fishes Brit. Mus. viii, 1870, p. 102.

Neomuræna nigromarginata GIRARD, Ichthyology, U. S. Geol. Survey, 1859, p. 76, pl. xli.

The Museum has a bottle, No. 5,160, containing many specimens of this species, old and young, collected in West Florida by Kaiser and Martin. The largest measure 16 inches; the smallest about 5.

* Abhandl. naturwiss. Verein Hamburg, iv, 2, 1860, (1859), p. xii, Taf. i, Fig. 3.

The coloration of these specimens is various and in general corresponds with the description given by Günther. Agassiz's figure represents a fish ornamented with fewer and larger spots than in these Florida specimens, which show the spots very closely contiguous, especially on the head. Some of these specimens show narrow longitudinal brown lines upon the throat and posterior part of the head below the branchial opening. The markings on the dorsal fin are also somewhat different from any heretofore described. We observe a regularly undulating line of white about as wide as the pupil of the eye, the upper undulations extending to the edges of the fin; between these undulations are sub-triangular spots of blackish brown, which together form an interrupted black margin to the fin. These markings, and indeed the general appearance of the fish, are perhaps best represented by Girard's figure, which, however, fails to indicate the white undulating line already mentioned.

The Museum has also a bottle, No. 5,997, containing old and young specimens of this species from Cedar Keys, Florida.

We have examined a specimen, apparently of this species, catalogued "No. 7,004, St. Joseph's Island, Texas, Geo. Würdemann," which we believe to be the original type of Girard's *Neomuræna nigromarginata*.

88. *Herpetoichthys ocellatus* (Les.).

Muraenophis ocellatus LE SUEUR, Journ. Acad. Nat. Sci. Phila. vol. v, p. 108, pl. iv, fig. 3.

A fine specimen, No. 22,289, measuring 575 millimetres.

89. *Neoconger mucronatus* Girard.

An eel-like fish, No. 5,161, 15 inches in length, sent from West Florida in 1863 or 1864 by Messrs. Kaiser and Martin, appears to have been described by Girard under the name *Neoconger mucronatus*.

39. LEPIDOSTEIDÆ.

90. *Lepidosteus platystomus* Rafinesque.—Alligator Gar; Gar Pike.

A single specimen, 15 inches in length, No. 21,485. D. 8; A. 8; P. 10; V. 6; C. 12. L. lat. 57; L. trans. $\frac{8\frac{1}{2}}{6\frac{1}{2}}$.

40. CEPHALOPTERIDÆ.

91. *Ceratoptera birostris* (Walbaum) Goode & Bean.

Said to be of frequent occurrence in the Gulf of Mexico.

41. MYLIOBATIDÆ.

92. *Rhinoptera quadriloba* (Les.) Cuv.—Skate; Whipperce; Corn-cracker.

A large female specimen, No. 21,221.

42. TRYGONIDÆ.

93. *Trygon sabina* LE SUEUR.—*Stingaree*.

A single specimen, No. 21,470 (40), length of body $6\frac{3}{10}$ inches; width of body $6\frac{1}{5}$ inches; length of tail $7\frac{2}{5}+$ inches.

A specimen, No. 22,804, length of body 11 inches; width 10 inches; length of tail $11\frac{3}{10}$ inches. ♀ with tail of young protruding.

A young male, No. 22,818, $3\frac{3}{10}$ inches in length; width of body $3\frac{1}{2}$ inches; length of tail 7 inches.

43. GALEORHINIDÆ.

94. *Hypoprion brevirostris* Poey.

This Cuban species was collected in West Florida by Dr. J. W. Velie.

44. GINGLYMOSTOMATIDÆ.

95. *Ginglymostoma cirratum* (Gmelin) M. & H.

A large individual was obtained in West Florida by Dr. J. W. Velie.

NOTE.—The following new species from the Gulf of Mexico are enumerated in this paper. Those marked by asterisks have been described on previous pages of these Proceedings; those in italics were first sent by Mr. Stearns.

- 29. *Seriola Stearnsii*, Goode & Bean.*
- 33. *Caulolatilus microps*, Goode & Bean.*
- 42. *Eucinostomus harengulus*, Goode & Bean.
- 46. *Pagellus Milneri*, Goode & Bean.
- 50. *Lutjanus Stearnsii*, Goode & Bean.*
- 51. *Lutjanus Blackfordii*, Goode & Bean.*
- 55. *Epinephelus Drummond-Hayi*, Goode & Bean.*
- 59. *Trisotropis microlepis*, Goode & Bean.
- 71. *Chirostoma peninsulae*, Goode & Bean.
- 72. *Chirostoma vagrans*, Goode & Bean.
- 79. *Brevoortia patronus*, Goode.*
- 82. *Harengula pensacola*, Goode & Bean.
- (82 a. *Harengula callolepis*, Goode, from Bermuda.)

NOTES ON NEW ENGLAND ISOPODA.

By OSCAR HARGER.

The marine Isopoda collected by the United States Commission of Fish and Fisheries having been placed in my hands by Professor Verrill, a report has been prepared including full descriptions, with figures of most of the species, except the *Bopyridæ*. Besides the collections of the Fish Commission, I have, through the kindness of Professor Verrill, had access to other extensive collections made principally by himself and Prof. S. I. Smith, at various points along the coast from Great Egg Harbor, New Jersey, to the Bay of Fundy, as is more fully detailed in the report now ready for publication. On account of unexpected delay in the publication of the report, it has been thought best to prepare the following brief summary of its contents, with especial reference to facts not hitherto published. Only such references are here given as are necessary to the understanding of the names adopted, and, in general, the distribution on the New England coast only is indicated.

The *Bopyridæ* have been identified by Professor S. I. Smith, who has also rendered other important assistance in the preparation of the report, of which the present paper may be regarded as an abstract.

The *Oniscidæ*, not being properly marine, are in general not included in the report; but three species, two of them as yet found only on the coast, are included as being commonly found by marine collectors. They are the first three of the following list, which embraces also all the marine Isopoda known to inhabit the waters of New England:

Philoscia vittata Say, Jour. Acad. Nat. Sci. Phil., vol. i, p. 429, 1818.

A southern species found as far north as Barnstable, Mass.

Scyphacella arenicola Smith, Rep. U. S. Fish Com., part i, p. 568 (274), 1874.

Sandy beaches, from Great Egg Harbor, New Jersey, to Nantucket, Mass. Not yet found north of Cape Cod.

Actoniscus ellipticus Harger, Am. Jour. Sci., III, vol. xv, p. 373, 1878.

Shores of Long Island Sound at Savin Rock, and Stony Creek, near New Haven. Collected by Professor Verrill.

Cepon distortus Leidy, Jour. Acad. Nat. Sci. Phil., II, vol. iii, p. 150, pl. xi, figs. 26-32, 1855.

"Branchial cavity of *Gelasimus pugilator*, Atlantic City, New Jersey."

Gyge Hippolytes Bate and Westwood, Brit. Sess. Crust., vol. ii, p. 230, 1868.—*Bopyrus Hippolytes* Kröyer, Grönlands Amfipoder, p. 306, pl. iv, fig. 22, "1838."

Parasitic on *Hippolyte*, etc., and found as far south as Massachusetts Bay.

Phryxus abdominalis Lilljeborg, Öfversigt af Kongl. Vetenskaps Akademiens Förh. Stockholm, 1852, p. 11.—*Bopyrus abdominalis* Krøyer, Naturhist. Tidssk., Bind iii, p. 102, 289, pl. 1, 2, (1840); Gaimard's Voyage en Scandinavie, etc., Atlas, pl. xxix, fig. 1 a-u, "1849."

Parasitic on *Pandalus*, *Hippolyte*, etc., and found as far south as Massachusetts Bay.

Dajus mysidis Krøyer, Gaimard's Voyage en Scandinavie, etc., Atlas, pl. xxviii, fig. 1, "1849."—*Bopyrus mysidum* Packard, Mem. Soc. Nat. Hist. Boston, vol. 1, p. 295, pl. viii, fig. 5, 1867.

Parasitic on *Mysis*, but not hitherto found south of Labrador.

Jæra albifrons Leach, Edinburgh Encyclopædia, vol. vii, p. 434, "1813-14"; Trans. Linn. Soc. London, vol. xi, p. 373, 1815.—*Jæra copiosa* Stimpson, Mar. Invert. Grand Manan, p. 40, pl. iii, fig. 29, 1853.

Common throughout the New England coast under sea-weed, in tide pools, etc. A comparison of specimens received from Oban, Scotland, through the kindness of Rev. A. M. Norman, indicates that our species must be regarded as identical with the well-known British species, and is therefore common to the two coasts.

Janira alta = *Asellodes alta* Stimpson, Mar. Invert. Grand Manan, p. 41, pl. iii, fig. 30, 1853.

A northern species not as yet found south of Massachusetts Bay, occasionally collected in tide-pools, but usually dredged, and extending to a depth of 190 fathoms.

This species is easily distinguished specifically from *J. maculosa* Leach, the type of the genus, but does not appear to differ by characters of generic importance, and I have therefore referred it to the older genus.

Janira spinosa, n. sp.

A second species of this genus was obtained in the summer of 1878, and on examination it appears to be as yet undescribed, although somewhat resembling *J. laciniata* G. O. Sars, but distinguished by the double instead of single row of spines along the dorsal region of the thorax.

The head is strongly rostrate, and has the antero-lateral angles acutely produced, but shorter than the median rostrum. The eyes are small and black, and placed a little behind the middle of the head, at about an equal distance from the median line and the lateral margin. The antennulæ are slender, and slightly surpass the first four segments of the antennæ. The antennæ are about as long as the head and thorax together, and the scale attached to the second peduncular segment is slender and pointed, surpassing the third segment. The flagellum forms about half the length of the antenna, and is slender, tapering, and multi-articulate.

The thoracic segments are all acutely produced at the sides into one or two salient angles, forming a row of acute serrations along the sides of the body. The first segment has a single angle produced somewhat

forward around the sides of the head; the second, third, and fourth segments usually present two serrations, both the anterior and posterior angles being produced and acute, and the last three segments are produced and directed more and more backward. In the dorsal region, each segment bears a pair of sharp tubercles or spines. Anteriorly these spines are near the front margins of the segments and directed forward, but become posteriorly more erect and nearer the middle of the segment, and the last three pairs are directed backward, the last pair being near the hinder margin of the seventh segment. The legs are slightly spiny, the first pair but little thickened in the females. The pleon tapers at the sides, where it is minutely serrulate. Its posterior angles are salient and acute, like the anterior angles of the head. The uropods are of moderate length, about as long as the pleon, and composed of a cylindrical basal segment, bearing two rami, of which the inner is somewhat the larger, and nearly as long as the basal segment. Both, together with the basal segment, are sparingly bristly.

The color in alcohol is nearly white. Length 8^{mm}.

Two specimens of this species were collected at Banquereau by Captain Collins, of the schooner Marion, August 25, 1878. They were found adhering to the cable of the schooner.

Munna Fabricii Kröyer, Naturhist. Tidssk., II, Bind ii, p. 380, 1847; Gaimard's Voyage en Scandinavie, etc., Atlas, pl. 31, figs. 1 a-g, 1849.

Casco Bay, near Portland, Me., Eastport and Western Bank, from low water to 150 fathoms.

Munnopsis typica M. Sars, Christiania Vidensk. Selsk., 1860, p. 84, 1861; Bidrag til Kundskab om Christiania Fjordens Fauna (Nyt Magazin), p. 70, pl. vi, vii, figs. 101-138, 1868.

This species has been taken in the Bay of Fundy in 60 fathoms; also, by Mr. J. F. Whiteaves, in the Gulf of Saint Lawrence.

Eurycope robusta Harger, Am. Jour. Sci., III, vol. xv, p. 375, 1878.

Not yet found south of the Gulf of Saint Lawrence, where it was taken by Mr. J. F. Whiteaves in 220 fathoms, muddy bottom.

Chiridotea cœca Harger, Am. Jour. Sci., III, vol. xv, p. 374, 1878.—*Idotea cœca* Say, Jour. Acad. Nat. Sci. Phil., vol. i, p. 424, 1818.

Common on the southern coast of New England, and taken as far north as Halifax in the summer of 1877.

Chiridotea Tuftsii Harger, Am. Jour. Sci., III, vol. xv, p. 374, 1878.—*Idotea Tuftsii* Stimpson, Mar. Invert. Grand Manan, p. 39, 1853.

This species has been taken at various points along the coast from Long Island Sound to Halifax, but was regarded as rare until the summer of 1878, when it was collected in abundance at Gloucester, Mass.

Idotea irrorata Edwards, Hist. nat. des Crust., tome iii, p. 132, 1840.—*Stenosoma irrorata* Say, Jour. Acad. Nat. Sci. Phil., vol. i, p. 423, 1818.—*Idotea tricuspadata* Desmarest, Dict. des Sci. nat., tome xxviii, p. 373, 1823; Consid. Crust., p. 280, 1825.

This species is common throughout the coast of New England, but is more abundant southward, being to a great extent replaced toward the north by the next species.

A comparison of English and European specimens with our own leaves no doubt of the identity of the species on the opposite coasts of the Atlantic. Being a common European species, it has been mentioned by many authors under a variety of names, which are more fully quoted and discussed in the report. Say's name appears to be the earliest that can be certainly connected with the species.

Idotea phosphorea Harger, Rep. U. S. Fish Com., part i, p. 569 (275), 1874.

Found throughout the coast, but more abundant northward.

Idotea robusta Kröyer, Naturhist. Tidssk., II, Bind ii, p. 108, 1846; Gaimard's Voyage en Scandinavie, etc., Atlas, pl. xxvi, fig. 3 a-r, 1849.

A pelagic species.

Synidotea nodulosa Harger, Am. Jour. Sci., III, vol. xv, p. 374, 1878.—*Idothea nodulosa* Kröyer, Naturhist. Tidssk., II, Bind ii, p. 100, 1846; Gaimard's Voyage en Scandinavie, etc., Atlas, pl. xxvi, fig. 2, 1849.

A northern species, found at Halifax, N. S., and 125 miles southward, in from 16 to 190 fathoms. Also from George's Bank.

Synidotea bicuspidata = *Idotea bicuspidata* Owen, Voyage of the Blossom, Crustacea, p. 92, pl. xxvii, fig. 6, 1839.—*Idotea marmorata* Packard, Mem. Soc. Nat. Hist. Boston, vol. i, p. 293, pl. viii, fig. 6, 1867.—*Idotea pulchra* Lockington, Proc. Cal. Acad. Sci., vol. vii, p. 45, 1877.

The determination of the synonymy of this species rests principally upon the work of Messrs. Streets and Kingsley in the Bulletin of the Essex Institute, vol. ix, p. 108, 1877. It has not yet been found south of the Grand Bank.

Erichsonia filiformis Harger, Rep. U. S. Fish Com., part i, p. 570 (276), pl. vi, fig. 26, 1874.—*Stenosoma filiformis* Say, Jour. Acad. Nat. Sci. Phil., vol. i, p. 424, 1818.

A southern species, not yet found north of Cape Cod.

Erichsonia attenuata Harger, Rep. U. S. Fish Com., part i, p. 570 (276), pl. vi, fig. 27, 1874.

Great Egg Harbor, New Jersey, and Noank, Conn. The species will probably be found at other localities, among eel-grass, on the southern shore of New England.

Epelys trilobus Smith, Rep. U. S. Fish Com., part i, p. 571 (277), pl. vi, fig. 28, 1874.—*Idotea triloba* Say, Jour. Acad. Nat. Sci. Phil., vol. i, p. 425, 1818.

A southern species, rare north of Cape Cod, but extending, with some other southern species, to Quahog Bay, on the coast of Maine.

Epelys montosus Harger, Rep. U. S. Fish Com., part i, p. 571 (277), 1874.—*Idotea montosa* Stimpson, Mar. Invert. Grand Manan, p. 40, 1853.

Replaces the preceding species for the most part at the north, but found also as far south as Long Island Sound. It has been obtained from a depth of 40 fathoms.

Astacilla granulata = *Leachia granulata* G. O. Sars, Arch. Math. og Naturvid. Christiania, B. ii, p. 351 (proper paging 251), 1877.—*Astacilla Americana* Harger, Am. Jour. Sci., III, vol. xv, p. 374, 1878.

St. George's Banks, 1877, and Banquereau, 1878. I have seen no specimens of Sars's species for comparison, but his description appears to apply perfectly to the specimens described by myself before seeing his paper.

Sphæroma quadridentatum Say, Jour. Acad. Nat. Sci. Phil., vol. i, p. 400, 1818.

A southern species, scarcely passing north of Cape Cod, but occurring at Provincetown, Mass.

Limnoria lignorum White, Pop. Hist. Brit. Crust., p. 227, 1857.—“*Cymothoa lignorum* Rathke, Skrivt. af Naturh. Selsk. v. 101, t. 3, f. 14, 1799.”—*Limnoria terebraus* Leach, Edinburgh Encyc., vol. vii, p. “433, 1813-14”; Trans. Linn. Soc. London, vol. xi, p. 371, 1815.

This genus was associated with the *Asellidæ* by Edwards without an examination of the specimens, and, so far as I know, he has been followed by recent authors. An examination of its structure appears to point unmistakably to affinity with the *Sphæromidæ*. I have not, however, thought best to include it in that family, but have placed it in a family by itself, the *Limnoriidæ*.

The species extends throughout the New England coast.

Cirolana concharum = *Conilera concharum* Harger, Rep. U. S. Fish Com., part i, p. 572 (278), 1874.—*Ega concharum* Stimpson, Mar. Invert. Grand Manan, p. 42, 1853.

Not found north of Cape Cod, but abundant at Vineyard Sound.

Cirolana polita = *Conilera polita* Harger, in Smith and Harger, Trans. Conn. Acad., vol. iii, p. 3, 1874.—*Ega polita* Stimpson, Mar. Invert. Grand Manan, p. 41, 1853.

St. George's Banks, Salem, and Eastport (Stimpson), rare.

Ega psora Krøyer, Grönlands Amfipoder, p. 318, “1838.”—*Oviscus psora* Linné, Syst. Nat., ed. x, tom. i, p. 636, 1758.—*Ega emarginata* Leach, Trans. Linn. Soc. London, vol. xi, p. 370, 1818.

Parasitic on the Cod, Halibut, etc.; also dredged on St. George's Banks.

Nerocila munda Harger, Rep. U. S. Fish Com., part i, p. 571 (277), 1874.

On dorsal fin of *Ceratacanthus aurantiacus*, Vineyard Sound.

Ægathoa loliginea Harger, Am. Jour. Sci., III, vol. xv, p. 376, 1878.

Mouth of Squid, New Haven, Conn.

Livonecca ovalis White, List Crust. Brit. Mus., p. 169, 1847.—*Cymothoa ovalis* Say, Jour. Acad. Nat. Sci. Phil., vol. i, p. 394, 1818.

White and several other British carcinologists use the orthography *Lironecca*; but in the Dictionnaire des Sciences naturelles, tome xii, where the genus is established by Dr. Leach, the name occurs, in French and Latin, nine times on pages 352 and 353, spelled always with *v* as the third letter. I have, therefore, adhered to that orthography, although there is reason for supposing that Dr. Leach intended to use the form *Lironecca*.

Parasitic on Bluefish, etc.; not yet found north of Cape Cod.

Anthura polita Stimpson, Proc. Acad. Nat. Sci. Phil., vol. vii, p. 393, 1855.—*Anthura brunnea* Harger, Rep. U. S. Fish Com., part i, p. 572 (278), 1874.

A southern species, not found north of Cape Cod until the summer of 1878, when it was taken at Gloucester, Mass. Usually found among Eel-grass or mud in shallow water.

Paranthura brachiata = *Anthura brachiata* Stimpson, Mar. Invert. Grand Manan, p. 43, 1853.

A northern species, but found as far south as Vineyard Sound, from 27 to 115 fathoms.

Ptilanthura tenuis Harger, Am. Jour. Sci., III, vol. xv, p. 377, 1878.

Rare, but found throughout the New England coast. The remarkably elongate flagellum of the antennulæ belongs to the males only.

Gnathia cerina = *Praniza cerina* Stimpson, Mar. Invert. Grand Manan, p. 42, pl. iii, fig. 31, 1853; and, also, *Aneus Americanus* Stimpson, op. cit., p. 42, 1853; the former being the female form and the latter that of the adult male.

A northern species, not yet found south of Cape Cod, occurring in from 10 to 220 fathoms, and, in the young stages, parasitic on fish.

Tanais vittatus Lilljeborg, Bidrag til Känn. Crust. Tanaid., p. 29, 1865.—*Crossurus vittatus* Rathke, Fauna Norwegens, (Nova Acta Acad., vol. xx,) p. 39, pl. i, figs. 1-7, 1843.

This species has been found at Noank Harbor, Conn., and will probably be found at other localities on our coast. I have had no European specimens for comparison, and, unfortunately, have not had access to some important European literature on the subject, but do not know of any character by which to distinguish it from Rathke's species, and have therefore regarded it as identical.

This genus is well separated from the next by the pleon, which bears only three pairs of pleopods and uniramous uropods, and by the remarkable incubatory sacs attached to the fifth thoracic segment of the females, and unlike anything else found among the *Isopoda*. They have been described by Rathke, Willemoes-Suhm, and others.

Leptocheilia algicola = *Paratanais algicola* Harger, Am. Jour. Sci., III, vol. xv, p. 377, 1878.—*Leptocheilia Edwardsii* Bate and Westwood, Brit. Sess. Crust., vol. ii, p. 134, 1868, (males).—*Tanais flum* Harger, Rep. U. S. Fish Com., part i, p. 573 (279), 1874, not of Stimpson.

A male specimen, received from Guernsey, through the kindness of

Rev. A. M. Norman, appears to agree perfectly with the males of this species, though not with Kröyer's description of *Tanaïs Edwardsii*. I have not therefore united my species with his, though I think it possible they may prove identical.

The species occurs in considerable abundance at Noank Harbor, Conn., among algæ, and also at Vineyard Sound, and will probably be found at other localities on the southern shore of New England. It has also been collected by Professor Verrill, during the present summer, at Provincetown, Mass., in company with *Limnoria* and *Chelura*, in old piles.

The genus *Leptochelia* has several years' priority over *Paratanais*, and, though founded on the male sex, ought, as I think, to be retained.

Leptochelia limicola = *Paratanais limicola* Harger, Am. Jour. Sci., III, vol. xv, p. 378, 1878.

Massachusetts Bay, off Salem, 48 fathoms, mud.

Leptochelia rapax, n. s.

Females of this species considerably resemble those of *L. limicola*, but may be distinguished by the following characters: The eyes are larger and more conspicuous; the last segment of the antennulæ is scarcely longer than the preceding, instead of nearly twice as long, as in *L. limicola*; the dactylus of the second pair of legs is somewhat shorter and the terminal spine less attenuated, and the external ramus of the uropods consists of a single very short and small segment, shorter than the basal segment of the inner ramus, which is not elongated. The inner ramus is five-jointed, instead of six-jointed, as in *L. alpicola*.

The males are remarkable for the long and slender prehensile hand terminating the first pair of legs. The body of the males is short and robust, with the segments well marked by constrictions. The head, with the united first thoracic segment, is short and rounded, bulging strongly at the sides just behind the eyes, which are conspicuous, somewhat less in diameter than the bases of the antennulæ, distinctly articulated, and coarsely faceted. The antennulæ are elongated, especially in the basal segment, which is more than one-third as long as the body, slightly swollen on the inner side, near the base, then tapering to the tip; the second segment is cylindrical, less than half as long as and more slender than the first; the third is less than half the length of the second, and is followed by about eight short flagellar segments, the last one tipped with setæ. The antennæ, when extended, do not attain the end of the basal antennular segment; the first three segments are short, the fourth longest, being longer than the first three together, the fifth slender and tipped with setæ. The terminal setæ of both antennulæ and antennæ arise in part from minute or rudimentary terminal segments. The first pair of legs forms the most striking feature of this species. These legs, when extended, are in general longer than the body of the animal, though they vary considerably in size, being usually proportionally smaller in the smaller specimens. In these legs, the segments preceding the carpus are short and robust; but the carpus is about half as long as the body, and the propodus

is even somewhat longer than the carpus, and usually strongly flexed beneath it. More than half the length of the propodus is made up of the slender digital process, which bears a low tooth on the inner side, near the base, and a stouter one near the slender incurved tip. The dactylus is slender, curved, and pointed, and armed with a few weak spinules along the inner margin. The forceps thus formed are capable of seizing and closing around the body of another individual.

The thoracic segments, except the first, are well separated; the second (first free) segment is shortest; the third, fourth, and fifth segments are of increasing length; the sixth is as long as the fifth; the seventh shorter. The first five segments of the pleon are of about equal length; the sixth shorter and obtusely pointed in the middle. The uropods consist on each side of a robust basal segment, bearing two rami, the outer short, and composed of a single segment, the inner five-jointed and tapering. Both rami are sparingly bristly. The males vary in length from 2.6^{mm} to 3.8^{mm}, and in breadth from 0.6^{mm} to 0.8^{mm}. The females are more slender. Color in alcohol nearly white or marked in the males by a brownish transverse band along the posterior margin of each segment.

This species was collected by Professor Hyatt and Messrs. Van Vleck and Gardner at Annisquam, Mass., in the summer of 1878.

Leptochelia filum = *Tanais filum* Stimpson, Mar. Invert. Grand Manan, p. 43, 1853.

“Bay of Fundy,” Stimpson.

Leptochelia cœca = *Paratanais cœca* Harger, Am. Jour. Sci., III, vol. xv, p. 378, 1878.

Collected along with *L. limicola* in 48 fathoms, mud, Massachusetts Bay, off Salem, 1877.

Of the forty-three species enumerated in the preceding list, the following eighteen have as yet been found only north of Cape Cod:

<i>Gyge Hippolytes</i> Bate and West-wood.	<i>Synidotea bicuspidata</i> Harger.
<i>Phryxus abdominalis</i> Lilljeborg.	<i>Astacilla granulata</i> Harger.
<i>Dajus mysidis</i> Kröyer.	<i>Cirolana polita</i> Harger.
<i>Janira alta</i> Harger.	<i>Æga psora</i> Kröyer.
<i>Janira spinosa</i> Harger.	<i>Gnathia cerina</i> Harger.
<i>Munna Fabricii</i> Kröyer.	<i>Leptochelia limicola</i> Harger.
<i>Munnopsis typica</i> M. Sars.	<i>Leptochelia rapax</i> Harger.
<i>Eurycope robusta</i> Harger.	<i>Leptochelia filum</i> Harger.
<i>Synidotea nodulosa</i> Harger.	<i>Leptochelia cœca</i> Harger.

The following ten have been found only south of Cape Cod:

<i>Scyphacella arenicola</i> Smith.	<i>Cirolana concharum</i> Harger.
<i>Actoniscus ellipticus</i> Harger.	<i>Nerocila munda</i> Harger.
<i>Cepon distortus</i> Leidy.	<i>Ægathoa loliginca</i> Harger.
<i>Erichsonia filiformis</i> Harger.	<i>Livonca ovalis</i> White.
<i>Erichsonia attenuata</i> Harger.	<i>Tanais vittatus</i> Lilljeborg.

The following fifteen have been found both north and south of Cape Cod:

<i>Philoscia vittata</i> Say.	<i>Epelys montosus</i> Harger.
<i>Jara albifrons</i> Leach.	<i>Spharoma quadridentatum</i> Say.
<i>Chiridoteca caeca</i> Harger.	<i>Limnoria lignorum</i> White.
<i>Chiridoteca Tuftsii</i> Harger.	<i>Anthura polita</i> Stimpson.
<i>Idotea irrorata</i> Edwards.	<i>Paranthura brachiata</i> Harger.
<i>Idotea phosphorea</i> Harger.	<i>Ptilanthura tenuis</i> Harger.
<i>Idotea robusta</i> Kröyer.	<i>Leptochelia algicola</i> Harger.
<i>Epelys trilobus</i> Smith.	

The following eleven species occur also on the coast of Europe:

<i>Gyge Hippolytes</i> Bate and Westwood.	<i>Astacilla granulata</i> Harger.
<i>Phryxus abdominalis</i> Lilljeborg.	<i>Limnoria lignorum</i> White.
<i>Jara albifrons</i> Leach.	<i>Ega psora</i> Kröyer.
<i>Munna Fabricii</i> Kröyer.	<i>Tanais vittatus</i> Lilljeborg.
<i>Munnopsis typica</i> M. Sars.	<i>Leptochelia algicola</i> Harger.
<i>Idotea irrorata</i> Edwards.	

NOTICE OF RECENT ADDITIONS TO THE MARINE INVERTEBRATA, OF THE NORTHEASTERN COAST OF AMERICA, WITH DESCRIPTIONS OF NEW GENERA AND SPECIES AND CRITICAL REMARKS ON OTHERS.

PART I—ANNELIDA, GEPHYREA, NEMERTINA, NEMATODA, POLYZOA, TUNICATA, MOLLUSCA, ANTHOZOA, ECHINODERMATA, PORIFERA.

By A. E. VERRILL.

Among the very extensive collections made during the past eight years by the U. S. Commission of Fish and Fisheries, under the direction of Professor Baird, there are still many species not recorded as American in any of the reports hitherto published; most of these are well-known Arctic or Northern European species, but others are still undescribed. As the final reports on the different groups will require a long time for their completion, owing to the vast number of specimens to be examined from more than a thousand localities, it has been thought desirable to record some of the more important additions to the fauna, without further delay.* More detailed descriptions and numerous figures will be published in the final reports, together with the details of their geographical distribution. All the species included in the following list, unless otherwise stated, have been collected by the U. S. Fish Commission.

*Many species have also been recorded in various articles in the American Journal of Science and Arts, during several years past. See, also, an important paper on the Podophthalmous Crustacea, by Professor S. I. Smith, and one on the Pycnogonida, by E. B. Wilson, in the Trans. Conn. Academy, vol. v, 1879.

ANNELIDA.

Sthenelais gracilis, sp. nov.

A small, slender, delicate species. Scales white, smooth, outer edge with few (12-16) very small, unequal, tapering papillæ, which are not crowded, the longest about as long as the intervening spaces. Head short, broad, the posterior and lateral margins rounded, the front emarginate. Eyes black, conspicuous; the posterior pair on the dorsal surface in advance of the middle of the head; anterior pair nearer together, close to the anterior margin; median antenna long, stout at base, tapering to a slender tip; the palpi have about the same form and length as the median antenna. Dorsal setæ longer than the ventral, extremely slender, tapering gradually toward the very fine tips, and very minutely serrulate. Upper ventral setæ (2-4) simple, very slender, with the shaft smooth, the serrate portion broader, with rather long ascending spinules, the tips tapering to a long fine point; the median setæ, above the acicula, have longer, much stouter, smooth shafts, expanded distally, with the terminal portion long, curved, divided into eight to twelve imperfect joints, tapering to very slender capillary tips, which are mostly acute, sometimes faintly hooked. Below the acicula there are others, similar in structure, but with the shaft not so stout, and with the terminal piece shorter, with fewer joints; the lower portion of the fascicle consists of numerous, much more slender, capillary setæ, with smooth shafts and very long, slender, tapering, terminal pieces, composed of ten to twelve or more imperfect joints.

Harbor of Gloucester, Mass., 7 to 10 fathoms, sand, 1879 (U. S. Fish Commission). Described from alcoholic specimens.

Sthenelais Emertoni, sp. nov.

A small, slender species, with white, translucent scales, their outer edge with very small, nearly equal, slender papillæ, often slightly clavate at tip, and rather near together, their interspaces being mostly less than their length; surface partially covered with minute rounded verrucæ.

Dorsal setæ very slender, capillary, very minutely transversely serrulate. Few (about 4) upper ventral setæ, simple, long, slender, with the terminal portion sharply serrulate, the tips fine and sharp; next to these are some slender compound setæ, the terminal piece slender, straight, of moderate length, acute, with six to eight imperfect joints; the median setæ have much stouter, smooth shafts, expanded distally, and a nearly straight, short, rapidly tapering, sharply pointed, terminal piece, of four to six joints; below these are some with similar though smaller shafts, and a short, stout, terminal piece, hooked at the tip, and with a sharp ascending spine at about the distal third; others of the same size have the terminal piece very acute, with six to eight or more joints; the lowest are very slender, with a longer, very fine, tapering, terminal piece, imperfectly divided into about four to six joints, at each of which there is a projecting acute angle like a tooth; the last of

these is not far from the minute curved tip, so that the tip often appears as if bifid. In this character it approaches the genus *Eusthenelais* of McIntosh, the validity of which may be doubtful.

Salem Harbor, Mass., on muddy bottoms (J. H. Emerton, 1879). Described from alcoholic specimens.

***Sthenelais picta* Verrill.**

In this species, the scales are partially covered with very small, round, slightly prominent, obtuse verrucæ, and the free margin bears a row of small, simple, rather slender, tapering or fusiform, mostly acute papillæ, which are of unequal lengths, and placed at irregular distances, but sometimes in small clusters. The setæ of the dorsal ramus are numerous, long and slender, but varying in size and length, the median and lower ones being much the stoutest and rather strongly serrulate. In the superior group of the lower ramus are several very acute setæ, strongly spirally spinulate toward the end; next to these are two or three, or more, slightly longer, compound setæ, with slender shafts, serrulate near the joint, and bearing a long, slender, terminal piece, imperfectly jointed in the middle and slightly bifid at tip; below these are numerous, stout, compound setæ, mostly shorter, with stouter, smooth shafts, enlarged distally, and bearing a short, thick, terminal piece, which is decidedly hooked and bifid at the tip; some of the upper ones in this group have the terminal piece more than twice longer than broad, but most of them have it triangular and little longer than broad; the next series of setæ are slender, some with smooth shafts and a slender, tapering, terminal portion, composed of two or three indistinct joints, and bifid at tip; others, among the most inferior setæ, have a slender shaft, serrulate distally, with a simple, slender, terminal piece, bifid at tip, or more properly with a slender spine-like process arising near to, and nearly as long as the sharp, incurved tip, which is opposed to it. Grows to the length of 6 to 8 inches or more.

Barnstable and Provincetown, Mass., to Virginia, in sand, at low-water.

***Sigalion arenicola*, sp. nov.**

An elongated, moderately stout, depressed species, narrowed and tapered posteriorly, and bearing very numerous, large, thin, white, translucent, smooth scales, which have large pinnate processes on their posterior edge.

Head small, shield-shaped, widest anteriorly, with a broad, slightly rounded lobe in front, and with the anterior angles rounded; ocelli small, but distinct, forming a quadrangle on the top of the head, the two pairs near together. A pair of minute, obtuse antennæ at the front edge; no trace of a median antenna. Scales, except the smaller, rounded, anterior ones, large and somewhat quadrangular, with three of the angles rounded; on the posterior border there are about eight to ten well-separated, large, deeply pinnate processes, borne on simple, slender

stems; the pinnate portion is broad-ovate, longer than the stems, with about four to six long, slender pinnæ on each side. The setæ are very numerous and complicated. Those of the dorsal fascicle are long, slender, capillary, mostly curved inward over the back. In the lower fascicles there are several kinds: the upper (*a*) are two to four simple ones, with long, tapering, strongly spinulated, very acute tips; the next (*b*) are several compound setæ, with the shaft stouter and strongly serrulated near the end, while the terminal piece, of variable length, is composed of many joints, and is minutely bifid at the tip; the next (*c*) are about six to eight stout, compound setæ, arising both above and below the supporting aciculæ, and having their shafts minutely and closely circularly serrulate toward the end, and with a short, stout, tapering, undivided, terminal piece, which has a hooked, claw-like tip, with a sharp secondary process opposed to it; below these are (*d*) numerous long, slender, compound setæ, with shafts scarcely or not at all serrulate, and with the subdivided terminal piece minutely bifid at the tip, varying in length and number of joints, the middle ones being comparatively stout, with the terminal piece tapering and not very slender, while the lower ones are very slender and capillary, with a very long, tapering, terminal piece, of many joints. Color nearly white or pale flesh-color. Length of largest, 80^{mm} to 100^{mm}.

Vineyard Sound and off Nantucket Island, Mass., 10 to 20 fathoms, clean silicious sand, 1875. Shores of Cape Cod Bay, in sand, at low-water, at Barnstable (A. E. V.), and Provincetown (H. E. Webster).

This elegant species is allied to *S. Buskii* M'Intosh, and has similar appendages to the scales. In our species, however, the pinnate processes are less crowded and have longer stems and fewer and longer pinnæ.

Lætmatonice armata, sp. nov.

Lætmatonice filicornis Verrill, formerly, in Amer. Jour. Science (*non* Kinberg).

Body stout, depressed, broadest in the middle, tapered slightly toward both ends, the posterior most obtuse. Back covered with large, thin, white, smooth scales, usually more or less concealed by a felt-like coating, to which mud and dirt adhere. Lower surface granulous. Head small, but prominent, with two minute, rounded, tubercle-like antennæ in front and a median antenna arising between them, which has a stout, tapering base, but becomes very slender for most of its length; it is much shorter than in *L. filicornis*, its tip not reaching to the basal third of the palpi. The latter are large and long, regularly tapered to the end, three to four times as long as the median antenna and four or five times as thick. The first parapodia bear two slender cirri on the upper ramus, which are about as large as the median antenna. The scales are large, smooth, and translucent, without appendages, mostly broadly rounded on the inner and posterior edges, and deeply emarginate on the outer attached border. The upper rami of the parapodia bear, besides

several divergent clusters of capillary setæ, a group, sometimes of six to eight, long, stout, spine-like, dark brown, acute and barbed setæ, having several short recurved hooks on each edge of the flattened tips, near the end. The ventral rami of the parapodia are prominent and bear three, or more, stout, elongated, brown setæ, with sharp, somewhat recurved tips, which are covered along the convex side with slender, sharp spinules; at the end of the straight shaft, and separated by a naked space from the spinulated portion, there is a strong, sharp, divergent spine. Length of a medium-sized specimen, 32^{mm}; breadth, exclusive of setæ, 13^{mm}; length of palpi, 7^{mm}.

Common on muddy bottoms in the Bay of Fundy and Gulf of Maine, in 50 to 150 fathoms. Collected first in 1864, 1865, and 1868, by the writer and Professor S. I. Smith, and subsequently by the U. S. Fish Commission, in many localities.

It differs from *L. filicornis*, with which it was formerly identified by me, not only in having a much smaller median antenna, but also in the character of the setæ, especially those of the ventral fascicle. Whether the Gulf of St. Lawrence specimens, recorded by McIntosh as *L. filicornis*, belong to this species, is uncertain.

***Eunoa spinulosa*, sp. nov.**

Body large, oblong, rather narrow, of nearly equal breadth through the greater part of its length. Head dark, deeply bilobed in front, the sides rounded; each lobe terminates in an anterior, acute, white point. Eyes large, lateral, the anterior farther apart than the posterior. Median antenna rather small, about twice as long as the head, tapering to a slender point; lateral antennæ smaller and about half as long as median; palpi moderate, smooth, much stouter and longer than the antennæ; tentacular and dorsal cirri long, slender, covered with numerous slender papillæ. Scales large, broad, rounded-oblong, the posterior part being produced and broadly rounded, the surface covered with minute, rounded grains and toward the border with very small, elongated, tapering, acute spinules; outer edge fringed with numerous small, slender papillæ. Setæ yellow, very abundant, forming large, dense tufts. Those of the upper parapodia are in part as long as those of the lower, and much stouter; the upper ones are shortest, unequal, stout, curved, spine-like, acute, finely and closely transversely serrulate throughout most of their length, only a very small tip being smooth; below these there is a group of longer and smoother spine-like setæ, the serrulation less distinct and not extending so far toward the base nor so near to the tip. The ventral parapodia have very numerous setæ, less than half as thick as the upper ones, but the longest about equal to or somewhat exceeding those of the upper fascicle; they are all of one general form, decreasing much in length toward the lower side; the shaft is long and smooth, the distal portion enlarged, somewhat curved, closely spinulated, ending in a short, smooth, slightly incurved, acute tip. Length (a few posterior segments

lacking), 35^{mm}; breadth, including setæ, 16^{mm}; breadth of body alone, 6^{mm}; length of largest scales, 8^{mm}; breadth, 5.5^{mm}.

One specimen, in alcohol. Sable Island Bank, off Nova Scotia. Captain McPhee, schooner "Carl Schurz," November, 1878 (U. S. Fish Commission).

Autclytus ornatus, sp. nov.

A small, slender species. The female form is easily distinguished by the bright red color of the ova and embryos, showing conspicuously through the pale yellowish integuments of the body, or incubatory sac. The head is short, broad, slightly emarginate in front; eyes conspicuous, lateral, rounded; antennæ nearly equal, the median one a little the longest; lateral ones about twice the length of the head. Dorsal cirri long, slender, about equal to the diameter of the body. The three anterior segments bear only short setæ, but fascicles of long setæ commence on the fourth; these are nearly as long as the breadth of the body. Length, about 5^{mm}.

Vineyard Sound, at surface, July 13 and August 28, 1875.

Another form, possibly the male of this species, was taken July 21. This was bright green in color. The lateral antennæ were of moderate length, tapered, swollen at base; odd median antenna and upper tentacular cirri slender, very long, about equal to half the body. Dorsal cirri long, more than half the diameter of the body. Fascicles of long setæ commence on the fourth segment.

Odontosyllis lucifera Verrill.

Eusyllis lucifera Verrill, Amer. Jour. Science, vol. x, p. 39, 1875.

An examination of the armature of the œsophagus of this species shows that it belongs to the genus *Odontosyllis*. The chitinous rim is somewhat horseshoe-shaped, the extremities often angular or tooth-like, turning inward and downward, while the opposite side bears a row of about six small, sharp, incurved denticles. Anal cirri two, rather long and slender, transversely lined.

Pedophylax longiceps, sp. nov.

A very slender species, allied to *P. dispar* Webster, but with much longer head and palpi, and longer and stouter caudal cirri. The head is nearly as long as broad, both the front and posterior edge a little produced in the middle; median antenna arising in advance of the center of the head, swollen toward the end, but with the tip acute, somewhat longer than the head, but scarcely reaching beyond the middle of the palpi: lateral antennæ very small, papilliform, nearly in line with the odd one. Ocelli four, the two pairs close together on the head, the anterior just outside of the lateral antennæ, the others just behind them. Palpi very long, more than twice as long as the head, at the base as broad as the head, slightly swollen, tapering gradually to the narrow end, the sides nearly straight or slightly incurved, slightly

emarginate at the tip, with a distinct sutural line along the middle above. Tentacular cirri small, papilliform. Parapodia small, each with a small dorsal and ventral cirrus and a large, obtuse, setigerous lobe. Setae of several kinds, the usual arrangement being as follows: one or two acicula shorter than the other setae, tapering, straight, spine-like, one usually acute and the other blunt at tip; one longer, slender, simple seta, curved and slightly enlarged toward the end, which suddenly narrows to a small acute tip; one, or sometimes two, of similar size and length, straight and abruptly expanded or spatulate near the end of the shaft, and bearing a long, very slender, acute, terminal piece; two or three unequal compound setae, with the shaft spatulate at the end and bearing a short, acute-triangular, terminal piece. Posteriorly the lowest is a simple, curved seta, with a short, sharp tip, similar to the upper one, but shorter, more tapered, and less curved. The pharynx occupies about four segments; the median tooth is rather large. Stomach large, occupying two segments, oblong, with many circles of granules. Caudal cirri relatively large, elongated, enlarged in the middle, tapering to acute tips, their length greater than the diameter of the body, much longer than the median antenna. Color, pale salmon. Length, 5^{mm} to 7^{mm}.

Thimble Islands and Savin Rock, near New Haven, Conn., 2 fathoms, among algæ, and at low-water, among the débris attached to tubes of *Diopatra*, October, 1873, and October 15, 1875 (A. E. Verrill).

A specimen, probably a sexual form of this species or *P. dispar*, was taken in Vineyard Sound, at surface, July 10, 1875. It was similar anteriorly, but on the segments behind the 11th there were fascicles of long, slender setae, twice as long as the diameter of the body. Color, yellowish green.

Nereis alacris, sp. nov.

Body rather slender, slightly enlarged behind the buccal segment. Antennae slender and pointed. First pair of superior tentacular cirri very long and slender, about equal to the first six segments; those of the second pair more than one-third longer, reaching about to the tenth segment; ventral cirri also long and slender, about one-third as long as the corresponding superior ones. Caudal cirri remarkably long and slender, longer and more slender than the longest tentacular cirri. General color of head and anterior segments bright olive-green; posterior segments and appendages tinged with orange-red; bases of antennae and cirri tinged with purplish red; anterior eyes dark green with a red center, posterior pale red with a dark red center; middle of head pale green; a row of more or less connected and sometimes confluent light spots extends along the back, one to each segment; these spots are usually greenish white anteriorly, yellowish posteriorly. Smaller specimens are plainer colored, mostly greenish or brownish, often without dorsal spots.

Parapodia, in the middle region, of moderate size; upper rami longest, having an inferior and superior branchial lobe, or lingula, of about equal

length, the superior one somewhat gibbous and bearing the long, slender, dorsal cirrus beyond its middle; beyond the origin of the latter the lingula is lanceolate, subacute at the end; three conspicuous dark spots on the superior lingula, one terminal, one at the origin of the cirrus, the other midway between that and the body; another spot on the body, at base of the appendage. The inferior lingula is also lanceolate, a little shorter than the superior. More than half the length of the dorsal cirrus projects beyond the end of the lingula. The ventral lingula of the lower ramus is oblong-lanceolate, obtuse, considerably smaller than the dorsal one. Ventral cirrus small, slender, acute, not reaching to the end of the ventral lingula. Setæ in both the upper and lower rami of two kinds: in the superior fascicle of each they have slender, acute, terminal pieces; in the inferior fascicle the terminal piece is short and hooked at the tip. It is very active in all its motions, and swims rapidly. It constructs a tenacious tube, attached to algæ, and supported by divergent silken threads. Length, 2 to 3 inches.

Vineyard Sound, 8-10 fathoms, 1875. Described from life.

Nereis megalops Verrill.

Nectonereis megalops Verrill, Report on Invert. of Vineyard Sd., etc., p. 298, [592], pl. xii, figs. 62, 63, 1873.

The female of this form was taken in Vineyard Sound, at surface, in 1875. Although agreeing in general with the male, it departs less widely from the ordinary *Heteronereis* form, both in respect to its head, palpi, and the dorsal parapodial appendages. The male has a simple, median, tapering, caudal cirrus. There are two minute, dark spots on each segment, along the middle of the ventral surface, posteriorly.

It is so nearly related to the *Heteronereis* stage of *Nereis Dumerili*, and to the *Heteronereis Malmgreni* described by Claparède, and to other related forms discovered on our coast by Professor Webster, that it seems probable that its *Nereis* stage, when known, will be closely allied to *N. Dumerili*, and consequently should be referred to *Nereis*, or to *Leontis*, if the latter be regarded as a distinct genus.

Ceratocephale Websteri, sp. nov.

Head small, with the cephalic lobe emarginate in front, and with a median groove running back; sides slightly incurved; posterior margin slightly convex. No eyes. Antennæ small, slender, tapering, coalescent at base with the palpi. Palpi small, slender, bent somewhat downward, not much larger than the antennæ, the terminal joint small, subacute, about one-third the whole length. The four cephalic organs are similar in form, and all are directed forward. Tentacular cirri slender, acute; the dorsal ones of the two anterior pairs are longer than the others, being nearly twice as long as the diameter of the body; the ventral ones are bent downward and forward in life, and are less than half as long; of the two posterior pairs, the dorsal are somewhat longer than the ventral.

Buccal segment large, somewhat swollen. Jaws small, light brown, strongly curved, with slender, sharp tips, the edge moderately serrulate. Denticles (or paragnaths) not observed, the proboscis being retracted. Parapodia of anterior segments small, the two rami of nearly equal length, and with similar fascicles of setæ, the lower ones most numerous, the upper lingula small, subtriangular, terminated by the slender, tapering, dorsal cirrus, which, at about the fifth segment, is more than twice as long as the lingula and reaches about to the end of the setæ. Ventral cirrus short, tapering. Farther back, at the eleventh segment and beyond, the rami become more unequal, the upper lingula develops into a long, flat, narrow, tapering branchia, bearing the filiform dorsal cirrus at its tip. At the fifteenth segment and beyond the branchia is decidedly longer than the parapodia, curved directly upward, and about eight times as long as its width in the middle, and more than half the diameter of the body, rather abruptly narrowed at the tip, and terminated by the long, slender cirrus, which equals or exceeds the branchia. In the enlarged base of the branchiæ there is a circular, thickened, white, round spot, due to an internal organ. On the setigerous lobe of the upper ramus is a narrow-lanceolate, lingula-like process, extending from the setigerous lobe as far as the tips of the setæ. On the lower ramus there are two similar lingulæ, one of which is terminal, and the other is situated at about the distal third, on the lower side. Ventral cirrus small, slender, tapered, single on the first sixteen segments; on the seventeenth and subsequent segments there are two equal ventral cirri, arising close together. Setæ in this region form a large fascicle in each ramus, with a single aciculum dividing each fascicle into two groups. The setæ in the upper ramus have a very long, slender, smooth, nearly straight, terminal joint, flexible at tip, and not distinctly flattened, even toward the base. In the lower ramus, the terminal joint is not quite so long, slender, and narrow, but distinctly flattened, and with the edge very finely serrulate; these are very slightly curved, but not abruptly bent, near the base. Diameter of the anterior part of the body, 6^{mm} to 7^{mm}. Color of body pale brownish or pinkish; branchiæ and bases of parapodia bright red; setigerous lobes greenish, the setæ dark at base. Described from life.

Dedicated to Professor H. E. Webster, who has largely contributed to the knowledge of American Annelids.

Twenty-four miles east of Cape Cod, 122 fathoms, soft mud (U. S. Fish Commission). Only one specimen, which lacks the posterior portion of the body. Closely related to *C. Loveni* Malmgren, but the latter has the branchial organs cirriform and slender, and the double ventral cirri are figured upon the tenth segment; the setæ of the lower ramus are also represented with the terminal joint abruptly bent at base, wider, and much more strongly serrulate than in our specimen. It is possible, however, that the two may be only sexual forms of one species.

Lumbrinereis hebes Verrill.

Lumbriconereis obtusa Verrill, Proc. Amer. Assoc. for 1873, p. 383, 1874.

The name *obtusa* having been preoccupied in this genus, the above name is proposed as a substitute.

Goniada gracilis Verrill.

Eone gracilis Verrill, Report on Invert. of Vineyard Sound, etc., p. 302, 1873, (vol. i, Rep. of U. S. Com. of Fish and Fisheries, p. 596).

This species has upon its proboscis the two rows of V-shaped denticles (in chevron) and also the jaws as in *Goniada*, to which genus it should, therefore, be referred.

Polydora gracilis, sp. nov.

Small, 3^{mm} to 4^{mm} long, very slender. Antennæ stout, blunt, very long, six times as long as breadth of body, or even more, transversely wrinkled.

Head with a long, narrow, oblong, central portion, acute behind, notched or bilobed in front, with the two anterior corners rounded and a little prominent; side lobes of the head not broad, gradually narrowed toward the front; eyes four, the front pair conspicuous, decidedly larger and but little wider apart than the others, which are small and but little farther back.

The four anterior segments have small, rounded, dorsal papillæ, with capillary setæ; on the fifth there are fascicles of about six large special setæ, of which the posterior are shorter. On the sixth and following segments, there are, with the capillary setæ, three or four uncini in the dorsal fascicles. Branchiæ elongated, commencing on the seventh segment, absent on the twelve posterior segments. Caudal appendage sucker-like, with a smooth margin, surrounded by a marginal circle of dark specks. Color pale salmon or light flesh-color; antennæ and head with dark specks.

Off Block Island, 1873, gregarious in galleries in *Pecten tenuicostatus*, and having slender sand-tubes projecting from the orifices in the shell.

Polydora concharum, sp. nov.

A very long, slender species, having more than 200 segments, and often becoming four or five inches long.

Head, or cephalic lobe, narrow in front, projecting considerably beyond the wide lateral lobes (formed by the buccal segment), and deeply divided at the end into two lanceolate, acute, divergent lobes. Eyes four, small, but conspicuous, black, the anterior ones much wider apart than the posterior, and but little farther forward. In some specimens, the eyes are absent. Antennæ very long and slender, fifteen to twenty times as long as the diameter of the body, or more, whitish or pale flesh-color, with a central red vessel, and usually with a fine dark line on each side. Buccal segment large and swollen below, with longitudinal sulci extending back from the mouth. On the four anterior segments, the

parapodia, above and below, bear slender, very acute, bent setæ, and a prominent, flat process, somewhat expanded and rounded at the end; on the first segment, these are smaller and less spatulate, and the setæ are fewer and shorter. The fifth segment is about as long as the three preceding ones, not much swollen, and it bears three distinct groups of setæ, differing in form; the upper and most anterior are fine, bent, capillary setæ, with acute tips, similar to, but much smaller than, those of the preceding segments; below these there is a group of small, slender setæ, abruptly bent backward and with blunt tips; then there is a row of five or six large, strong, dark-colored, nearly straight, blunt spines, which are nearly equal in diameter, the anterior and upper ones longer, and, when projected at right angles to the body, forming an oblique, somewhat curved, transverse row; finally, in a row below the last of these, are two or three lighter-colored and more slender, straight spines, with abruptly tapered, acute tips. On the succeeding segments, the lower fascicles consist of strong, elongated uncini, in rows of six or seven, with the tip bidentate, strongly curved, beak-like, and with a thin, spatulate border; near the posterior end, they are replaced by acute setæ and fine capillary ones. The upper fascicles, on the segments behind the fifth, consist of numerous, long, bent, very acute setæ, like those of the anterior segments, the upper one in each fascicle with longer and more slender tips than the lower; toward the posterior end they become longer and fewer, with straighter tips, equalling or exceeding the diameter of the segments. Branchiæ appear in a rudimentary form as small papillæ on the sixth segment; on the seventh they are short conical papillæ; on the eighth they become longer and more distinctly ligulate, and increase in length on the following segments, soon becoming long and slender, recurved, and meeting across the back. They exist on one hundred or more of the succeeding segments. After the branchiæ cease the succeeding segments are very numerous, smaller, and rounder, so that the body is more slender and attenuated posteriorly, and somewhat broader and a little flattened on the branchiferous portion. Anal segment small, terminating in four small, roundish, equal, flattened lobes.

Color somewhat variable, usually pale flesh-color, or grayish or yellowish white anteriorly, and more or less tinged with dull greenish or brownish posteriorly, the red dorsal vessel showing plainly, and the branchiæ red. Length, 100^{mm} to 140^{mm}; breadth, 1^{mm} to 1.5^{mm}; length of antennæ, 20^{mm} to 30^{mm}. Described from life.

Very common all along the coast, from Cape Cod to Nova Scotia, in 10 to 100 fathoms, in tortuous, narrow galleries excavated in shells, especially of *Cyprina Islandica*; also in decayed wood dredged in 32 fathoms off Cape Cod. Collected by the writer in the Bay of Fundy in 1863, 1864, 1868, 1870, and subsequently at various localities while dredging for the U. S. Fish Commission in 1872, 1873, 1877, 1878, and 1879.

A new genus, related to *Spio*, but with a pair of branchial appendages behind the long antennæ, and with a distinct collar on the front edge of the second setigerous segment, was discovered near New Haven, Conn., at low-water, in 1877, and had been briefly described in this article. But learning that Professor H. E. Webster had also discovered the same genus, and had described it in a forthcoming paper on the Annelids of New Jersey, with an abundance of good specimens, my description has been withdrawn.

Spio limicola, sp. nov.

A small, slender species, with branchiæ on all the segments, and usually characterized by blackish, transverse lines and spots on the head and anterior segments. Body thickest anteriorly, tapering gradually to the end, somewhat depressed. Head flattened, obtusely rounded in front. Eyes four, small, nearly in a square. The anterior a little wider apart. Antennæ rather stout at base, tapered, blunt, about four or five times as long as breadth of body, whitish, with red vessels, and sometimes with thin, dark lines along the edges. Branchiæ flat, shorter, broader, and blunt anteriorly; narrower, longer, and more tapering farther back, where they meet across the back; posteriorly they become small and papilliform. The parapodia have anteriorly, in the upper ramus, two broad lingulæ, of which the posterior is the longer and more acute; the capillary setæ, arising between them, form large fascicles anteriorly; posteriorly they become longer, exceeding the diameter of the body, and form small fascicles. In the posterior region, the upper lingulæ become more unequal, the posterior one becoming elongated and the anterior one reduced to a mere papilla. The lower ramus is nearly the same on all the segments, consisting of a broadly rounded, flat, thick lobe, bearing a group of numerous uncini. Anal segment small, bearing four moderately long, blunt cirri, their length about twice the diameter of the anal segment.

Color, pale reddish white or light flesh-color, with bright red vessels and branchiæ, and showing the greenish intestine posteriorly; head with two blackish spots in front and others on the sides and beneath; anterior segments with blackish, transverse spots or interrupted lines of blackish between the segments on the ventral side and laterally; branchiæ and both upper and lower lingulæ usually with flake-white specks or a white line along their margins; anal segment and cirri greenish yellow.

Length, 25^{mm} to 35^{mm}; breadth, 1^{mm} to 1.5^{mm}. Described from life. Cape Cod Bay, 16 to 25 fathoms, soft, fetid, sandy mud (U. S. Fish Commission, 1879). Some of the specimens were filled with pink eggs, August 29.

Spiophanes tenuis, sp. nov.

A very delicate and slender species, thickest anteriorly at the branchial segments, gradually attenuated posteriorly. Head changeable,

depressed, narrow in middle, expanding laterally at the front, with prominent, blunt, lateral angles, and with a broadly rounded or sometimes slightly emarginate front margin; posteriorly the narrow head-lobe extends back to the second setigerous segment. Eyes four, minute, in a quadrangle, the anterior pair wider apart. Antennæ slender, not very long, about three times as long as diameter of body. Buccal segment swollen, forming short, convex, lateral lobes along the posterior half of the head; below the mouth is a prominent, strongly ciliated lobe. Branchiæ in four pairs, on the 2d, 3d, 4th, and 5th setigerous segments; the anterior pair branched, the others apparently foliaceous and shorter.* The first setigerous segment has a small, prominent, rounded, upper ramus, with few short setæ. The 2d to 5th have a broad linguliform, or leaf-like, upper ramus, with the inner distal edge prolonged into an angle over the back, and a very broad, fan-shaped fascicle of long acute setæ set transversely and protecting the gills; a smaller lobe also exists in front of the setæ; lower ramus composed of a small, rounded lobe with a fascicle of slender setæ, and with uncini in the fascicles beyond the 15th segment, and a cluster of acute setæ. The parapodia increase rapidly in size from the 1st to the 6th, and then gradually decrease to the 17th segment, beyond which they are rudimentary; on the 5th to 8th the upper lingula is about half as long as the breadth of the body; beyond the 5th they are more or less expanded distally, or wide, spatulate, bluntly terminated; beyond the 10th small, not very prominent, rounded; on 5th to 10th segments the upper setæ are slender, acute, longer than the lingula, and in large fascicles, though in much smaller ones than those of the branchiferous segments; on the posterior segments the uncini become longer, and the capillary setæ mostly disappear in the lower fascicles. Color yellowish or greenish white, often decidedly greenish posteriorly, and with a dark greenish-yellow intestine. Some were filled with pale pink eggs, August 29.

Cape Cod Bay, 16 to 21 fathoms, soft, fœtid mud (U. S. Fish Commission, 1879).

***Heterocirrus fimbriatus*, sp. nov.**

A delicate species, remarkable for the great length and slenderness of its setæ, which form a wide fringe along the sides of the body. Head small, about twice as long as broad, not half as broad as the body, obtusely rounded in front, with a pair of sublateral ocelli at about the anterior third. Tentacular cirri short, usually absent in preserved specimens. The three to six anterior segments bear each a pair of slightly

*A larger specimen was taken in 31 fathoms, off Cape Cod, which may be a distinct species. In this the branchiæ are long, lanceolate, acute, and all are pectinately divided along the posterior margin, with slender papillæ. The eyes are red. Proboscis urceolate, with the extended margin scolloped. The first eleven segments bear capillary setæ, above and below, in large fascicles; on the 12th to 16th there are also stouter acute spinules in the lower fascicles; beyond the 16th segment there are uncini mingled with the capillary setæ.

clavate, unequal, branchial cirri, mostly less than four times as long as the diameter of the body. The two anterior segments have slender capillary setæ in the upper fascicles, less long than the diameter of the body; they increase in length and numbers farther back, and on the seventh and forty to fifty succeeding segments they become very numerous and remarkably long, being from two to three times as long as the breadth of the body; toward the posterior end of the body they again diminish in length, becoming comparatively short on the last twenty segments. The ventral setæ are all capillary and fine-pointed on the anterior and median segments; they somewhat exceed the diameter of the body in the middle segments, but are shorter toward both ends. On the last twenty segments there are, in each ventral fascicle, one or two short unciform setæ with somewhat hooked but scarcely bidentate tips. Similar unciform setæ exist in some of the posterior dorsal fascicles. The setæ are silvery white. Body dark olive-green, with lighter dorsal line; branchiæ with dark tips. Length, about 25^{mm}; diameter, without appendages, 1^{mm} to 1.75^{mm}.

Off Campo Bello Island, Bay of Fundy, 60 fathoms, burrowing in dead shells of *Pecten tenuicostatus*, 1872.

Dodecaceria concharum Ersted.

This species is nearly allied to the last, and occurred with it. It is very common, on our coast, in various shells. The genus *Dodecaceria* Ersted has not been distinctly distinguished from *Heteroeirrus* Grube, to which it is closely related. The number of branchial cirri is variable in both, but their arrangement is the same. The setæ, however, are different in their arrangement. In *D. concharum* the 1st segment bears no setæ; on the 2d to 7th there are short capillary setæ, above and below; on the 8th there is a solitary, long, unciform seta in the dorsal fascicle of capillary setæ, and four or five stouter ones, with bidentate tips in the ventral fascicles, and no capillary ones; on the 9th and succeeding segments, the ventral setæ continue as on the 8th, and the dorsal fascicles usually contain four or five elongated, simple, hooked uncini, together with more or less numerous fine, acute, capillary setæ, which are often absent, but they occur on some of the segments even to the posterior end, where they are often about one-third as long as the diameter of the body. Behind the middle of the body the uncini become smaller, shorter, and fewer, only two or three to a fascicle, but near the posterior end, on four or five segments, they become stouter, more hooked, and distinctly bidentate, especially on the ventral side.

The color is usually dark green or greenish black, and no distinct ocelli were detected, but some obscure dark specks may represent them.

Praxillura, gen. nov.

Body very long and composed of a larger number of segments than is usual in the *Maldanidae*. Posterior segments very numerous, short, becoming indistinct posteriorly. Caudal segment subacute, destitute of

a funnel, and, in our specimens, of any other appendage. Anterior segments numerous and short, eight or more (in the type), bearing, in the lower rami, one or two simple, acute spines; in the middle and posterior regions bearing a row of uncini. Head gibbous posteriorly, without any well-marked lateral fold.

Praxillura ornata, sp. nov.

Body very long, slender, of nearly uniform diameter, composed of about forty setigerous segments; the eight anterior bear only one or two spines in the ventral rami, uncini appearing on the 9th. Head swollen and gibbous above, posteriorly, abruptly flattened in front, with the anterior edge bluntly rounded; two rounded, lateral lobes beneath; front concave beneath; no distinct lateral lobes above; numerous small, red ocelli in several rows around the front margin. Buccal segment thick, coalescent with the head, long, biannulate, the head and buccal segment together about equal in length to the first two setigerous ones. The eight anterior, setigerous segments are short, scarcely longer than broad, with a well-marked suture between, and biannulate, the posterior half smaller, the anterior swollen in the middle, where the setae arise, and with a red band behind the setae. In the middle region, the segments are long and narrow. The seven or eight anterior segments have a small upper fascicle of slender acute setae, and one stout acute spine below (sometimes two). On the ninth segment* there are two uncini and a spine below them; and on the tenth to the twelfth and several following there are four to eight uncini, and the number increases farther back. The last seventeen setigerous segments are very short. These are followed by several scarcely distinct segments at the posterior end, which is tapered and simple. Color pinkish white, with a bright red band on each segment anteriorly, a dark red spot on each side of the head, and two bands of red on the buccal segment. Ocelli red. On the middle region, the bands are less distinct, and the surface is covered with dark brown specks. Length, 125^{mm} to 150^{mm}. Diameter, 1^{mm} to 1.5^{mm}. Described from life.

Off Race Point, Cape Cod, 25 fathoms, sandy mud, in long, round, rigid tubes, made of fine sand (U. S. Fish Commission, 1879). Casco Bay (U. S. Fish Commission, 1873).

Maldane filifera, sp. nov.

Very slender, elongated, with twenty-one setigerous segments, of which fifteen elongated ones are included in the middle region, three short ones are anterior, and three short ones posterior. The head is swollen, convex, and gibbous at the posterior part, abruptly flattened in front, with the front edge bluntly rounded; a low lateral fold; buccal segment coalescent with the head. The three anterior setigerous segments are short, about as long as broad, with a fascicle of long, acute

* In one specimen there are four, somewhat unciniiform, ventral spinules, in a row, on the eighth segment, and more on the ninth, without the acute spinule below.

setæ above, and a row of about three spines below; on the fourth and fifth segments there are six to nine uncini in the row, and more farther back, where they become prominent, strongly hooked, or claw-like uncini. The fourth and several succeeding segments are usually more than twice as long as broad, with an annulation in front of the middle; farther back, in the middle region, the segments are six to eight times as long as broad, very slender, swollen near the posterior end, where the setæ arise. The last three setigerous segments are about as long as broad, swollen in the middle, and bear slender setæ about one-half as long as the breadth of the body, and a row of uncini. Anal segment consolidated with the preceding, apparently single, non-setigerous one, very obliquely truncated at the end, and surrounded by a well-developed, smooth border, interrupted dorsally, so that when expanded it has a spatulate form. The anal opening appears to be nearly central, within the border. The caudal membrane is filled with blood-vessels. In the middle region of the body, on the ninth to eighteenth segments, in the upper fascicles of acute setæ, are two very long, slender, flexible, thread-like setæ, usually unequal, the longer six to eight times as long as the diameter of the segments; they are covered with sharp spinules, alternating on the two sides. Color of middle segments salmon, thickly specked with orange-brown and reticulated with red blood-vessels; anterior and posterior segments greenish or yellowish white.

Off Cape Cod, 20 to 50 fathoms, in hard sand; tubes attached to valves of dead bivalves (U. S. Fish Commission, 1879).

Notomastus gracilis, sp. nov.

Very small and slender. Head moderately acute in extension. Six anterior segments bear fascicles of capillary setæ above and below; the seventh and succeeding segments bear uncini above and below, but in the lower fascicles of the seventh segment there are often some capillary setæ also. The fascicles are all small. The uncini are elongated, distinctly constricted toward the end, and expanded in a blade-like form beyond, with the tip only slightly hooked. Color red. Length, 40^{mm} or more; diameter, 0.05^{mm}.

Noank, Conn., 4 to 5 fathoms, mud (U. S. Fish Commission, 1874).

This species resembles *N. filiformis* Verrill, but differs in the form and arrangement of the setæ. In the latter, the five anterior segments bear large groups of long, capillary, acute setæ; but on the fifth there are sometimes a few uncini mingled with the capillary ones in the lower fascicles. The uncini are numerous on the following segments, and are long and somewhat bent, but show no constriction, the distal portion being regularly narrow, spatulate, or paddle-shaped, with the central shaft curved, blunt, and slightly hooked at the tip. In some specimens there are two well marked black eyes. The tip of the head is elongated and acute.

The genus *Ancistria* Quatrefages would include both the above species, but it seems to be impossible to distinguish that genus by any defi-

nite structural characters from *Notomastus* Sars. Therefore, the two species formerly described by me from Casco Bay as *Ancistria capillaris* and *A. acuta* should be named *Notomastus capillaris* and *N. acutus*.

Polycirrus phosphoreus, sp. nov.

A large, handsome, bright red species, remarkable for its brilliant violet-blue phosphorescence when disturbed.

Body very changeable in form, soft and flaccid, usually swollen anteriorly, narrowing somewhat near the head, and more attenuated posteriorly. Tentacles very numerous, originating from an elongated and somewhat spatuliform cephalic process. Fascicles of acute, capillary setae exist on twenty-four segments. The uncini commence on the tenth setigerous segment. They are minute, strongly hooked, and form a linear row, consisting of about twenty on the tenth segment, and of thirty to forty on the succeeding ones. The posterior region not having capillary setae consists of thirty or more segments, toward the end becoming very short and indistinct. Anal segment small, simple, with a minute papilla. Ventral glandular shields conspicuous on the nine anterior segments, covering the whole ventral surface, becoming narrower backward, and bilobed; beyond the ninth segment the ventral shields are smaller and more distant, squarish, bilobed, and separated by a median furrow. On the nine anterior segments there is also a thickened, annular, light-colored, glandular area, just below the fascicles of setae; farther back these become rudimentary. Color bright red or blood-red. In August, females were filled with large quantities of light red ova. Length, up to 75^{mm} to 80^{mm}; greatest diameter, 4^{mm} to 5^{mm}. Described from living examples.

From off Stonington, Conn., to the Bay of Fundy, in 10 to 50 fathoms. Common in the Bay of Fundy, where it was collected by the writer in 1863, 1864, 1868, 1870, 1872. Casco Bay and Massachusetts Bay (U. S. Fish Commission).

Trichobranchus glacialis Mahgren.

In life, the anterior part of the body is swollen, bright red, brightest near the head on the dorsal side. Posterior portion of body slender, yellowish or greenish. Lip and cephalic lobe bright blood-red anteriorly. Below the mouth is a turgid fold, which is light red, crossed by longitudinal lines of bright red. Tentacles whitish, those in front clavate or spatulate, the posterior ones very numerous, slender, filiform. Branchiae slender, cirriform, in length about equalling the diameter of the body.

Off Cape Cod, 122 fathoms, soft mud (U. S. Fish Commission, 1879).

Spirorbis Stimpsoni, sp. nov.

Spirorbis nautiloides? Verrill, in former papers. See Trans. Conn. Acad., vol. iii, p. 45, pl. iv, fig. 4 (*non* Lamarek).

Tubes dull white, opaque, terete, rather closely coiled, the aperture not raised; surface somewhat rough with the lines of growth, often

smoothish. Branchiæ nine, rather long, lanceolate, with slender, naked tips and numerous lateral processes. Operculum elongated obconic, hollow, containing the eggs; pedicel slender at base, enlarging gradually to the operculum.

Massachusetts Bay to Nova Scotia, common, in 10 to 80 fathoms, on shells and stones.

Tomopteris Smithii, sp. nov.

A large and very elegant species, remarkably transparent and exceedingly active in its motions. Outline, including lateral appendages, elongated oval or lanceolate, the length being about three and one-half times the breadth. Head with two small eyes, near together; two short, tapering, acute antennæ, and two very long and slender cirriform processes, nearly half as long as the body; these originate from broad subconical bases. The lateral appendages of the body commence close to the head; the first are about equal to the diameter of the body, but those at about the anterior third are twice as long, while the posterior ones become very small and more distant; the tail ends in a narrow, naked portion, of considerable length. The lateral appendages taper from the base to the fork, where they divide into two lobes, each consisting of a broad, elliptical, and very thin membrane, supported by an acute central branch of the main stem. The naked caudal portion in one specimen had about six faint bands of reddish, not seen in the other; all other parts are so limpid as to be nearly invisible in clear water. The interior of the body and appendages contained numerous eggs. Length, 63^{mm} and 70^{mm}; breadth across appendages, 18^{mm}; length of middle appendages, 7^{mm}; of long cephalic appendages, 29^{mm}.

Eastport, Me., August, 1872, two specimens, at surface. Named in honor of Professor S. I. Smith, who first discovered it.

GEPHYRÆA.

Priapulus pygmæus, sp. nov.

A small yellowish white or flesh-colored species. In extension the proboscis is usually slightly clavate, nearly as long as the body, and often somewhat greater in diameter. The proboscis is distinctly longitudinally marked with about twenty-five white, muscular lines, between which there are as many rows of small, prominent, conical papillæ, largest toward the mouth and disappearing on the posterior third. Body usually cylindrical, changeable, abruptly tapered or subtruncate at the posterior end, distinctly annulated, with fine circular and longitudinal lines on the annulations; at the posterior end having very small conical papillæ on the annulations. Caudal appendage in length about equal to diameter of body, with a rather stout stem, bearing about twelve short, fusiform papillæ or branches, which are changeable in form, and covered with small conical papillæ. The integument is so translucent that the corpusculated circulating fluid can be easily seen circulating in the hollow stem and tubercles. The corpuscles are minute and round.

Pharynx provided with numerous teeth in longitudinal rows, each with a whitish, slightly curved, acute, central denticle. Intestine brown, scarcely longer than the body. Proboscis whitish or pale flesh-color; body and caudal appendage yellowish. Largest seen were about 15^{mm} long and 2^{mm} in diameter. Described from life. The form of the body and proboscis continually changes.

Massachusetts Bay, off Plymouth, 27 fathoms, soft mud; Harbor de Luth, Campo Bello Island, Bay of Fundy, 4 to 5 fathoms, soft mud (U. S. Fish Commission, July 30, 1872).

Thalassema viridis, sp. nov.

A small bright green species with swollen body and long slender proboscis, somewhat spoon-shaped at the end. Body round, thick, about twice as long as broad, largest and obtusely rounded posteriorly; the surface is minutely granulous in appearance, the granules in circular lines; anteriorly the body rapidly narrows to the base of the proboscis, where there are two small spines at the mouth. The proboscis is so infolded at the edge as to form a groove, like a spout, which expands near the end; it is longer than the body. Color bright grass-green. Length of body, about 6^{mm}. Described from life.

Off Head Harbor, Campo Bello Island, 77 fathoms, mud, 1872. Found in holes in hard nodules of blue clay.

NEMERTINA.

Amphiporus virescens, sp. nov.

Body long, slender, tapering gradually to the tail, widest anteriorly in extension. Active in its movements. Head ordinarily obtusely rounded in front. Ocelli numerous, forming a very long lateral cluster on each side of the head; anteriorly each cluster consists of several rows, but it narrows backward to a single row, which extends back beyond the head and neck. Color clear pale green, varying in tint. Length of largest specimens seen, about 40^{mm}.

New Haven and Noank, Conn.; Wood's Holl, Mass., etc. Common among hydroids on the piles of wharves.

Amphiporus agilis Verrill (= *Ophionemertes agilis* Verrill, Am. Jour. Science, vii, p. 45, pl. 7, fig. 1).

This species belongs to *Amphiporus*, as characterized by M'Intosh. It has only been taken in 20 to 90 fathoms, off the coast of Maine.

Amphiporus roseus Verrill (= *Planaria rosea* Müller).

The species which I thus identify is common in Massachusetts Bay and the Gulf of Maine, on muddy bottoms, in 20 to 100 fathoms. It agrees well with the original figures and descriptions, but does not agree with *A. pulcher*, to which M'Intosh refers Müller's species, erroneously it seems to me. The color above is usually deep cherry-red to reddish brown, varying toward orange and chocolate-brown; beneath, flesh-color.

Ocelli in two large clusters on each side of the head, the anterior groups largest, somewhat triangular, covering the antero-lateral margins and extending upward and backward on the head, where they terminate on each side in a small subdorsal group of ocelli, more distinct than the rest; just back of these are two distinct clusters of ocelli. Transverse fossæ run up on each side, in line with the posterior groups of ocelli. Proboscis large, finely papillose, reddish. Length, 50^{mm} or more.

I have also met with another species, which agrees nearly with *A. pulcher*, as described by M'Intosh, and with which it is probably identical.

Amphiporus Stimpsoni Verrill (= *Ommatoplea Stimpsoni* Girard, in Stimpson).

This is very common in Massachusetts Bay and northward to the Bay of Fundy and Labrador, from low-water mark, under stones, to 100 fathoms. It is easily recognized by its clear, dark purplish or chocolate-brown color above, with pale margins and a squarish or triangular white spot on each side of the head, and usually with a narrow white band across the neck; beneath, pinkish or flesh-color. Ocelli in two or more rows in an elongated group on each antero-lateral margin of the head, and a pair of small subdorsal clusters on the transverse white nuchal band. Often 150^{mm} long and 8^{mm} to 10^{mm} broad.

The *Planaria angulata* of Otho Fabricius was probably based on this species; but his description is insufficient to determine this with certainty.

Amphiporus lactifloreus M'Intosh.

Common at Eastport, Me., under stones, at low-water mark. Its color there is usually pale flesh-color, or dull whitish or grayish. Length, 50^{mm} to 100^{mm}.

Amphiporus cruentatus. sp. nov.

A species peculiarly characterized by having red blood, so that the vessels appear distinctly red through the translucent integument. Body flaccid, versatile, slender, tapering to both ends; head not very distinct; snout strongly ciliated. Ocelli about 12 on each side of the head, in an interrupted longitudinal row, the most anterior one considerably larger. Two slight transverse grooves on each side of the head, apparently not extending across the dorsal side, but the anterior ones curve forward in front of the ganglia, and the posterior ones behind the ganglia. Proboscis long, densely covered with elongated, conical papillæ. A simple central stylet and two small lateral ones on each side. Color light reddish salmon, with conspicuous bright red median and lateral blood-vessels, containing a corpusculated red fluid.

Vineyard Sound, 4 to 5 fathoms, July 21, 1875.

Tetrastemma vermiculus Ehr. (?); M'Intosh.

This species, as determined by M'Intosh, was common on the piles of wharves at Gloucester, Mass., in 1878. Color pale grayish or yellowish,

usually with more or less distinct brownish mottlings along the sides, due to internal organs. The two pairs of ocelli are rather distant, and usually there is a dusky line extending between the two eyes of the same side. On the head, in front of the eyes, there are often flake-white specks; and frequently others occur along the middle of the back. Not before recorded from the American coast.

Tetrastemma vittata Verrill.

American Journal of Science, vol. vii, p. 45, pl. 7, figs. 3, *a, b*, 1874; Proc. Amer. Assoc. for Adv. of Science for 1873, p. 389, pl. 2, figs. 7, 8, 1874.
Cosmocephala (?) *cordiceps* (Sars, MSS.), Jensen, Turbellaria ad Litora Norvegiæ, p. 82, tab. viii, figs. 13-16, 1879.

The species described by Jensen from the coast of Norway agrees so well, in form and color, with our *T. vittata*, as to render its identity highly probable. The eyes were not observed by Sars in the Norwegian specimens, but they are often so obscured by the very dark color of the head, in our darkest examples, as to be almost invisible.

This species was dredged in considerable numbers this season in Cape Cod Bay, 16 to 22 fathoms, mud, by the U. S. Fish Commission. Some of the specimens were 3 inches long.

Lineus viridis Verrill (= *Planaria viridis* Fabr.).

Lineus Gessercensis McIntosh.—*Nemertes viridis* Verrill, Report on Invert. of Vineyard Id., etc., p. 334 [628].

This species is exceedingly abundant on our coast, from the Arctic Ocean to Long Island Sound. It occurs gregariously under stones, between tides, and also at the depth of several fathoms. The most abundant variety is green, varying from dull olive-green to greenish black, the anterior end usually darkest, and the ventral surface paler than the back. The transverse light lines are usually indistinct. Length, often 150^{mm} or more.

Var. **fusca** (= *Planaria fusca* Fabr.).

This variety occurs like the last, and is usually associated with it. The color varies from pale reddish brown to dark brown and greenish brown.

Lineus communis Van Beneden.

This species, accurately described and figured by Van Beneden, is very common, often occurring in large groups under stones and among muscels, on muddy shores, between tides (Eastport, Me., to Long Island Sound). It much resembles the preceding species in form and color, but is more slender, with a more elongated head, the mouth being farther back. The color is usually dark olive-green to greenish black, but varies to brownish and dull reddish. Ocelli black, often rather indistinct in dark specimens, forming a single lateral row on each side of the head. It is probable that *L. socialis* (Leidy sp.) is not distinct from this.

Lineus dubius, sp. nov.

Similar to the last in form and habits. Body very slender in extension, and attenuated posteriorly. Head elongated, narrow. Ocelli *white*, inconspicuous, forming a simple lateral row of about twelve, extending back on each side of the head, beyond the lateral (nasal) fossæ. Color light green to dark olive-green. Length of largest observed, 50^{mm} to 75^{mm}.

Gloucester, Mass., under stones, between tides, 1878.

Lineus pallidus, sp. nov.

Long and very slender in extension, subterete, attenuated posteriorly. Lateral (nasal) fossæ long and deep. Mouth situated far back. Head elongated, usually obtuse and wider than the body, but very changeable. Ocelli absent. Color usually whitish or pale ochre-yellow, becoming reddish toward the head, and with a rather indistinct paler dorsal line; anteriorly there are usually two pale dorsal spots, in front of which the head is yellowish. Length, in extension, 100^{mm}; breadth, 0.5^{mm} to 0.75^{mm}.

Off Cape Ann, Mass., 45 fathoms, mud, 1878.

Micrura affinis V. (= *Polia affinis* Girard, in Stimpson).

This species is very common from Massachusetts Bay to the Bay of Fundy, in 10 to 100 fathoms, on hard bottom. It is usually bright clear red or reddish brown above, rarely varying toward dark olive-green; beneath, pinkish white; front of head with a white margin running back in a short median point. Ocelli black, several in a single row on each margin of the head, the front one largest, variable in number. Caudal filament slender, acute, white. Length, often 125^{mm} to 150^{mm}; breadth, 2^{mm} to 4^{mm}.

Micrura inornata, sp. nov.

Body subterete, moderately elongated, thickest anteriorly, gradually tapered to the somewhat flattened tail; caudal filament white, very slender and acute, sometimes as long as the diameter of the body, but usually less. Head obtuse, often as wide as the body or wider. Lateral fossæ deep, extending to opposite the mouth, the latter not being very far back. No ocelli. Color bright cherry-red, varying to dark red, the middle of the head brightest; tail pale. Length of largest specimens observed, about 75^{mm}; breadth, 0.10^{mm} to 0.12^{mm}.

Massachusetts Bay and Gulf of Maine, 45 to 110 fathoms, mud. Resembles the young of *Cerebratulus luridus* V., which occur with it.

Micrura albida, sp. nov.

Body thickest and nearly round anteriorly, tapered and somewhat flattened posteriorly, with a small, slender, caudal filament. Head obtuse, narrower than the body. No ocelli. Lateral fossæ short, not conspicuous. Color whitish or pale yellowish, often becoming light red toward the head; posteriorly often with grayish or clay-colored internal mottlings along the sides. Very sluggish in its motions. Two specimens from

140 fathoms, apparently of the same species, had a narrow ring of blue around the body, behind the head. Length, 50^{mm} to 100^{mm}; diameter, 2.5^{mm} to 3^{mm}.

Common in the Gulf of Maine and Massachusetts Bay, on muddy bottoms, in from 30 to 140 fathoms.

NEMATODA ?

Nectonema, gen. nov.

Body long, slender, nearly round, smooth. Head without appendages, obtusely rounded or blunt-conical, apparently with the mouth on the under side. Along each side of a considerable part of the length of the body, posteriorly, there is a delicate fin, composed of very numerous, slender, hair-like processes, apparently in two close alternating rows (perhaps in life connected together by a delicate web). In the supposed male, the tail is more or less incurved, tapered to a small papilliform tip. No external sexual organ visible. In the larger form, regarded as female, the posterior end is subtruncate, with a small terminal papilla.

Nectonema agilis, sp. nov.

A long, slender, and exceedingly active, round worm, resembling a *Gordius*, found swimming at the surface with a rapid, eel-like, undulatory motion. Integument firm, opaque, generally smooth, but with minute, oblong, brown verrucae posteriorly. Body, in life, nearly round, slightly flattened on two sides, of nearly uniform size throughout, but slightly tapered close to the somewhat smaller, depressed, obtusely conical head, and somewhat more gradually tapered to the posterior end in the male. The peculiar fins are generally more or less injured, even in life, so that their real length is difficult to determine; but they appear to occupy half the length of the body, and perhaps more. In life they appear to have a continuous web, binding the hair-like rays together, but whether it was anything more than mucus is uncertain. The fin-rays, in length, are more than half the diameter of the body. Owing to the opacity of the integument, little could be seen of the internal structure without dissection or the preparation of transverse sections, for which no suitable opportunity occurred. In the head, which is more translucent, there appeared to be four roundish bodies, visible by transmitted light, while a transverse whitish band behind these seemed to indicate the position of the mouth. At the posterior end there seemed to be an anal opening, and a straight intestine leading to it. In some female specimens, a central whitish line, due to an internal organ (intestine?), could be traced from the head to the extreme posterior end, and a yellowish white organ (ovaries?), with numerous transverse divisions, extending from near the head to the tail, could be indistinctly seen. Color, in life, grayish or yellowish white, with four narrow, double, longitudinal lines of dark slate-color. Length, 80^{mm} to 200^{mm}; diameter, 0.5^{mm} to 1^{mm}.

Vineyard Sound, Mass., swimming actively at the surface in the

evening. June and July, 1871, and July, 1875. First observed by Professor S. I. Smith.

This species was referred to as an "Undetermined Genus" in my Report on the Invertebrata of Vineyard Sound, etc., p. 632, 1873.

PÓLYZOA.

Alcyonidium rubrum, sp. nov.

An encrusting species, forming broad, smooth colonies, covering stones and large shells. Zoëcia rather large, mostly hexagonal, but often pentagonal, with their boundaries well-marked in alcoholic specimens by a distinct line. The retracted zooids in preserved specimens usually form a small papilla in the middle of the zoëcia. Color, in life, bright brick-red, or sometimes orange-red.

Common all along the coast, from Long Island Sound to Nova Scotia, mostly in 10 to 50 fathoms, and especially on *Pecten tenuicostatus*.

Bugula cucullata Verrill, Amer. Jour. Sci., xviii, p. 52, July, 1879.

Zoarium much branched, branches slender, dichotomously divided, the branchlets diverging but little. Zoëcia in two alternating rows, rather large, elongated, narrow, with the long, narrow, frontal area occupying most of the length. At the distal angles there are usually two rather long slender spines on each side, but often three on the outer angle. The spines are unequal, divergent, more or less curved and directed upward; the one farthest in front is usually longest, curved forward and upward at base. Avicularia large, elongated, the length greater than the width of the zoëcia, situated rather in advance of the middle of the outer margin of the frontal area, the beak reaching beyond the distal end of the zoëcia; the head is compressed, broad-oval, and tapers below at the posterior end into the pedicel, which is thick at first, but narrows to a slender base; the beak is long, concave above, but strongly incurved or hooked at the tip. Oëcia short, but wide, nearly hemispherical, the front edge turned upward, showing a large opening in a front view, and giving them a hood-like appearance; surface more or less areolated, glistening.

Jeffrey's Ledge, off Maine, 51 fathoms, taken by Dr. A. S. Packard and Mr. C. Cooke, while dredging on the "Bache," in 1874, for the Fish Commission. A second specimen of this fine species was dredged this season, off Cape Cod, in 75 fathoms, mud. When placed in alcohol, it quickly became bright rose-red; but the alcohol soon dissolved the color, becoming light pink, while the specimen became white.

Bugula decorata Verrill, Amer. Jour. Sci., xviii, p. 52.

Zoarium rather large, with thick, much branched stems, producing densely branched, somewhat plumose tufts, two inches or more high. Branches unequally dichotomous, often somewhat spirally arranged. Zoëcia in two alternating rows, large, broad, prolonged proximally. Frontal area large, elongated, sunken and wrinkled in the dry state.

The distal angles are prolonged into a single, stout, often short spine on each side, frequently absent on the inner angle. Avicularia on the middle of the front side of the zoëcia, toward the base; they have a short, broad, swollen head, with a short, strongly curved beak; the pedicels are short and thick, rapidly enlarged from the base upward. Oëcia large, globose, brilliantly iridescent, elegantly sculptured, with a series of raised curved lines passing up over each side and converging to the middle of the front side, while their concave interspaces are covered with microscopic transverse lines. Dredged at Eastport, Me., by the writer, and also in the Gulf of Maine, 110 fathoms, near George's Bank, by Dr. A. S. Packard and Mr. C. Cooke, in 1872 (U. S. Fish Commission).

The other species of *Bugula* found on the New England coast are as follows:

Bugula turrata (Desor) Verrill. Florida to Casco Bay.

Bugula avicularia (L.) Oken. Long Island Sound to Spitzbergen; Europe.

Bugula flustroides (Lamx.) (= *B. flabellata* Gray). Long Island Sound to Maine; Europe.

Bugula fastigiata (L.) Alder (= *B. plumosa* Busk). Massachusetts Bay to Labrador; Europe.

Bugula Murrayana Busk. Long Island Sound to Spitzbergen; Europe.

B. Murrayana, var. *fruticosa* (Packard). Massachusetts Bay to Spitzbergen.

Bugula flexilis Verrill* and *Bugula umbella* Smitt belong to the genus *Kinetoskias* Dub. and Koren. Both occur in deep water off Maine and Nova Scotia.

Bugulella fragilis Verrill (Amer. Jour. Sci., xvii, p. 472, June, 1879).

A peculiar genus, in which the branches are composed of a single series of cells, connected together by small and short joints. Zoëcia with an oval frontal area, surrounded by spines.

Off George's Bank, 220 fathoms, on *Acanella*.

CELLULARIDÆ.

Notwithstanding the very numerous restrictions which the ancient genus *Cellularia* has undergone, it is still made to include heterogeneous species by several recent writers, while others restrict it to groups not originally included by Pallas. In the excellent memoirs of Smitt on the Arctic Bryozoa, five species still remain in the genus *Cellularia*. These belong, however, to three well-marked groups, some of which have received several generic names, so that their synonymy is very complicated. Having had occasion to revise this family, I offer the following summary, so far as it concerns the New England species.

* See American Jour. Science, ix, p. 415, pl. 7, fig. 1, 2, 1875; and vol. xvii, p. 259, 1879.

- I. *Cellularia* Pallas, 1766, (restricted). Zoecia unilateral, in two alternating rows, mostly protected by lateral spines, either simple or dilated. Vibracula and lateral and median avicularia present. Type *C. scruposa*.*
- a. Subgenus *Cellularia* (= *Scrupocellaria, pars*, Gray, Busk). Lateral spines all simple.
- b. Subgenus *Cellarina* Van Ben. (incl. *Tricellaria* Flem., 1828). One of the lateral spines usually more or less dilated and often expanded in a shield-like form in front of the zoecia. Two New England species: *C. scabra* Van Ben. and *C. ternata* (Sol.), with varieties *gracilis* and *duplex* (Smitt).
- The name *Tricellaria* (given to *ternata*) might have been adopted for this subgenus, but it is very inapplicable to the group, and even to the type-species, as now known.
- II. *Scruparia* Oken (restricted) (= *Scrupocellaria, pars*, Gray; *Canda* Busk, non Lamx.). Lateral avicularia and vibracula absent. A lateral spine develops into a protective (often frondose) shield. Type *S. reptans* (Linné), not yet found on the American coast.
- III. *Bugulopsis* Verrill (= *Cellularia, pars*, Busk, non Pallas). Characterized by the simple, unarmed zoecia, arranged in alternating rows, and destitute of avicularia, vibracula, and shields. Type *C. Peachii* (Busk), Gulf of Maine and Bay of Fundy. European seas, north to Spitzbergen.

As no species of the last group was originally included in *Cellularia*, it is inadmissible to restrict that name to it. Either *reptans* or *scruposa* should be taken as the type of *Cellularia*, both having been originally included by Pallas, as well as by most subsequent authors. *Scruparia* † Oken (1815) originally included not only the group that had previously been named *Eueratea* by Lamouroux (1812), but also *S. reptans*. Therefore there seems to be no good reason why it should not be restricted, as above, rather than be displaced by the much later and more objectionable name, *Scrupocellaria*. *Menipea*, used by Busk and others for *Cellarina*, is inadmissible, in that sense, for the original group named *Menipea* by Lamouroux is a valid and very distinct genus. *Canda* (Lamx., 1816), adopted by some for *Cellularia reptans*, cannot properly be so used, for the original type is a distinct genus.

Porellina stellata Verrill, Amer. Jour. Sci., xviii, p. 53.

A large species, forming radiating patches on shells, etc. Zoecia arranged in quincunx, large, broad, moderately convex, white, shining, mostly imperforate and smooth, the marginal ones more or less perforate in front. Apertures nearly semicircular, the proximal edge straight or nearly so, often with two spines on the distal border; median pore, a short distance from the aperture, large, nearly circular, provided with numerous, slender, convergent spinules, which nearly reach the center, giving the pore a stellate appearance. Avicularia near the lateral margin, about opposite the median pore, varying in size and form; in the same colony some are short triangular, others long triangular, while others with a long and acute erect tip show the transition toward vibra-

*This species has been recorded from the Gulf of St. Lawrence by Packard and others, but I have myself seen no American examples.

†This name has recently been given to a new genus, in a new sense, by Hincks, in accordance with a practice that is nearly always unsafe, as well as confusing.

cula. Length of zoëcia, 0.60^{mm} to 0.70^{mm} ; breadth, 0.50^{mm} to 0.60^{mm} ; breadth of apertures, 0.12^{mm} to 0.15^{mm} ; of median pore, 0.05^{mm} to 0.06^{mm} . The zoëcia are about twice as large as those of *P. ciliata*.

Casco Bay, Maine (U. S. Fish Commission, 1873).

In the nearly circular form of the median pore this species approaches the genus *Porina*, as restricted by Smitt (Florida Bryozoa); but in all other respects, except size, it agrees so closely with *P. ciliata*, made the type of *Porellina* by Smitt, as to forbid a generic separation, although the latter has a crescent-shaped pore.

The genus *Porellina* was, however, originally established by D'Orbigny for erect fossil species, having the surface foveolated. In his system, the present species would belong to *Reptoporina*, based on the encrusting forms with aperture and special pore as in *Porina*. Perhaps it may be desirable to separate generically the species having the hemispherical apertures, median ciliated pore, and sublateral avicularium, as in this species and *P. ciliata*, whatever be their mode of growth.

Mr. Hincks has recently proposed a genus, *Microporella*, with *P. ciliata* as type, which might also, if adopted, include the present species. *Diporula* Hincks* seems scarcely worthy of generic separation from the latter.

Smittia Hincks (= *Escharella* Smitt, non Gray).

The genus *Escharella*, as defined by Smitt, still included somewhat heterogeneous species. The form of the zoëcial aperture, chiefly relied upon by both Smitt and Hincks, proves to be a rather indefinite character, since it varies in the form and breadth of the sinus, in the several species now known, from an ill-defined, broad, shallow sinus, nearly as in *Lepralia*, to a deep and narrow one, like that of *Escharina* (*Hippothoa* Smitt). It would appear best, therefore, to combine, with the form of the aperture, the presence of a median avicularium in front of the sinus, or within its margin. The mere form of growth, presence or absence of pores in the zoëcia and oëcia, are of no importance generically, as Smitt has well shown. This restriction would exclude *E. sanguinea* Sm., *E. Jacotini* Sm., and some other species, most of which can be well referred to *Escharina* (*Schizoporella* Hincks), as here limited. The species first described in 1853, by Stimpson, as *Flustra solida* (= *Eschara palmata* Sars), and referred to *Escharella* by Smitt, seems, however, worthy of generic separation, on account of the chitinous fibres strengthening the zoarium. It appears to belong to the genus *Flustri-morpha* Gray, so far as can be determined by his description, in which the position of the avicularia is not mentioned, nor even the exact form of the zoëcial apertures.

As to the correct name for this natural and important genus, there is still room for diversity of opinion. *Escharella* Gray, 1848, (non D'Orbigny), certainly ought not to have been restricted to this division, for

*Annals and Magazine of Natural History, vol. iii, p. 156, Feb., 1879.

it included only three species, neither of which belongs to the present group. Moreover, his first species (*immersa*) and third species (*variolosa*, in part) belong to the older genus *Escharoides*, as restricted and adopted by him in the same work. The second is a *Porina* or *Porellina*. Therefore it would be better to regard *Escharella* as a synonym of *Escharoides* Edw. (1835), in Gray's restricted sense. *Escharella* D'Orbigny (1852) was established wholly independently of Gray's genus, and is a group entirely distinct from Gray's, and if the name is to be used at all, it should be used only in D'Orbigny's sense. *Smittia*, recently proposed by Hincks (Ann. and Mag., Feb., 1879), may well be adopted, therefore, for the present group. The following species, from our coast, belong to this genus:

Smittia porifera (Smitt) Hincks. Massachusetts Bay to Labrador, common.

Smittia candida (Stimp.) Verrill. Gulf of Maine, Bay of Fundy, etc.

Smittia globifera (Packard) Verrill. Casco Bay to Labrador, common.

Smittia auriculata (Hassal?) Verrill. Gulf of Maine.

Smittia Landsborovii (Johnst.) Hincks. Massachusetts Bay, northward, common.

Smittia bella (Busk) Hincks. Gulf of St. Lawrence (Whiteaves).

The last species I have not seen from our coast; but I have at least two additional, undetermined species.

***Smittia candida* V. (= *Lepralia candida* Stimpson).**

This species has been entirely misunderstood by Smitt and others, owing doubtless to the imperfection of the original description. Stimpson's figure, however, represents very well the form of the aperture and of the zoëcia in young colonies, without oëcia and avicularia. The zoëcia are rather large, and conspicuously perforated over the front; the aperture has a distinct rounded sinus. The avicularia, which are usually absent on many or most of the zoëcia of a colony, are large, obtusely rounded at the end, commonly placed transversely just in front of the sinus, or sometimes partially within it, but on some crowded colonies varying much in direction, some being direct, others oblique, others transverse. Oëcia large, globose, usually perforate, but sometimes, when highly calcified, the pores mostly disappear, or become small, and the surface becomes rough and granulous. It is very closely related to *S. porifera*, but has larger zoëcia and avicularia, while the usual obliquity of the latter is generally distinctive.

***Smittia globifera* V. (= *Lepralia globifera* Packard, Canadian Naturalist, vol. viii, p. 408).**

This species is very closely related to *S. auriculata*, with which I have, in former papers, united it. As compared with an authentic English specimen of *S. auriculata*, received from the Rev. A. M. Norman, the zoëcia and avicularia are about one-half larger, but of nearly the same form. The zoëcia are less regularly perforated. In our species, the

oœcia are prominent, but scarcely globose, the front surface being more or less flattened, and perforated with rather large pores, which are mostly confined to the flattened front surface. The median avicularium is well-rounded, direct, and just in front of the well-defined sinus. This species occurs in the encrusting (Lepralian) form, and also in the various foliaceous (Hemescharine) states, sometimes cup-shaped, saucer-shaped, and hat-shaped, according to place of growth. It is very common in the Bay of Fundy and on the Grand Banks.

Escharina Edw., 1835, = *Hippothoa* (*pars*) Smitt, = *Schizoporella* Hincks, 1879.

Edwards, in establishing this generic group, assigned a definite species as its type (*E. vulgaris* Moll); and although he afterwards united with it several incongruous species, the name ought to be retained for the group including his specified type. The earlier name, *Hippothoa* Lamouroux, adopted by Smitt for this group and the true *Hippothoa*, combined with it by him, should, of course, be retained for the group typified by *H. divaricata*, from which *H. hyalina* (type of *Celleporella* Gray) does not appear to me to be generically distinct. The name given by Edwards, being next in order,* and definitely applied, should, therefore, be retained for the present group. Moreover, Gray, in 1848, when restricting the genus, retained the name for the typical group. The name *Herentia* Gray, as restricted by Smitt, would also be available for this group, if *Escharina* could properly be rejected. In any case, the new name proposed by Hincks seems wholly unnecessary.

Escharina, as understood by me, includes those species which have the primary zoœcial aperture more or less subcircular, with a distinct, often narrow, median sinus, and with the avicularia lateral, when developed. Mode of growth varies, but more generally encrusting in a single layer; sometimes, as in *E. Isabelliana*, forming thick masses, consisting of numerous layers of cells. Our species, so far as determined, are as follows:

Escharina Isabelliana D'Orb. = *E. variabilis* Leidy.

Escharina reversa Verrill. Perhaps a variety of the preceding.

Escharina linearis (Hassal).

Escharina biaperta (Mich.).

Escharina secundaria (Smitt).

Escharina ansata (Johnst.) Gray.

Escharina porosa Verrill, sp. nov.

One or two undetermined species are also in our collection.

Escharina porosa Verrill, sp. nov.

Escharella pertusa Verrill, Amer. Journ. Sci., vol. x, p. 41, 1875, (*non* Smitt).

Zoarium encrusting shells and stones. Zoœcia large, oblong, perforated by numerous, rather large, round pores; apertures large, roundish,

*The name *Escharina* was used by Ehrenberg in 1834 as the name of the family, but in that sense it was a synonym of *Escharidæ* Fleming, 1828, and consequently might be used as a generic name in another sense.

with a broad, shallow, median sinus, and small, lateral, opercular denticles. Oœcia large, prominent, globose, the surface rough with sharp granules, and perforated by small, inconspicuous pores. Avicularia scarce, often absent, when present lateral, opposite the side of the aperture, broad, obtusely rounded, the point directed toward the zoœcial aperture. Color, when dry, reddish brown.

Vineyard Sound and Long Island Sound, 8 to 12 fathoms, common.

The species here described has a close resemblance to both *S. porifera* and *S. candida*, and when the avicularia and oœcia are wanting it will not be easy to distinguish them. The resemblance to *S. candida* is particularly close, and extends even to the oœcia, but these are rougher and less porous in *E. porosa*. The situation and form of the avicularium are, however, the best diagnostic characters.

This species is closely related to *E. sanguinea* (Norman) of Europe. It also has a general resemblance to *E. pertusa* (Esper), as described by Smitt; but there appears to be great confusion in regard to the identification of the latter, and doubtless several species have been confounded under that name. Hincks refers *pertusa* to *Lepralia*. American writers have referred several distinct species to *pertusa*, and I am not sure that the genuine *pertusa* inhabits our coast. The species thus named by Dawson, on examination of specimens kindly furnished by him, proves to be *Smittia porifera*. Probably *S. candida* has also been identified as *pertusa* by some writers.

The generic relations of the species, well described and figured by Smitt as *Escharella Jacotini* (Aud.), has been variously determined. In Gray's system, it appears to have been united with one of the forms of *Escharoides coccinea*, under the name of *variolosa*, and referred to *Escharella*. Smitt placed it under *Escharella* in a special subdivision. It seems to me, however, to have more definite relations to the genus *Discopora*, as defined by Smitt, and more particularly to that subdivision of *Discopora* which includes *D. pavonella*, *D. appensa*, etc., characterized by having lateral avicularia, and with a median denticle at the proximal edge of the primary zoœcial aperture, and to which the name *Mucronella*, given by Hincks to the group called *Discopora* by Smitt, may be properly restricted.

We may subdivide *Discopora* into three natural groups, easily defined, as follows:

Discopora Lamarek (*pars*), restricted by Edw. (*non* Fleming; *non* Gray).

Discopora (*pars*) Smitt, Skandnaviens Hafs-Bryozoer, p. 25, 1868. *Palmicellaria* (*pars*) Hincks.

The type of this genus, as restricted by Edwards, was *D. verrucosa* Lam. (*non* Esper). As shown by Edwards, this species is very distinct from Esper's species, and is closely allied to the well-known *D. Skenei* of the North Atlantic. Gray was, however, misled by the quotation of Esper's name in the synonymy, and erroneously took Esper's species as

the type of *Discopora*. Hincks attributed the name to Fleming, who used it in a different sense, and, apparently overlooking the fact that the name originated with Lamarek, rejected it for the original group.

Discopora, as I propose to restrict it, is characterized by having both median and lateral avicularia, with the former (or both) often raised on a prominence in front of the zoæcial aperture. *D. Skenei*, with its Lepralian form described as *L. crassispinia* by Stimpson, is the only known New England species.

Escharoides Edw., in Lam., 1835; Gray (restr.), 1848, (*non* Smitt).

Mucronella (*pars*) Hincks, 1879.

Type *E. coccinea* (Abildg.), as defined by Smitt, = *E. Peachii* (Johnston).

This group includes those species of *Discoporidae* having a prominent median denticle, but without avicularia. The zoæcial aperture is usually somewhat raised, and is often armed with marginal spines. As *E. coccinea* was one of the species originally included by Milne Edwards, Gray's restriction was correctly made, and should be adopted.

The typical species, with several varieties, abounds on our coast.

Mucronella Hincks (restricted), Ann. & Mag., iii, p. 162, 1879.

Discopora (*pars*) Smitt, Skandinaviens Hafs-Bryozoen, p. 25, 1868.

Characterized by having lateral avicularia on one or both sides of the zoæcial aperture, but without the median avicularium. Median denticle of various forms, often small. Apertures armed or unarmed with spines. Growth various, most often encrusting, foliaceous, or lichen-like, sometimes forming thick crusts composed of many layers. Our species are as follows:

Mucronella appensa (Hassal) Verrill.

Mucronella paronella (Alder) Hincks.

Mucronella nitida Verrill = *Discopora nitida* V., 1875.

Mucronella Jacotini (Aud.) V. = *Escharella Jacotini* Smitt.

Mucronella scabra (Fabr.) V. = *Discopora scabra* Smitt.

M. scabra, var. *labiata* (Stimp.) = *Lepralia labiata* Stimp.

Mucronella orata (Smitt) V. = *D. scabra*, var. *orata* Smitt.

Mucronella nitida Verrill.

Discopora nitida Verrill, Amer. Journ. Sci., ix, p. 415, pl. vii, fig. 3, 1875.

This species is very abundant in Vineyard Sound and Long Island Sound. Although it is an encrusting species, when young often forming small, thin, radiating patches, when old it forms thick, irregular, cellular crusts, composed of numerous layers of cells. Some of these finally become large, subglobular masses, with an uneven surface, sometimes two inches or more in diameter. The color, when recently dried, is usually bright greenish yellow, sometimes brownish. The younger cells have the walls of both oëcia and zoëcia uniformly perforated; when older, the bounding walls become raised; a marginal row of conspicuous pores remains, while those over the front mostly disappear, or are obscured by granules; the pores of the globose oëcia also mostly dis-

appear and their surface becomes roughly granulous. The lateral avicularia are generally abundant, very few cells being without one or both; they vary somewhat in size, form, and position, but are usually small and near the aperture. The zoœcial aperture is small, always with a small, squarish mnero in front, and with a slender lateral process on each side for the articulation of the operculum. In the secondary stages of calcification, a strong, prominent, flat process often rises up on each side of the aperture.

Mucronella scabra Verrill.

The relationship of *M. scabra* is not always obvious, owing to the fact that usually only one large lateral avicularium is developed, and this is crowded so far in front of the zoœcial aperture as to appear like a large, rostriform, median avicularium, facing sidewise. A careful examination of the young cells will, however, usually show some cells with two lateral avicularia, with the small median denticle of the aperture between them.

Escharopsis Verrill = *Escharoides* Smitt (*non* Edw.).

Bulletin National Museum, No. 15, p. 149, 1879.

I proposed this name for a group, including two of our larger, northern, *Eschara*-like species. The zoœcial aperture has a narrow median sinus, which in the later stages of growth includes within it a small laterally placed avicularium, facing sidewise. The genus is otherwise apparently closely related to *Escharina*, *Celleporaria*, and *Retepora*.* Smitt, in his Florida Bryozoa, even referred one of the species to *Retepora* (*R. rosacea*). The growth of both our species is often Lepralian and foliaceous as well as *Escharine*.

Escharopsis lobata (Lamx.) Verrill = *Escharoides Sarsii* Smitt = *Lepralia producta* Packard.

Escharopsis rosacea (Sars) Verrill = *Escharoides rosacea* Smitt.

TUNICATA.

Ascidia inornata, sp. nov.

In expansion the body is upright cylindro-conical, about twice as high as broad; the base is about the same in diameter as the middle portion, and but very little expanded. The oral tube is much longer than the other, subterminal, swollen at base, tapering, the upper part cylindrical, the opening surrounded by seven low, rounded, thin lobes or crenulations, between which are seven orange-colored ocelli; corresponding with the ocelli there are seven thickened, pointed lobes or folds of the test, which run down from them along the tube as slightly prominent costæ, with transverse wrinkles between them. The anal tube is subterminal, shorter and smaller, situated to one side, and only about half

* In a paper received from Dr. Smitt, since the above was written, he has enlarged his genus *Discopora*, so as to include the northern species of *Retepora* (*R. cellulosa* and *R. elongata*), and also the species here called *Escharopsis rosacea*. (Öfversigt af Kongl. Vet.-Akad. Förh., 1878, p. 30.)

as long as the oral. Its orifice is surrounded by six lobes and ocelli, like those of the other. Test moderately thick and firm, somewhat wrinkled, nearly glabrous, translucent, dull yellowish, blotched more or less with russet-brown. The internal organs show through faintly as yellow and dark markings. Height, in expansion, 32^{mm}; greatest diameter, 17^{mm}; length of oral tube, 12^{mm}; of anal, 4^{mm} to 5^{mm}.

Johnson's Bay, near Eastport, Me., 12 fathoms, stony, August 8, 1872.

Halocynthia Verrill = *Cynthia* Savigny (*non* Fabr., 1808).

Bulletin National Museum, No. 15, p. 147, 1879.

This name was proposed for the restricted genus *Cynthia* of Savigny, characterized by having both apertures quadrangular, and ovaries developed on both sides. The species now known from our northeast coast are as follows:

Halocynthia pyriformis (Rathke) = *Cynthia pyriformis* authors.

Halocynthia rustica (Linné) = *Ascidia monoceros* Möller.

Halocynthia tuberculum (Fabr.) = *Cynthia carnea* (Ag.) Verrill.

Halocynthia pulchella Verrill = *Cynthia pulchella* Verrill.

Halocynthia echinata (Linné) = *Cynthia echinata* authors.

Halocynthia partita (Stimp.) = *Cynthia partita* Stimpson.

MOLLUSCA.

Xylophaga dorsalis (Turton).

Many living specimens of this species have been found in bits of old wood, dredged in Casco Bay; in 100 to 110 fathoms, about thirty miles off Cape Ann; and in various parts of Massachusetts Bay and Cape Cod Bay. It has previously been recorded by Mr. J. F. Whiteaves from Gaspé Bay. Found on the European coast south to the Adriatic.

Lunatia nana (Möller) G. O. Sars, Moll. Reg. Arct. Norveg., p. 159, pl. 21, fig. 16.

Natica nana Möller, Kroyer's Tidss., vol. iv, p. 80, 1843.

Three living specimens of this species were dredged on Stellwagen's Bank, north of Cape Cod, in 26 to 32 fathoms, sand, by the U. S. Fish Commission, 1879. It has not previously been recorded from the American coast; but it was dredged in 1872 by Messrs. Smith and Harger, in 45 fathoms, on Le Have Bank. It is easily distinguished from all our other species of the group by its horny operculum and closed umbilicus. Except in the last character, it resembles *L. immaculata*. Its color is ivory-white, shining.

Dendronotus robustus Verrill, Amer. Journ. Science, vol. 1, p. 405, fig. 1, 1870.

Dendronotus velifer G. O. Sars, Mollusca Reg. Arcticæ Norvegiæ, p. 315, tab. 28, fig. 2, tab. xv, fig. 4 (dentition), 1878.

The species well-described and figured in the excellent work of Sars is identical with the American form. Our *D. robustus* was described from a specimen not fully grown; but we have since dredged it of larger size, agreeing with *D. velifer*, in numerous localities, from off Cape Cod

to Nova Scotia, in 20 to 100 fathoms. The dentition of our original specimen is like that figured by Sars for *D. velifer*.

Idalia pulchella Alder and Hancock.

Idalia pulchella G. O. Sars, op. cit., p. 313, tab. 23, fig. 1, a-c, tab. xiv, fig. 8 (dentition), 1878.

This species has been found, for the first time, upon the American coast, by Mr. J. H. Emerton, who discovered it at Salem, Mass., this season. He has kindly sent me a specimen and a colored drawing of the species, which he had already determined. The specimen agrees very closely with Sars's description and figures, both in external characters and in dentition, but not so well with those of Alder and Hancock.

ANTHOZOA.

Bolocera multicornis, sp. nov.

A large, handsome species, broad and low, with a multitude of moderate-sized tentacles, crowded in many rows, and covering the greater part of the disk. Column smooth, very short; in our specimen the disk was so expanded that the margin was on a level with the base; a smooth rim below the bases of the tentacles. Tentacles very numerous (several hundred), crowded in twenty or more indistinct, close, concentric rows, which entirely cover and conceal the disk, except a narrow, naked zone around the mouth; they are changeable in form, often cylindrical and blunt at tip, at other times fusiform, clavate, or swollen in any part, their length nearly equal in extension, and mostly less than a fifth of the diameter of the disk, or 14^{mm} to 18^{mm}. The disk, as expanded, is regularly convex, and the specimen showed no inclination to contract or withdraw its tentacles. Mouth with a distinct, gonidial groove at each end, bordered by a large fold or lobe on each side; sides of mouth with numerous irregular lobes or folds and wrinkles. Color of body and tentacles nearly uniform bright red-lead color or orange-scarlet; mouth-folds a deeper tint of the same color.

Diameter of expanded disk, about 3.75 inches, or 194^{mm}; height at center, 30^{mm} to 33^{mm}.

One specimen only, dredged off Cape Cod, in 45 fathoms, shelly bottom, 1879 (U. S. Fish Commission).

Edwardsia pallida, sp. nov.

A long, slender, soft, flaccid, whitish species. Column smooth, destitute of any investment, but sometimes with grains of sand, slightly adherent; surface faintly longitudinally sulcated, and sometimes finely wrinkled transversely. The form is somewhat changeable, usually much elongated, nearly cylindrical, but often tapered at the posterior end. Tentacles about twenty-four, slender, the length about twice the diameter of the body, of nearly uniform diameter to near the tip, translucent whitish, often with a pale olive-green central line, interrupted by a line of opaque white spots, often ten to twelve on a tentacle, or sometimes

by transverse lines of white; the central dark line is sometimes absent; column translucent, dull gray or grayish white, striped with narrow flake-white lines, between which the dark internal organs show through; a circle of lunate spots of opaque yellowish white is situated just below the tentacles, corresponding with the broad longitudinal stripes. Disk often much protruded, yellowish white, radiated with opaque white.

Provincetown, Mass., in sand, at low-water (U. S. Fish Commission, 1879).

Anthothela, gen. nov.

This generic division is proposed for the *Briareum grandiflorum* (Sars) and allied species. It is related to *Briareum* and *Paragorgia* in having a soft spiculose axis, but its polyp-cells are prominent and permanently exsert, and the polyps themselves are not entirely retractile. The cœnenchyma is thin, and often spreads out irregularly over foreign bodies or around the base, as an encrustation.

Anthothela grandiflora (Sars) Verrill.

Briareum grandiflorum Sars, Fauna Litt. Norvegiæ, p. 63, pl. 10, fig. 10-12.

This species has been obtained in several instances by the Gloucester halibut fishermen in deep water, off Nova Scotia, and presented to the U. S. Fish Commission. It was first obtained by Capt. N. McPhee and crew, of the schooner "Carl Schurz," off Sable Island.

Halipterus Christii (Koren and Dan.) Kölliker.

A single specimen of a species of *Halipterus*, which is, perhaps, identical with the above species, although differing somewhat from the descriptions and figures of the Norwegian form, has been presented to the U. S. Fish Commission by Capt. Thos. F. Hodgdon and crew, of the schooner "Bessie W. Somes," from the Grand Bank.

Alcyonium digitatum Linné (?).

Two specimens, which I refer very doubtfully to this species, were taken by Captain Greenwood and crew, of the schooner "Sultana," in 80 fathoms, on Clark's Bank, east of Cape Cod.

They form low, thick, lobular masses, with the polyps scattered over the entire surface, except at the very base, and everywhere showing the cœnenchyma between them. The base is somewhat spreading, and there is no main trunk, for the division into rounded or flattened lobes takes place close to the base, and they again subdivide, so that a group of short, thick, obtuse lobes, partly rounded and partly flat, results. The polyps are rather larger than in *A. carneum*, and some are retracted into the cells that are scattered over the cœnenchyma, and others more or less expanded; toward the summits of the lobes they are more numerous, but not crowded. The surface of the cœnenchyma, under a lens, shows a granular appearance, due to the small white spicula.

If not identical with *A. digitatum* of Europe, it is at least very closely

related, and belongs to the same section of the genus. A comparative study of the spicula has not yet been made.

Alcyonium multiflorum, sp. nov.

A large, upright species, with a tall bare trunk, which divides near the top into numerous divergent cylindrical branches, which are naked, except near the ends, where they again subdivide in the same way into secondary branches, which in turn divide again into a cluster of short, terminal branchlets. The ultimate branchlets bear at their ends an umbel-like cluster of crowded polyps, which in contraction form rounded groups. The whole forms a panicle-like structure, not unlike a cauliflower—a resemblance noticed by the fishermen. The minute polyp-cells are closely crowded at the ends of the branchlets, so as to leave no naked cœnenchyma visible between them. They are apparently not retractile, but the tentacles are often contracted into eight rounded, minute, rather rigid lobes at the summit of the polyps, which, in contraction, have small, short bodies. The branches, branchlets, and trunk are usually sulcated in alcoholic specimens, and have a smooth, scarcely granular surface. The surface is smoother than in *A. carneum*, though the structure of the cœnenchyma and interior is firmer and less flexible. Height, about 4 to 5 inches; breadth, about 3 inches, in contraction. Some specimens are considerably larger. Color, in alcohol, yellowish white; in recently preserved specimens, bright red, stained with purple.

Received from Daniel McKinnon and crew, of the schooner "Mary F. Chisholm," N. lat. $44^{\circ} 06'$, W. long. $52^{\circ} 54'$, 220 fathoms. Taken also by Captain John E. Wilson and crew, of the schooner "Polar Wave," in 200 fathoms, N. lat. $44^{\circ} 30'$, W. long. $57^{\circ} 08'$, and in various other localities, in deep water, by the fishermen. Called sea-cauliflower by the fishermen. Closely related to *A. carneum*, but differs in having smaller polyps, which are so crowded as to show no bare cœnenchyma between their bases. The naked branches are longer and more paniced. It resembles in general appearance the *Gorgonia florida* Müller (Zool. Danica); but the latter appears not to be known to modern Scandinavian writers, and its affinities are doubtful.

Alcyonium Lütkeni, sp. nov.

Alcyonium glomeratum Lütken, MSS. (non Johnston).

Several specimens of a species agreeing perfectly with Greenland specimens sent to me several years ago, under the above MSS. name, by Dr. Chr. Lütken, were dredged in 52 fathoms, off Halifax, N. S., by the U. S. Fish Commission, in 1877.

It may be distinguished by having the integument, especially of the polyp-bodies and bases of the tentacles, filled and covered with spicula, so as to render them decidedly rigid and incapable of complete contraction. The main stem is upright, without polyps, giving off cylindrical branches along the sides; from these small lateral branchlets arise all along their sides as well as at their ends, each bearing a cluster of

three to five, or more, polyp-cells, which are larger than in *A. carneum*, and, when contracted, are obovate, incurved, and show the bases of the eight tentacles as small terminal lobes. The spicula are larger and rougher than in *A. carneum* and the two preceding species. Height, 3 inches, or more.

ECHINODERMATA.

Tremaster, gen. nov.

Body thin, pentagonal, the rays united by a thin interradial web extending to their tips. Five interradial openings, situated toward the center of the disk, pass directly through to the lower side, where they open at the aboral side of the jaw-plates. Ambulacral grooves wide toward the mouth. Suckers in four rows. Upper surface covered with imbricated flat plates, which may bear granules and marginal spinules. Lower surface with small imbedded plates, bearing spines.

Tremaster mirabilis, sp. nov.

Body thick in the central region, very thin at the margin, the ends of the rays extending but little beyond the interradial margin, while the interradial web extends in a rounded lobe a little beyond the proper end of the rays, so that there is at the tip a slight but evident emargination. In all the specimens, the body is bent upward in a very convex form, with the rays and margin bent abruptly downward, so that the edges are in contact with the ground, or nearly so, all around, leaving a large concavity underneath. The margin is thrown into a broad fold or undulation between the rays. On the dorsal surface, the imbricated plates of the radial regions are more prominent, thicker, and with a broader free portion than those of the interradial regions, and they bear a row, sometimes of eight to ten small, acute, appressed spines (often but one or two in the young) along the free edge; these plates form, therefore, a regular rosette or star on the dorsal surface, its rays broad at the base and rapidly narrowed toward the margin, where the plates become very small and lack the spinules; all the dorsal plates are covered with small scattered granules, often with one or several larger central ones. In the interradial areas, the plates are thin, flat, the inner or free ends are oval and destitute of spines, and each plate is usually overlapped by only two, laterally placed, and not by the one directly behind it, as in the radial areas; these plates are large and somewhat rhomboidal toward the central area of the disk, but become very small and rounded toward and at the margin; each minute lower marginal plate bears a small ovate spinule, which form a close row or fringe around the margin. The central area of the disk is covered by large granulated plates; four or five, somewhat irregular in form, surround the central opening, which is protected by a circle of about twelve to eighteen small, obtuse spines. Madreporic plate prominent, close to the central opening, surrounded by small spinules. The five disk-perforations are large and conspicuous, when distended elliptical in form, and bordered by a row of small spines, which often converge above it. The interradial areas of the lower surface are formed

by small, more or less oblong plates, which become very small toward the margin; each bears a spine, which toward the mouth are rather long and acute, gradually becoming shorter, flatter, and blunter toward the margin, near which they are spatulate, but close to the margin they become very small and slender. The adambulacral plates are transversely elongated; each usually bears four spines, the two inner small, slender, acute, the innermost the smaller, and two outer much larger and stouter ones, the outermost usually the largest, flattened and often slit or channeled at the end. The disk-perforations are large, rounded, with a smooth rim, and not surrounded by special spines. Jaw-plates prominent, each bearing at the oral end two or three long, acute spines, and others on the upper surface, while on the lateral margin a row of six or eight smaller, slender spinules, usually with a second row behind them, of fewer spines. Ambulacral suckers and pores large, arranged in two alternating rows on each side of the median line; the grooves are broad and deep.

Color of specimens recently preserved in alcohol, deep orange-red above, yellowish-white beneath. The surface is covered with a soft, thin, mucous layer. Greatest diameter of the largest specimen, 112^{mm}; lesser or interradial diameter, 100^{mm}; breadth of larger dorsal plates, 9^{mm} to 11^{mm}; length of longest adambulacral spines, 8^{mm} to 9^{mm}. A smaller one has the greater radius 63^{mm}; lesser, 55^{mm}; breadth of larger dorsal plates, 6^{mm}; length of largest adambulacral spines, 4^{mm} to 5^{mm}; of inner ones, 1^{mm}.

This remarkable new starfish has hitherto been obtained only by the Gloucester halibut fishermen, who have presented three specimens to the U. S. Fish Commission. The first specimen was taken by Capt. Charles Anderson and crew, of the schooner "Alice G. Wunson," in 250 fathoms, off George's Bank, N. lat. 42° 08', W. long. 65° 31', April 28, 1879. The largest specimen was taken by Capt. Thomas Olson and crew, of the schooner "Epes Tarr," in 150 fathoms, N. lat. 47° 06', W. long. 58° 15'. Another specimen was taken in 220 fathoms, by Captain Kilpatrick and crew, of the schooner "Polar Wave," in N. lat. 44° 32', W. long. 57° 09'.

Porania spinulosa, sp. nov.

Greater radius, 40^{mm}; lesser radius, 23^{mm}. Whole upper surface covered with fine, sharp spinules. Pores on the dorsal surface very numerous, arranged in irregular groups of 6 to 15 or more, over the whole upper surface of the disk and rays, and in a marginal series between the upper and lower marginal plates. Lower marginal plates with a group of ten to twelve sharp spinules, in two or more rows on each plate. Lower surface with large, oblong, flat plates, separated by radial grooves, and bearing at their outer ends a row of two or three small, appressed spines; their surface bearing scattered, small, sharp granules. Adambulacral spines sharp, in several rows; two inner ones

side by side on each plate; one, somewhat stouter, farther out, alternating with them; outside of these are usually two, obliquely placed, divergent and usually pointing toward the end of the rays; jaw-plates bearing somewhat larger acute spines.

Color, in life, orange-red, mottled with brighter red on the dorsal side; beneath, light yellow.

Two characteristic specimens of this species have been dredged by the U. S. Fish Commission, off Cape Cod, in 80 fathoms, mud, 15 miles N. 65° E. from Race Point; the other in 130 fathoms, mud, 26 miles E. by N. from Race Point Light. Another specimen was taken by Capt. Thomas Goodwin and crew, of the schooner "Howard," in 170 fathoms, N. lat. 45° 25', W. long. 57° 10'.

This species differs so much from typical *Porania* that it might well form a new generic type. It has not the smooth, naked skin of typical *Porania*.

Archaster tenuispinus Duben and Koren.

Several specimens of this species have been recently presented to the U. S. Fish Commission by the Gloucester halibut fishermen, from deep water, off the Nova Scotia coast. It is a new addition to the American fauna. They vary in size from about 35^{mm} in diameter up to 250^{mm}.

The largest specimen was presented by Capt. Daniel McKinnon and crew, of the schooner "Mary F. Chisholm." It was from 130 to 160 fathoms, N. lat. 45° 02', W. long. 56° 11 $\frac{3}{4}$ '. Two smaller ones, one from 128 fathoms, N. lat. 40° 28', W. long. 55° 25', February, 1879, the other from 250 fathoms, N. lat. 42° 40', W. long. 63° 06', were presented by Capt. Daniel McEachern and crew, of the schooner "Guy Cunningham." With the latter were fine specimens of the rare simple-armed Ophiuran, *Astrochele Lymani* V., much larger than the original type.

Astrophyton Lamarckii Müller and Troschel.

Numerous specimens of this species have been obtained in deep water off George's Bank and off the Nova Scotia coast by the Gloucester fishermen, and presented to the U. S. Fish Commission. They are found clinging to *Paragorgia arborea*, *Primnoa reseda*, *Aleyonium carneum*, and other Aleyonaria.

Easily distinguished from *A. Agassizii* and *A. eucnemis*, both of which also occur in the same region, by the granulation of the disk, which is entirely covered, both over the ribs and interradial spaces, by coarse granules.

Ophiacantha millespina, sp. nov.

A five-rayed species, allied to *O. bidentata* Ljung. (= *O. spinulosa* M. & Tr.), but distinguished readily by the very numerous and minute three-pronged and four-pronged, slender spines which thickly cover the disk. The mouth-plates are four-lobed or somewhat cross-shaped, the outer lobe narrow and long, extending into the interbrachial spaces; the inner lobe is nearly triangular; the side-lobes are nearly as long as the outer

lobe, but narrower. Mouth-papillæ large, stout, subacute, usually three on each side of the jaw, the outermost thicker than the others, which are compressed. Arm-spines numerous, long, slender, tapered, subacute, translucent, rough with small acute spinules; the upper spines on the two or three joints just beyond the margin of the disk are longer than the rest, being considerably longer than the diameter of the arm; on the second joint beyond the disk the two rows nearly meet on the dorsal side, there being ten in each row; farther out the number is soon reduced to seven or eight, the upper ones longest, the lower ones short. Under arm-plates, near the base of the arms, short and broad, with a small central angle on the proximal edge; the distal edge curved. Farther out they rapidly become narrower and longer, the proximal angle becoming more prominent and the lateral edges being incurved, while the distal edge is convex. The ventral plates are separated by the side arm-plates. Diameter of disk, 11^{mm}; length of arms, 45^{mm} to 50^{mm}; of longest arm-spines, 4^{mm}. Color, in alcohol, yellowish white.

Taken on the eastern slope of George's Bank, in 220 fathoms, and presented by Captain Anderson and crew, of the schooner "Alice G. Wunson."

PORIFERA.

Cladorhiza grandis, sp. nov.

A large and remarkable species, with a strong, branched root, a long, stout, round, unbranched stem, and a very thick, elongated, club-shaped, compact body, from which a large number of lateral processes diverge, on all sides, nearly at right angles, so as to resemble somewhat an Indian war-club. The lateral processes are long, round, enlarged at base, and swollen or clavate toward the end, which terminates in a fascicle of slender setæ; other clusters of setæ project from and roughen the surface of the swollen end. These lateral processes are arranged irregularly, but rather uniformly, and often appear to form eight to ten or more irregular rows, but are more commonly without order, and about half an inch apart at base, diverging on all sides, more or less curved to one side or downward, the lowest and the uppermost somewhat shorter; their number, on the largest specimens, amounts to a hundred or more, while in the smallest observed there are about twenty; they are tubular, the small central tube connecting with larger cavities in the body of the sponge, at their bases; the internal cavity is lined with long, slender, longitudinal spicula, and their external surface is roughened with small projecting spicula, while the surface of the sponge-body is comparatively smooth. A large central bundle of long spicula runs through the whole length of the stem and body, and subdivides so as to go into all the branches of the root, which subdivides irregularly into numerous branches, differing in the different specimens. Color, in alcohol, yellowish white or clear white.

Height of largest examples, about 18 inches; diameter of the stem, 0.5 inch; of body, 1.5 inches; length of lateral processes, 1.5 to 2 inches; their diameter in middle, about 0.15 to 0.20 inch.

A moderate-sized specimen is 220^{mm} high; the root (imperfect) is about

40^{mm}; the stem, 70^{mm}; the body, 110^{mm}; diameter of the stem, 10^{mm}; of the body, 20^{mm}; length of lateral processes, 25^{mm}; their diameter in middle, 3^{mm} to 4^{mm}. The smallest specimen seen has the stem 40^{mm} long; the body, 30^{mm} long; diameter of the stem, 5^{mm}; of the body, 15^{mm}; length of lateral processes, up to 20^{mm}.

Numerous specimens of this very remarkable sponge have been brought in by the halibut fishermen from the deep-water fishing grounds off Nova Scotia, during the past year, and presented to the U. S. Fish Commission. Two of the best were taken by Captain McCormick and crew, of the schooner "Wachusett," in 180 fathoms, N. lat. 43° 17', W. long. 60° 58'. Several specimens have been presented by Capt. J. W. Collins and crew, of the schooner "Marion," from Banquereau.

NEW HAVEN, CONN., October, 1879.

DESCRIPTION OF A NEW GENUS AND SPECIES OF FISH, *LOPHOLATILUS CHAMÆLEONTICEPS*, FROM THE SOUTH COAST OF NEW ENGLAND.

By G. BROWN GOODE and TABLETON H. BEAN.

A few days ago Captain William H. Kirby, of Gloucester, Massachusetts, took 500 pounds of a remarkable new fish on a cod-fish trawl in lat. 40° N., lon. 70° W., at a depth of 84 fathoms, 80 miles south by east of Noman's Land. One of these was forwarded by him to the United States National Museum, and forms the type of a new genus and species. The single individual secured (No. 22899, Earl 342) is 33 inches long. The largest one taken, according to Captain Kirby, weighed 50 pounds.

The species appears to be generically distinct from the already described species of the family *Latilidae* Gill. It is related by its few-rayed vertical fins and other characters to the genus *Latilus* as restricted by Gill, but is distinguished by the presence of a large adipose appendage upon the nape, resembling the adipose fin of the *Salmonidae*, and by a fleshy prolongation upon each side of the labial fold extending backward beyond the angle of the mouth. For this genus we propose the name *Lopholatilus*.

Lopholatilus chamæleonticeps sp. nov.

DESCRIPTION.—The greatest height of the body (.306), which is at the ventrals, is contained about 3½ times in the length to the origin of the middle caudal rays, and 4 times in the extreme length. Its greatest width (.144) equals the length of the caudal peduncle (.144); this latter being measured from the end of the soft dorsal to the origin of the middle caudal rays. The least height of the tail (.0867) is contained 4 times in the distance of the spinous dorsal from the snout.

The greatest length of the head (.33) is contained 3 times in the length to the origin of the middle caudal rays. Its greatest width (.165) is slightly more than twice the width of the interorbital area (.08). The length of the snout (.122) is contained twice in the length of the pectoral of the right side (.244). The length of the operculum to end of flap

(.11) is $\frac{1}{6}$ of total length. The length of the upper jaw (.15) equals $\frac{1}{2}$ the height of the body at the ventrals, and is contained $2\frac{1}{2}$ times in the length of the head. The maxilla extends to the perpendicular through the anterior margin of the orbit; the mandible does not quite reach the perpendicular through the middle of the orbit; the length of the labial appendage is slightly more than half the long diameter of the orbit and $\frac{1}{3}$ the length of the 1st pectoral ray. The length of the mandible (.156) slightly exceeds the distance from the snout to the orbit (.15), and equals 3 times the long diameter of the eye (.052), which is contained $6\frac{1}{2}$ times in the length of the head. The operculum and preoperculum are scaly; the latter is finely denticulated on its posterior margin. The distance of the posterior nostril from the eye equals the length of the first anal spine; the distance between the anterior nostril and the end of the snout is twice as great. The intermaxillaries are supplied with an outer series of about 19 canine teeth, and behind these a band of villiform teeth widest at the symphysis. The mandible has a few large canines and an inner series of small conical teeth continued from a patch of similar teeth at the symphysis; vomer and palatines toothless.

The distance of the adipose dorsal from the snout (.206) equals nearly 3 times its height (.07); its length of base (.123) equals the length of the snout. The height of the adipose dorsal equals the distance from the tip of the ventral to the vent.

The distance of the spinous dorsal from the snout (.347) equals the distance of the ventral from the snout (.347); its length of base (.144) equals the length of the caudal peduncle. The 1st spine is imperfect—what remains of it is $\frac{1}{3}$ as long as the 3d spine (.09). The 2d spine (.082) is about equal to the width of the interorbital area. The 4th and the 6th spine are equal in length (.097) and equal the distance from the end of the snout to the posterior nostril. The 5th spine (.095) is a little shorter than the 6th. The last spine (7th) is contained 10 times in the total length. The length of the first ray of the soft dorsal (.094) equals the distance between the anterior nostril and the end of the snout. The 13th, and longest ray (.147), about equals the length of the base of the spinous dorsal. The last ray (.07) is half as long as the 13th. The 13th ray of the soft dorsal extends to the origin of the external caudal rays.

The distance of the anal from the snout (.60) is about equal to twice the height of the body at the ventrals. The length of the anal base (.318) is slightly more than twice the length of the mandible. The 1st anal spine (.04) is half as long as the second dorsal spine. The 2d anal spine (.075) is half as long as the upper jaw. The 1st ray of the anal (.102) is as long as the last spine of the dorsal. The 11th, and longest anal ray (.134), is contained $7\frac{1}{2}$ times in the total length, and nearly equals the length of the middle caudal rays. The last anal ray (.078) is half as long as the mandible. The 11th ray of the anal extends almost to the perpendicular through the origin of the middle caudal rays.

The caudal is emarginate, the external rays being only $1\frac{1}{2}$ times as long as the middle rays. The length of the superior external rays (.216), measured from the origin of the middle rays, equals $1\frac{1}{2}$ times the length of the spinous dorsal base.

The distance of the pectoral from the snout (.32) very slightly exceeds the length of the anal base. The length of the pectoral of the right side (.244) equals twice that of the snout. The pectoral of the left side is probably imperfect; its length (.216) being equal to that of the superior external caudal rays. The right pectoral can be made to reach the vent; in its natural position it extends to the perpendicular let fall from the 4th ray of the 2d dorsal.

The distance of the ventral from the snout (.347) equals 4 times the least height of the tail. The length of the ventral (.183) equals twice that of the 3d dorsal spine, and it extends to a point under the third dorsal ray. The distance from the tip of the ventral to the vent equals half the length of the middle caudal rays. The vent is under the interval between the fourth and fifth dorsal rays.

Radial formula.—B. VI; D. VII, 15; A. III, 13; C. 18; P. II, 15; V. I, 5; L. Lat. 93; L. Trans. 8+30.

Color.—The operculum, preoperculum, upper surface of head, and major portion of the body, have numerous greenish-yellow spots, the largest of which are about $\frac{1}{3}$ as long as the eye. Upon the caudal rays are about eight stripes of the same color, some of them connected by cross blotches. The upper part of the body has a violaceous tint, and the lower parts are whitish, with some areas of yellow. The anal and ventral fins are whitish. The pectorals have the tint of the upper surface of the body, with some yellow upon their posterior surfaces. The soft dorsal has an upper broad band of violaceous, and a narrow basal portion of whitish. Many of the rays have upon them a yellow stripe; there are some spots of the same color, especially upon the anterior portion of the fin.

NOTE.—In the table of measurements, the unit of comparison is the length to the origin of the middle caudal rays.

Table of Measurements.

Current number of specimen	22,889.	
Locality	80 miles S. by E. of Noman's Land.	
	Millime- tres.	100ths of length.
Length to origin of middle caudal rays.....	692	
Length to end of middle caudal rays	788	
Body:		
Greatest height (at ventrals)	212	30.6
Greatest width	100	14.4
Least height of tail	60	8.67
Length of caudal peduncle.....	100	14.4
Head:		
Greatest length.....	230	33
Greatest width	114	16.5
Width of interorbital area	56	8
Length of snout	85	12.28
Length of operculum	77	11
Length of upper jaw.....	105	15
Length of mandible.....	108	15.6
Distance from snout to orbit.....	103	15
Long diameter of eye	36	5.2

Table of Measurements—Continued.

Current number of specimen	22,899.	
Locality	{ 80 miles S. by E. of Noman's Land.	
	Millime- tres.	100ths of length.
Dorsal (adipose):		
Distance from snout	143	20.66
Length of base	85	12.28
Greatest height	48	7
Dorsal (spinous):		
Distance from snout	240	34.68
Length of base	100	14.4
Length of first spine (possibly broken)	20	3
Length of second spine	57	8.24
Length of third spine	63	9.1
Length of fourth spine	67	9.68
Length of fifth spine (possibly broken)	66	9.54
Length of sixth spine	67	9.68
Length of seventh spine	70	10
Dorsal (soft):		
Length of base	300	43.35
Length of first ray	65	9.4
Length of longest ray (thirteenth)	102	14.74
Length of last ray	48	7
Anal:		
Distance from snout	416	60
Length of base	250	31.79
Length of first spine	29	4.2
Length of second spine	52	7.5
Length of first ray	71	10.26
Length of longest ray (eleventh)	93	13.44
Length of last ray	54	7.8
Caudal:		
Length of middle rays	96	13.87
Length of external rays	{ superior .. 150	21.67
	{ inferior .. 145	21
Pectoral:		
Distance from snout	223	32.22
Length	{ right side. 169	24.42
	{ left side .. 150	21.67
Ventral:		
Distance from snout	240	34.68
Length	127	18.35
Branchiostegals	VI	
Dorsal	VII, 15	
Anal	II, 13	
Caudal	18	
Pectoral	II, 15	
Ventral	I, 5	
Number of scales in lateral line	93	
Number of transverse rows above lateral line	8	
Number of transverse rows below lateral line	30	

Capt. William Dempsey, of Gloucester, has since furnished nine fresh specimens of this *Lopholatilus* and the following information:

"The fish were caught with Menhaden bait in July, 1879, while 'trying' for cod 50 miles south by east of Noman's Land, in lat. 40° 10' N., lon. 70° 55' W., 75 fathoms, on very hard clay bottom. Two miles inside of this bottom there is nothing but a green ooze, on which no fish will live.

"Two of the 9 fish were spent females. The few remaining eggs of these 2 were not so large as those of the herring, and resemble the eggs of the Norway Haddock. The other 7 had nothing to determine whether they were male or female.

"The liver is small, somewhat like that of the mackerel, and contains no oil. The flesh is oily and will soon rust after splitting and drying.

"The stomach and intestines are small, the latter resembling those of an eel.

"The swim-bladder is similar to that of a cod.

"Some of the fish 'blister' like eusk when taken on deck."

"They were very abundant and bit freely."

The largest of the individuals brought in by Captain Dempsey has a bifid nuchal crest.

SMITHSONIAN INSTITUTION, July 30, 1879.

ON THE OCCURRENCE OF *LYCODES VAHLII*, REINHARDT, ON LA HAVE AND GRAND BANKS.

By G. BROWN GOODE and TARLETON H. BEAN.

The United States Fish Commission has received from Captain Z. Hawkins and the crew of the schooner "Gwendolen," of Gloucester, Mass., a fine specimen of a species of *Lycodes*, obtained on La Have Bank in latitude 42° 43' north and between the meridians of 62° 20' and 63° 30' west, at the depth of 300 to 400 fathoms, the schooner having changed position while fishing. A second specimen, 632 millimetres in length, was presented by Captain Wm. H. Greenleaf and the crew of the schooner "Chester R. Lawrence," who secured it on the Grand Banks. After a careful comparison of this species with that described by Reinhardt under the name *Lycodes VahlII*,* and previously recorded only from Greenland, we are inclined to believe the two identical.

Reinhardt's description of *Lycodes VahlII* is very full, and is supplemented by a long table of measurements, which has been very serviceable in the study of the specimens before us.

The dentition of the La Have specimen agrees exactly with that of *L. Verrillii*. The lower jaw has the teeth in two series, with an imperfect series of smaller ones between. The upper jaw has a single series of teeth, with a few smaller ones behind the symphysis. There are about seven teeth on the vomer and a single row of about seven on each palatine. The teeth are obtuse-conic, not curved as in *L. Verrillii*. In the specimen of *L. VahlII* from La Have, the colors are somewhat less regular in distribution than those described and figured by Reinhardt; instead of showing six light bands, the arrangement of light color upon the dark ground of the body is as follows: one white spot on each side, above the posterior end of the opercular flap, the spots not meeting on the dorsal line. The first saddle-shaped marking begins on the back, under the 8th ray of the dorsal fin, and extends on either side nearly to the middle of the body. The second saddle-shaped marking begins under the 27th dorsal ray and extends nearly to the margin of the fin, involving the width of about two rays and the connecting membrane, and extends also downward nearly to the middle line of the body, increasing in width as it descends. The next begins under the 54th ray, and resembles the last in form and extent. The next begins under the 79th, and, though smaller, resembles the others. The individ-

* Ichthyologische Bidrag til den Groenlandske Fauna af Johannes Reinhardt, Professor. Vid. Selsk. Naturvidensk. og Mathem. Afh. vii, pp. 86-228. Eight plates (p. 153, pl. v).

ual from the Grand Banks is the largest yet recorded. The measurements are as follows:

Table of Measurements.

Current number of specimen..... Locality	22,491.		21,991.		Measurements of type given by Reinhardt.*		Collett's meas- urements of a type-specimen.†	
	Grand Banks.		La Have Bank.		Danish inches.		Milli- metres.	
	Milli- metres.	100ths of length.	Milli- metres.	100ths of length.		100ths of length.	Milli- metres.	100ths of length.
Extreme length.....	632		540		18		390	
Body:								
Greatest height.....		13		11		10		8
Greatest width.....		9		11		8		5½
Width at vent.....				7				
Height at ventrals.....		10½						
Height at vent.....		12		13		7½		
Snout to middle of vent.....				39		40		43
Head:								
Greatest length.....		21½		20½		21		20½
Distance from snout to nape.....		14½						
Width over eyes.....				9½		10½		
Greatest width over cheeks.....		9½		10½		12½		
Greatest height over cheeks.....				10				10
Width of interorbital area.....		4½				9		3½
Height over eyes.....				9		6½		
Length of snout.....		7		6				6
Length of operculum.....		5½		5½				
Length of postorbital portion of head.....				10½				10½
Length of maxillary.....		9½		9				
Length of mandible.....		10½		9½		11		
Distance from snout to orbit.....		7½						
Distance from snout to mid- dle of pupil.....				8½		9		4
Long diameter of eye.....		2		3½		ca. 4		
Dorsal (spinous):								
Distance from snout.....		24		24½		26½		26½
Length of first ray.....						3		
Length of eleventh ray.....				5		5		
Length of twenty-fourth ray.....				5½		6½		
Length of fifty-fourth ray.....				5½		6		
Length of ninety-third ray.....				5½		5½		
Length of ray at end of tail.....				2½		2		
Length of longest ray.....		6½		5½		6½		
Anal:								
Distance from snout.....		41		42				
Length of first ray.....				2½		4½		
Length of twenty-fourth ray.....				4½		5½		
Length of sixty-fourth ray.....				6		6½		
Length of eighty-fifth ray.....				3½		3		
Length of longest ray.....		4½		6		5½		
Pectoral:								
Distance from snout.....		21½		20		22		
Distance of tip from snout.....				32		33½		
Length.....		12		12		11½		14
Ventral:								
Distance from snout.....		18		16		18		16
Length.....		2		3		2½		1½
Branchiostegals.....	5							
Dorsal.....			110		116-117			
Anal.....			97		91-93, 95			
Pectoral.....	23		20		19-20			
Ventral.....	3		3					

* Dansk. Vid. Selsk. naturvid. og math. Aftn., Deel vii, 1838, p. 153, pl. v. † Norges Fiske, 1875, p. 99.

The synonymy of the species stands as follows:

Lycodes VahlII Reinhardt.

Lycodes VahlII, REINHARDT, Kongelige Danske Videnskabernes Selskabs naturvidenskabelige og matematiske Aftndl. vii, 1838, 153, tab. v.

GILL, Catalogue of the Fishes of the Eastern Coast of North America, 1861, p. 46; Proc. Acad. Nat. Sci. Philadelphia, 1863, p. 260, (Sept.); Catalogue Fishes of East Coast of North America, 1873, p. 18.

GÜNTHER, Catalogue of the Fishes in the British Museum, iv, 1862, p. 319.

WASHINGTON, May 21, 1879.

LIST OF NAMES, AGE, TRIBE, &c., OF INDIAN BOYS AND GIRLS AT HAMPTON NORMAL AND AGRICULTURAL INSTITUTE, VIRGINIA. PLASTER CASTS OF WHOSE HEADS WERE TAKEN BY CLARK MILLS, ESQ., MARCH, 1879.

By Lieut. R. H. PRATT, U. S. A.

No.	Names.	Age.	Tribe.	Where from.	Remarks.
GIRLS.			DAKOTA.		
1	Josephine Malnourie	18	Gros Ventre ..	Fort Berthold Agency ..	Half white.
2	Sarah Walker	13	do	do	Do.
3	Carrie Anderson	12	Sioux	Yankton Agency	Do.
4	Anna Dawson	10	Arrickaree ..	Fort Berthold Agency ..	Do.
5	Mary Kettle	16	Sioux	Yankton Agency	Full blood.
6	Zowie	15	do	Crow Creek Agency	Do.
7	Rosa Pleets	15	do	Standing Rock Agency ..	Half white. Sister to No. 37.
8	Lizzie Spider	14	do	Yankton Agency	Full blood.
BOYS.					
12	Oscar Brown	13	Sioux	Yankton Agency	Full blood.
13	E-corrupt-ta-ha	18	Mandan	Fort Berthold Agency ..	Do.
14	Joseph Winnebago	16	Sioux	Lower Brule Agency ..	Do.
15	Joseph Cook	19	do	Yankton Agency	Do.
16	Charley Stone	14	do	Crow Creek Agency	Do.
17	Ka What	12	Mandan	Fort Berthold Agency ..	One-fourth white. Brother to No. 35.
18	Louis Aygenoughwea	15	Sioux	Cheyenne River Agency	Full blood.
19	George Bushotter	15	do	Lower Brule Agency ..	Do.
20	Edwin Ashley	18	do	Crow Creek Agency	Do.
21	Karunach	16	Arrickaree ..	Fort Berthold Agency ..	Half Sioux.
22	Daniel Chantaywahnee-chay.	14	Sioux	Cheyenne River Agency	Son of Chief Little-no-heart. Full blood.
23	Tom Smith	14	Gros Ventre ..	Fort Berthold Agency ..	Half white.
24	A-hu-ka	20	Arrickaree ..	do	Full blood.
25	Arihotchkish	13	Gros Ventre ..	do	Son of Chief Hard-horn. Full blood.
26	Charley Willis	18	Sioux	Yankton Agency	Full blood.
27	Leroy Shutaschney	14	do	Cheyenne River Agency	Do.
28	Charley Tah-tahn-kahskah..	12	do	do	Son of White Bull. Brother to No. 29.
29	John D. Robb	17	do	do	Full blood. Son of White Bull. Brother to No. 28.
30	Francis Rencountre	17	do	Lower Brule Agency ..	Full blood.
31	Mark-pia-monia	19	do	Crow Creek Agency	Do.
32	Henry Rencountre	18	do	Lower Brule Agency ..	One-fourth white.
33	Andrew Fox	16	do	Crow Creek Agency	Full blood.
34	Edmund Bishop	14	do	Yankton Agency	Do.
35	White Breast	18	Mandan	Fort Berthold Agency ..	One-fourth white. Brother to No. 17.
36	U-hah-ke-nmpa	16	Sioux	Standing Rock Agency ..	Full blood.
37	John Pleets	18	do	do	Half white. Brother to No. 7.
38	Harry Brown	14	do	Cheyenne River Agency	Full blood.
39	Henry Fisherman	17	do	do	Do.
40	Frank Yellow-Bird	18	do	Yankton Agency	Do.
41	Samuel Waluminyah Luzah	14	do	Cheyenne River Agency	Do.
42	Laughing Face	18	Arrickaree ..	Fort Berthold Agency ..	Do.
43	George Deloria	15	Sioux	Yankton Agency	Do.
44	Samuel Four Star	19	do	do	Do.
45	Pamani	19	do	Crow Creek Agency	Do.
46	John Cadocte	18	do	Standing Rock Agency ..	Do.
47	Lezedeo Rencountre	16	do	Lower Brule Agency ..	One-fourth white.
48	Joseph Wahn	14	do	Crow Creek Agency	Half white.
49	James Wokasaka	17	do	Lower Brule Agency	Full blood.
50	David Simmons	13	do	Yankton Agency	Half white.

[For report of procuring these youth to come east for education, see page 173, Report of Indian Commissioner, 1878.]

R. H. PRATT.
First Lieutenant, Tenth Cavalry.

DESCRIPTION OF A NEW FISH FROM ALASKA (*ANARRHICHAS LEPTURUS*), WITH NOTES UPON OTHER SPECIES OF THE GENUS *ANARRHICHAS*.

By TARLETON H. BEAN.

The United States National Museum has received from Mr. Lucien M. Turner a species of *Anarrhichas*, which I at first hoped would prove to be the *orientalis* of Pallas.* It differs, however, widely from the description of that species, and does not correspond with any other known to me.

Two specimens of the Alaskan *Anarrhichas* were secured at St. Michael's in 1876. These are the first and only representatives of the genus from the Pacific in the Museum collection.

One of them, No. 21509, is 600 millimetres long; the other, No. 21510, is 495 millimetres. The lengths to the origin of the middle caudal rays are 555 and 455 respectively, and with these all the other measurements are compared.

DESCRIPTION.—The greatest height of the body (.20) is contained 5 times in the unit of length, and equals the distance of the dorsal from the end of the snout (.20). Its height at the pectorals (.17½) is contained 3 times in the distance of the anal from the snout (.52½). The least height of the tail (.04½) is contained twice in the length of the middle caudal rays (.09).

The greatest length of the head (.24) equals 1½ times its greatest height (.16), and is contained in the unit of length 4 times. The distance from the nostril to the anterior margin of the orbit (.015) is contained 3 times in the distance between the eyes (.045). The greatest width of the head (.11) is a little less than half its length, and is contained 9 times in the unit of length. The width of the interorbital area (.045) is about equal to the length of the snout (.04–.045). The length of the upper jaw (.13) equals 3 times the width of the interorbital area, and a little more than one-half of the length of the head. The maxillary extends to the perpendicular through the middle of the length of the head, the angle of the mouth being equally distant from the end of the snout and the end of the opercular flap.

The length of the mandible (.145) nearly equals that of the pectoral (.15), and is contained 7 times in the unit of length. The mandible extends to a point about equally distant from the end of the snout and the origin of the dorsal. There are four large canines in the upper jaw and five in the lower, all of them strongly recurved. Behind the canines in each jaw are a few short, sharp, conical teeth, also recurved. The palatines are in two rows, 4 teeth in the outer and 5 in the inner series. The teeth of the outer series are much the longer. Vomerine teeth ten, in two series. The vomerine patch begins in advance of the palatines, and

* Zoög. Rosso-Asiatica, iii, 1831, p. 77.

extends farther back than the latter. The length of the palatine series is to that of the vomerine as 16 to 27.

The distance from the snout to the orbit (.05-.055) is contained nearly or quite 4 times in that from the snout to the origin of the dorsal. The long diameter of the eye (.035) equals one-seventh, or slightly more than one-seventh, of the length of the head, and not quite one-fourth of the length of the lower jaw.

The distance between the end of the snout and the origin of the dorsal (.20) is contained 5 times in the unit of length, and equals twice the length of the longest dorsal ray (.10).

The distance of the anal from the snout (.52) equals 3 times the height of the body at the pectorals. The length of the first anal ray (.035) equals the long diameter of the eye (.035). The longest anal ray (.05-.055) equals a little less than half of the width of the body, and less than one-fourth of the length of the head. The vent is about midway between the end of the snout and that of the dorsal, and under the 25th to the 27th dorsal rays.

The length of the middle caudal rays (.085) is contained twice in the height of the body at the pectorals, and equals twice the least height of the tail. The caudal is rounded.

The distance of the pectoral from the snout (.23) is contained $4\frac{1}{3}$ times in the unit of length, and the length of the pectoral (.15) is contained $6\frac{2}{3}$ times. The extended pectoral reaches to the perpendicular through the origin of the 16th dorsal ray.

Radial formula: D. 81; A. 50-53; C. 20-21; P. 21.

Scales: Head and fins scaleless. The median line of the body and the whole of the tail are covered with small widely-separated scales, resembling those of *Lota*, but not depressed.

Color: The prevailing color of the alcoholic specimens is dark brown, without bands and spots. The belly is light brown or gray, clouded with very dark brown.

Anarrhichas lepturus needs to be contrasted only with *A. orientalis* and *A. lupus*. It seems to me improbable that any species of *Anarrhichas* can be safely identified with *orientalis*. The description of that species is certainly insufficient, and may be erroneous. The total length, for example, is stated to be 2 feet 2 inches, English measure; the length of the head, 11 inches—a proportion which is without a parallel in the other species of the genus. Assuming that the length of the head is not correctly given, and that it bears the same proportion to the total length as that of *A. lepturus*, it still differs from the latter in (1) the absence of scales, (2) the situation of the nostril midway between the eye and the mouth, (3) its radial formula—D. 84; C. 17—(4) the presence of 6 canines in the upper jaw. We must, however, accept the description as it stands, for the measurements are evidently those intended by the author, in which event the length of the head alone will serve to distinguish *orientalis* from all other species.

A. lepturus is distinguished from *A. lupus* by (1) its uniform brown color, (2) its scanty squamation, (3) its slender tail, (4) its greater number of dorsal and anal rays. It resembles *A. lupus* in many respects, but differs from it as widely as *lupus* does from *latifrons*.

In the measurement tables which follow the hundredths of length are calculated from the total length without the caudal.

A key to the species of *Anarrhichas* is given. In this no reference is made to the *denticulatus* of Kröyer, because the slight descriptions which we have of this species do not serve to distinguish it from *latifrons*. The species known on the American coast as *A. latifrons* is evidently the *latifrons* of Steenstrup* & Collett,† and I cannot see that it differs from the *denticulatus* of Günther‡ or of Kröyer.§

Table of Measurements.

Species: *Anarrhichas lepturus*.

Current number of specimen	21510.		21509.	
	St. Michael's, Alaska.		St. Michael's, Alaska.	
Locality				
	Milli- metres.	100ths of length.	Milli- metres.	100ths of length.
Extreme length	495		600	
Length to origin of middle caudal rays	455		555	
Body:				
Greatest height		20		19
Greatest width		13		13
Height at base of pectorals		17½		17
Least height of tail		4½		4
Head:				
Greatest length		24½		23
Distance from nostril to anterior margin of orbit		1½		1½
Greatest width		12		10½
Width of interorbital area		4½		4½
Length of snout		4		4½
Greatest height		16		15½
Length of upper jaw		12½		13½
Length of mandible		14½		14½
Distance from snout to orbit		5		5½
Diameter of orbit		3½		3½
Dorsal:				
Distance from snout		20		20
Greatest height		6		
Length of longest ray		10		
Anal:				
Distance from snout		52½		52
Length of first ray		3½		
Length of longest ray		5½		5
Caudal:				
Length of middle rays		9		8
Pectoral:				
Distance from snout		23		23½
Length		15		15
Dorsal	81		81	
Anal	50		53	
Caudal	21		20	
Pectoral	21		21	

*Noget om Slægten Søulv &c., 1876, p. 43 (Vidensk. Medd. fra den naturhistoriske Forening i Kjöbenhavn, 1876, p. 201, tab. iii, figs. 3, 3', & 3'').

†Chra. Vidensk.-Selsk. Forhandl. 1879, No. 1, p. 46, pl. ii, fig. 2.

‡Cat. Fish. Brit. Mus. iii, 1861, p. 211.

§Gaimard, Voy. en Scand. etc., Zool., Poiss., pl. xii, fig. 1 (no description).

Table of Measurements—Continued.

Species: *Anarrhichas lupus*.

Current number of specimen	23364 a.		23364 b.	
	Locality		Locality	
	Milli- metres.	100ths of length.	Milli- metres.	100ths of length.
Current number of specimen	23364 a.		23364 b.	
Locality	Lat. 42° 50' N., Lon. 65° 50' W., 85 fth.		Lat. 42° 50' N., Lon. 65° 50' W., 85 fth.	
Extreme length	107	-----	123½	-----
Length to origin of middle caudal rays	94	-----	109	-----
Body:				
Greatest height	19	20	22	20
Greatest width	12	12¾	13	12
Height at base of pectorals	19	20	22	20
Least height of tail	4	4¼	6	5½
Head:				
Greatest length	25	26½	28½	26
Greatest width	13	14	13½	12½
Width of interorbital area	5	5½	5	4.6
Length of snout	4	4¼	5	4.6
Teeth	(*)	-----	(*)	-----
Length of upper jaw	13	14	14	13
Length of mandible	14	15	15	14
Distance from snout to orbit	6½	7	6½	6
Long diameter of eye	8	8½	8	7½
Dorsal:				
Distance from snout	24	25½	24	22
Greatest height	6½	7	8	7½
Length of first ray	6	6¾	7	6¾
Length of longest ray	10	10¾	12	11
Anal:				
Distance from snout	53	56¾	59	54
Length of first ray	3½	4	4	3¾
Length of longest ray	6½	7	8	7½
Caudal:				
Length of middle rays	13	14	14½	13½
Pectoral:				
Distance from snout	24	25½	27	25
Length	17	18	19	17¾
Branchiostegals	VII	-----	VII	-----
Dorsal	75	-----	75	-----
Anal	45	-----	46	-----
Caudal	21	-----	21	-----
Pectoral	19	-----	20	-----

* The vomerine series extends farther back than the palatines.

Table of Measurements—Continued.

Species: *Anarrhichas lupus*.

Current number of specimen	22249.		17419.		23005.		†14900.	
	Ipswich Bay, Massachusetts.		Bergen, Nor- way.		Christiania Fjord, Norway. R. Collett.		Coxswain's Ledge, July 25, 1874.	
Locality	Milli- metres.	100ths of length.	Milli- metres.	100ths of length.	Milli- metres.	100ths of length.	Milli- metres.	100ths of length.
Extreme length	380	.....	570	.....	639	.....	1110	.....
Length to origin of middle caudal rays	345	.....	522	.....	585	.....	1020	.....
Body:								
Greatest height		19½		19		21½		24½
Greatest width		9½		9				10½
Height at base of pectorals		18		18		19½		21½
Least height of tail		5		5		4½		5
Head:								
Greatest length		24		23		22½		24½
Distance from nostril to anterior margin of orbit		2		2½		2		2
Greatest width		13		11½		10		11½
Width of interorbital area		3½		4½		4½		6
Length of snout		4½		5½		4½		5½
Greatest height		17		18		10		20½
Length of upper jaw †		12		11½		10½		12½
Length of mandible		13		12½		12½		14½
Distance from snout to orbit		6½		7		6½		6½
Long diameter of eye		5		3½		3½		3
Dorsal:								
Distance from snout		22		21		19½		21
Greatest height		6½				7		
Length of longest ray		10		12		10½		12½
Anal:								
Distance from snout		50		50		49½		52
Length of first ray		5				3		4½
Length of longest ray		7		7½		5½		6
Height at last ray						3½		
Caudal:								
Length of middle rays		10		9½		9½		9
Length of external rays								8½
Pectoral:								
Distance from snout		23½		22½		22		*22
Length		15		15		14½		14½
Branchiostegals					VI			
Dorsal	74	.....	73	.....	74	.....	72	.....
Anal	46	.....	47	.....	48	.....	44	.....
Caudal	20	.....	20	.....	20	.....		.....
Pectoral	20	.....	20	.....	20	.....	21	.....

* The pectoral extends to the 14th dorsal ray.

† These measurements are taken from a cast.

‡ In No. 17419 the vomerine teeth extend farther back than the palatine.

Table of Measurements—Continued.

Species: *Anarrhichas latifrons*, Stp.

	Collett's measurements, Chra. Vid. Selsk. Forh. 1879, No. 1, p. 51.		21845.	
	Milli- metres.	100ths of length.	Milli- metres.	100ths of length.
Current number of specimen.....			21845.	
Locality.....	Öxfjord, West Finmark.		Banquereau.	
Extreme length.....	656	.....	1108	.....
Length to origin of middle caudal rays.....	608	.....	1048	.....
Body:				
Greatest height.....	145	23.85	255	24.33
Greatest width.....	.....	.....	97	9.25
Distance of anus from snout.....	318	.....	.....	.....
Height at anal origin.....	130	21.38	239	23
Least height of tail.....	21	3.45	44	4.19
Head:				
Greatest length.....	120	19.74	192	18.32
Greatest width.....	78	12.83	116	11.05
Width of interorbital area.....	29	4.78	57	5.44
Length of snout.....	34	5.59	68	6.49
Length of postorbital part of head.....	75	.....	.....	.....
Length of upper jaw*.....	57	9.37	101	9.64
Length of mandible.....	.....	.....	111	10.59
Distance from snout to centre of orbit.....	44	7.24	85	8.11
Diameter of eye.....	20	3.29	27	2.58
Dorsal:				
Distance from snout.....	116	19.08	205	19.56
Length of base.....	.....	.....	875	.....
Length of first ray.....	.....	.....	22	2.10
Length of longest ray (63d).....	.....	.....	68	6.49
Anal:				
Distance from snout.....	.....	.....	590	56.30
Length of base.....	.....	.....	455	.....
Length of first ray.....	.....	.....	20	1.91
Length of longest ray (38th).....	.....	.....	52	4.96
Caudal:				
Length of middle rays.....	48	7.89	60	5.73
Length of external rays.....	.....	.....	53	5.06
Pectoral:				
Distance from snout.....	136	22.37	220	21
Length.....	75	12.34	126	12.02
Dorsal.....	77	.....	ca. 77	.....
Anal.....	45	.....	46	.....
Caudal.....	18	.....	17	.....
Pectoral.....	22	.....	20	.....

* The palatine series of teeth in No. 21845 extends much farther back than the vomerine and is nearly or quite twice as long as the latter.

KEY TO THE SPECIES OF THE GENUS *Anarrhichas*.

A. Banded species.

b. Bluish gray, with 9-12 darker cross-bands. Vomerine teeth extend farther back than the palatine..... LUPUS.

bb. Greenish, with 14 deep green cross-bands; operculum having a green or blue spot; head, back, and sides above mingled bluish and red. Height of body contained about 5½ times in its length..... FASCIATUS.

A A. Species without bands.

c. Spotted (in life).

d. Many large, round, black spots. Vomerine teeth extend nearly or quite as far back as the palatine..... MINOR.

- dd.* Brown, obscurely spotted with darker. Vomerine teeth do not extend nearly so far back as the palatine.....LATIFRONS.*
- cc.* Unicolored.
- e.* Brown; D. 84; C. 17; scales none; rostril midway between eye and mouth; head contained $2\frac{1}{2}$ (!) times in total length; 6 canines in upper jaw.....ORIENTALIS.
- ee.* Dark brown; vomerine series longer than palatine, and extends farther back; D. 81; C. 20-21; scales few; nostril nearer eye than mouth; head contained $4\frac{1}{2}$ - $4\frac{3}{4}$ times in total length; 4 canines in upper jaw.....LEPTURUS.

A partial synonymy of the species is appended:

1. *Anarrhichas lupus* Linné.
Anarrhichas lupus LINNÉ, Syst. Nat., I, 1766, p. 430: DEKAY, Nat. Hist. N. Y., Fishes, 1842, p. 158, pl. xvi, fig. 43.
Anarrhichas vomerinus STORER, Hist. Fish. Mass., 1867, p. 99, pl. xviii, fig. 1.
2. *Anarrhichas minor* Olafsen.
Anarrhichas minor OLAFSEN, Reise i Island, 1772, § 683*b*, p. 592, tab. 42.
Anarrhichas pantherinus ZUEW, Nov. Act. Petrop., 1781, p. 271, tab. *b*.
Anarrhichas leopardus AGASSIZ in SPIX, Pisc. Bras., 1829, p. 92, tab. li.
3. *Anarrhichas orientalis* Pallas.
Anarrhichas orientalis PALLAS, Zoog. Rosso-Asiat., 1831, p. 77, tab. xi.
4. *Anarrhichas latifrons* Steenstrup & Hallgrímsson.
Anarrhichas latifrons STP. & HALLGR., Förh. Skand. Naturf., 3die Möte, 1842, p. 647: COLLET, Chra. Vid. Selsk. Forh., 1879, No. 1, p. 46, pl. ii.
Anarrhichas (Lycichthys) latifrons GILL, Baird's Ann. Rec. S. & I. for 1876 (1877), p. clxvii.
? *Anarrhichas denticulatus* KRÖYER, Overs. Vidensk. Selsk. Kjöbenhavn, 1844, p. 140: GAIMARD, Voy. en Seand., etc., Zool., Poiss., 1845, pl. 12.
5. *Anarrhichas fasciatus* Bleeker.
Anarrhichas fasciatus BLKR., Nederlandsch Tijdschrift voor de Dierkunde, Amsterdam, Deel iv, 1874, p. 151.
U. S. NATIONAL MUSEUM, October 25, 1879.

NOTES ON CERTAIN TYPICAL SPECIMENS OF AMERICAN FISHES
IN THE BRITISH MUSEUM AND IN THE MUSEUM D'HISTOIRE
NATURELLE AT PARIS.

By DAVID S. JORDAN, M. D.

In a recent visit to Europe the writer has had the privilege of examining the original types of certain species of American fishes, described

* *Anarrhichas latifrons* and *A. denticulatus* are made the type of a distinct subgenus by Professor Gill, who proposes to separate these from the *lupus* type by the following characters: The greater convexity and longitudinal arching of the skull at the posterior frontal region, and the much greater extension backwards of the palatine series of teeth as compared with the vomerine band. Examination of the large collection of the three Atlantic species of *Anarrhichas* in the National Museum has convinced me that these characters have not the taxonomic value claimed for them, owing to their great variability in individuals. The figures published by Steenstrup (Vid. Medd. naturh. For. Kjob., 1876, tab. iii) represent extremes of *A. minor* and *A. latifrons*, which, without access to many examples of both species, would be misleading. *A. minor*, for instance, sometimes has the vomerine band of teeth extending little farther back than is observed in *A. latifrons*. The dentition of *A. latifrons*, too, is subject to considerable variation with age, as is the shape of the skull. *A. minor* seems to show closer affinity to *A. latifrons* than to *A. lupus*.

by Dr. Albert Günther from specimens in the British Museum, and by Cuvier, Valenciennes, and others from examples in the Museum at Paris. Notes on some of these, the proper identification of which may affect our nomenclature, are here presented.

1. *Micropterus dolomieu* Lacépède.

Lacépède, Histoire Naturelle des Poissons iv, 324.

The original type of this species is a large specimen, still in good condition. Its peculiarity, which led to its separation from "*Labrus*" by Lacépède, is that the last rays of the dorsal are detached from the others, and somewhat distorted, the result of some accident to the fish while young. The injury to the specimen is therefore not a museum mutilation, as I had heretofore understood, but a healed wound. This specimen belongs to the southern variety of the small-mouthed Black Bass, recognized by me (Bull. U. S. Nat. Mus., xii, 1878, p. 30) as *Micropterus salmoides* var. *salmoides*. Prof. Vaillant recognizes this form provisionally (MSS. Mission Scientifique au Mexique) as a distinct species (*Micropterus dolomieu* Lac.) from the northern form, but the differences seem to me to have no more than varietal value.

As shown below, there is little doubt that the specific name *dolomieu*, is the first ever distinctly applied to our small-mouthed Black Bass, as the name *Micropterus* is its earliest generic appellation. Unless we adopt the earlier *salmoides*, its name should, therefore, be *Micropterus dolomieu*.

On the other hand it is true that the name *Micropterus dolomieu* was applied to a deformed specimen, which was considered as a distinct genus and species solely on account of its deformity.

It is an established rule of nomenclature (Dall, Rept. Comm. Zoöl. Nomencl., 48,) that "a name should be rejected * * * when it expresses an attribute or character positively false in the majority or the whole of the group in question, as in cases (among others) when a name has been founded on a monstrous, abnormal, immature, artificial, or mutilated specimen."

The name *Micropterus* was founded on a monstrous specimen; in the sense intended by its author it expresses a false character, although the species really have smaller fins than are found in related genera. In the opinion of some writers it should be set aside and the next name in order (*Calliurus* Raf.) should be adopted in its stead. The species might then stand as *Calliurus dolomieu*. The specific name "*dolomieu*" is also open to objection, as it is a French noun having neither a Latin nor a genitive form, but being an unmodified name of a person. This hardly seems to me a reason for rejecting the name, although, if retained, it should receive a genitive form, as *dolomii*, or *dolomiei*.

The question of the adoption of the name *Micropterus* is still an open one. The weight of authority is, however, at present in favor of its retention, and the writer sees no sufficient reason for setting it aside.

2. *Grystes salmoides* Cuvier & Valenciennes.

Labrus salmoides Lacépède, Hist. Nat. des Poiss. III, 716.

Grystes salmoides Cuv. & Val., Hist. Nat. des Poiss. III, 54, pl. 46.

It seems rather a thankless task to reopen the question of the proper nomenclature of the Black Bass, but it is evident that we have not yet reached the bottom. The name *Micropterus salmoides* is now generally adopted in America as the proper name of the small-mouthed Black Bass, not only among naturalists, but among anglers and sportsmen as well. In the Museum at Paris, however, the same name is fully adopted for the large-mouthed Black Bass. Let us inquire into the history of the use of the name *salmoides*.

In 1800, the name *Labrus salmoides* was given by Lacépède to a fish inhabiting the waters of Carolina, and known to Americans as "Trout." This fish was known to Lacépède only through a drawing and manuscript description by Bose. Both species of Black Bass occur in Carolina, the large-mouth most abundantly. Neither drawing nor description is exact enough to enable us to tell with certainty, or even with reasonable probability, which species was meant by Bose and Lacépède. It is unlikely that Bose discriminated between them at all, both being alike "Trout" to the Carolina fishermen. In the figure the mouth is drawn large, and if we *must* choose, the large-mouth is best represented.

The specific name *salmoides* next appears in the great work of Cuvier & Valenciennes (III, p. 54) as *Grystes salmoides*. The description here given is for the most part applicable to both species; the small size of the scales ("il y en a quatre-vingt-dix sur une ligne longitudinale et trente-six ou quarante sur une verticale"*) and the naked preoperculum render it evident that at least that part of the description was taken from a small-mouth, while the accompanying figure more resembles the large-mouth.

We are, however, not here left in doubt. The original material of the French naturalists is still preserved in the museum. It consists of the following specimens as described by Cuvier and Valenciennes:

1. "Nous avons reçu, par M. Milbert, un individu de huit à neuf pouces et un de six à sept. C'est ce dernier qui a six rayons à la membrane des ouies et quatorze rayons sous à la dorsale."

From one of these specimens the figure in the *Histoire Naturelle des Poissons* (pl. 46) was taken.† This specimen is unquestionably a large-mouthed Black Bass.

2. "Plus tard, M. Lesneur nous en a envoyé de la rivière Wabash un individu long de seize pouces, et trois autres qui n'en ont guère que cinq. Les jeunes sont d'un vert plus pale, et ont sur chaque flanc vingt-cinq à trente lignes longitudinales et parallèles brunes, qui paraissent s'effacer avec l'âge."

These specimens are still preserved, bearing the MSS. name of *Cichla variabilis* Le Sueur, and belong to the small-mouthed species. This

*The very small precaudal scales are doubtless here included.

†*I*de Vaillant.

name, which, so far as I know, was never published by Le Sueur, is thus noticed by Cuvier and Valenciennes:

“M. Lesueur, croyant l'espèce nouvelle, en a publié une description dans le Journal des sciences à Philadelphie, sous le nom de *cichla variabilis*; mais nous avons tout lieu de croire que c'est ce poisson qui est représenté et décrit par M. de Lacépède (t. iv, p. 716 et 717, et pl. 5, fig. 2), sous le nom de *labre salmoïde*, d'après des notes et une figure fournies par M. Bosc qui le nommait *perca trutte*. La figure en est un peu rude, mais la description s'accorde avec ce que nous avons vu, sauf quelques détails, qui tiennent peut-être moins au poisson même qu'à la manière dont il a été observé.”

Later (vol. v, p. v), the type of *Micropterus dolomieu* was re-examined and fully identified by Cuvier as a *Grystes salmoides*.

It is thus evident that Cuvier and Valenciennes completely confounded the two species under the name *Grystes salmoides*, and that the uncertain *salmoides* of Lacépède became in their hands a complex species. We may perhaps say that their *salmoides* must be the fish described by them, and that the figure is to be taken into consideration only when other evidence is wanting. M. Vaillant, however, maintains that the large-mouthed species should be considered as the *salmoides* of Cuvier and Valenciennes, inasmuch as one of that species served as the type of their published figure.

The next writers who use the name *salmoides* (De Kay, Storer, etc.), have merely copied or echoed the description of Cuvier and Valenciennes, and have in no way given precision to the name.

Later Agassiz uses the name “*salmoncus*” (slip of the pen for “*salmoides*”?) apparently referring to the large-mouthed species.

The description given by Dr. Günther of *Grystes salmoides* in the Catalogue of the Fishes of the British Museum, I, 252, adds nothing to the precision of our knowledge of the species, the characters given being either taken from Cuvier and Valenciennes, or else common to both species.

Next a description is given of *Grystes salmoides* by Holbrook (Ich. S. Car., p. 28, pl. 4, f. 2), accompanied by an excellent figure, which leaves no possible doubt of the species intended. This is the large-mouthed Bass.

Omitting papers of lesser importance, we come finally to the very able discussion of these questions by Professor Gill (Proc. Am. Ass. Adv. Sci., 1873, p. 55-72), in which the whole subject is exhaustively treated, and the name *Micropterus salmoides* is definitely adopted for the small-mouthed Black Bass. This arrangement has been followed by most recent ichthyologists. In an important paper just now passing through the press (Mission Scientifique au Mexique), however, Messrs. Vaillant and Bocourt have adopted the name *Micropterus salmoides* for the large-mouthed species, for the reasons indicated above.

This question resolves itself into two. Is the specific name *salmoides* available for either species? and if so, for which?

Between the publication of the works of Lacépède and Cuvier both

species had been more than once described under different names by Rafinesque and Le Sueur. Of these names, *Lepomis pallidus* Raf. for the large-mouthed Black Bass, *Micropterus dolomieu* Lac. for the southern, and *Bodianus aehigan* Raf. for the northern variety of the small-mouth have priority over the others. All these, therefore, antedate any precise definition of the name *salmoides*.

The question as to whether a specific name, at first loosely applied and afterwards precisely fixed, shall claim priority from its first use or not, has been differently answered by different writers, and has perhaps never been settled by general usage. I suppose that the amount of doubt or confusion arising from its use or rejection enters with most writers as an element. The name *salmoides*, left unsettled by Lacépède, has been generally received by writers, in consequence of the supposed precision given to it by Cuvier. We have seen, however, that both species were included by Cuvier under one name, and that we must look farther for real restriction of the species. The first distinct use of the name *salmoides* for any particular species is by Holbrook, for the large-mouthed form. On the basis of the first unquestionable restriction, the name, if used at all, must be applied to that species. Forty years previous to this restriction, however, the specific name *pallidus* was conferred on the same fish by Rafinesque.

In the writings of nearly all the older naturalists, as well as in many of the later ones, we find descriptions of species which are really generic in their value, and which, as our knowledge of species becomes greater, cannot be disposed of with certainty or even with any high degree of probability, for absolute certainty rarely accompanies any identification.

In the absence or impossibility of any general rule regarding such cases, the following supposed examples will illustrate what seems to the present writer a fair method of treating them.

Let us suppose that the genus *Micropterus* contains two well-marked species; that to one of these the name *salmoides* was early applied; that next the names *dolomiei* and *pallidus* were applied to the two respectively, and that *subsequently* the name *salmoides* was restricted to the one called *pallidus*.

Now if (1) the original *salmoides* were definitely a complex species, distinctly including both, we may hold its author to be a "conservative" writer, and that the subsequent restriction, like the restriction of a genus, is a change of view or the elimination of an error. In this case, the name *salmoides* should be retained, dating its priority from its original use, and applying to the species *pallidus*.

If (2) the original *salmoides* be not complex, but simply uncertain, the probabilities being undeniably in favor of its identity with *pallidus* rather than with *dolomiei*, it should be adopted instead of *pallidus*. Absolute certainty of identification cannot be expected of many names older than the present generation, and each writer must judge for himself of

the degrees of probability. If we may express it numerically, a probability of 75 per cent. should perhaps be sufficient, and this probability should be unquestionable—that is, not merely subjective and varying with the mental differences of the different writers.

If (3) the original *salmoides* be evidently a *Micropterus*, but hopelessly uncertain as to the species intended, it should claim priority from its first use for a definite species of *Micropterus*. If the name *pallidus* intervene between its first use and its final precise use, *salmoides* should become a synonym of *pallidus*, and should not be available for the other species. This rule is followed more or less consistently by most writers, and it seems to me a fair one. The revival of hopelessly uncertain ancient specific names in place of well-defined modern ones is productive only of confusion, and is open to gross abuse. The revival even of well-defined but forgotten names is confusing enough, and it has been strongly objected to by many writers.

If (4) the name *salmoides*, left hopelessly uncertain by its author, should have been definitely used for some species to which it might not improbably have referred *before* the use of the name *pallidus* for the same species, it should be retained, dating its acceptance from its second use, and the name *pallidus* should be considered as a synonym of *salmoides*.

If (5) the name *salmoides* should have been adopted by the second author supposed in (4) for some species not a *Micropterus*, or for some species which could not reasonably be identical with the original *salmoides*, the identification should be taken as an erroneous one, and should not be considered in our nomenclature.

The actual state of the name *salmoides* is that supposed under (3) above. I do not consider the name *salmoides* as rightfully entitled to priority over either *pallidus* or *dolomiei* as the specific name of a species of Black Bass. If it must be used, however, I think it wisest to retain it, with Professor Gill, for the small-mouthed species. For this purpose, we must consider the *salmoides* of Lacépède as complex, including both species. The case would then be that supposed by (1) above. We must hold further that Cuvier and Valenciennes restricted the name to the *small-mouthed* form. No possible settlement of the case can be free from question or objection. I propose to adopt the following view of the case, proposed by Dr. Gill (in *lit.*), to whom I have submitted the evidence above given.

Dr. Gill remarks:

“I think we can retain our old names (i. e. *Micropterus salmoides* and *Micropterus pallidus*) on the following grounds:

“(1) Let us admit that *Labrus salmoides* Lac. may be the small-mouthed.

“(2) The name *salmoides*, it may be considered, was re-established by Cuvier and Valenciennes for the largest specimen (the small-mouthed, according to your observations). The description was evidently based

on that, as appears from the number of scales, the absence of any on the preopercular limb ("le limbe de son préopercule [etc.] en manquent"), and the form of the dorsal. Even if it is certain that the figure was taken from a large-mouthed specimen, this would not affect the question, inasmuch as we must accept the description when that is definitive, and such is the case here.

"(3) It may be held that the name is further specialized by Cuvier and Valenciennes by its use to supersede the name of Le Sueur (p. 55), and as a substitute for *M. Dolomieu* (vol. v, p. 5).

"(4) The majority of the C. & V.'s specimens belonged to the small-mouthed Bass.

"(5) The figure was based on a large-mouth simply through accident of size and condition, not selected on account of exhibition of characters. In the same way, we might maintain that the type of *Pomotis vulgaris* C. & V. (although the description plainly points to *Eupomotis aureus*) was *Lepomis pallidus* [rather *auritus*], for the figure apparently represents such."

3. *Micropterus variabilis* Vaillant & Bocourt.

Cichla variabilis Le Sueur, MSS.

Micropterus variabilis Vaillant & Bocourt, MSS., Mission Scientifique au Mexique.

This is the ordinary northern small-mouthed Black Bass, *Micropterus achigan*, or var. *achigan* of authors, *Micropterus salmoides achigan* of the present writer.

4. *Bryttus unicolor* Cuvier & Valenciennes.

Hist. Nat. des Poiss. vii, 464.

A specimen collected by Le Sueur at Philadelphia, and doubtless the original type, seems to be the young of *Lepomis auritus*. Some of the specimens labelled *Pomotis vulgaris* are likewise *Lepomis auritus*. From one of these the figure of the species was apparently taken.

5. *Bryttus punctatus* Cuvier & Valenciennes.

Hist. Nat. des Poiss. vii, 462.

The types of this species (Charleston, Holbrook Coll.) belong to the species recently described by Prof. Cope as *Lepomis apiatus* (Proc. Am. Philos. Soc., 1877) and by me as *Lepiopomus apiatus* (Bull. U.S. Nat. Mus. x, 1877, 25). This species should therefore stand as *Lepomis punctatus*.

6. *Bryttus reticulatus* Cuvier & Valenciennes.

Hist. Nat. des Poiss. vii, 463.

This species is unquestionably identical with the preceding.

7. *Pomotis holbrooki* Cuvier & Valenciennes.

Hist. Nat. des Poiss. vii, 466.

This species is the *Pomotis speciosus* of Holbrook, *Pomotis microlophus* Günther. It should therefore stand as *Eupomotis holbrooki*. *Xystroplites longimanus* Cope, is at least very similar, as also *Pomotis pallidus* Ag.

8. *Pomotis catesbyi* Cuvier & Valenciennes.

Hist. Nat. des Poiss. vii, 469.

As commonly supposed, this species is *Eupomotis aureus* (*Pomotis vulgaris* C. & V.).

9. *Pomotis ravenelii* Cuvier & Valenciennes.

Hist. Nat. des Poiss. vii, 469.

This species is an *Eupomotis*, probably *aureus*, as supposed by me (Bull. U. S. Nat. Mus. x, 38), but the types are too far decayed for certain identification.

10. *Pomotis gibbosus* Cuvier & Valenciennes.

Hist. Nat. des Poiss. vii, 467.

The types of this species, as well as those of *Pomotis incisor* C. & V. (l. c. p. 446), belong to the species called by me *Lepomis pallidus*.

11. *Pomotis solis* Cuvier & Valenciennes.

Hist. Nat. des Poiss. vii, 438.

Only the Philadelphia specimens seen. These are badly decayed, but probably belong to *Eupomotis aureus*.

12. *Plesioperca anceps* Vaillant.

(Nouvelles Archives du Muséum d'Hist. Naturelle, tome 9, p. 37, 1873.)

As already supposed by the present writer, this species is the *Hadropterus nigrofasciatus* Agassiz.

13. *Esox deprandus* Le Sueur.

(Le Sueur MSS., Cuv. & Val. Hist. Nat. des Poiss. xviii, 336.)

The type of this species, a large stuffed skin, is an ordinary *Esox lucius* L. The cheeks, as usual, are scaly; the opercles naked below.

14. *Leuciscus gardoneus* Cuv. & Val.

(Hist. Nat. des Poiss. xvii, 316; Günther Cat. Fishes Brit. Mus. vii, 258.

Chondrostoma gardoneum Cope, Trans. Am. Phil. Soc. 1866, 293.)

The single typical specimen of this species agrees with *Notemigonus chrysoleucus* in most respects, differing chiefly in the short anal (9 or 10 developed rays). It must be referred to the genus *Notemigonus*, of which it possesses the carinated abdomen, backward dorsal, and the teeth 5-5, the edges of the grinding surface strongly crenate. If the specimen is normal, not an accident or hybrid, the species should stand as *Notemigonus gardoneus*. Professor Cope's statement, that the type of this species (also examined by him in Paris) is "identical with *Chondrostoma* in dentition and other characters," is not reconcilable with my ideas of the genus *Chondrostoma*.

15. *Leuciscus spiralingulus* Cuv. & Val.

Hist. Nat. des Poiss. xvii, p. 321, pl. 506.

The types are small specimens of *Luxilus cornutus* (Mitch.).

16. *Gobio cataractæ* Cuv. & Val.

Hist. Nat. des Poiss. xvi, 315, pl. 483.

The type of this species, as already supposed by me (Man. Vert. E. U. S., ed. 2d, p. 307), is the *Rhinichthys nasutus* of authors, which should

therefore stand as *Rhinichthys cataractæ*. The teeth of the typical specimens have never been examined. The difference in the dentition of *Gobio* and *Rhinichthys* does not therefore affect the correctness of this identification.

17. *Leuciscus boucardi* Günther.

Cat. Fishes Brit. Mus. vii, 485.

The teeth of this species have a very narrow grinding surface. It is therefore probably referable to the genus *Myloleucus* as understood by me.

18. *Ceratichthys sallæi* Günther.

Cat. Fishes Brit. Mus. vii, 484.

As this species has no barbels, the propriety of its reference to *Ceratichthys* is not evident. It has the teeth 4-4 with grinding surface, and is therefore referable to the genus *Hudsonius* (*Hybopsis* Cope) as now understood by me.

19. *Ceratichthys cumingi* Günther.

Cat. Fishes Brit. Mus. vii, 177

This species is a true *Ceratichthys*, evidently closely related to *C. amblops*. It perhaps was not taken in California.

20. *Graodus nigrotæniatus* Günther.

Cat. Fishes Brit. Mus. vii, 485.

There are three typical examples of this species. The teeth of two of them were examined by Dr. Günther, and have, as stated by their describer, "pharyngeal teeth quite rudimental replaced by a somewhat uneven ridge of the bone." The third specimen, however, proved on examination to have developed teeth, of the ordinary sort, *two* on each *side*. Traces of the roots of similar teeth were visible on the other specimens, but in none were any evidences of the existence of a greater number. It is, therefore, possible that the normal number is 2-2. It is my opinion, however, that the teeth are normally 4-4, and that in these examples they have been lost, either by natural shedding or through the softening due to long preservation in spirits. If this view is correct, the genus *Graodus* should be suppressed. As the teeth are without grinding surface, the species should be referred to the genus *Cliola*, as understood by me, and should stand as *Cliola nigrotæniata*. If the teeth are normally 2-2, the genus *Graodus* should be retained.

The writer wishes to express his obligations to Dr. Günther for the permission to examine these and other specimens in the British Museum, and to Professors Vaillant and Sauvage for similar favors at the Museum at Paris.

OCTOBER 20, 1879.

LIST OF MARINE INVERTEBRATA FROM THE NEW ENGLAND COAST, DISTRIBUTED BY THE U. S. COMMISSION OF FISH AND FISHERIES.

SERIES I.

[Distributed in fifty sets, put up by Mr. Richard Rathbun, under the direction of Professor A. E. Verrill, 1879.]

EXPLANATION.

The specimens included in the following list are preserved in alcohol, unless otherwise stated. The authority given for the name is usually the author who first used the *combined binomial* name herein adopted, and is not necessarily that of the author who first described the species, or gave the *specific* name. (A name in parentheses is authority for the specific name only.)

The species are not all included in each of the fifty sets, but those sent in each numbered set are checked on the list bearing the corresponding number. The species now distributed are not to be considered as *the most common*, but simply those which happen to be at present most abundantly represented in the collections of the Fish Commission, or those which, for other reasons, can be most conveniently distributed at this time, and have been so selected as to give representatives of most of the important groups. It will also be understood that the species included in this list form but a very small proportion (less than one-twelfth) of the total number of species contained in the collections made by the Fish Commission on the New England coast.

PYCNOGONIDA.

- 1. *Nymphon hirtum* Fabr.
U. S. F. C.—Off Halifax, N. S., 52 fath., 1877.
- 2. *Phoxichilidium maxillare* Stimp.
U. S. F. C.—Casco Bay, shore.

MEROSTOMATA.

- 2a. *Limulus Polyphemus* Latr. Dry.
U. S. F. C.—Cape Cod Bay, shore, 1879.

CRUSTACEA.—DECAPODA.

- 2b. *Gelasimus pugnax* Smith.
U. S. F. C.—Cape Cod Bay, shore, 1879.
- 2c. *Gelasimus pugnax* Smith.
U. S. F. C.—New Haven, Conn., shore.
- 3. *Gelasimus pugilator* Latr.
U. S. F. C.—Vineyard Sound, Mass., shore.
- 3a. *Callinectes hastatus* Ordway.
U. S. F. C.—New Haven, Conn.
- 3b. *Platyonichus ocellatus* Latr. Young.
U. S. F. C.—Cape Cod Bay, surface, 1879.
- 4. *Platyonichus ocellatus* Latr.
U. S. F. C.—Vineyard Sound, Mass.

- 4a. *Cancer borealis* Stimpson. Dry
U. S. F. C.—Casco Bay, Maine, shore.
- 5. *Cancer irroratus* Say.
U. S. F. C.—Vineyard Sound, Mass.
- 5a. *Cancer irroratus* Say. Young.
U. S. F. C.—Gloucester, Mass., shore.
- 6. *Hyas coarctatus* Leach.
U. S. F. C.—Gulf of Maine, 22 to 44 fath.
- 7. *Libinia emarginata* Leach.
U. S. F. C.—Vineyard Sound, Mass.
- 8. *Eupagurus pollicaris* Stimp.
U. S. F. C.—Vineyard Sound, Mass.
- 9. *Eupagurus pollicaris* Stimp.
U. S. F. C.—Off Nantucket I.
- 9a. *Eupagurus pollicaris* Stimp.
U. S. F. C.—Off Noank, Conn.
- 10. *Eupagurus pubescens* Brandt.
U. S. F. C.—Coast of Maine, 20 to 34 fath.
- 11. *Eupagurus bernhardus* Brandt.
U. S. F. C.—Gloucester, Mass.
- 11a. *Homarus Americanus* Edwards.
U. S. F. C.—New Haven, Conn.

11*b*. *Homarus Americanus* Edwards.
U. S. F. C.—Vineyard Sound, Mass.

12. *Crangon vulgaris* Fabr.
U. S. F. C.—Massachusetts coast.

13. *Pandalus borealis* Kröyer.
U. S. F. C.—Mass. Bay, 40 to 55 fath.

14. *Pandalus Montagui* Leach.
U. S. F. C.—Mass. Bay, 42 to 50 fath.

15. *Hippolyte spina* Leach.
U. S. F. C.—Bay of Fundy, 10 to 20 fath.

CRUSTACEA.—SCHIZOPODA.

15*a*. *Thysanopoda inermis* Kröyer.
U. S. F. C.—Cape Cod, from whale stomach.

16. *Thysanopoda Norvegica* M. Sars.
U. S. F. C.—Bay of Fundy, surface.

17. *Mysis mixta* Lilljeborg.
U. S. F. C.—Mass. Bay, 40 to 50 fath.

CRUSTACEA.—CUMACEA.

18. *Diastylis quadrispinosus* G. O. Sars.
U. S. F. C.—Off Grand Menan I., 8 to 10 fath.

CRUSTACEA.—AMPHIPODA.

19. *Ptilocheirus pinguis* Stimp.
U. S. F. C.—Long I. Sd., off Noank, Conn.

19*a*. *Talorchestia longicornis* Smith.
U. S. F. C.—Cape Cod, shore, 1879.

20. *Gammarus locusta* Fabr.
U. S. F. C.—Gloucester Harbor, Mass.

CRUSTACEA.—ISOPODA.

21. *Idotea robusta* Kröyer.
U. S. F. C.—Vineyard Sound, Mass.

22. *Idotea irrorata* Edw.
U. S. F. C.—Vineyard Sd., Mass.

22*a*. *Æga psora* Kröyer.
U. S. F. C.—George's Bank, on cod-fish.

CRUSTACEA.—CIRRIPEDIA.

23. *Lepas fascicularis* Ellis and Sol.
U. S. F. C.—Vineyard Sound, Mass.

23*a*. *Balanus balanoides* Stimp. Dry.
U. S. F. C.—New Haven, Conn., shore.

23*b*. *Balanus balanoides* Stimp. Dry.
U. S. F. C.—Cape Cod Bay, shore, 1879.

ANNELIDA.—CHÆTOPODA.

24. *Lepidonotus squamatus* Leach.
U. S. F. C.—Bay of Fundy, 10 to 25 fath.

25. *Harmothoe imbricata* Malmg.
U. S. F. C.—Bay of Fundy, 10 to 25 fath.

26. *Nephtys cæca* Johnst.
U. S. F. C.—Gloucester, Mass., shore.

27. *Nephtys incisa* Malmgren.
U. S. F. C.—Off Vineyard Sd., 10 to 20 fath.

28. *Nereis pelagica* Linné.
U. S. F. C.—Vineyard Sd., 6 to 12 fath.

29. *Nereis virens* Malmgren.
U. S. F. C.—Gloucester, Mass., shore.

30. *Nothria conchylega* Malmgren.
U. S. F. C.—Gulf of Maine, 85 fath.

31. *Nothria opalina* Verrill.
U. S. F. C.—Gulf of Maine, 90 to 175 fath.

32. *Arabella opalina* Verrill.
U. S. F. C.—Vineyard Sd., 8 to 12 fath.

33. *Rhynchobolus dibranchiatus* Ver.
U. S. F. C.—Barnstable, Mass., shore.

34. *Sternaspis fossor* Stimp.
U. S. F. C.—Mass. Bay, 25 to 45 fath.

35. *Clymenella torquata* Verrill.
U. S. F. C.—Gloucester, Mass., shore.

36. *Thelepus cincinnatus* Malmgren.
U. S. F. C.—Bay of Fundy, 10 to 30 fath.

37. *Potamilla reniformis* Malmg.
U. S. F. C.—Bay of Fundy.

37*a*. *Spirorbis lucidus* Mörch.
U. S. F. C.—Halifax, N. S.

38. *Spirorbis borealis* Daud.
U. S. F. C.—Gloucester, Mass., shore.

39. *Clitellio irrorata* Verrill.
U. S. F. C.—Gloucester, Mass., shore.

GEPHYRÆA.

40. *Phascolosoma cæmentarium* Quatr.
U. S. F. C.—Gulf of Maine, 40 to 100 fath.

40*a*. *Phascolosoma Gouldii* Dies.
U. S. F. C.—Salem and Barnstable, Mass.

CHÆTOGNATHA.

41. *Sagitta elegans* Verrill.
U. S. F. C.—Vineyard Sd., surface.

NEMERTINA.

42. *Lineus viridis* Verrill.
U. S. F. C.—Gloucester, Mass., shore.

42*a*. *Lineus viridis* Verrill.
U. S. F. C.—Eastport, Me., shore.

43. *Cerebratulus ingens* Verrill.
U. S. F. C.—Gloucester, Mass., shore.

44. *Cerebratulus roseus* Verrill.
U. S. F. C.—Gloucester, Mass., shore.

HOLOTHURIOIDEA.

45. *Pentacta frondosa* Jæg.
U. S. F. C.—Bay of Fundy, 10 to 40 fath.

- 45a. *Lophothuria Fabricii* Verrill.
U. S. F. C.—Grand Menan, N. B.

- 45b. *Lophothuria Fabricii* Verrill.
U. S. F. C.—Mass. Bay, 20 to 30 fath.

46. *Thyone Briareus* Selenka.
U. S. F. C.—Vineyard Sd., Mass.

- 46a. *Leptosynapta Girardii* Verrill.
U. S. F. C.—Cape Cod, shore, 1879.

ECHINOIDEA.

47. *Echinarachnius parma* Gray. Dry.
U. S. F. C.—Vineyard Sd., Mass.

48. *Strongylocentrotus Dröbachiensis*
A. Ag.
U. S. F. C.—Eastport, Maine.

49. *Strongylocentrotus Dröbachiensis*
A. Ag.
U. S. F. C.—Wood's Holl, Mass.

- 49a. *Strongylocentrotus Dröbachiensis*
A. Ag.
U. S. F. C.—Off Cape Cod, 20 to 40 fath., '79.

50. *Arbacia punctulata* Gray. Dry.
U. S. F. C.—Noank, Conn.

- 50a. *Arbacia punctulata* Gray. Dry.
U. S. F. C.—Wood's Holl, Mass.

- 50b. *Arbacia punctulata* Gray. Dry.
Young.
U. S. F. C.—Wood's Holl, Mass.

- 50c. *Arbacia punctulata* Gray.
U. S. F. C.—Vineyard Sd., Mass.

ASTERIOIDEA.

51. *Asterias vulgaris* Stimpson.
U. S. F. C.—Halifax, N. S.

- 51a. *Asterias vulgaris* Stimp.
U. S. F. C.—Eastport, Maine.

- 51b. *Asterias stellionura* Perrier.
U. S. F. C.—Off Nova Scotia, 90 to 110 fath.

52. *Asterias Forbesii* Verrill.
U. S. F. C.—Gloucester, Mass.

53. *Asterias Forbesii* Verrill. Dry.
U. S. F. C.—Vineyard Sd., Mass.

- 53a. *Asterias Forbesii* Verrill.
U. S. F. C.—Vineyard Sd., Mass.

54. *Leptasterias compta* Verrill.
U. S. F. C.—Off Watch Hill, R. I., 22 fath.

55. *Cribrella sanguinolenta* Lütken.
U. S. F. C.—Mass. Bay, Gulf of Maine.

- 55a. *Hippasteria phrygiana* Agassiz.
U. S. F. C.—Off Mass. Bay, 30 to 80 fath.,
1878-'79.

56. *Ctenodiscus crispatus* D. and Kor.
U. S. F. C.—Mass. Bay, 40 to 50 fath.

- 56a. *Ctenodiscus crispatus* D. and Kor.
Dry.
U. S. F. C.—Mass. Bay, 40 to 50 fath.

OPHIUROIDEA.

57. *Ophiopholis aculeata* Gray.
U. S. F. C.—Bay of Fundy, 10 to 100 fath.

58. *Ophiopholis aculeata* Gray.
U. S. F. C.—Mass. Bay and Gulf of Maine,
10 to 100 fath.

59. *Ophioglypha Sarsii* Lyman.
U. S. F. C.—Mass. Bay, 20 to 125 fath.

- 59a. *Ophioglypha Sarsii* Lyman. Dry.
U. S. F. C.—Mass. Bay, 20 to 125 fath.

60. *Ophioglypha robusta* Lyman.
U. S. F. C.—Bay of Fundy.

- 60a. *Astrophyton Agassizii* Stimp.
U. S. F. C.—Eastport, Maine.

- 60b. *Astrophyton Agassizii* Stimp.
U. S. F. C.—Off Cape Cod, 25 to 35 fath., '79.

- 60c. *Astrophyton Agassizii* Stimp. Dry.
U. S. F. C.—Off Cape Cod, 25 to 35 fath., '79.

ANTHOZOA.

61. *Urticina nodosa* Verrill.
U. S. F. C.—Gulf of Maine, 50 to 175 fath.

- 61a. *Urticina nodosa* Verrill.
U. S. F. C.—Off Nova Scotia.

62. *Bolocera Tuediæ* Gosse.
U. S. F. C.—Gulf of Maine, 50 to 175 fath.

63. *Metridium marginatum* Edw. and H.
U. S. F. C.—Noank, Conn.

64. *Alcyonium carneum* Agassiz.
U. S. F. C.—Casco Bay, 10 to 60 fath.

- 64a. *Alcyonium carneum* Agassiz.
U. S. F. C.—Off Cape Cod, 25 to 35 fath., '79.

HYDROIDA.

65. *Obelia geniculata* Hincks.
U. S. F. C.—Vineyard Sd., Mass.

66. *Obelia dichotoma* Hincks.
U. S. F. C.—Casco Bay, Maine.
67. *Campanularia flexuosa* Hincks.
U. S. F. C.—Bay of Fundy.
68. *Sertularia cupressina* Linné.
U. S. F. C.—Nantucket Shoals.
69. *Sertularia argentea* Ellis and Sol.
U. S. F. C.—Long Island Sound.
70. *Sertularia pumila* Linné.
U. S. F. C.—Gloucester, Mass., low water.
71. *Hydrallmania falcata* Hincks.
U. S. F. C.—Bay of Fundy, 10 to 60 fath.
72. *Sertularella tricuspidata* Hincks.
U. S. F. C.—Bay of Fundy, 50 to 55 fath.
73. *Diphasia fallax* Agassiz.
U. S. F. C.—Bay of Fundy, 20 to 55 fath.
- 73a. *Diphasia fallax* Agassiz.
U. S. F. C.—Vineyard Sd., Mass.
74. *Gobiceps tiarella* Ayres.
U. S. F. C.—Vineyard Sd., Mass.
- 74a. *Thamnocnida spectabilis* Agassiz.
U. S. F. C.—Noank, Conn.
75. *Halecium halecinum* Sweig.
U. S. F. C.—Long I. Sound, 8 to 12 fath.

CEPHALOPODA.

- 75a. *Ommastrephes illecebrosa* (Les.)
U. S. F. C.—Cape Cod Bay, 1879.
76. *Loligo Pealii* Lesueur.
U. S. F. C.—Vineyard Sd., Mass.
- 76a. *Loligo Pealii* Lesueur. Young.
U. S. F. C.—Vineyard Sd., Mass.

GASTROPODA.

77. *Fulgur carica* Conrad.
U. S. F. C.—Vineyard Sd., Mass.
78. *Neptunea decemcostata* Ad. Dry.
U. S. F. C.—Eastport, Maine.
79. *Buccinum undatum* Linné. Dry.
U. S. F. C.—Bay of Fundy.
80. *Tritia trivittata* H. and A. Ad. Dry.
U. S. F. C.—Vineyard Sd., Mass.
81. *Ilyanassa obsoleta* Stimpson. Dry.
U. S. F. C.—Vineyard Sd., Mass.
- 81a. *Ilyanassa obsoleta* Stimpson.
U. S. F. C.—Gloucester, Mass.
82. *Urosalpinx cinerea* Stimpson. Dry.
U. S. F. C.—Vineyard Sd., Mass.

83. *Purpura lapillus* Lamarek.
U. S. F. C.—Gloucester, Mass.
- 83a. *Purpura lapillus* Lamarek. Dry.
U. S. F. C.—Casco Bay, Maine.
84. *Anachis avara* Perkins. Dry.
U. S. F. C.—Vineyard Sd., Mass.
85. *Astyris lunata* Dall. Dry.
U. S. F. C.—Vineyard Sd., Mass.
86. *Lunatia heros* H. and A. Ad. Dry.
U. S. F. C.—Vineyard Sd., Mass.
- 86a. *Lunatia heros* H. and A. Ad.
U. S. F. C.—Vineyard Sd., Mass.
87. *Lunatia heros* H. and A. Ad.
U. S. F. C.—Gloucester, Mass.
88. *Littorina littorea* Menke.
U. S. F. C.—Gloucester, Mass.
- 88a. *Littorina palliata* Gould. Dry.
U. S. F. C.—Casco Bay, Maine.
89. *Littorina palliata* Gould.
U. S. F. C.—Gloucester, Mass.
- 89a. *Littorina rudis* Gould.
U. S. F. C.—Casco Bay, Maine.
90. *Lacuna vineta* Turton.
U. S. F. C.—Gloucester, Mass.
91. *Bittium nigrum* Stimpson. Dry.
U. S. F. C.—Vineyard Sd., Mass.
92. *Crepidula fornicata* Lam. Dry.
U. S. F. C.—Vineyard Sd., Mass.
93. *Crepidula plana* Say. Dry.
U. S. F. C.—Vineyard Sd., Mass.
94. *Crucibulum striatum* H. and A. Ad.
Dry.
U. S. F. C.—Vineyard Sound.
95. *Margarita helicina* Möll. Dry.
U. S. F. C.—Grand Menan.
96. *Acmaea testudinalis* Han.
U. S. F. C.—Casco Bay, Maine.
- 96a. *Trachydermon ruber* Carpenter.
U. S. F. C.—Eastport, Maine.
97. *Melampus lineatus* Say. Dry.
U. S. F. C.—Barnstable, Mass.

SCAPHOPODA.

98. *Entalis striolata* Stimpson. Dry.
U. S. F. C.—Eastport, Maine.

LAMELLIBRANCHIATA.

99. *Clidiophora trilineata* Carp. Dry.
U. S. F. C.—Vineyard Sd., Mass.

100. *Spisula solidissima* Gray. Dry.
U. S. F. C.—Vineyard Sd., Mass.
- 100a. *Spisula solidissima* Gray. Dry.
Young.
U. S. F. C.—Vineyard Sd., Mass.
101. *Spisula ovalis* Gould. Dry.
U. S. F. C.—Off Cape Ann, Mass.
- 101a. *Spisula ovalis* Gould. Dry.
U. S. F. C.—Grand Menan.
102. *Macoma sabulosa* Mörch. Dry.
U. S. F. C.—Mass. Bay and Gulf of Maine.
103. *Venus mercenaria* Linné. Dry.
U. S. F. C.—New Haven, Conn.
- 103a. *Venus mercenaria* Linné. Dry.
U. S. F. C.—Nantucket, Mass.
104. *Cyprina Islandica* Lam. Dry.
U. S. F. C.—Mass. Bay, Gulf of Maine.
105. *Astarte undata* Gould. Dry.
U. S. F. C.—Eastport, Me.
106. *Yoldia limatula* Woodw. Dry.
U. S. F. C.—Vineyard Sd., Mass.
107. *Yoldia thraciformis* Stimp. Dry.
U. S. F. C.—Mass. Bay, Gulf of Maine.
108. *Scapharca transversa* Ad. Dry.
U. S. F. C.—Vineyard Sd., Mass.
- 108a. *Modiola plicatula* Lamk.
U. S. F. C.—New Haven, Conn., shore.
109. *Modiola modiolus* Turton. Dry.
U. S. F. C.—Vineyard Sd., Mass.
- 109a. *Modiola modiolus* Turton. Dry.
U. S. F. C.—Gloucester, Mass.
- 109b. *Mytilus edulis* Linné.
U. S. F. C.—New Haven, Conn., shore.
110. *Pecten irradians* Lam. Dry.
U. S. F. C.—Vineyard Sd., Mass.
111. *Pecten tenuicostatus* Migh. Dry.
U. S. F. C.—Off Watch Hill, R. I., 22 fath.
- 111a. *Pecten tenuicostatus* Mighels.
U. S. F. C.—Off Watch Hill, R. I., 22 fath.
112. *Anomia aculeata* Gmelin. Dry.
U. S. F. C.—Capeo Bay, Maine.
- 112a. *Ostrea Virginiana* Lister. Dry.
U. S. F. C.—New Haven, Conn.
113. *Venericardia borealis* Carp. Dry.
U. S. F. C.—Off Noank, Conn.
114. *Nucula proxima* Say. Dry.
U. S. F. C.—Buzzard's Bay and Vineyard
Sd.
115. *Mya arenaria* Linné.
U. S. F. C.—Guilford, Conn.
116. *Ensatella Americana* Verrill.
U. S. F. C.—Barnstable, Mass.
117. *Saxicava arctica* Desh.
U. S. F. C.—Capeo Bay, Maine.
118. *Callista convexa* Ad. Dry.
U. S. F. C.—Vineyard Sd., Mass.
119. *Tottenia gemma* Perkins. Dry.
U. S. F. C.—Long Island Sd., with *Littori-
nella minuta* St.

TUNICATA.

120. *Ascidia mollis* Verrill.
U. S. F. C.—Gulf of Maine, 50 to 175 fath.
121. *Ascidiopsis complanata* Verrill.
U. S. F. C.—Bay of Fundy, shore to 50 fath.
122. *Molgula retortiformis* Verrill.
U. S. F. C.—Bay of Fundy, 10 to 25 fath.
123. *Molgula Manhattensis* Verrill.
U. S. F. C.—Vineyard Sd., Mass.
- 123b. *Molgula Manhattensis* Verrill.
U. S. F. C.—Cape Cod, outer shore, 1879.
124. *Glandula arenicola* Verrill.
U. S. F. C.—Vineyard Sd., 10 to 20 fath.
125. *Halocynthia partita* Verrill.
U. S. F. C.—Vineyard Sd., 3 to 12 fath.
126. *Halocynthia echinata* Verrill.
U. S. F. C.—Grand Menan, 1 to 40 fath.
127. *Halocynthia pyriformis* Verrill.
U. S. F. C.—Bay of Fundy, 1 to 45 fath.
128. *Boltenia Bolteni* (Linné).
U. S. F. C.—Eastport, Maine, 1 to 20 fath.
129. *Perophora viridis* Verrill.
U. S. F. C.—Vineyard Sd., 1 to 12 fath.
130. *Botryllus Gouldii* Verrill.
U. S. F. C.—Vineyard Sd., Mass., shore.
131. *Amorœcium pellucidum* Verrill.
U. S. F. C.—Vineyard Sd., Mass.
132. *Amorœcium stellatum* Verrill.
U. S. F. C.—Vineyard Sd., Mass.
133. *Amorœcium constellatum* Verrill.
U. S. F. C.—Off Nantucket, Mass.
134. *Leptoclinum albidum* Verrill.
U. S. F. C.—Vineyard Sd., Mass.
135. *Leptoclinum albidum*, var. *lute-
olum* Verrill.
U. S. F. C.—Vineyard Sd., Mass.

136. *Salpa Caboti* Desor.
U. S. F. C.—Vineyard Sd., Mass., surface.

BRACHIOPODA.

137. *Terebratulina septentrionalis* Gr.
U. S. F. C.—Casco Bay, Maine.
137a. *Terebratulina septentrionalis* Gr.
U. S. F. C.—Eastport, Maine, 1 to 60 fath.

POLYZOA or BRYOZOA.

138. *Crisia eburnea* Lamouroux.
U. S. F. C.—Gloucester Harbor, Mass.
139. *Tubulipora serpens* Flem.
U. S. F. C.—Vineyard Sound, Mass.
140. *Tubulipora Atlantica* Smitt.
U. S. F. C.—Bay of Fundy.
141. *Alcyonidium ramosum* Verrill.
U. S. F. C.—New Haven, Conn.
142. *Flustrella hispida* Gray.
U. S. F. C.—Gloucester, Mass., shore.
143. *Gemellaria loricata* Busk.
U. S. F. C.—Casco Bay, Maine.
143a. *Gemellaria loricata* Busk.
U. S. F. C.—Off Cape Cod, 20 to 40 fath.,
1879.
144. *Cellularia ternata* Johnst. (var.)
U. S. F. C.—Gulf of Maine, 10 to 45 fath.
145. *Caberea Ellisii* Smitt.
U. S. F. C.—Bay of Fundy, 1 to 20 fath.
146. *Bugula Murrayana* Busk.
U. S. F. C.—Nantucket Shoals, 8 to 12 fath.
147. *Bugula turrita* Verrill.
U. S. F. C.—Vineyard Sd. and off Nan-
tucket Island.
148. *Mucronella nitida* Verrill. Dry.
U. S. F. C.—Vineyard Sd., Mass.

149. *Membranipora pilosa* Farre.
U. S. F. C.—Gloucester, Mass.

- 149a. *Membranipora pilosa* Farre.
U. S. F. C.—Gloucester, Mass., on algæ.
150. *Escharina Isabelliana* D'Orb. Dry.
U. S. F. C.—Vineyard Sound, Mass.
151. *Hippothoa hyalina* Smitt. Dry.
U. S. F. C.—Vineyard Sd., Mass.
152. *Lepralia Americana* Verrill. Dry.
U. S. F. C.—Gloucester, Mass., shore.

PORIFERA (SPONGES).

153. *Microciona prolifera* Verrill. Dry.
U. S. F. C.—Vineyard Sd. and Long I. Sd.
154. *Chalina oculata* Bowerb. Dry.
U. S. F. C.—Vineyard Sd., Mass.
154a. *Chalina oculata* Bowerb. Dry.
U. S. F. C.—Casco Bay, Maine.
155. *Suberites compacta* Verrill. Dry.
U. S. F. C.—Off Nantucket, Mass.
156. *Suberites compacta* Verrill.
U. S. F. C.—Off Nantucket I., Mass.
156a. *Suberites compacta* Verrill.
U. S. F. C.—Cape Cod Bay, 15 fath.
156aa. *Suberites compacta* Verrill. Dry.
U. S. F. C.—Cape Cod Bay, 15 fath.
157. *Cliona sulphurea* Verrill. Dry.
U. S. F. C.—Vineyard Sd., Mass.
158. *Tethya gravata* Hyatt.
U. S. F. C.—Buzzard's Bay, Mass.
159. *Tethya gravata* Hyatt. Dry.
U. S. F. C.—Buzzard's Bay, Mass.
160. *Raphiodesma lingua* Bow. Dry.
U. S. F. C.—Bay of Fundy, 10 to 60 fath.

OCURRENCE OF CHELURA TEREBRANS, A CRUSTACEAN DE-
STRUCTIVE TO THE TIMBER OF SUBMARINE STRUCTURES, ON
THE COAST OF THE UNITED STATES.

By SIDNEY I. SMITH.

Upon the coast of Europe an Amphipod belonging to the genus *Che-
lura* has long been known, associated with the Isopod *Limnoria ligno-
rum*, or "gribble" of English writers, in destroying the timber of all
kinds of submarine structures. But, upon the coast of the United States,
the *Chelura* has apparently escaped detection until very recently, and I

am not aware of any published notice of its occurrence, although *Limnoria* has been known for many years, and its ravages have often attracted attention. I have repeatedly made careful search for *Chelura* at many different points upon our eastern coast from New Jersey to Nova Scotia, and have examined many pieces of *Teredo*- and *Limnoria*-bored timber from other parts of the coast, but, until 1875, I was not able to discover an individual of the genus. In the summer of that year, while connected with the party of the United States Fish Commission at Woods Holl, Massachusetts, two small specimens of *Chelura* were discovered, associated with *Limnoria*, in a bit of wood scraped from one of the piles of the government wharf. A careful search was made upon the piles of several wharves in the neighborhood and among the government store of spar buoys, but no more specimens could be discovered, although *Limnoria* was found in abundance.

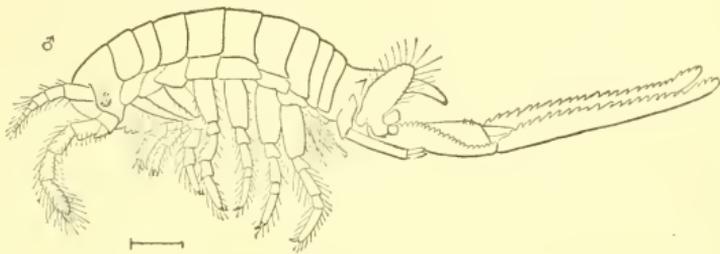


Figure 1.—*Chelura terebrans*; male; lateral view, enlarged about twelve diameters.

Without European specimens for comparison, these two individuals were scarcely sufficient to establish the identity of our species with the common species of Europe; and I delayed calling attention to the subject until more material should be discovered. No other specimens came to hand until August of the present year, when Professor Verrill discovered the species in abundance in old submerged piles at Provincetown, Massachusetts. The specimens found by Professor Verrill were all in wood submerged from 8 to 12 feet below the surface at low water, and were associated with *Limnoria lignorum* and *Teredo navalis*. The *Limnoria* occurred only sparingly, however, in this case, though it was found, by Mr. Sanderson Smith, in great abundance, with *Teredo navalis*, but without *Chelura*, in water-logged wood dredged the past summer in Cape Cod Bay in $7\frac{1}{2}$ fathoms. The specimens obtained by Professor Verrill exhibit all the variations due to age and sex, and show plainly that our species is identical with the European *Chelura terebrans*.

The species was first brought to notice by Philippi, who discovered it at Trieste, in company with *Teredo navalis*, in planks just taken from the sea, and who described and figured

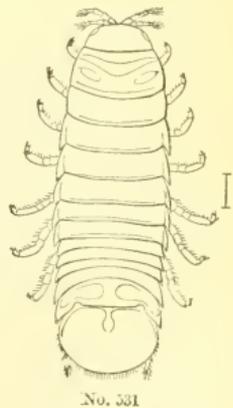


Figure 2.—*Limnoria lignorum*; dorsal view, enlarged ten diameters.

it in 1839. It was more fully described and figured by Allman, in 1847, from specimens found in the piles of the jetty in the harbor of Kingstown, near Dublin, Ireland. It has since been noticed at various points on the coast of Europe from Southern Norway to the Adriatic, and attention has often been called to its ravages.

There is apparently but one species of the genus known. The *C. pontica*, described by Czerniavski, in 1868, judging from the figures and the Latin part of the description, is not distinct. The figure which he gives of one of the abdominal swimming legs (pleopods) shows only one multi-articulate ramus, which is an evident inaccuracy in the drawing, and some other slight differences shown in the figures are apparently due to a similar cause. It is perhaps well to mention, in connection with this reference to Czerniavski's paper, a very remarkable paper published the same year by Eugene Hesse, in which this well-known European species is redescribed and extensively figured, from specimens taken on the coast of France, as a new species of *Limnoria*! The genus *Chelura* unquestionably belongs to the Amphipoda, and has been placed in that order and near *Corophium* by all carcinologists who have written upon the subject. It has, in fact, no structural features which ally it to the Isopoda, as distinguished from the Amphipoda, and it has no external resemblance to *Limnoria*, with which it need not be confounded by the most superficial observer.

The *Chelura* is readily distinguished from all the known genera of crustaceans by the structure of the three pairs of caudal stylets (uropods). The first (antepenultimate) pair of these appendages are slender and tipped with two small and nearly equal rami; the second have the dorsal edge of the basal portion expanded into a thin, broad, oval plate projecting beyond the two small rami which are attached in an emargination of the lower margin; the last pair have very stout but short bases, to each of which is articulated a single very long and strong ramus, which, in fully grown males, is nearly as long as the body of the animal, but much shorter in females and young. The length of fully grown male, from the front of the head to the ultimate pair of caudal stylets, is about a quarter of an inch (6^{mm}); that of the female somewhat less.

According to notes, made upon the specimens taken at Wood's Holl in 1875, the color of *Chelura* is very different from that of *Limnoria*, being semitranslucent, thickly spotted and mottled above with pink, somewhat as in *Unciola irrorata*, but wanting the opaque white of that species.

The following synonymy gives the bibliographical history of the species:

***Chelura terebrans* Philippi.**

Chelura terebrans Philippi, Archiv für Naturgeschichte, v, 1839, p. 120, pl. 7, fig. 5; Annals Nat. Hist., iv, p. 94, pl. 3, fig. 5, 1839.—Allman, Annals and Magazine Nat. Hist., xix, p. 361, pls. 13, 14, 1847 (see further under *C. destructor*).—White, Catalogue British Crust., p. 56, 1850; Popular History British Crust., p. 202, pl. 11, fig. 2, 1857.—Gosse, Marine Zoology, i, p.

Chelura terebrans—(Continued.)

138, fig. 250, 1855.—Bate, Report British Assoc. Adv. Sci., 1855, p. 59, pl. 13, fig. 3 (antenna), pl. 17, fig. 10 (integument), 1856; Annals and Magazine Nat. Hist., II, xix, p. 150 (1857); Catalogue Amphip. Crust. British Museum, p. 285, pl. 48, fig. 1, 1862.—Bate and Westwood, British sessile-eyed Crust., i, p. 503 (woodcut), 1863.—Heller, Beiträge zur näheren Kenntniss der Amphipoden des Adriatischen Meeres (Denkschriften Math.-Naturwissensch. Classe Kaiserliche Akad. Wissenschaften, Wien, xxvi), pp. 52, 61, 1866.—Boeck, Crust. Amphipoda borealia et arctica (Christiania Videnskab.-Selskabs Forhandling for 1870), p. 173 (253), 1870; Skandinaviske og Arktiske Amphipoder, p. 647, 1876.—Metzger, Jahresbericht der Comm. zur wissensch. Untersuchung der deutschen Meere für 1872-1873, Nordsee, p. 278, 1875.

Nemertes nesoides Leach, White, List Crust. British Museum, p. 90, 1847 (teste White, Catalogue British Crust., p. 56, 1850).

Chelura destructor Allman, loc. cit., p. 362, 1847 [provisionally proposed in case the Irish specimens prove distinct from Philippi's species].

Limnoria xylophaga Hesse, Annales des Sci. nat., Zoologie, V, x, p. 101, pl. 9, 1868.

Chelura pontica Czerniavski, Materialia ad zoographiam Ponticam comparatam, p. 95, pl. 7, figs. 1-18, 1868.

NEW HAVEN, October 16, 1879.

DESCRIPTION OF NEW SPECIES OF NORTH AMERICAN FISHES.

By **DAVID S. JORDAN.**

1. **BOLEOSOMA VEXILLARE**, sp. nov.

Allied to *Boleosoma effulgens*. Body rather short and stout; caudal peduncle not contracted; head moderate, the muzzle somewhat decurved; eye moderate; gill membranes scarcely connected; cheeks and breast naked; opercles scaly; a naked strip in front of the dorsal fin; opercular spine moderately developed; *second dorsal very short and high*, higher than long; pectorals and ventrals not reaching to anal.

Coloration olivaceous, the sides with traces of vertical bars, probably greenish in life; male with the first dorsal, ventral, and anal black; second dorsal and caudal strongly barred with black and white in fine pattern; head black; female not seen, but probably without black. Lateral line complete. Scales very large, 4-35-6.

Head 4 in length to base of caudal; depth $4\frac{2}{3}$.

Fin rays. Dorsal VIII-10; A. I., 7.

Length of type $2\frac{1}{2}$ inches.

This species differs from its relatives in the larger scales and the much shorter and higher second dorsal. (D. IX-13 in *B. effulgens*.)

The type was taken in the Rappahannock River at Warrenton, Va., by a correspondent of "Forest and Stream," and forwarded to me for identification by the editor of that journal, Mr. Charles Hallock.

2. NANOSTOMA VINCTIPES, sp. nov.

Allied to *Nanostoma zonale* (*Pæcilichthys zonalis*, Cope). Body fusiform, little compressed; head short, the snout strongly deurved; eye large, longer than snout, nearly 3 in head; mouth small, horizontal, the lower jaw included; teeth small, not distinguishable on the vomer and palatines; cheeks, opercles, neck, and throat closely sealed; opercular spine well developed; gill membranes broadly connected across the breast.

First dorsal rather low, with slender spines; second dorsal shorter and rather higher; the two well separated. Anal spines high, the first much the higher. Caudal moderate, subtruncate. Ventrals pointed, not reaching to the vent. Pectorals moderate, reaching rather beyond tips of ventrals.

Lateral line complete, with 45 scales in its course.

Color olivaceous, with about 8 obscure darker lateral shades or bars, with narrow paler interspaces. These bars meet around the body behind the vent, but not anteriorly; back with 6 darker quadrate shades. A dark streak downward and forward from eye, and some black markings in front of opercle. Fins all strongly cross-banded with darker, the pectorals and *ventrals* especially so; spinous dorsal reddish at base, with a blackish edging.

Fin rays, D. X-11; A. II, 7. Length of types about $2\frac{1}{2}$ inches.

This species differs from *N. zonale* in its less compressed body and in coloration. In the latter species the ventrals are plain and the lateral bars encircle the belly.

The types of this species, five in number, were taken in a tributary of Illinois River, at Naperville, Ill., by Dr. Ernest R. Copeland. One of these is in the U. S. National Museum, numbered 23454.

3. PÆCILICHTHYS VIRGATUS, sp. nov.

A slender species, resembling an *Etheostoma*, not closely related to any of the species thus far made known.

Body moderately elongate, subfusiform, compressed; the back somewhat elevated, the caudal peduncle rather deep; head long and rather pointed, little compressed, rather slender; the snout but little deurved; mouth rather large, somewhat oblique, the maxillary reaching to the pupil, the lower jaw scarcely shorter than the upper; teeth small, even, in several rows; eye rather large; gill membranes not connected. *Cheeks, opercles, neck, and breast wholly naked. Humeral region with an enlarged black scale-like process as in P. punctulatus, Ag., and in the species of Etheostoma.* Posterior border of preopercle obtusely but distinctly crenate-dentate. Scales rather large—53 in a longitudinal series, the lateral line distinct on about 20 of them.

Color greenish, each scale with a small blackish spot, these forming conspicuous lateral stripes as in *Etheostoma lineolatum*. Back and sides

with cross-blotches. Vertical fins faintly barred. Humeral scale large and black.

Head $3\frac{3}{8}$ in length without caudal; depth 5.

Fin rays, D. IX-10; A. II, 8.

Length of types 2 to $2\frac{1}{2}$ inches.

This species differs from its congeners in its form and coloration. From all except *P. lepidus*, B. and G., it is separated by its naked head. From all but *P. punctulatus*, Ag., by the black humeral process.

The numerous typical examples were taken by me in the Rock Castle River, at Livingston, Ky. Their resemblance to *Etheostoma flabellare* caused them to be overlooked until lately. One of these is in the U. S. National Museum (No. 23456). Another has been forwarded to the British Museum.

4. ZYGONECTES RUBRIFRONS, sp. nov.

Body moderately stout, little compressed, not elevated, the caudal peduncle deep; head rather long, broad between the eyes, flat above; eyes large, $3\frac{1}{2}$ in head, their range horizontal; mouth rather large. *Teeth small, nearly even, in a narrow band.* Scales moderate. Dorsal fin very short and small, placed a little behind the anal or about even with it, its position in the males rather more posterior; anal short, high in the males; ventrals very small; pectorals small.

Color, males dark olivaceous, with a dark, bronze-orange spot on each scale posteriorly, much as in *Xenisma catenatum*. Below these spots are bright orange. Faint orange, narrow vertical bars along the lower and posterior part of the body. Vertical fins with orange spots. Jaws and space in front of eyes bright orange-red; paired fins dusky. Females almost uniform brassy-olivaceous, without evident spots or red markings.

Head $3\frac{1}{2}$ in length to base of caudal; depth $3\frac{3}{8}$. D. 7 or 8; A. 8 or 9; lat. 1. 32; L. transv. 11 or 12; B. 5; L. $2\frac{1}{2}$ to 3 inches.

St. Sebastian River, Florida, the numerous types collected by Dr. J. A. Henshall. A larger species than most in the genus, and with the dorsal fin less posterior.

Some of these in the U. S. National Museum are numbered 23450.

5. ZYGONECTES HENSHALLI, sp. nov.

Body rather stout, deep and compressed, the profile nearly straight, the back little elevated, and the caudal peduncle short and deep; head moderate; mouth rather small; *jaws each with a series of long and rather slender canine-like teeth, followed by a band of small teeth*; the canines larger in the lower jaw; eye large; scales rather large; dorsal fin short and high, inserted slightly behind the anal in the males, exactly opposite it in the females; caudal large; anal fin larger and rather lower than dorsal; ventrals quite small; pectorals moderate.

General color olivaceous; sides covered, especially posteriorly, with rather large, irregularly placed orange spots, which also extend on the

vertical fins; dorsal dusky, with a dark bar; head without red; caudal and anal more or less yellow; females obscurely marked; young with diffuse greenish vertical bars.

Head $3\frac{1}{2}$ in length to base of caudal; depth $3\frac{1}{2}$. B. 5; D. 7 or 8; A. 10 or 11; lat. l. 33; L. transv. 10; L. 3 to $3\frac{3}{4}$.

San Sebastian River, Florida, where it is abundant, in company with *Jordanella floridae*, *Zygonectes rubrifrons*, and other *Cyprinodonts*, the numerous types collected by Dr. J. A. Henshall. Some of these in the U. S. National Museum are numbered 23449. The largest species of the genus strongly resembling the preceding, from which it may be known by its dentition, its larger size, and the different coloration.

6. CERATICHTHYS LUCENS, sp. nov.

Allied to *Ceraticthys biguttatus* (Kirt.).

Body elongate, compressed, the back somewhat elevated from the occiput to the base of dorsal, thence rapidly declined to the long and slender caudal peduncle. Head short, compressed, the cheeks nearly vertical; interorbital space rather broad and flat, somewhat grooved; eye very large, circular, high up, placed nearly midway of the length of the head; its diameter about equal to the length of the snout, and scarcely greater than the width of the interorbital space. Preorbital bone large, oblong, conspicuous and silvery; suborbital bones rather narrow.

Mouth rather small, horizontal, the lower jaw included, the edge of the premaxillary below the level of the eye; the maxillary not reaching to the vertical from the front of the orbit. Barbel quite small. Snout boldly and abruptly decurved much as in *C. amblops* (Raf.), the tip of the snout thickened, forming a sort of pad.

Scales moderate, thin, and brightly silvery. Lateral line decurved in front, thence nearly straight; about 16 scales in front of the dorsal, 42 in the course of the lateral line; 5 series above and 4 below. Rows of scales along the back converging behind the dorsal where the upper series run out, as in *Luxilus cornutus*.

Fins rather higher and more falcate than in *Ceraticthys biguttatus*; the dorsal fin inserted well forward, directly over or slightly in advance of base of ventrals. Pectoral fins pointed, not reaching ventrals, the ventrals not reaching the vent.

Teeth 4-4, hooked, without grinding surface.

Color translucent greenish above; sides and below brilliantly silvery; eye white; cheeks and opercles with a bright silvery lustre; upper fins yellowish; lower unspotted; a slight plumbeous lateral shade, but no distinct markings anywhere either in large or small specimens.

Length of head contained $4\frac{1}{3}$ times in total length to base of caudal; greatest depth 4 times.

Dorsal rays, I, 8; anal I, 8.

Length of largest of typical examples $5\frac{1}{8}$ inches.

This species is described from three examples taken at the Falls of the Ohio. Two of these are now in my own collection; the third in the U. S. National Museum is numbered 23462.

This species is larger than the others of the genus except *C. biguttatus* and the Californian *C. symmetricus*, (Grd.). In coloration it differs widely from *C. biguttatus*, which species is wholly destitute of silvery lustre. Its head is likewise shorter and blunter, and the mouth smaller. The form of the body very different. From *C. amblops*, *C. rubrifrons*, etc., it differs in the number of teeth and in the smaller scales.

7. LUXILUS ZONISTIUS, sp. nov.

(*Codoma curystoma* JORDAN & BRAYTON, Bull. U. S. Nat. Mus. xii, 42, 52; not *Photogenis curystomus* JORDAN, Ann. Lyc. Nat. Hist. N. Y., 356, 1877.)

Allied to *Luxilus coccogenis*, Cope. Body rather stout, compressed, the back elevated at the base of the dorsal fin, thence rapidly declined, the caudal peduncle rather short and slender. Head short and rather thick; interorbital space broad and flat; cheeks nearly vertical. Length of head about equal to greatest depth of body, about 4 times in length to base of caudal. Eye large, longer than snout, about 3 in head, its diameter about equal to the interorbital space. Mouth comparatively large, oblique; in size intermediate between *L. coccogenis* and *L. cornutus*. Jaws about equal in the closed mouth. Premaxillary on the level of the pupil; maxillary reaching to opposite the front of the eye. Pre-orbital short and deep; suborbitals narrow.

Scales large, 6-43-3, closely imbricated on the sides of the body where they are much higher than long. Lateral line strongly decurved.

Fins moderate. Dorsal fin inserted somewhat behind the line of the ventrals, I, 8, not much elevated. Anal longer than in the related species, I, 10. Pectorals scarcely reaching ventrals; the ventrals reaching past the vent.

Teeth 2, 4-4, 2, hooked, with narrow grinding surface.

Color steel-blue above; sides somewhat silvery; dorsal fin with a conspicuous jet black cross-bar about half way up; a distinct round black spot at base of caudal, rather smaller than the eye, behind this a cream-colored area, a curved black bar at the shoulder behind and above the opercle; top of head and base of pectorals with dusky punctulations. Females and young specimens have these dark markings obscure. Males in spring have the dorsal cross-bar scarlet and more or less dull ferruginous; red on the head and caudal fin. The snout is covered with small tubercles in spring.

The types of this species, about 20 in number, ranging from 2 to 4½ inches in length, were taken in Suwannee Creek, a tributary of the Chattahoochee River in Northern Georgia.

A few young specimens of this species were mixed with the types of "*Photogenis*" *curystomus*, Jor., a species which the present one somewhat resembles. The specimens referred to by Jordan and Brayton (l. c.) as *Codoma curystoma* are the types of the present species. *Photogenis leu-*

copus Jordan & Brayton, Bull. U. S. Nat. Mus., XII, 41, is, I think, identical with "*Photogenis*" *eurystomus*. The teeth of genuine examples of the latter species are always 1, 4-4, 1. Those with the teeth 2, 4, all belong to *Luxilus zonistius*.

One of the typical examples of this species is numbered 23452 in the U. S. National Museum.

8. LUCANIA GOODEI, sp. nov.

Allied to *Lucania parva* (*Cyprinodon parvus*, Baird and Girard). Body elliptical, rather elongate, the back considerably elevated to a point just in front of the origin of the dorsal fin; the caudal peduncle rather deep and compressed; greatest depth contained 4 to $4\frac{1}{4}$ times in length to base of caudal. Head short, comparatively narrow, and bluntly pointed, its length contained $3\frac{3}{4}$ to $4\frac{1}{4}$ times in length of body. Mouth small, terminal, both jaws with rather large conical canine-like teeth, apparently in a single series. Eye large, near the middle of the side of the head, its diameter contained $2\frac{1}{2}$ to $2\frac{3}{4}$ times in the length of the head, about equal to the width of the interorbital space. Scales large, their exposed surfaces higher than long, in about 30 (29 to 32) longitudinal and 7 vertical series. Humeral scale like the others.

Fins large, especially in the males. Dorsal rays 9. Anal 9. Origin of dorsal about midway between snout and base of caudal, conspicuously in advance of anal. Height of dorsal fin in the males two-thirds the length of the head, about equal to the length of the base of the fin. In females a little lower. Anal fin similar and nearly as high and long, beginning nearly under the middle of the dorsal. Caudal moderate subtruncate. Ventrals long; in the males reaching the front of the anal; in the females reaching the vent. Pectorals reaching past front of ventrals in both sexes.

Color olivaceous, the scales with dark edgings. A very distinct black band in both sexes running through eye and snout straight to the base of the caudal, where it ends in a round black spot. This band is about as wide as a series of scales, although developed on parts of two series. A conspicuous black band in both sexes along the lower edge of the caudal peduncle, from the root of the caudal to the vent, dividing and passing on each side of the anal fin. Fins in the female plain. In the male basal half of dorsal and anal jet black, outer half pale with a black edge. Pectorals and especially ventrals also dark-edged. Caudal fin faintly mottled. Vertical fins with more or less red in life (*vide* Goode).

The typical specimens, about 30 in number, ranging from $\frac{3}{4}$ to $1\frac{1}{4}$ inches in length, were obtained in Arlington River, Florida, a tributary of the St. John's, by Prof. G. Brown Goode, in company with *Girardinus formosus*, *Zygonectes* (*Gambusia*) *arlingtonensis*. These are numbered 23505 on the register of the U. S. National Museum. The species is well separated from its congeners *venusta* and *parva* by its black lateral band and colored fins. From the former the fewer dorsal rays also distinguish it.

9. XIPHISTER, gen. nov. (Fam. *Xiphisteridae*).

(*Xiphidion* Girard, U. S. Pac. R. R. Expl. Fishes, 119; preoccupied in Orthoptera; *Xiphidium*, Serv.)

As the name *Xiphidion* or *Xiphidium* is preoccupied for a genus of Orthoptera, the name *Xiphister*, of similar etymology, is proposed as a substitute. The typical species *Xiphidion mucosum*, Girard, may be known as *Xiphister mucosus*.

ON THE MIGRATIONS AND NESTING HABITS OF WEST-COAST BIRDS.

By J. G. COOPER, M. D.

Uniformity in the dates of arrival of birds and laying eggs has usually been considered among the "constants of nature" in the temperate zone. Where the distinction of seasons is well marked, these events are among the most reliable phenomena connected with the climate, and exceptional dates are noted down with particular interest.

It has, however, been ascertained that there is much less uniformity in the habits of the same species within the tropics. There being no changes of temperature, the division into wet and dry seasons, where existing, can alone influence them. It does so by regulating the flowering and fruiting of trees, etc., on which the food of birds directly or indirectly depends (except in the case of aquatic species), the rapacious kinds following the vegetivorous in their search for food.

Even on the border of the temperate zone, in Arizona and Florida (probably also in Texas), an approach to the irregularity of tropical habits has been observed, some species laying eggs in autumn, at the end of the rainy season, and many abandoning the migratory habits seen northward.

In California we might expect to find similar conditions, because of the mildness of the winters in the less elevated regions, giving us an almost subtropical climate. But it can only have an effect south of latitude 34°, in the lower part of the Colorado Valley, if anywhere, sufficiently marked to cause the birds to lay in autumn, though its influence is seen to some extent in the wintering of several species farther north than on the east coast.

As far south as frost extends, which is south of San Diego and perhaps to Fort Yuma, the habits of the temperate zone prevail. At Tucson, Arizona, however, where Captain Bendire noticed eggs laid in autumn, the advantage of being about thirty miles south of Fort Yuma is compensated for by the elevation being 748 feet greater. The more barren, almost desert character of the country near Fort Yuma is probably the reason why such habits among the birds are not noticed, perhaps also because no observers have looked for them at the right season. The only peculiar climatic influence observable in California is therefore

dependent on the alternation of wet and dry seasons, which prevails in less degree along the whole coast northward.

It is indeed the excess of rain until quite late in spring, which appears to prevent the earlier laying of eggs by some species that begin to lay in the east earlier than on this slope. This is noticeable among Hawks and Owls, and may also be expected with the Crossbills, Waxwings, and others breeding farther north, but of which no records exist for this coast. North of latitude 60°, however, where Professor Dall found so many eastern species mixed with the western, the division into wet and dry seasons is not marked, which may account for the breeding there of those eastern birds not found south of that latitude on this coast.

In California we find the influence of the rains causing considerable difference in dates of laying in various localities, where they end sooner or later. Thus at Fort Mojave, Colorado Valley, though the winter is colder than at San Diego, it is much drier, the climate, like that of Arizona, being wet in summer. I therefore found the same species laying much earlier at Fort Mojave, though the arrival of migratory birds was generally later, more so than the difference of latitude (one hundred and forty miles farther north) would account for. Many species are also found wintering there which do not remain along the rainy coast at that season.

At Haywood, on the east side of San Francisco Bay, I also found many species laying earlier and more abundantly than at Santa Cruz on the coast, forty-eight miles farther south, but more rainy. This last place is itself much more favorable to most species than the foggy cool promontory of Monterey, twenty-five miles southward.

Of the influence of climate in localities still farther inland I cannot state much from personal observation north of Fort Mojave, but have quoted some interesting dates for comparison, reported by Mr. Ridgway at Sacramento, though of less value in this connection than if he had been there earlier and later in the season.

On account of the great elevation and very different climate of Nevada and Utah, his observations there are of little value for comparison with Western California, though in some degree comparable with Fort Mojave.

The period at which rains cease being quite different in different years, we also find considerable variation in the arrival of some birds as well as in dates of laying at any locality selected. In some years the migrants seem to take a much more inland route northward than in others, not appearing along the coast until long after their comrades * have reached even to Alaska. Thus Mr. Dall records the arrival and laying of some species along the Yukon at about the same times they are recorded near the California coast.

The moderately dry parts of California, where, south of latitude 38°, trees are limited chiefly to the northeast slopes of hills and the banks of streams, we find to be the favorite breeding grounds of most

western birds (except of course the water-loving species), nests being both far more numerous and more easily found than in the thickly wooded regions of the mountains and northern coast. I have myself found more in one spring in the vicinity of Haywood, than during three seasons near the Columbia River. A similar abundance of nests has been noted by me along the sparsely wooded shores of the Upper Missouri River, and similar streams crossing the "Great Plains" on both sides of the Rocky Mountains. The scattered tree-growth of those regions, like that of an old cultivated country, is therefore most favorable for the increase of most land-birds, and if moderate protection instead of persecution is granted to them, they may always continue abundant even when the country is cultivated. The little fertile valleys scattered through the desert regions west of the Rocky Mountains are always found to contain most of the birds, and being also attractive to settlers, the abundance of birds has been wrongly attributed to their presence. The only way in which settlements aid in the increase of birds is by driving off or killing the rapacious kinds, and thus protecting such of the small species as do not injure the crops.

There is no doubt of the increase in numbers of many species about the settlements of California, from this cause, since 1849, but others, especially game-birds and birds of prey, have very much diminished under the effect of persecution by the gun, and poisoning, through the use of poisoned grain intended to kill vermin.

The influence of the more local attachments of the west-coast birds, which are so generally constant residents instead of migratory, is also very soon observed in the disappearance of a species from a neighborhood like Haywood, where they have been robbed of their nests and eggs for several seasons. The same thing seems to keep away migratory species to some extent, though other reasons may be found for their absence. As instances, the Blue-birds (*Sialia*) entirely disappeared in 1878, not returning even in winter; though I knew of several of their nests that were not molested in 1877. The migratory Lawrence's Goldfinch and Blue Linnet (*Cyanospiza*) also failed to appear in the breeding season of 1878, perhaps from former persecutions, and perhaps from taking another route northward, or from causes yet unknown.

As a rule scarcely any of the birds of California, south of latitude 38°, raise two broods in a season. When late broods are found they seem either to be replacements of lost broods, or are perhaps hatched by one parent while the other still takes care of a first brood, as observed by me in the case of a pair of House Wrens. This is the effect of the rapidity with which the breeding season passes, corresponding to the rapid but short growing season of vegetation after the frosts cease and before it becomes too dry. Caterpillars and other soft insects suitable for the young become scarce when the vegetation gets dry. Even swallows, which feed in the air, are obliged to catch young grasshoppers in some localities near the coast in June, so that they can raise

two broods of young. Apparently an effort to raise a third or a very late brood causes them often to abandon it to starve when they leave us in August.

In the following table I have included only those land-birds that are best observed in regard to habits, giving the records I have made at the chief localities where I have collected in the proper seasons, and adding such notes as seemed suitable, made by me in other localities, and by others where exact dates of the events are given. The object has been to give exact dates of the usual arrival and departure (with a few also quite exceptional), and the first laying of eggs noticed, as well as the latest when long after. A few quotations of observations in other regions are also given for comparison, but these are much fewer than desirable from the fact that the older authors neglected usually to give the *exact* dates, and where the *month* only is given a comparison of times through a range of twenty degrees of latitude is impracticable. The categories of "Resident," etc., refer only to the localities given in the general table.

The arrangement of localities being by date of collections is not exactly according to their relative positions in latitude.

My opportunities for observing in regard to most aquatic birds have been too few to be worth noting, the sea-shore and the great interior marshes or lakes not having been visited at the proper seasons, except in a few localities. Where it is practicable the dates of laying of the Gulls, Murres, and other birds whose eggs are collected for market, are found quite uniform, though showing the influence of early or late seasons in a certain degree. This makes them well worthy of record whenever opportunities are offered.

Name, season of residence, etc.	Camp Mojave, 1860-61; lat., 35°; alt., 5,000 ft.	San Diego, 1861-62; lat., 32° 30'; alt., 50 ft.	Santa Cruz, 1865; lat., 37°; alt., 50 ft.	Saticoy, 1872-73; lat., 34° 27'; alt., 50 ft.	Haywood, 1875-76; lat., 37° 40'.	Haywood, 1877-78; alt., 50-100 ft.	Other localities and remarks.
1. <i>Turdus naevius</i> . Winter. (Summers in Alaska to lat. 60°. <i>Dall</i> .)	Leave April 1.			Arrive Nov. 5.	Ar. Oct. 12.	Lv. May 1.	Catalina I. Oct. 30, 1861. "Not at Camp Bowie, Ariz., till Oct. 19, '74." <i>Hensh.</i>
2. <i>Turdus ustulatus</i> . Summer.		Ar. April 25.	Nest May 4.	Ar. May 8. Lv. Oct.	Ar. Apr. 29, '75. Ar. Apr. 23, '76. Nest May 14 to June 27, '76. Lv. Sept. 20, '75.	Ar. Apr. 26, '77. Ar. May 6, '78. N. May 24, '77, to June 24, '77. N. May 25, '78. Lv. Sept. 7, '78.	Probably raises only one brood in Cal. Ar. Columbia River, May 1. N. June 15 to July 13. Lv. in Sept. '54.
3. <i>Turdus merula</i> . Winter. (Summers from mouth Columbia River to lat. 65°.)			Ar. Oct. Lv. Apr. 1.		Ar. Oct. 23, '76.	Ar. Oct. 29, '78.	
4. <i>Harporhynchus rufirostris</i> . Resident.				N. May 28.			N. San José V'y., May 8, '63.
5. <i>Sialia mexicana</i> . Resident.	N. Feb'y?				N. Mar'h 12, '75. N. Apr. 12, '76.		
6. <i>Psaltriparus minimus</i> . Resident.		N. Apr. 25.			N. May 15, '75. N. May 23, '76.	N. Apr. 11, '77. N. May 10, '78.	N. Santa Cruz Mts., 3,000 ft., Apr. 29, '64; Santa Barbara, about Apr. 6. "N. Columbia R., May 15, '35." <i>Nuttall.</i>
7. <i>Thryothorus bewickii</i> , var. <i>splendens</i> . Resident.		N. Apr. 15.				N. May 18, '77. N. May 23, '78.	Have seen fledged young two weeks earlier at Haywood.
8. <i>Troglodytes domesticus</i> , var. <i>parkmanni</i> . Resident south of lat. 37°.		N. Apr. 20.			Ar. Mar. 15, '75. N. May 7, '75. N. Apr. 12, '76.	Ar. Mar. 16, '77. N. Apr. 26, '77.	Ar. Puget's Sound, Apr. 20, '54. Ar. San Francisco, May 15, '65. "N. Vancouver's I., May 18, '52." <i>Hepburn.</i>
9. <i>Dendroica aestiva</i> . Summer.	Ar. Apr. 15.		Ar. Apr. 12.	Ar. Apr. 17. N. May 24.	Ar. Apr. 20, '75. N. May 13, '75. Lv. Oct. 15, '75. Ar. Apr. 22, '76. N. May 14, '76.	N. May 12, '77. N. May 13, '78. to June 15, '78.	Ar. Monterey, Apr. 18, '74. "Ar. Puget's Sound, May 3, '56." <i>Swedge.</i> "Ar. lat 60° Alaska, May 10, '71." <i>Dall.</i>
10. <i>Dendroica auduboni</i> . Winter. (Locally, summer.)		Lv. March.	Ar. Sept. 25. Lv. Apr. 15.	Ar. Oct. 11. Lv. Apr. 10.	Ar. Sept. 29, '75.	Lv. Apr. 15, '77.	N. and E. seen, taken in S. F. Co., Apr. '77; ♀ killed! Young, Sierra Nevada, July, 1,000 ft.

Name, season of residence, etc.	Camp Mojave, 1860-61; lat., 38°; alt., 500 ft.	San Diego, 1861- 62; lat., 32°; 30'; alt., 50 ft.	Santa Cruz, 1865; lat., 37°; alt., 50 ft.	Saticoy, 1872- 73; lat., 34°; 27'; alt., 50 ft.	Haywood, 1875- 76; lat., 37°; 40'.	Haywood, 1877- 78; alt., 50-100 ft.	Other localities and remarks.
11. <i>Dendroica nigrescens</i> . Spring and autumn (only 1).	Ar. Apr. 20.....	Ar. Apr. 20.....	.....	.....	Ar. Apr. 10, '75..	Ar. Apr. 26, '77..	Ar. Monterey, Apr. 18, '74. "Pur- get's Sound, May 4, '56." <i>Stockley</i> . "Tejon Pass, Oct., '54." <i>Heermann</i> . "Tejon Mts., Aug., '75." <i>Hensb.</i>
12. <i>Dendroica townsendi</i> . Spring and autumn (breed 1).	.....	Ar. Apr. 21.....	.....	.....	Ar. May 6, '75.. Seen Sept. 12. Ar. May 5, '76. Lv. Dec. 5, '76.	Ar. May 6, '78..	"Seen Columbia R., Oct. 28, '35." <i>Townsend</i> . "Seen? Columbia R., Dec. 25, '54. Shot, Mount- ain View, Cal., Nov., '55. <i>D. occidentalis</i> . The obtaining of this species at Petaluma, Cal., given as Apr. 1, '56 (Sam- uels), in P. R. R. Rep., IX, is changed to May 1, in "N. A. Birds," which is more proba- ble. Very rare near the coast.
13. <i>Icteria viridis</i> , var. <i>longi- canada</i> . Summer.	Ar. Apr. 20..... N. May 19.	Ar. Apr. 26.....	Ar. Apr. 27..... Lv. Sept.	Ar. Apr. 17..... Lv. Sept. 30.	N. May 20, '76..	Ar. Apr. 26, '77..	"N. Sacramento, June 11 to 17, '67." <i>Ridgway</i> .
14. <i>Mniotiltus pusillus</i> , var. <i>pallidus</i> . Summer. (A few winter?)	.....	Ar. ? Apr. 16.....	Ar. ? Apr. 20.....	Ar. Mar. 18.....	Ar. Mar. 31, '75.. N. June 17, '75.	Ar. ? Apr. 4, '77.. N. May 10, '77.	Seen at Puget's Sound, W. T., Apr. 8, '54. "N. Yukon, R., May 20, '71." McDougall. Seen Catalina I., Oct. 30, '61.
15. <i>Hirundo erythrogaster</i> , var. ? <i>horreorum</i> . Summer.	Ar. Mar. 25.....	Ar. Mar. 18.....	Ar. Mar. 21..... Lv. Sept. 15.	.....	Ar. Mar. 20, '75.. Lv. Sept. 20, '75. Ar. Mar. 23, '76.	.....	"N. Apr. 30 to Aug. 4 at S. F." <i>Hepburn</i> . Raises two broods.
16. <i>Hirundo fulva</i> , var. <i>luni- frons</i> . Summer.	.....	Ar. Mar. 15.....	Ar. ? Apr. 10..... N. Apr. 20 to July 5.	.....	Ar. Mar. 24, '75.. Ar. Mar. 27, '76.	Ar. Mar. 28, '78..	In 1877 very dry, and few seen the whole season. A few stay till October. Raise two broods, but leave many young to die.
17. <i>Hirundo bicolor</i> , var. <i>ves- pertina</i> . A few residents S. of lat. 39°.	Ar. Feb. 21.....	.....	Lv. Sept. 2.....	N. May 14.....	Ar. Jan. 28, '75..	Ar. Jan. 30, '77..	"Shot S. F., winter '54." <i>Cutts</i> . "N. Sacramento, May, '53." <i>Hepburn</i> . Two broods?
18. <i>Hirundo thalassina</i> . Sum- mer.	.....	Ar. Mar. 19..... Lv. Oct. 5.	.....	.....	.....	.....	Ar. San José VY., Mar. 15, '64. "Puget's Sound, May 10, '66." <i>Stockley</i> .

19. <i>Progne subis</i> . Summer.....				Ar. Mar. 17..... (Stragglers?)					"Ohio R., Mar. 15," <i>And.</i> S. F., Apr. 29, '63. N. Monterey, Apr. 25, '74.
20. <i>Lanius ludovicianus</i> , var. <i>excubitoroides</i> . Resident.	N. Mar. 19 to Apr. 4.	N. Apr. 12 to 20.....			N. Mar. 30, '75..... N. to June 2, '76.	N. May 19, '77..... N. to June 10, '78.			Perhaps raises two broods in some years.
21. <i>Carpodacus frontalis</i> , var. <i>rhodocolpus</i> . Resident.	N. May 8.....	N. Mar. 19.....	N. Apr. 10.....		N. Apr. 2, '75..... N. June 2 to 21, '76.	N. Apr. 14, '77.....			Raises two broods, perhaps 3 at times.
22. <i>Chrysomitris tristis</i> . Some resident.		N. May to June.....		N. Apr. 18.....	N. June 24 to June 28, '76.	N. May 21, '77..... N. to June 13, '78.			"N. Sacramento, June 6 to 29, '67," <i>Ridgway</i> . "N. New England, July 10 to Sept." <i>Brewer</i> .
23. <i>Chrysomitris psaltria</i> . Resi- dent.					N. Apr. 16, '75..... N. Apr. 29 to June 29, '76.	N. Apr. 24 to June 15, '78.			This and last species may raise two broods.
24. <i>Chrysomitris lawrencii</i> . Some resident S. of lat. 38°.					Ar. Mar. 27, '76..... N. May 4, '75.	Ar. Mar. 26, '77..... N. June 2, '77.			None seen after April in 1878.
25. <i>Passerculus sandwichensis</i> , var. <i>alaudinus</i> . Winter (some resident?). Var. <i>an- thracinus</i> . Resident S. of lat. 37°.				Ar. Oct. 25..... Lv. Apr.	Ar. Nov. 1.....				Near Columbia R., Mar. to Oct., '54 (<i>alaudinus</i>). Sept. to Apr. (<i>Sandwich</i> s). A few of <i>alaudinus</i> probably breed near the coast, lat. 35° (and on mountains?).
26. <i>Chondestes grammacus</i> . Resi- dent S. of lat. 36°.						N. May 1, '77..... N. May 29 to June 20, '78.			"N. Sacramento, Cal., June 8 to 29, '67," <i>Ridgway</i> .
27. <i>Zonotrichia leucophrys</i> , var. <i>gambeli</i> . Resident N. of lat. 37°. Winter only south- ward.	Lv. May 15.....	Ar. Oct. 15.....	N. May 7.....	Ar. Sept. 29..... Lv. Apr. 20.	Ar. Sept. 20..... Lv. Apr. 15.	Ar. Sept. 30, '78..... Lv. Apr. 20, '77.			Winter birds are chiefly var. <i>intermedia</i> . Seen on Catalina I., Oct. 30, '61. Ar. Columbia R., Mar. N. June. Lv. Oct., '54.
28. <i>Zonotrichia coronata</i> . Win- ters (only?).									"Breeds McCloud R., Cal." <i>Brewer</i> , 1878. Seen at Mon- terey, Apr. 20, '74. The nest eggs described in Heer- mann's report as from Sacra- mento were probably those of <i>Chondestes</i> , description trans- posed from his next paragraph.

Name, season of residence, etc.	Camp Mojave, 1860-61; lat., 35°; alt., 5,000 ft.	San Diego, 1861-62; lat., 32° 30'; alt., 50 ft.	Santa Cruz, 1865; lat., 37°; alt., 50 ft.	Sticov, 1872-73; lat., 34° 27'; alt., 50 ft.	Haywood, 1875-76; lat., 37° 40'.	Haywood, 1877-78; alt., 50-100 ft.	Other localities and remarks.
29. <i>Junco oregonus</i> . Resident in mountains and at Monte Rey. "Teton Mts., Aug., 1875." <i>Henshaw</i>.	.....	Lv. Apr. 1.	.....	Lv. Apr. 10	.....	.....	N. foot Santa Cruz Mts., May 1; 3,000 ft. alt., May 30, '64 N. Sierra Nev., 6,000 ft. alt., July 28, '70.
30. <i>Spizella socialis</i> , var. <i>arizonensis</i> . Summer. Winter in Colorado Valley, lat. 35°, and southward.	.....	Ar. ? Apr. 30	Ar. Apr. 11 N. May 3.	Lv. Nov. 5	Ar. Apr. 2, '75. N. May 20, '75. Ar. Apr. 9, '76. N. May 22, '76.	Ar. Mar. 22, '77. N. Apr. 27, '77.	Ar. S. F., Apr. 4, '63. "A. F. Puget's Sound, April, '56." <i>Stackley</i> .
31. <i>Melospiza fasciata</i> , var. <i>heermanni</i> . Resident.	Var. fallax. N. May 19.	.....	N. Apr. 15 to July 10.	N. May 15	N. May 7, '75. N. May 16, '76. to June 22, '76.	N. May 12, '77. N. May 15, '78.	Supposed young seen at Santa Cruz, Apr. 7, '65. Those of var. <i>gairana</i> in May at Puget's Sound, '54.
32. <i>Melospiza lincolni</i> . Migratory (summer on mountains).	.....	Lv. Mar. 26	.....	Ar. Nov. 15 Lv. Mar. 23	.....	Lv. Mar. 15, '77.	All probably winter S. of lat. 35°. "Nests, Alaska, May to July." <i>Dall</i> . N. 7,000 ft. alt. in lat. 39°, July 27, '70.
33. <i>Passerella townsendi</i> . Winter.	.....	.....	.....	Ar. Nov. 11 Lv. Apr. 13	Ar. Nov. 15, '75.	Ar. Nov. 9, '79.	Ar. S. F., Oct. 20, '63.
34. <i>Guiraca melanoccephala</i> . Summer.	.....	Ar. Apr. 12	Ar. Apr. 12	.....	N. May 14, '75. N. May 18, '76.	Ar. Apr. 10, '77. N. May 5, '77. N. May 13 to June 16, '78.	N. San Josec Vv., May 12, '74. Probably only raise one brood.
35. <i>Guiraca caerulea</i> . Summer.	Ar. May 6.	.....	Ar. Apr. 12	Ar. Apr. 17	Ar. ? May 1, '76.	.....	N. Sacramento, June 14, '65. Do., "June 11 to 20, '67." <i>Ridgway</i> .
36. <i>Cyanospiza amana</i> . Summer.	.....	Ar. Apr. 22	Ar. Apr. 12 N. May 2. Lv. Oct.	Ar. Apr. 17	Ar. Apr. 20, '75. N. May 15, '75. Ar. May 1, '76. N. May 24, '76. to June 18, '76.	Ar. Apr. 26, '77.	N. Santa Barbara, May 6, '63. Ar. Puget's Sound, May 15, '55. None seen in '78. Probably only one brood.
37. <i>Pipilo maculatus</i> , var. <i>melanogargus</i> , mixed with var. <i>Oregonus</i> . Resident.	.....	.....	.....	.....	N. June 3, '76.	N. Apr. 29, '77. N. June 18, '77. (3 feet up in brush.)	N. Santa Cruz Mts., 3,000 ft. alt., May 28, '64 N. S. F., June 10, '64. Probably but one brood.

38. <i>Pipilo fuscus</i> , var. <i>crissalis</i> . Resident.	N. Apr. 10.....	N. Mar. 17 to May 8.	.....	N. Apr. 9, '75.. N. Apr. 5 to June 24, '76.	N. Apr. 14, '77 to June 24, '77.	May raise two broods.
39. <i>Anthus pheniceus</i> , var. <i>gubernator</i> . Resident.	.....	.....	.....	N. Apr. 18, '75..	N. May 4, '77.....	N. Santa Barbara, Apr. 25, '63. To 3,000 ft. on Santa Cruz Mts. "N. near Saticoy to June 21, '75." <i>Henshaw</i> .
40. <i>Agelaius tricolor</i> . Resident.	.....	.....	N. May 22.....	.....	.....	"N. Wash. Ter., June 19, '56." <i>Stockley</i> . N. San José VY., May 18, '64.
41. <i>Sturnella magna</i> , var. <i>neg- lecta</i> . Resident.	.....	.....	.....	N. May 7, '76.....	N. May 8, '77.. N. May 10, '78.	"Ar. Puget's Sound, May 15, '54. Ar. Dallas, Oregon, May 7, '55." <i>Stockley</i> .
42. <i>Icterus bullockii</i> . Summer.	Ar. Apr. 1..... N. Apr. 17.....	Ar. Apr. 3.....	Ar. Mar. 22..... Lv. Sept. 15. (1 seen Nov. 25.)	Ar. Mar. 31, '75.. N. May 20, '75. Ar. Apr. 3, '76.	Ar. Mar. 19, '77.. N. May 18, '77. Ar. Mar. 31, '78. N. May 28 to June 20, '78.	
43. <i>Scolecophagus cyanocephala</i> . Resident.	.....	N. Apr. 16 to May 20.	.....	N. Apr. 23, '76 to June 18, '76.	N. Apr. 14, '77.	N. Santa Barbara, May 1, '63. Sometimes two broods; scarce in '78.
44. <i>Corvus americanus</i> , var. <i>caurinus</i> . Resident.	.....	N. Apr. 23.....	.....	.....	.....	Very locally distributed.
45. <i>Cyanocitta californica</i> . Res- ident.	.....	N. Apr. 8.....	.....	N. May 20 to June 21, '76.	N. June 10, '78..	"In '34 bred at Columbia R." <i>Nuttall</i> . Not recently ob- served there.
46. <i>Tyrannus verticalis</i> . Sum- mer.	Ar. Apr. 24.....	Ar. Mar. 20..... Lv. Oct.	Ar. Mar. 27..... N. Apr. 20 to June 29. Lv. Oct. 1.	Ar. Apr. 12, '75.. N. May 22, '75. Ar. Mar. 26, '76. N. May 15, '76.	N. May 15 to June 29, '77.	N. Santa Barbara, May 12, '64. N. Sacramento, June 11 to 20, '67." <i>Ridgway</i> .
47. <i>Tyrannus vociferans</i> . Some winter S. of lat. 37°.	.....	N. Mar. 29.....	.....	.....	.....	One nest found in hole in side of house.
48. <i>Melospiza cinerea</i> , var. <i>cinerascens</i> . Summer (chief- ly).	(A few winter) Ar. Mar. 10.	Ar. Apr. 17.....	.....	.....	N. May 11, '77.. N. June 3 to June 20, '78.	Raises two broods.
49. <i>Sayornis nigricans</i> . Resi- dent.	Lv. Mar. 25..... (None in sum- mer?)	N. Mar. 27.....	N. Mar. 29.....	N. Apr. 15, '76..	N. Apr. 14, '77 to June 17, '78.	
50. <i>Contopus richardsonii</i> . Summer.	Ar. ? May 20.....	Ar. Apr. 16.....	Lv. Sept. 28.....	Ar. ? May 20, '77..	.....	Ar. Monterey, May 11, '74. "Petaluma, Cal., Apr., '56." <i>Sparrows</i> . "N. Sacramento, June 10 to 24, '67." <i>Ridgway</i> .

Name, season of residence, etc.	Camp Mojave, 1860-61; lat., 35°; alt., 500 ft.	San Diego, 1861- 62; lat., 32° 30'; alt., 50 ft.	Santa Cruz, 1865; lat., 37°; alt., 50 ft.	Saticoy, 1872- 73; lat., 34° 27'; alt., 50 ft.	Haywood, 1875- 76; lat., 37° 40'.	Haywood, 1877- 78; alt., 50-100 ft.	Other localities and remarks.
51. <i>Fempidonax flaviventris</i> , var. <i>difficilis</i> . Summer.	Ar. ? Apr. 15..... Lv. Oct.	Ar. Mar. 13.....	Ar. Mar. 18.....	Ar. Mar. 31, 75. N. Apr. 27, 75. Ar. Apr. 2, 76. N. May 13 to 20, 76.	Ar. Mar. 16, 77. N. Apr. 21, 77. N. May 6, 78. Lv. Nov. 1, 79.	Ar. Pigeon's Sound, Apr. 25. Lv. Sept. 1, '55.
52. <i>Chondestes vanzoi</i> . Summer.	Ar. Apr. 26, '72..	Ar. May 4..... Lv. Oct. 5.	Ar. Apr. 21.....	.....	.....	Not yet known to build in chim- neys, or in towers.
53. <i>Salasphorus rufus</i> . Sum- mer. (Part of the California birds may be var. <i>Menashaui</i> , <i>Ellioti</i> .)	Ar. Feb. 5.....	Ar. Mar. 9, '65..	Ar. ? Mar. 18..... N. Apr. 9 to May 20.	Ar. Feb. 16, 75.. Ar. Feb. 18, 76. N. May 24, 76.	Ar. Feb. 16, 77. N. Apr. 17 to June 9, 77.	Ar. Columbia R., Mar. 10, '54. " N. Columbia R., May 10, '56." <i>Stackley</i> .
54. <i>Colaptes auratus</i> . Resident southward.	N. Feb. 20, 75. N. Feb. 16 to June 24, 76.	N. Feb. 9 to May 30, 77.	May raise two broods.
55. <i>Picus villosus</i> , var. <i>harrisi</i> , Resident.	N. May 18, 77..	N. Santa Barbara, May 8, '64. " Var. <i>villosus</i> has two broods in the south." <i>Aud.</i>
56. <i>Picus nuttalli</i> . Resident.	N. Apr. 20.....	.....	.....	.....	.....	N. Monterey, May 12, '74. " Young, Santa Barbara, May 1, '43." <i>Gambel</i> .
57. <i>Colaptes mexicanus</i> . Resi- dent.	N. Apr. 15.....	.....	.....	N. May 7, 75. N. May 10, 76, to May 27, 76.	N. Apr. 23, 77.	N. Santa Barbara, May 1, '63.
58. <i>Strix flammea</i> , var. <i>ameri- cana</i> . Resident.	N. Apr. 4, 75. N. Apr. 14 to May 12, 76.	N. Apr. 13, 77..	" N. Florida at all seasons; in South Carolina, Sept. 15, '33." <i>Aud.</i> !
59. <i>Troglodytes virginianus</i> . Resi- dent.	N. Mar. 18.....	.....	.....	.....	N. Apr. 24, 77..	" N. Yukon R., Alaska, Apr. 10." <i>Kernicott</i> . " N. Mass., Feb." <i>Judson</i> . " N. Penn., Feb." <i>Jackson</i> .
60. <i>Scops asio</i> , var. <i>maccalli</i> . Resident.	N. May 17, 76..	N. Apr. 14, 77. N. May 2, 78.	N. Santa Barbara, Apr., '64.
61. <i>Otus brachyotus</i> , var. <i>vil- losianus</i> . Resident.	N. Mar. 25.....	.....	.....	.....	.....	" N. in British America, Apr. to July, two broods." <i>Reb- ardson</i> .

DESCRIPTIONS OF NEW SPECIES OF CARBONIFEROUS INVERTEBRATE FOSSILS.

By C. A. WHITE.

The fossils herein described are among the collections of the National Museum. The coral was obtained by Prof. O. St. John in the Black-foot Range of mountains, southward from the Yellowstone National Park, in the summer of 1877, while prosecuting his work as geologist of one of the parties of the survey then in charge of Dr. F. V. Hayden. The spines of *Archæocidaris* are a part of a small collection of Upper Coal Measure fossils sent by Mr. Frank M. Dininny from Tecumseh, Nebraska. The four species of crinoids, here described as new, constitute part of a collection which has been for several years in the cases of the Museum, the donor of which collection is unfortunately unknown. The only label accompanying the fossils contained only the following inscription: "From thirty miles west of Humboldt, Kansas." The place thus indicated, as determined by a Land-Office map, is in the valley of one of the upper branches of Verdigris River, a tributary of Arkansas River. Besides the four new species just mentioned, those enumerated with them in the following list constitute this interesting collection:

1. *Platyceras nebrascensis*, Meek.
2. *Pinna peracuta*, Shumard?
3. *Terebratula millipunctata*, Hall.
4. *Spirifer cameratus*, Morton.
5. *Spirifer (Martinia) lineatus*, Martin.
6. *Spirifer (Martinia) planoconvexus*, Shumard.
7. *Spiriferina kentuckensis*, Shumard.
8. *Spirigera subtilita*, Hall.
9. *Retzia mormonii*, Marcou.
10. *Hemipronites crassus*, Meek and Hayden.
11. *Meckella striatocostata*, Cox.
12. *Productus semireticulatus*, Martin.
13. *Productus punctatus*, Martin.
14. *Productus longispinus*, Sowerby.
15. *Productus nebrascensis*, Owen.
16. *Cyathaxonia distorta*, Worthen.
17. *Fistulipora nodulifera*, Meek.
18. *Rhombipora lepidodendroides*, Meek.
19. *Glaucanome* ———?
20. *Lecythiocrinus olliculaformis*, sp. nov.
21. *Cyathocrinus stillativus*, sp. nov.
22. *Erisocrinus typus*, Meek and Worthen.
23. *Erisocrinus planus*, sp. nov.
24. *Rhodocrinus vesperalis*, sp. nov.

Besides these there were fragments of three other species of crinoids

belonging to the *Cyathocrinida*. Although all, or nearly all, the crinoids hitherto published from the Upper Coal Measures of the United States, belong to the *Cyathocrinida*, the species No. 21 of the foregoing list is the first one known from that formation which presents exactly the calyicular formula of true *Cyathocrinus*. Besides this two of the other new species of crinoids belong to genera that have hitherto been unknown in North American strata above the Subcarboniferous, one of them, indeed, being never before known to exist. Such facts demanded rigid inquiry as to whether these strange forms might not have been derived from some older formation, and become accidentally mixed with those from the Upper Coal Measures, especially as the package was not, when first examined by me, securely closed, and the record was defective as before indicated. All the specimens were therefore subjected to careful examination under the lens, which disclosed the fact that some one or more of these new forms had adhering to its surface a greater or less number of minute fragments of Polyzoans, which were not only recognized as Upper Coal Measure species, but fragments of the same were found adhering to many of the well-known Upper Coal Measure brachiopods associated with them in the collection. In addition to this, the character and aspect of the imbedding matrix, so far as it remained with the fossils, were found to be essentially the same upon both the new and well-known forms. There appears, therefore, to be no room for reasonable doubt that these new forms, as well as the others which are associated with them in the collection, came from Upper Coal Measure strata at the locality indicated by the label as before mentioned; and that they are all from substantially the same local horizon. The loss of the record of the donor's name is to be regretted, but it was no doubt occasioned by the confusion into which a part of the collections of the Museum fell at the time of the fire which a few years ago damaged the building of the Smithsonian Institution.

The discovery of these new crinoidal forms is not only interesting in itself, but it is important as showing a persistence of certain paleozoic crinoidal types up to almost the closing epoch of Paleozoic time as it is represented by North American strata. The intimate relationship of at least the brachiopodal fauna of the Subcarboniferous series of the Mississippi Valley (especially that of the Chester limestone member of that series) with that of the Upper Coal Measure limestone and shales is well known. Indeed, quite a number of the brachiopods of these two formations we must consider as specifically identical. The case is different, however, with the crinoidal faunæ of the two formations as regards specific identity, for they afford no exception to the rule that fossil crinoids have a narrowly limited vertical range. But in the case of these fossils there is shown by this collection to be a recurrence of formerly existing types, or, more properly speaking, these newly discovered types indicate the continuation through preceding epochs of

certain generic and family types, that have heretofore been discovered only in the strata representing the earlier of those epochs. Thus *Rhodoerinus vesperalis* and *Cyathocrinus stillatirus* have their nearest known representatives in the Burlington limestone of the Subcarboniferous series. This is interesting because the crinoidal fauna of the Upper Coal Measures had hitherto presented a good degree of contrast with corresponding faunæ of the different divisions of the Subcarboniferous group as well as with that of the group as a whole. For example, as has been already mentioned, there is a great preponderance of the *Cyathocrinidae* in the Upper Coal Measure strata. These are mostly of peculiar types, and their bodies are mostly also composed of massive pieces. *Erisocrinus* is peculiar to this latest of the Carboniferous epochs, as represented by the strata of the great Mississippi Valley, and it is interesting to note that the new genus *Lecythocrinus* agrees with it in excluding the whole of the anal series of its pieces from participating in the structure of the calyx.

The other species of crinoids which are named in the list as associated with these new forms belong to types, either generic or intergeneric, which have been hitherto found only in Upper Coal Measure strata.

The spines of the species here described as *Archæocidaris dininuii* give a very inadequate idea of the characteristics of the whole animal, and such a description has very little value in zoölogical classification; but for the convenience of geological study it is thought best to give systematic names even to such zoölogically imperfect objects as these, that they may be used in the classification of all the recognizable fossils which characterize different formations respectively. The species represented by these spines has quite a wide geological range in the Upper Coal Measures of the valleys of the Lower Missouri and Upper Mississippi Rivers, and their characteristics are such that the species may be readily recognized.

The full Carboniferous series of the great Rocky Mountain region is several thousand feet in thickness; and the horizon within this limit, from which the coral herein described as *Acerularia adjumetiva* comes, is not accurately known. This discrepancy, however, is apparently of less importance than it otherwise would be, from the fact that not only is the great Carboniferous series of that region not marked off into epochal groups in the same manner that it is in the Mississippi Valley, but it is there everywhere difficult to find any recognizable planes, either paleontological or stratigraphical, for the separation of the series into any well-defined groups.

ACTINOZOA.

Genus ACERVULARIA, Schweigger.

Acervularia adjunctiva (sp. nov.). Plate 1, figs. 1, 2, and 3.

Corallum massive or subdiscoidal, composed of compactly united corallites of somewhat unequal size; corallites approximately straight, irregularly polygonal, averaging about five millimeters in diameter, their outer surfaces faintly marked by vertical lines which indicate the places of the septa within, but they are not sufficiently distinct to give a crenulated border to the calyx; these surfaces also present more or less distinct irregular transverse wrinkles or undulations; outer wall of the corallites distinct but not thick; inner wall well developed; diameter of the space inclosed by the inner wall equal to about one-half the full diameter of the corallite; the transverse tabulæ of this central space well developed, distinctly separate from each other, their number being about ten to each centimeter of length of the corallite. The space between the outer and inner walls is occupied by numerous more or less complete shallow infundibuliform plates, which are not quite so numerous as the central tabulæ. These plates spring from the inner wall, which they successively help to form, and arch upward and outward to the outer wall; being the successively abandoned floors of the outer portion of the calyces. They appear to have been not always complete, either as regards their extension to the outer wall or their construction of a symmetrical cup, but they are apparently no more imperfect in these respects than the calyces of such corals often are.

The condition of the only specimens discovered is not such as to show any of the calyces in their natural condition, and the structure of the corallites has therefore been determined by the examination of polished sections, both longitudinal and transverse. While the parts already described are thus distinctly shown, the rays are discovered with difficulty, and they were evidently only slightly developed; their number, as near as it can be ascertained, is about 16 or 17.

The genus *Acervularia* has been regarded as peculiarly a Devonian form, but as related corals are common to both Devonian and Carboniferous strata, there appears no good reason why *Acervularia* may not exist in the latter. This form seems to differ from the typical species of that genus, at least to such an extent as might be naturally expected of it, when found in strata of so much later date than those which contain the typical forms. This is an interesting form, not only as regards its structure, but also in consequence of the marked difference which it presents from any Actinozoan yet described from American Carboniferous strata.

Position and locality.—Carboniferous strata, Blackfoot Range, south of the Yellowstone National Park, where it was discovered by Prof. O. St. John.

ECHINODERMATA.

Genus *LECYTHIOCRINUS* (gen. nov.).

Etym. *Ληκίθιον*, a small oil flask.

Generic formula.—Basal pieces, 3; subradial pieces, 5; first radial pieces, 5; anal and interradial pieces, 0.

Generic diagnosis.—The basal, subradial, and first radial pieces are all well developed, none of them being minute. The dome is not known, but it was very small in comparison with the size of the body. The facet for the attachment of the column is small and round, but the column is not known. The facets for the attachment of the arms are small; the arms are not known, but they were five in number, and evidently small and delicate. The character, shapes, and arrangement of the three basal pieces are precisely as in *Platyerinus*, and the arrangement of the five subradial pieces upon them is the same as that of the first radials upon the basals in *Platyerinus*. The arrangement of the first radial pieces upon the subradials is essentially the same as that of *Erisoerinus*; that is, they alternate regularly with each other and have no anal or interradial pieces intervening. The body, which is the only portion of the animal yet known, is therefore composed of thirteen pieces, the arrangement of which is essentially that of five first radials, all in close contact with each other, superimposed upon the calyx-structure of *Platyerinus*. Or, if it be assumed that the basal cycle of pieces in the body of every true crinoid contains the elements of five pieces, and that in case there are only three apparent in the adult state, as in *Actinoerinus* and many species of *Platyerinus*, there has been an early ankylosis of two adjacent pieces in two cases, we may regard *Lecythioerinus* as a Cyathocrinid thus modified. I am disposed to adopt this view, and I therefore refer the new genus to the *Cyathocrinida*. It is thought to be not improbable that if other species of this genus should be discovered the base may be found to be composed of five separate pieces instead of three, but no trace of a fourth and fifth suture can be discovered in the base of the form here described. In case other examples should prove to possess a base composed of five pieces, the other characteristics which it possesses are still sufficient to hold it as a new generic form among the Crinoidea.

Only one example of this interesting crinoid, consisting of the body alone, has been discovered. It is small and delicate in structure, the delicacy of the pieces composing it being similar to that of certain species of *Platyerinus* and *Dichoerinus* found in the Burlington limestone. In this respect it differs from all the hitherto known crinoids of the Upper Coal Measures, the pieces composing the bodies of which are

thick and often massive. This delicacy of structure is probably a generic characteristic.

Lecythiocrinus olliculæformis (sp. nov.). Plate 1, figs. 4 and 5.

Body small, subovoid or pot-shaped, higher than broad, broadest a little below the middle, composed of thin pieces; base convex; basal pieces rather small but not minute; subradial pieces larger than any of the others, higher than wide, their height equal to a little more than half the full height of the body, not materially varying in size or shape; first radial pieces smaller than the subradials but larger than the basals, broader below than above, height and greatest breadth about equal; at top, on both sides of the small prominent arm-facet, the border of each first radial is bent inward, constricting the already narrow interbrachial space at the top of the body, which space was probably covered by a dome of minute pieces. Sutures not impressed or otherwise specially marked. Surface, to ordinary vision, apparently smooth, but a good lens shows it to be very finely granular.

Height, 9 millimeters; breadth, $7\frac{1}{2}$ millimeters.

Position and locality.—Upper Coal Measure strata, thirty miles west of Humboldt, Kansas. See introductory remarks.

Genus ERISOCRINUS, Meek and Worthen.

Erisocrinus planus (sp. nov.). Plate 1, figs. 6 and 7.

Body rather small, subcircular or obscurely pentahedral as viewed from above or below, shallow convex-basin-shaped from the top of the first radials downward; base somewhat deeply impressed at the center, the depression gradually rounding outward to the sides; basal pieces very small, occupying the bottom of the depression of the base and almost covered by the first joint of the column; subradial pieces moderately large, their inner ends bent inwardly by the depression of the base to meet the small basal pieces there, their outer ends extending outward and upward so as to be more or less plainly visible by side view of the body; first radial pieces comparatively large, convex vertically, their upper edges rounded inward to the suture between them and the second radials, their lower angles extending downward almost to the lowest portion of the body visible by side view. The other characters are those common to the genus. One minute piece remains attached to the upper border of the calyx of one of the specimens, at the junction of two of the first radial pieces. This is no doubt an anal piece, its outer surface being in the plane of the outer surface of the calyx, but it does not in any degree enter between the two first radials upon which it rests.

Transverse diameter of the calyx, 14 millimeters; height of the same, 5 millimeters.

This species differs from *E. typus* in having a shallower and more rounded basin-shaped calyx, proportionally smaller basal, and larger subradial pieces, and a more deeply impressed base. It very closely resembles the *Poteriocrinus hemisphericus* of Shumard, examples of which are associated with it in the collection. Indeed, so far as the characteristics of the calyx alone are concerned, there appears to be no essential difference except in the relative position of the small anal piece. In *Erisocrinus* no anal piece is recognized as entering into the structure of the calyx, at least none that is visible upon the outer surface, as a greater or less number of such pieces do in *Cyathocrinus* and *Poteriocrinus*, but I am not without suspicion that this form which I have, according to the recognized usage in the limitation of genera, here described as new, really belongs to the same species with *P. hemisphericus*, Shumard, and that the displacement of the small anal piece from the rim of the calyx is an individual variation only. If this should prove to be the case it is clear that a revision of the generic formula of *Erisocrinus* will be necessary; and it will doubtless also be necessary to assign the type of this proposed species to *P. hemisphericus*, Shumard. It is clear that the last-named species does not strictly belong to either *Poteriocrinus* or *Cyathocrinus*, but it is not my purpose to discuss the generic relations of these forms at this time. Figure 8, plate 1, represents an example of the *P. hemisphericus* of Shumard, which is introduced for comparison with those of *E. planus*.

Position and locality.—Upper Coal Measures, thirty miles west of Humboldt, Kansas. See introductory remarks.

Genus CYATHOCRINUS, Miller.

Cyathocrinus stillativus (sp. nov.). Plate 1, figs. 9 and 10.

Body below the upper border of the first radial pieces shallow basin-shaped, much wider than high, having a narrow, moderately deep, abrupt, five-sided depression at the center of the base, at the bottom of which is the facet for the attachment of the column; composed of eighteen moderately thick and strong pieces, all of which, except the basals, are more or less tumid in their middle portion, some of them presenting an irregular, uneven surface, which, with the impressed sutures and the still more deeply impressed corners of the pieces, gives the surface of the body a decidedly rugose aspect; basal pieces very small, occupying the bottom of the depression at the base, the greater part of each being covered by the first joint of the column; subradial pieces having their height and width about equal, four of them pentagonal, and one, that which is next below the first anal piece, hexagonal, there being no appreciable angle upon that side of any of them which adjoins the basal pieces; first radial pieces much larger than the subradial, wider than their full height including the arm facet; the two

which are adjacent to the anal series being very little if any narrower than the others; arm facets large, about one-third wider than high, their plane being nearly vertical, notched at the upper border and marked transversely by the double ridge or raised lines which are common to the arm facets of many of the *Cyathocrinidae*; anal pieces three known, nearly equal in size, or the first a little larger than the two second, each with a prominent tubercle at the center; first anal piece five-sided, abutting against one subradial, two first radials and two second anal pieces; the two second anal pieces abut against the first anal, against each other, and each abuts against a first radial.

Diameter of calyx, 14 millimeters; height of the same, 6 millimeters.

This is the first and only species of true *Cyathocrinus* that has to my knowledge yet been discovered in Upper Coal Measure strata; *C. inflexus*, Geinitz, and *C. hemisphericus*, Shumard, sp., not being regarded as typical species of that genus. It belongs to a type that is more characteristic of the Burlington limestone division of the Subcarboniferous than of any other division of the great Carboniferous series, and together with the next described form it shows the crinoidal fauna of the Upper Coal Measures to be more intimately related to that of the Subcarboniferous than it has before been known to be.

Position and locality.—Upper Coal Measure strata, thirty miles west of Humboldt, Kansas. See introductory remarks.

Genus RHODOCRINUS, Miller.

Rhodocrinus vespertalis (sp. nov.). Plate 1, figs. 11 and 12.

Body subglobose, the sides and outer portion of the base continuously convex; the base having a deep, sharply defined, five-sided pit which contains the whole of the five basal pieces, and also the sharply inflexed inner ends of the five subradial pieces; the latter pieces moderately large, but not much larger than some of the radials and interradials; first radial pieces varying a little in size in the different rays, the larger ones nearly or quite as large as the subradial; second radials much smaller than the first, and the third radials still much smaller than the second, the difference in size being greater in their vertical than in their transverse diameter. The third radial in each ray, which is very narrow vertically, supports two brachial pieces, and they in turn each support another brachial piece, beyond which the structure is unknown; interradian pieces up to a line with the center of the arm bases, three for four of the interradian spaces, and four for that of the anal side; the first or lower interradian pieces are of about equal size in each of the spaces, and a little larger than the two next above; dome moderately convex, prominent opposite the arms and somewhat depressed between them, composed of numerous small pieces; proboscis subcentral, its length unknown. All the pieces of the body, except those of the

base, are slightly tumid, their surfaces being rugose or wrinkled, and in some if not all cases marked by obscure lines which radiate from the center of each piece in groups of threes, and become continuous with similar lines on adjoining pieces.

Height from the base of the body to the base of the proboscis, 12 millimeters; breadth of the same, 16 millimeters.

Although this species serves as a very suggestive link between the erinoidal fauna of the Upper Coal Measures and that of the Subcarboniferous, especially that of the Burlington limestone division of that series, it differs too much specifically from any described form embraced by that genus to need detailed comparisons.

Position and locality.—Upper Coal Measure, thirty miles west of Humboldt, Kansas. See introductory remarks.

Genus ARCHÆOCIDARIS, McCoy.

Archæocidaris dininnii. Plate 1, figs. 13, 14, and 15.

Principal spines fusiform, moderately strong, 50 or 60 millimeters long, the greatest diameter being about the middle, which is there about 5 millimeters. The diameter of the basal ring of such a specimen is about $3\frac{1}{2}$ millimeters, and the short neck or plain space above it is scarcely $2\frac{1}{2}$ millimeters in thickness. Above the short plain neck the whole spine is studded with irregularly disposed spinules, 1 to 2 millimeters in length, which stand out at nearly right angles with the axis of the spine, except near its point, where they are directed upward. The spinules are usually more numerous and stronger upon the lower portion of the spine than elsewhere, and upon the middle portion of the large spines they are sometimes obsolete, apparently from some other cause than accidental removal. The smaller spines are often not so thickly studded with spinules as the larger ones, and they are usually more slender or less fusiform than the larger; and some of them seem to have been without a basal ring.

A marked peculiarity of this species is the abundance of spinules upon the spine, especially its lower portion, and the general position of most of them at nearly right angles to its axis.

Position and locality.—Upper Coal Measures, near Tecumseh, Nebraska, whence it was sent with other Upper Coal Measure fossils by Mr. Frank M. Diniiny, in whose honor the specific name is given. This species has also been recognized by me in rocks of that formation in other portions of Nebraska and also in Western Iowa.

WASHINGTON, November 8, 1879.

EXPLANATION OF PLATE 1.

ACERVULARIA ADJUNCTIVA.

Fig. 1, a small cluster of corallites, natural size. Fig. 2, transverse section of the same. Fig. 3, vertical section of a single corallite.

LECYTHOCRINUS OLLICULEFORMIS.

Fig. 4, side view of body enlarged to $1\frac{1}{2}$ diameters. Fig. 5, diagram of the same, in the same proportions.

ERISOCRINUS PLANUS.

Fig. 6, basal view of body, natural size. Fig. 7, view of oval side of the same. Fig. 8, similar view of the *Poteriocrinus hemisphericus* Shumard, for comparison.

CYATHOCRINUS STILLATIVUS.

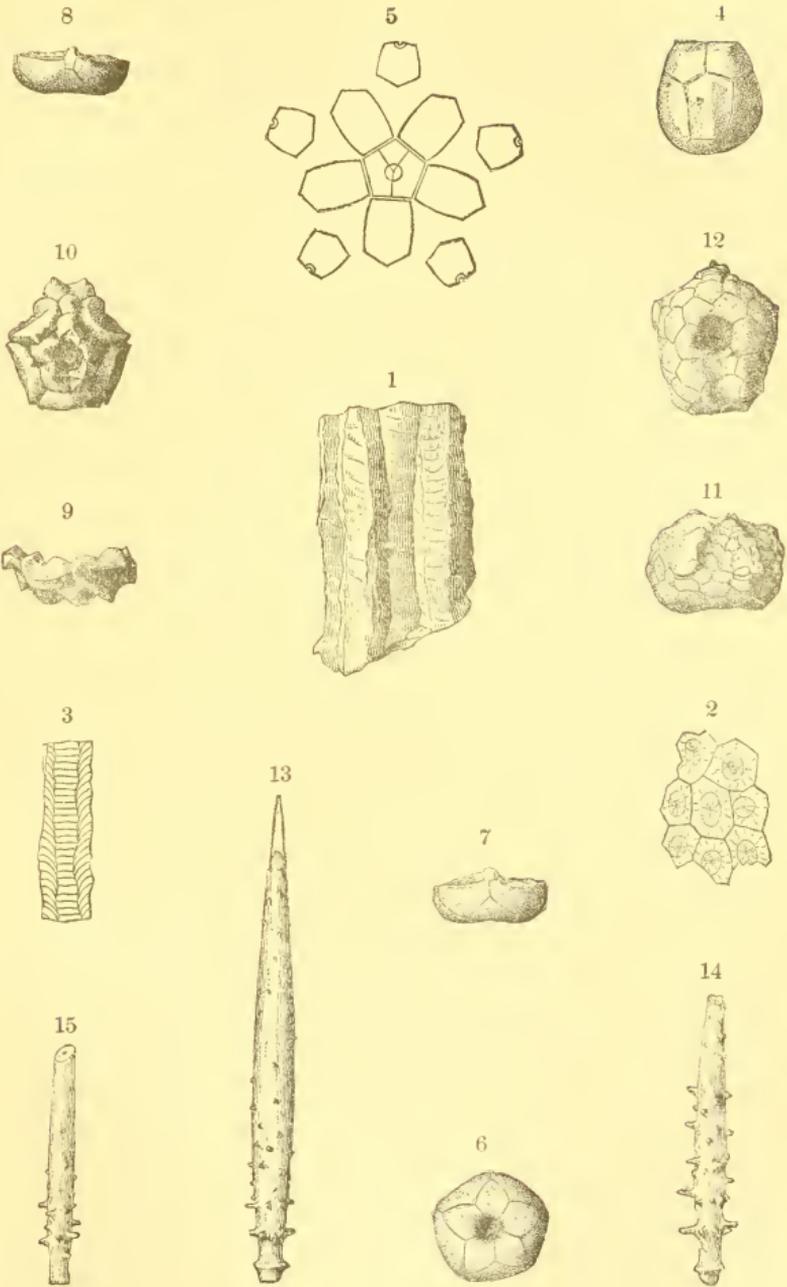
Fig. 9, side view of calyx, natural size. Fig. 10, basal view of the same.

RHODOCRINUS VESPERALIS.

Fig. 11, side view of the body, natural size. Fig. 12, basal view of the same.

ARCILEOCIDARIS DININII.

Figs. 13, 14, and 15, views of different spines.



1, 2, and 3.—ACERVULARIA ADJUNCTIVA.
 4 and 5.—LECYTHOCRINUS OLLICULEFORMIS.
 6 and 7.—ERISOCRINUS PLANUS.
 8.—POTERIOCRINUS HEMISPHERICUS.
 9 and 10.—CYATHOCRINUS STILLATIVUS.
 11 and 12.—RHODOCRINUS VESPERALIS.
 13, 14, and 15.—ARCHÆOCIDARIS DINXII.

**A STUDY OF THE TRUNK-FISHES (OSTRACIONTIDÆ), WITH NOTES
UPON THE AMERICAN SPECIES OF THE FAMILY.**

By G. BROWN GOODE.

The fishes of the order *Plectognathi* have afforded a knotty problem to writers on systematic ichthyology. Many genera have been established, and, between them, the several species have been buffeted to and fro until their synonymy is tangled like a spider's web. The following historical sketch of the progress of opinion in the classification of the Ostracionts was drawn up as an aid in determining what generic names should be used for the common West Indian forms.

Artedi and Linnæus were acquainted only with those which have the carapace closed behind the anal fin, now included by Günther in the subgenus *Ostracion*. The first of the other type, with carapace open behind the anal fin, was described by Houttuyn in 1782,* and again by Thunberg, under another name, eight years subsequently.† Schneider, Shaw, Lacépède, and their contemporaries recognized only the old genus, and it was not until 1838 that Dr. Gray separated certain species under the name *Aracana*.‡

Lacépède was the first to propose a division of the genus *Ostracion*, though he did not advocate the use of names for his subgenera, nor indeed propose any. His divisions were based upon the arrangement of the spines on the carapace, as given below. He knew no representatives of the *Aracana* type.

FIRST SUBGENUS.

No spines before the eyes nor under the tail.

1. L'OSTRACION TRIANGULAIRE (= *O. triquetus*).
2. L'OSTRACION MAILLÉ (= *O. triquetus*).
3. L'OSTRACION POINTILLÉ (= *O. punctatus*).
4. L'OSTRACION QUATRE-TUBERCULES (affinities unknown).
5. L'OSTRACION MUSEAU-ALLONGÉ (= *O. cubicus*).
6. L'OSTRACION DEUX-TUBERCULES (= *O. cubicus*).
7. L'OSTRACION MOUCHETÉ (= *O. cubicus*).
8. L'OSTRACION BOSSU (= *O. nasus*).

SECOND SUBGENUS.

Spines in front of the eyes but none under the tail.

9. L'OSTRACION TROIS-AIGUILLONS (mythical?).

*1782. HOUTTUYN, M. Beschrijving van Eenige Japansche Visschen en andere Zeeschepselen. < Verhand. d. Holland. Maatsch. Wetenschappen, Haarlem, xx, 2, 1782, pp. 311-350. *Ostracion aculeatus*, p. 346.

†1790. THUNBERG, C. P. Beskrifning på tvänne fiskar inifrån Japan <. Vetenskaps Acad. Nya. Handl. xi, 1790, p. 106 +. *Ostracion hexagonus*, p. 107.

‡1838. GRAY, J. E. < Ann. Nat. Hist. 1, p. 110.

THIRD SUBGENUS.

Spines under the tail but none in front of the eyes.

10. L'OSTRACION TRIGONE (= *O. trigonus*).
 11. L'OSTRACION DOUBLE-AIGUILLON (= *O. bicaudalis*).

FOURTH SUBGENUS.

Spines in front of the eyes and under the tail.

12. L'OSTRACION QUATRE-AIGUILLONS (= *O. quadricornis*).
 13. L'OSTRACION LISTER (= *O. quadricornis*).
 14. L'OSTRACION QUADRANGULAIRE (= *O. cornutum*).
 15. L'OSTRACION DROMADAIRE (= *O. turritus*).

The next attempt at a subdivision was by Swainson in 1839,* and was based entirely upon the shape of the carapace. The peculiar features of this arrangement can most easily be shown by quoting in full from the preliminary synopsis (p. 194).

I. Sub-family OSTRACINÆ. Body mailed with angular plates.

OSTRACION. *Body quadrangular, destitute of spines.

TETROSOMUS. Body quadrangular; spines on the back and belly.

*Body triangular.

Platycanthus. Body with several flattened bony obtuse spines.

Lactophrys. Front and vent with two horn-like, acute spines.

Rhincosomus. Body without spines, often scored as in the *Balistinae*.

In the main body of the "Classification of Fishes, etc." (pp. 323-324), the definitions of genera and subgenera were expanded as follows:

I. Sub-fam. OSTRACINÆ.

Body smooth, quadrangular in the typical and triangular in the aberrant groups, covered by angulated bony plates, soldered at their sutures; dorsal fin one; no ventral fin; caudal rounded.

OSTRACION, Linn. Body quadrangular; destitute of spinal processes.

O. cubicus, Bloch. pl. 137. *nasus*, Ib. pl. 138.

TETROSOMUS, Sw. Body quadrangular; armed with spines on the back and belly.

T. turritus, Bl. pl. 136.

Lactophrys, Sw. (fig. 102). Body triangular, armed with strong spines, curved backward just before the anal fin, and generally with two others, resembling horns.

L. trigonus, Bl. pl. 135.

cornutum, Bl. 133.

bicaudalis, Ib. 132.

quadricornis, Ib. 134.

Rhincosomus, Sw. Body triangular, entirely destitute of spines, and often scored or reticulated as in *Balistes*.

R. triquet, Bloch. pl. 130. *concatenatus*, Ib. pl. 131.

Platycanthus, Sw. (*Acarana*, Gray). Compressed, subtriangular, with broad obtuse plates or spines scattered over the body and eyes.

P. auratus, Shaw. Nat. Miss. pl. 338.

It would be interesting to know what relations are indicated by the different kinds of type employed by the author. But for the direct

* 1839. SWAINSON, WILLIAM. The Natural History | of | Fishes, Amphibians, and Reptiles | or | Monocardian Animals. | By William Swainson, F. R. S., F. L. S., &c., &c. | ——— | in two volumes. | ——— | Vol. I (II). (Vignette.) | London: | Printed for Longman, Orme, Brown, Green, and Longmans, Paternoster Row, | and John Taylor, Upper Gower St., | 1839. Vol. ii, pp. 193, 323.

statement of a quadrangular character for *Tetrosomus* it would appear certain that the three following divisions were intended as subgenera, subordinated to *Tetrosomus*. As it is, it seems to be more than probable that an omission was made by the author, and that the diagnosis should read "triangular or quadrangular;" for the species chosen as type of *Tetrosomus* is in fact pentagonal. This, however, would throw out *Rhinosomus* and certain species in *Lactophrys*. Be this as it may, we have no right to guess at the real meaning of the author; these divisions are treated as genera in every particular except that their names are in italics instead of capitals, and as genera they must be quoted, charging discrepancies to the account of carelessness and bad workmanship.

In 1855 the group underwent another revision at the hands of Dr. Kaup.* Besides forming several new subgenera for the *Acarana*-like forms he made a complete redistribution of the species among the genera. Regarding the triangular species as types of the genus *Ostracion* of Linnaeus he proposed a new generic name, *Cibotion*, for *Ostracion* as limited by Swainson, and in this group placed *O. tuberculatus*, *O. cubicus*, *O. punctatus*, *O. argus*, *O. cyanurus*, and *O. Sebac*. In "*Lactophrys*, Swains. (part)," he placed *O. cornutus*, *O. fornasini*, and *O. diaphanus*, all species with spinous, four-ridged carapaces, while in "*Ostracion*, Lim. (part), Kaup," which he regarded as equivalent to *Rhinosomus* and *Tetrosomus*, Swains., he placed all the triangular species, which he divided into five sections: "a. Without long spines over the eyes and on the edges of the body"—*O. triquetus*. "b. With spines near the anal fin"—*O. bicaudalis*, *O. trigonus*, and *O. oriceps* (= *O. trigonus*). "c. With spines over the eyes and on the edge of the carapace"—*O. quadricornis*. "d. With 2-3 short spines on the elevated dorsal ridge, short spines over the eye and upon the edges of the very broad carapace, diminishing with age to weak points"—*O. concatenatus*. "e. With strongly quadrangular body and much elevated back, provided with a strong spine; spines over the eyes and on the lower edges of the carapace."—*O. gibbosus*.

In the following year a fresh revision was undertaken by Prof. H. Hollard, of the Faculty of Sciences at Poitiers,† who reassembled in the one genus, *Ostracion*, all the species with a post-abdominal bridge to the carapace, retaining for the others the name *Acarana*, Gray. In this usage he is followed by Dr. Bleeker in his later publication, though he freely admits that earlier in his career as an ichthyologist, impressed like his predecessors by the diversified forms of the known species of *Ostracionts*, he was inclined to believe that many genera could be distinguished among them. "But," he continues, "in searching for characters which should define them satisfactorily, I discovered that I could

* Op. cit., pp. 214-221.

†1853. HOLLARD, H. Monographie de la Famille des Ostracionides. <Annales des Sciences Naturelles, 4^e ser. Zool. vii, 1857, pp. 121-170.

find none." Bleeker admits three genera, *Ostracion*, *Aracana*, and *Centaurus*, the latter founded on a grotesque form known to ichthyologists only from a drawing of a very young individual made by Dr. Hooker. *Ostracion* is divided by Bleeker into subgenera as follows:

Ostracion, Art. = *Tetrosomus*, Swms. = *Rhinosomus*, Swms. = *Lactophrys*, Swms. = *Cibotium*, Kp.

Pyxis postice integra basin pinnae dorsalis et analis includens, medio inferne plana non carinata. Pinna dorsalis. Pinna caudalis radiis 10 (1 | 8 | 1). Spec. typ. *Ostracion tetragonus*, L.

Subgenus *Ostracion*, Art. Pyxis tetragona, trigona vel pentagona, anacantha. Spec. typ. *Ostracion tetragonus*, L.

Subgenus *Lactophrys*, Swms. Pyxis trigona vel pentagona, utroque latere carina ventrali postice spina armata. Sp. typ. *Ostracion trigonus*, L.

Subgenus *Tetrosomus*, Swms. Pyxis trigona vel pentagona orbitis, crista dorsali mediana carinisque ventralibus acanthophora, spinis orbitalibus sursum nec antorsum directis, ventralibus pluribus. Spec. typ. *Ostracion turritus*, Forsk.

Subgenus *Acanthostracion*, Blkr. Pyxis trigona, pentagona, vel tetragona orbita carinaque ventrali postice acanthophora, spinis orbitalibus antorsum directis. Spec. typ. *Ostracion quadricornis*, L.*

These divisions correspond very closely to those of Lacépède already referred to; *Ostracion* being equivalent to section 1, *Lactophrys* to section 3, while section 4 is about equally divided between *Tetrosomus* and *Acanthostracion*.

Dr. Günther,† like Hollard and Bleeker, considers the typical *Ostracions* to be embraced within the limits of one natural genus, and even includes those with carapace open behind the anal fin. Such, at least, is his course in the generic diagnosis of *Ostracion*, though he actually adopts the name *Aracana* as if it represented a true genus, and enumerates the species under a separate series of numbers.

In arranging the species of *Ostracion* he adheres rather to the method of Swainson than of Lacépède, considering the shape of the carapace to be the most convenient basis of classification. His divisions are as follows:

- I. Carapace three ridged.
- II. Carapace four or five ridged, without spines.
- III. Carapace four ridged with spines.

The third division corresponds exactly to Swainson's *Tetrosomus*, if his diagnosis be accepted without change, the second division to Swainson's *Ostracion* and Kaup's *Cibotium*, the first division to the three last subgenera (?) of Swainson, which he probably meant to subordinate to a third genus which he neglected to name.

The usage of American authors has been various. Storer, although he described his Holmes' Hole specimen under the name *Ostracion Yalei*, accepted in his "Synopsis" the names *Rhinosomus triquetter* and *Lactophrys scæcornis*.

* Atlas ichthyologique, v, 1805, pp. 27-28.

† Catalogue of the Fishes in the British Museum, viii, 1870, p. 256.

Professor Gill, in 1873, catalogued the east coast species as *Lactophrys trigonus*.*

Poey, in his "Synopsis Piscium Cubensium,"† follows the lead of Bleeker, accepting his subgenera though not bracketing them into the middle of the binomial names as was the practice of the Dutch zoologist. In a later work, the "Enumeratio Piscium Cubensium," he adopts the genera *Ostracion*, *Acanthostracion*, and *Lactophrys*. Jordan uses the name *Lactophrys quadricornis*, accepting provisionally Swainson's arrangement.

After studying the group, as represented in the collections of the National Museum, I am unable to recognize any characters sufficiently persistent to serve in dividing the typical *Ostracions* into genera. The most dissimilar forms are connected by others, intermediate in character, and a series of specimens in various stages of growth of a single species like *O. quadricornis* or *O. concatenatus* shows great age-variation both in shape of carapace and in size and distribution of spines.

As has been remarked, Lacépède and Bleeker regarded the position of the spines as the most reliable character for classification.

Hollard sums up his observations on the specimens in the Paris Museum as follows:

"The diversity of species at a first glance appears greater than it is in reality; at least it is easy to reduce them to a small number of typical forms. The true types are those based upon form. *The absence, the presence*, and the number of the spines, large or small, with which many of the *Ostracionts* are provided, afford characters of very secondary and simply specific value. These spines in fact are present or absent without regard to more important characters. * * * They should be subordinated to other differences between which no known examples form connecting links."‡

Kaup and Swainson, on the other hand, adopted the form of the carapace as the most important character. This was considered by Hollard as of but little value for generic diagnosis, and by Bleeker is disposed of most summarily. "The triangular or quadrangular form of the body," he remarks, "appears to have no real value (for the separation of genera) since it depends simply upon the greater or less convexity or elevation of the dorsal plane of the carapace. If, for example, we place an *Ostracion triqueter*, L., by the side of an *Ostracion tetragonus*, L. (= *O. cubicus*), we have before us two well-marked types, one with a triangular the other with a quadrangular carapace (*Ostracion*, Kaup, and *Cibotia*, Kaup). But if between these two extremes we place an *Ostracion guineensis*, Blkr., and an *Ostracion nasus*, Bl., we cannot decide whether we are dealing with a triangular or quadrangular form, for the dorsal surface is elevated in the shape of a roof, presenting two faces which descend from a central crest to unite at an obtuse angle with the

* Rep. U. S. Com. Fisheries, part i, p. 793.

† Repertorio Físico-Natural de Isla de Cuba, ii, 1868, pp. 439-442.

‡ Annales des Sciences Naturelles, vii, p. 140.

lateral walls of the carapace. It is evident, from the study of these transitions, that the form of the carapace cannot furnish a certain basis for the establishment of distinct genera.

"The character of the spines has, however, a greater value than that of the form of the carapace. Although it be true that spines do not occur exclusively upon this or that form of carapace, since there are triangular trunk-fishes without spines, others armed with frontal and anal spines, and others with anal spines alone, while there are also quadrangular ones, spineless, or armed on the forehead and beneath the tail, still there may be observed a certain consistency in their arrangement as regards their position, their form, their number, and their direction. But this constancy does not extend to their persistency since some spines, or indeed all of them, are absorbed and disappear entirely in adult individuals of certain species. In this manner all the spines disappear with age in *Ostracion concatenatus*, and if one were disposed to see generic characters in its arming, three genera might be founded upon *Ostracion stellifer*, Bl., Schn. (in which the forehead, the dorsal keel, and the ventral ridge are spinous), *Ostracion bicuspis*, Blum., figured by A. Smith (which has only dorsal and ventral spines), and *Ostracion concatenatus*, Bl. (which has the carapace entirely spineless). In reality these species are merely nominal; *Ostracion stellatus* and *Ostracion bicuspis* being young individuals of the species of which *O. concatenatus* is the adult. In one other species, *Ostracion cornutus*, Linn. (not Bloch), the spines in the middle of the lateral dorsal ridge, and those on the ventral ridge, decrease with age, and in the adult finally disappear. In other species the spines are much more constant, but their proportions, very different in accordance with the age of the individual, render it sufficiently evident that they afford a character of very doubtful value. I should, however, note the fact that there is no known example of an *Ostracion* with horizontal frontal and anal spines in which these spines disappear in adult age."

As has already been stated, the subgenera adopted by Bleeker are founded solely upon the number and position of the spines. In *Tetrosomus* he places one pentagonal species, but in *Acanthostracion* and *Ostracion* he includes triangular, tetragonal, and pentagonal forms without discrimination. Notwithstanding the strong grounds taken by him in regard to the importance of the shape of the carapace it seems to afford the most reliable guide in an arrangement of the species of this genus. An arrangement with reference to the position of the spines produces some incongruous results, while the other plan harmonizes to a great extent with all structural features as well as with the geographical distribution of the group. Hollard remarked that the serial gradation of the species was of great interest, but he did not work it out with the care which might have been expected. I have endeavored to indicate what seems to me to be a natural series, from the triangular spineless form through the pentagonal form, provided with many spines, to the tetragonal spineless form at the other extreme.

Serial arrangement of the species of Ostracion.

- I. Form triangular, spineless *O. triquetter*.
- II. Form triangular, with two ventral spines..... *O. trigonus*, *O. bicaudalis*.
- III. *a.* Form triangular, with two ventral and two horizontal frontal spines, the posterior extension of whose base gives in young individuals a semblance to a tetragonal, in adults to a pentagonal shape..... *O. quadricornis*.
- b.* Like the last in every respect except that there is a median dorsal spine. (This is frequently seen in the young of *O. quadricornis*, disappearing at different stages of growth in different individuals, but in others persistent)..... *O. quadricornis*, subspecies *notacanthus*.
- IV. *a.* Form subtriangular, approaching to pentagonal, the posterior extension of the orbital crest being more pronounced than in III. Frontal spines small, vertical, frequently double, two small spines upon the dorsal ridge and two on each ventral keel, all the spines obsolescent with age.... *O. concatenatus*.
- b.* (A side-shoot from *a.*) Like the last, but with all characters exaggerated and more persistent, the dorsal spine single and high, the spines on each lateral keel four in number.
O. turritus (by Günther considered to be probably identical with *O. concatenatus*).
- V. *a.* Form subtetragonal, approaching pentagonal, but with a dorsal surface clearly defined, though the affinity to the triangular forms is indicated by a pronounced elevation of the dorsum, surmounted by a high spine. Frontal spines horizontal, stronger. The fullness of the anterior part of the body observed in the forms already studied is suggested by a bulging of the ventral surface *O. Fornasini*, *O. cornutus*, Linn. = *O. diaphanus*, Schn.
 In *O. diaphanus* the dorsal surface is flatter than in *O. Fornasini*, but there are small spines on the dorsal and ventral keels, obsolescent in age, which suggest the preceding form. The two forms together, or an average between them, form a needed link in the series.
- b.* (A side-shoot with great development of frontal and ventral spines.) Forms similar to the last but approximating still more closely to the tetragonal, particularly in adult age; without dorsal spine, though with a trace of its presence in an elevated dorsal ridge. Horizontal spines very prominent.
O. arcus, Schn. = *O. cornutus*, Bloch.
- VI. Form tetragonal, spineless, similar to the last, but with squarer angles. "A more or less sharp protuberance in front of the dorsal fin, from which several pointed lines radiate." Horizontal spines absent. This is the transition from the subpentagonal and subtetragonal to the truly tetragonal forms.
O. ornatus.
- VII. *a.* Form tetragonal, spineless, similar to the last, but with lower though still very distinct dorsal ridge. A trace of rostral prominence..... *O. nasus*.
- b.* (Side-shoot from *a.*) Similar to *a.*, but with prominent rostral hump.
O. rhinorhynchus.
- c.* Form truly tetragonal, back convex, not ridged, dorsal and ventral keels blunt..... *O. cubicus*, *O. punctatus*, *O. sebca*.
- VIII. Form tetragonal, spineless, back flat, ridges sharp..... *O. Renardi*, *O. solorensis*.

Such is the continuity of the gradation in this series that it is almost impossible to distribute the species into subgenera, though the extreme forms would be considered by many writers as belonging to well-marked genera were the intermediate forms not known. The transition is perfect, without a break from *O. triquetter* to *O. Renardi* and *O. solorensis*. Even the size, abundance, and distribution of the spines are seen to be correlated to the shape of the body, for these are to be regarded, as

was suggested by Hollard, merely as exaggerations of the crests and ridges which define the lateral, dorsal, and ventral surfaces of the carapace, occurring in those parts of the body and in that part of the above series where these crests and ridges are most emphasized, and their absence coinciding with the absence of prominent lines of demarcation. They are most numerous in the middle portion of the above series, in the forms transitional between the triangular and tetragonal sections of the genus, and are alike also at both extremes.

The geographical distribution of the species is interesting in the light of this gradation. The triangular forms (I and II) occur only in the West Indies. The next in order (III) occur not only in the West Indies but in the southeastern Atlantic. The subtriangular form (IV) is represented in the southeastern Atlantic (at the Cape of Good Hope), in the western Pacific (China), in Australia and the East Indian Archipelago. The subtetragonal forms (V) are represented in the Indian Ocean, west to the Cape of Good Hope, in Japan and Australia, and in the East Indian Archipelago, while the tetragonal forms (VI, VII, and VIII) almost exclusively in the Indian Archipelago and the Indian Ocean.

There is no dearth of names for the sections of this group, but as has been remarked, it is impossible to assign them or subdivide the genus by any but arbitrary methods.

Swainson's *Ostracion* corresponds to Divisions VI, VII, and VIII; his *Tetrosomus* to Divisions IV and V, although he assigns *O. cornutus* to the following genus; his *Lactophrys* to Divisions II and III, and his *Rhinosomus* to Division I.

Kaup's *Ostracion* would include Divisions I, II, III, and IV; his *Lactophrys*, Division V; and his *Cibotium*, Divisions VI, VII, and VIII. Bleeker's *Ostracion* includes I, VI, VII, and VIII; his *Tetrosomus*, IV; his *Acanthostracion*, II, III, and V.

Dr. Bleeker by assuming Division V, instead of Division I, as one extreme of the series, made his division of the group into subgenera more plausible. This arrangement does not, however, allow as complete a gradation of form.

SUBORDER OSTRACODERMI,* GILL.

Synonym as family name.

- < *Sclerodermes*, CUVIER, Règne Animal. 1st ed ii, 1817, p. 153; 2d. ed. ii, 1829, p. 375.
- < *Sclerodermi*, GÜNTHER, Cat. Fish. Brit. Mus. viii, 1870, p. 207. (Synonym as subordinal name.)
- < *Sclerodermes*, HOLLARD, Ann. Sci. Nat. (4) xiii, 1860, p. 31.

Synonyms as ordinal names.

- < *Sclerodermi*, BONAPARTE, Giorn. Accad. di Scienze, lii, 1832 (Saggio Distrib. Metod. Animali Vertebr. a Sangue Freddo, p. 39). •

*The synonymy of this suborder is in substance quoted from GILL. MS.

- = *Ostraciones*, BLEEKER, Enum. Sp. Pisc. Archip. Indico, xiv, 1859, Atlas Ichthyologique, v, 1865, p. 25.
 = *Ostracodermi*, GILL, Arrangement of the Families of the Fishes, 1872 (November), pp. xii, i.
 = *Cataphracti*, FITZINGER, Sitzungsber. k. Akad. Wiss. (Wien), lxxvii, Abth. 1, 1873, p. 47.

FAMILY OSTRACIONTIDÆ.

- Ostracidi*, RAFINESQUE, Indice d'Ittiolog. Siciliana, 1810, p. 39 (Gill).
Ostracidia, RAFINESQUE, Analyse de la Nature, 1815 (as subfamily, *vide* Gill).
 Subfam. *Ostracina*, SWAINSON, Nat. Hist. Fish. Amphib. and Rept. 1839, ii, pp. 194, 323.
Ostraciontini, BONAPARTE, Nuovi Annali d. Sci. Nat. ii, 1838, p. 131; iv, 1840, p. 186 (as subfamily, *vide* Gill); NARDO, l. c. inf. p. 71.
Ostraciontida, NARDO, Atti Congressi Scienz. Ital. rac. et ord. i (1842), 1844, p. 70 (Gill).
Ostraciones, BLEEKER, Bijdrage; Balist. en Ostraciones van den Ind. Archip. 1852, pp. 28-36.
 (Family) *Ostraciontida*, GILL, Arrangement of the Families of Fishes, 1872, p. 1.
 (Family) *Ostracionida*, KAUP, Archiv für Naturgeschichte, 1855, pp. 215-221.
 Famille des *Ostracionides*, HOLLARD, Annales des Sciences Naturelles, vii, 1856, pp. 121-170, pl. xiii.
 Familia *Ostracionoidei*, BLEEKER, "Enum. sp. Pisc. Archipel. Ind. xiv, 1859;" Atlas Ichthyologique, v, 1865, pp. 24-42, ppl. cci-civ.
 Group *Ostraciontina*, GÜNTHER, Catalogue of the Fishes in the British Museum, viii, 1870, pp. 255-268.
Ostraciida, COPE, Proc. Amer. Assoc. Adv. Sci. xx, 1872, p. 340; GOODE, Cat. Fish Bermudas, 1876, p. 53 (name only); GILL, Bibliog. Fish Pacific Coast (unpublished).
Ostraciontes, FITZINGER, l. c. sup.

DIAGNOSIS OF FAMILY.

Plectognath fishes with short, angular bodies, covered by a modified integument consisting of numerous closely juxtaposed polygonal osseous plates. Caudal peduncle, bases of fins, and snout covered with flexible skin. Maxillary and intermaxillary bones anchylosed. A single row of short teeth in each jaw. A single dorsal fin opposite the anal; no ventrals. Vertebrae 14, the first 9 elongate. No ribs.

SYNOPSIS OF GENERA.

- Carapace forming a continuous bridge behind anal fin, ventral surface acarinate, caudal with 10 rays OSTRACION (Art.) Linn.
 Carapace open behind anal fin, ventral surface carinate, caudal with 11 rays or more. ARACANA, Gray.

GENUS OSTRACION.

- > *Ostracion*, ARTEDI, Gen. Pisc. 1738, p. 55.
 = *Ostraciones polyodontes*, ARTEDI, l. c.
 = *Ostracion*, LINNÆUS, Syst. Nat. ed. x, 1758, 1, p. 330; ed. xii, 1766, p. 407.
Les Ostracions, LACÉPÈDE.
Les Coffres (*Ostracion L.*), CUVIER, Règne Animal. ed. 1, 1817, p. 154; ed. ii, 1829, p. 375.
Ostracion, GRAY, Annal. Nat. Hist. 1, 1838, p. 110.
Ostracion + *Tetrosomus* + *Lactophrys* + *Rhinesomus*, SWAINSON, Nat. Hist. Fish. Amphib. and Rept. 1839, ii, pp. 193-194, 323-324.
Ostracion, BLEEKER, Verhandelingen van het Bataviasch Genootschap van Kunsten en Wetenschappen, xxiv, 1852, Bijdrage tot de Kennis der Balistini en Ostraciones van den Indische Archipel. p. 28; Atlas Ichthyologique, v, 1865, pp. 25-42.

*Carapace tetragonal*₂.

(Carapace with ventral and frontal spines.....O. ARCUS, L.)

NOTES ON AMERICAN SPECIES.

OSTRACION TRIQUETER, Linn.

Ostracion triqueter, LINNÆUS, Syst. Nat. ed. x, 1758, 1, p. 330, No. 1, ed. xii, 1766, 1, p. 407.—BLOCH, Ichthyologie, iv, 1787, p. 106, taf. cxxx.—GMELIN, Linn. Syst. Nat. i, 1788, p. 1441.—LACÉPÈDE, Hist. Nat. Poiss. etc., i, 1798, p. 444; ed. ii, 1819, ii, p. 331, pl. xiv, fig. i.—SCHNEIDER, Bloch, Syst. Ichth. 1801, p. 498.—SHAW, Gen. Zool. v, 1804, p. 420.—CUVIER, Règne Animal, ed. i, 1817, p. 154; ed. ii, 1829, ii, p. 376, note.—MÜLLER & GROSCHEL in Schomburgk's Hist. Barbados, 1848, p. 677.—KAUP, Arch. für Naturg. 1855, p. 217.—HOLLARD, Ann. Sci. Nat. vii, 1856, p. 154.—BLEEKER, Atl. Ichth. v, 1865, p. 26.—GÜNTHER, Cat. Fish Brit. Mus. viii, 1870, p. 256.

Ostracion triquetrum, POEY, Mem. Sob. Hist. Nat. Cuba, ii, 1861, p. 361; Rep. Fis. Nat. Cuba, ii, 1868, p. 442; Enum. Pisc. Cubens. 1876, p. 176.

Ostracium triquetrum, COPE, Trans. Am. Phil. Soc. 1870, p. 475.—GOODE, Cat. Fish Bermudas, 1876, p. 23; Amer. Journ. Sci. and Arts, 1877 (Oct.), p. 290.

Rhincosomus triqueter, SWAINSON, Nat. Hist. Fish. Rept. and Amphib. 1839, ii, p. 323.

Piscis triangularis ex toto cornibus carens, LISTER in App. Willughby Hist. Pisc. 1686, p. 20.—RAY, Syn. Method. Pisc. p. 45, No. 9.

Ostracion triangulus, tuberculis exiguis innumeris, aculis carens, ARTEDI, Gen. Pisc. 1738, p. 57, No. 10; Syn. Pisc. 1738, p. 85, No. 14.

Ostracion polyodon incermis triqueter, LINNÆUS, Mus. Adolphi Frederici, i, 1754, p. 60.

L'Ostracion maille, LACÉPÈDE, l. c.

Cuckold, Bermudas.

Chapin, Cuba.

Drunken-fish, Trunk fish, Plate-fish, or Fair Maid, Barbados.

DISTRIBUTION.

Bermudas (Goode).	Tortugas (National Museum).
Jamaica (Günther).	Trinidad (Günther).
Cayenne (Günther).	Barbados (Schomburgk).
Cuba (Poey).	St. Croix (Cope).
Gulf of Mexico (Hollard).	Mexico (Hollard).
Bahia (Castelnau).	Brazil (Cope).
St. Martins (Cope).	Vera Cruz (Cope).

Ostracions with triangular carapace, without spines. Height slightly greater than half the length of the body without the caudal, breadth equal to half the length of the body in adults, greater in young. Ventral surface of carapace convex anteriorly, concave posteriorly. Back elevated compressed, sides joining at an angle of about thirty degrees. Carapace continuous behind dorsal fin. Head contained three times in length of body. Interorbital space concave. Upper surface of snout concave. Diameter of eye contained eight to nine times in total length, four to four and one-half in height of side.

Teeth long, spike-like, eight to ten in upper jaw; eight to ten in lower jaw.

Scales of the sides hexagonal, in young with striae radiating from

centre to angles of each scale, in adult armed simply with tubercles, nine to ten, in longitudinal series from gill-opening to tail, eight in median line of ventral surface, eight between ventral keel and angle of back. Posterior dorsal scute unarmed.

Branchial aperture oblique, its length greater than the diameter of the eye, descending before the base of the pectoral. Fins obtusely rounded. Pectoral equaling in length. Caudal of moderate length and rounded.

Radial formula D. 10, A. 10, P. 12.

Color: The color of living individuals is thus recorded in my Bermuda note-book:—"Dark-brown, thickly studded with circular spots of yellowish white, each about two lines in diameter; the position of these spots appears to have no relation to the shape of the plates of the carapace. Ventral surface lighter and spotless. The epidermis is often abraded leaving the shell uniform tawny-white. The lips, bases of the fins, and tail-stem are brown like the ground color of the body." In dried specimens the epidermis dries and loses its color, and the shell shows through with a lighter shade. Günther states that the lips, roots of the fins, root of the tail, and tip of the caudal are black. This I have not observed.

The largest individuals seen by me measured about 265 millimetres in length, but these were quite unusual in size.

The Cuckold is common throughout the West Indies, and has been found south to Bahia, while, to the north, it is carried by the Gulf Stream as far as the Bermudas. Its limits of distribution are more closely restricted to the Caribbean Sea and the neighboring waters than those of any other species in the genus.

It is recorded that the crew of Columbus, on their first voyage, in 1492, while at anchor on the coast of Cuba, captured a fish which "was like a swine, all covered with a very hard skin, no part whereof was soft but the tail," which was probably one of the Ostracions.

Little can be said in reference to its habits, except that it is sluggish and lives close to the bottom, where it probably feeds upon hydroids ascidians, and other soft-bodied animals. This is somewhat conjectural for no one has ever taken the pains to examine the stomach contents of any member of the genus, but it is not very hazardous to make this surmise, for the sluggish movements of the Trunk-fish would not permit it to pursue active living prey, while its small, weak teeth are thoroughly unsuitable for feeding upon shells and barnacles.

The method of locomotion in this and other members of the genus Ostracion is very peculiar. When in Bermuda, in 1872, I had two of them for a time in my aquarium, and had an excellent opportunity of observing the movements of their fins.

The rigid shell prevents any flexure of the body, the only parts with power of independent motion being the lips, the dorsal and anal fins, and the stem of the tail. These protrude through openings in the cara-

pace, and the bases of the fins as well as the lips are encased in tough skin, leathery and flexible. Even the gill-openings are incapable of independent motion, for they are only straight, narrow, vertical slits in the carapace just in front of the pectoral fins.

The sinuous muscular movement of the posterior half or two-thirds of the body, which plays so important a part in the movement of the ordinary fish, is of course impossible, and the rotary, sculling motion so noticeable in the caudal fin of a fish, like a minnow or a trout, seems equally unknown. The power of propulsion appears to be vested chiefly in the dorsal and anal fins. These are broad and round, provided apparently with strong muscles, and the anal is placed almost directly beneath the dorsal. When the fish moves it is solely by the effect of a strong, slow, regular half-rotary movement of these two vertical fins, much resembling that of the screw-wheel of a propeller-engine. The caudal fin is kept vertical, and, moved from side to side, plays the part of a rudder, except when needed for an unusually rapid movement, and then it adds its strength with long, strenuous side-strokes. There are no ventral fins, nor do they seem to be needed, for the fish is balanced upon its centre of gravity and well under the control of its propulsive fins. The pectorals probably perform a certain part in balancing, but seem to be most useful in keeping up a circulating current through the gill-apertures.

Their movements are sluggish, and they do not seem to require a rapid aeration of the blood, for I have known them to live for two or three hours out of water, and when restored seem none the worse for the change of element, save that for a time they were prevented from sinking to the bottom by the air which they had swallowed and which kept them awkwardly suspended at the surface.

I have rarely seen them swimming among the reefs. They appear to spend most of the time resting on the bottom, on the broad nether surface of the carapace. They never take the hook, but often enter the fish-pots set at a depth of two to ten fathoms.

No one has been so fortunate as to observe the breeding habits of the Ostracions; even the time of spawning is unknown.

In the Bermudas they are sometimes eaten, though not held in high estimation. I was unable to learn that evil effects ever follow their use for food at this locality. Hollard states that its flesh is said to be palatable and wholesome, but cites no authority for this observation, which is probably taken second-hand from Lacépède, who gives an enthusiastic eulogy of its good qualities. "Its flesh," wrote the fluent Gaul, "is more sought after than that of almost any other fish in the seas of America where it makes its home." And then he continued with a most amusing proposition for acclimating the species in the waters of France, and which is a good example of the theories of the would-be fish-culturists of eighty years ago. "Although it appears to thrive only in tropical regions we might endeavor to acclimate it in

waters more remote from the equator, since the differences of temperature presented by the water at different degrees of latitude are far less marked than those of the atmosphere. On the one hand we know with what facility fishes found only in the sea can be habituated to life in fresh water. The exquisite flavor and exceedingly wholesome nature of the flesh of the 'triangulaire' should encourage us to make persevering and well considered experiments in this direction; we might accomplish this acclimation, which would be important from more than one point of view, by gradual steps; we should gradually accustom the species to temperatures successively less warm; we should even continue the experiment through many generations of the animal before abandoning it completely, without artificial protection, to the climate in which it is to be naturalized. We should do for the 'triangulaire' what has been done for many species of plants; we should bring individuals of this species, and we should care for them through a long period in water, which we should keep at a temperature closely resembling that of the equatorial seas in their surface strata: then we should lower the temperature of the little pools in which the 'triangulaires' are kept by almost insensible degrees and by very gentle variations. In the regions of Europe and other parts of the globe, far removed from the tropics, where the thermal currents flow, we might at least profit by these naturally heated waters to give to the triangulaires that degree of heat which is to them absolutely necessary, or to accustom them by insensible degrees to enduring the ordinary temperature of the fresh waters or of the seas of those various regions."—(Lacépède, l. c.)

OSTRACION BICAUDALIS, Linn.

- Ostracion bicaudalis*, LINNÆUS, Syst. Nat. ed. x, 1758, i, p. 330, No. 3; ed. xii, i, 1766, p. 408.—BLOCH, Ichthyologie, iv, 1787, p. 109, p. cxxxii.—GMELIN, Linn. Syst. Nat. i, 1788, p. 1441.—LACÉPÈDE, Hist. Nat. Poiss. etc., i, 1798, pp. 465-466; ed. ii, 1819, pp. 342-343.—SCHNEIDER, Bloch, Syst. Ichth. 1801, p. 499.—SHAW, CUVIER, Règne Animal, ed. i, p. 154; ed. ii, 1829, ii, p. 375.—KAUP, Archiv für Naturg. 1855, p. 217.—HOLLARD, Ann. Sci. Nat. vii, 1856, p. 153.—POEY, Rep. Fis. Nat. Cuba, ii, 1868, p. 442.—GÜNTHER, Cat. Fish Brit. Mus. viii, 1870, p. 257.
- Ostracion bicaudale*, POEY, Mem. sob. Hist. Nat. Cuba, vi, 1861, p. 362.
- Ostracium bicaudale*, COPE, Proc. Amer. Phil. Soc. 1870, p. 474 (St. Martins).
- Lactophrys bicaudalis*, SWAINSON, Nat. Hist. Fish, Rept. and Amphib. 1839, ii, p. 323.—POEY, Enum. Pisc. Cubens. 1876, p. 176.
- Piscis triangularis, parvus non nisi imo ventre cornutus*, LISTER, in App. Willughby Hist. Pisc. 1686, xiv, p. 20.—RAY, Syn. Method. Pisc. 1713, p. 45.
- Piscis mediocris triangularis, ad imum ventrem prope caudam tantum cornutus*, etc., LISTER, l. c. p. 20.—RAY, l. c. p. 45.
- Ostracion triangulatus, tuberculis hexagonis radiatis, aculeis duobus in imo ventre*, ARTEDI, Gen. Pisc. 1738, p. 57, No. 9; Syn. Pisc. p. 85, No. 13.
- Ostracion triangulatus totius maculosus ac tuberculosus, aculeis duobus in imo ventre*, ARTEDI, Gen. Pisc. p. 57, No. 8; Syn. Pisc. 85, No. 12.
- Chapino, PAERA. *Trunk-fish*, Jamaica
Chapin, Cuba.

DISTRIBUTION.

Jamaica (Günther).	Barbados (Schomburgk).
Antilles (Hollard).	Jamaica (National Museum).
St. Martins (Cope).	Belize, Honduras (Günther).
Cuba (Poey).	Island of Ascension (Günther).

Ostracions with triangular carapace and with flat prominent spine on each ventral ridge. Breadth of body less than half its length without caudal.

Space between eyes concave. From the median dorsal line the sides of the back descend rapidly, curving outward slightly. Caudal fin rounded.

Color yellowish, with numerous small round brown spots on carapace, tail, and caudal fin. D. 10, A. 10, P. 12.

The Brown-spotted Trunk-fish has a wider distribution to the south than the Cuckold, having been recorded by Dr. Günther from the Island of Ascension, where a young individual was taken by Mr. J. Robinson. It is also in Mr. Osbert Salvin's Honduras collections. It has not yet been recorded from the coast of Florida, or to the north of Cuba.

It attains a much larger size than the preceding. Hollard gives the following dimensions for one of the largest in the Museum d'Histoire Naturelle:

	M.
Length	0.440
Maximum height	0.143
Length of head	0.090
Tail-stem	0.080
Caudal	0.080
Breadth of abdomen	0.110

The Trunk-fishes appear to have been objects of curiosity in the early days of American exploration, and were evidently among the choicest treasures of the primitive museums of the seventeenth and eighteenth centuries. Their strange shapes naturally attracted the attention of travellers, and then, as now, the ease with which their shells could be preserved made them favorites of curiosity hunters. No group of tropical fishes is so thoroughly worked out in the writings of "the fathers" as the Plectogonids, and none more so than the Ostracions. Over two hundred years ago every species of *Ostracion* now known from the western Atlantic had been named and described by the naturalists of northern Europe, and it is a well-deserved tribute to their discrimination as zoologists to say that none of the many efforts which have since been made to subdivide these species have been at all successful.

Artedi in his notes upon the different forms of *Ostracion* mentions the various collections in which he observed specimens. The "Naggs' head," "White Bear," and the "Green Dragon in Stepney," to which he very often alludes, seem to have been London taverns where curiosities were kept. He also speaks of seeing them in the museum of Hans Sloane, the nucleus of the British Museum; also in the collections of D.

Seba, in Amsterdam, of Mr. Lillja, in London, of Mr. (Don) Salteros, in Chelsea, and of seeing various specimens at Stratford, and "in spring-garden." No other kinds of fishes appear to have been preserved except "the monk- or Angel-fish *Anglis, aliis Mermaid-fish*," probably a species of *Squatina*, which he saw in London at the Naggshead and in the town of Chelsea. The art of taxidermy was evidently not thoroughly established in 1738.

Of *Ostracion bicaudalis*, he remarks, "Vidi Londini, in the White Bear," and "Apud D^m Sebam vidi." *Ostracion trigonus* he saw "Apud Sir Hans Sloane et in Naggshead"; *Ostracion triqueter* and *O. quadricornis*, "Londini in the Naggshead et apud Mr. Lillia."

The specimens were all said to have come from India.

OSTRACION TRIGONUS, Linn.

Ostracion trigonus, LINNÆUS, Syst. Nat. ed. x, 1758, i, p. 330, No. 2: ed. xii, 1766, i, p. 408.—BLOCH, Ichthyologie, iv, 1787, p. 115, pl. cxxxv (*coffre à perles*).—GMELIN, Linn. Syst. Nat. 1788, i, p. 1441 (assigning erroneously 14 rays to first dorsal).—LACÉPÈDE, Hist. Nat. Poiss., etc. i, 1798, pp. 465-466; ed. ii, 1819, p. 842.—SCHNEIDER, Bloch Syst. Ichth. 1801, p. 499 (erroneously described with orbital spines).—SHAW, Gen. Zool. v, 1804, p. 422.—CUVIER, Règne Anim. ed. 1, 1817, p. 154: ed. ii, 1829, p. 375, note.—KAUP, Arch. für Naturg. 1855, p. 218 (a quoted name: Kaup did not profess to have examples).—HOLLARD, Ann. Sci. Nat. vii, 1856, p. 150.—GÜNTHER, Cat. Fish Brit. Mus. viii, 1870, p. 256.

Ostracion trigonum, POEY, Mem. sob. Hist. Nat. Cuba, ii, 1861, p. 362.

Lactophrys trigonus, SWAINSON, Nat. Hist. Fish, Rept. and Amphib. 1839, ii, p. 324, fig. 102.—POEY, Enum. Pisc. Cubens. 1876, p. 174.

Ostracion Yulci, STORER, Bost. Journ. Nat. Hist. i, 1837, p. 353, pl. viii.

Lactophrys Yulci, DEKAY, Zool. N. Y. Fishes, 1842, p. 362.—STORER, Mem. Am. Acad. Sci. viii, 1861, p. 429, pl. xxxv, fig. 3; Hist. Fish Mass. 1867, p. 429, pl. xxv, fig. 3.

Lactophrys oriceps, KAUP, l. c.

Ostracion (Lactophrys) undulatus, POEY, Rep. Fis. Nat. Cuba, ii, 1868, p. 441 (a specific name founded solely on color).

Lactophrys undulatus, POEY, Enum. Pisc. Cubens. 1876, p. 176.

Ostracion expansum, COPE, Trans. Amer. Phil. Soc. 1870, p. 474, figs. 9, 10.

Piscis triangularis clusii, cornibus carvens, LISTER, in App. Willughby, Hist. Pisc. 1686, p. 156.—RAY, Syn. Method. Pisc. 1713, p. 44.

Ostracion triangulatus, limbis figurarum hexagonarum eminentibus, aculeis duobus in imo ventre, ARTEDI, Gen. Pisc. 1738, p. 56, No. 7.

Ostracion triangulatus, limbis figurarum hexagonam eminentibus, aculeis duobus in imo ventre, ARTEDI, Syn. Pisc. 1738, p. 85, No. 11.

Ostracion polyodon tetragonus, abdomine pone bicorni, LINNÆUS, Iter Scand. p. 160.

Species dubia an Lactophrys trigonus? POEY, Rep. Fis. Nat. Cuba, ii, 1868, p. 441.

Chapin, PARRA, Desc. Dif. Piez. Hist. Nat. Cuba, 1787, p. 31, pl. xvii, fig. i, vide POEY, Proc. Acad. Nat. Sci. Phila. 1863, p. 183.

L'Ostracion triangulo-tuberculé, BONNATERRE, Encyc. Method. 1788, p. 21, pl. xiii.

Chapin, Cuba. *Trunk-fish*, Jamaica.

DISTRIBUTION.

St. Croix (Günther).

Jamaica (Günther).

Bermuda (Goode).

Cuba (Poey, National Museum).

Holmes Hole, Mass. (Storer).

Chesapeake Bay, October, 1877 (Lugger).

Barbados (Schomburgk).

St. Martins (Cope).

Tortugas (National Museum).

Bahia (Günther).

Bahamas (National Museum).

Ostracions, with triangular carapace, provided with a flat, conspicuous spine on each abdominal ridge, which is itself sharp and prominent.

Hollard claims that *Ostracion trigonus* is one of the largest, if not the largest, as was claimed by Artedi,* of the triangular species, and gives the following measurements of one of the specimens studied by him :

	M.
Total length	0.460
Greatest height.....	0.150
Greatest width (in abdominal region).....	0.135
Length of cephalic region	0.180
Length of tail-stem	0.100
Caudal	0.060
Largest diameter of lateral scutes.....	0.028

The largest specimen obtained by me in the Bermudas did not exceed 350 millimetres in length.

Linnaeus in his *Systema Naturæ*, edition tenth, attributed to this species fourteen dorsal rays, an error which, as Hollard has pointed out, has been copied and recopied by ichthyological writers down to the present day.

Kaup (l. c.) described the species anew under the name *Ostracion oviceps*. He appears not to have recognized any of the specimens studied by him as belonging to *O. trigonus*, the characters of which were totally misapprehended by him. His description of *O. oviceps* corresponds to the characters of *O. trigonus*,† while the radial formula, the only characters given by him for *O. trigonus*, are imaginary and do not apply to any fish known to exist. The formula for the dorsal perpetuates the Linnaean error already referred to; that for the caudal was probably made out from mutilated specimens. Hollard, who worked over the collections in the Paris Museum the year subsequent to the publication of Kaup's Memoir, states that he found certain specimens of *O. trigonus* which had been labeled with the name *O. oviceps* by Dr. Kaup, while others precisely like them had been left with the identification *O. trigonus*. This signifies little, however, for no good characters have ever been given for the proposed new species.

The color of living individuals of *Ostracion trigonus* is a uniform brown, with numerous irregularly grouped whitish spots, more abundant on the caudal stem than elsewhere. The fins are lighter than the body. Young specimens have a subcircular blackish blotch upon the side behind the gill-opening.

This species probably breeds in the Bermudas. I obtained three specimens ranging in length from 1 inch to 12 inches, though I was not so fortunate as to secure young of any other species of the genus.

* "Maximus est ex triangulatis," ARTEDI, Gen. Pisc. p. 57.

† Profil des Kopfes convex und plötzlich herabsteigend. Der lange Schwanz blau gefleckt oder einfarbig mit einem Hornschild auf der Wurzel nächst dem Panzer. Der Rücken hinter den erhöhten Augenkreisen begumend- Schwanzflosse gegabelt :

Trigonus, P. 10, D. 14, A. 9, C. 7. *

Oviceps, P. 12, D. 10, A. 10, C. 10. Kaup, l. c.

Lacépède and Hollard speak of the power of making audible sounds attributed to this species by travellers, and which had gained for it the name *cochon de mer*. I have never had one of them in captivity, but have often observed the same habit in *Ostracion triquetrum*, which utters frequent and audible grunting sounds when taken from the water. These sounds are similar to those made by several members of the family Tetodontidae, familiar to every collector of fishes on the Atlantic coast of the United States.

OSTRACION QUADRICORNIS, Linnæus.

- Ostracion quadricornis*, LINN. Syst. Nat. ed. x, 1758, i, p. 331; ed. xii, 1766, i, p. 408.—BLOCH, Ansl. Fische Ichth. iv, 1787, p. 113, pl. cxxxiv.—GMELIN, Linn. Syst. Nat. 1788, i, p. 1442.—LACÉPÈDE, op. cit. i, 1798, pp. 442, 468; ed. ii, 1819, ii, p. 343, pl. xv, fig. 2.—SCHNEIDER, Bloch Syst. Ichth. 1801, p. 499.—SHAW, Gen. Zool. v, 1804, p. 424.—CUVIER, Règne Animal, ed. i, 1817, p. 154; ed. ii, 1829, p. 375.—KAUP, Arch. für Naturg. xxi, 1855, p. 218.—HOLLARD, Ann. Sci. Nat. 1857, p. 148.—BLEEKER, Poiss. Guinée, 1863, p. 20.—GÜNTHER, Cat. Fish Brit. Mus. viii, 1870, p. 258.
- Ostracion quadricorne*, POEY, Mem. Hist. Nat. Cuba, ii, 1861, p. 362.
- Ostracion quadricorne*, COPE, Trans. Amer. Phil. Soc. 1870, p. 474.—GOODE, Cat. Fish Bermudas, 1876, p. 24; Amer. Journ. Sci. and Arts, 1877, p. 290.
- Ostracion (Acanthostracion) quadricornis*, BLEEKER, Atlas Ichthyologique, 1865, p. 32.
- Ostracion (Acanthostracion) quadricorne*, POEY, Rep. Fis. Nat. Cuba, ii, 1868, p. 439.
- Acanthostracion quadricorne*, POEY, Enum. Pisc. Cubensium, 1876, p. 174.
- Lactophrys quadricornis*, SWAINSON, Hist. Nat. Fish and Rept. 1839, ii, p. 324.
- Ostracion tricornis*, LINN. fide Bleeker, Ned. Tyds. Dierk. ii, p. 298.—LACÉPÈDE, op. cit. i, 1798, p. 435; ed. ii, 1819, ii, p. 342, pl. xv, fig. 1.
- Ostracion Listeri*, LACÉPÈDE, Hist. Nat. Poiss. i, 1798, p. 468, pl. xxxiii, fig. 2 ("cop. Willughby") ed. ii, 1819, ii, p. 343.
- Ostracion sex-cornutus*, MITCHILL, Amer. Month. Mag. ii, 1818, p. 328 (desc. of spec. from Gulf of Mexico near mouth of Mississippi River).
- Lactophrys sex-cornutus*, STORER, Mem. Amer. Acad. ii, p. 498; Syn. 1846, p. 246.
- Ostracion cornutus* (not Bl. or Linn.), MÜLL. and TROSCHE, in Schonburgk, Hist. Barbados. 1848, p. 677.
- Ostracion guineensis*, BLEEKER, Ned. Tyds. Dierk. ii, p. 298 (ou young individual).
- Ostracion Gronorii*, BLEEKER, l. c.
- Ostracion maculatus*, HOLLARD, op. cit. p. 149.
- Species dubia an Acanthostracion maculatum*, POEY, Rep. Fis. Nat. Cuba, ii, 1868, p. 439.
- Species dubia an Acanth. quadricorne mas*, POEY, Rep. Fis. Nat. Cuba, ii, p. 439.
- Acanthostracion polygonius*, POEY, Enum. Pisc. Cubens. 1876, p. 175.
- Quamajace apé*, MARCGRAVE, Hist. de Brasil, 1648, iv, p. 142 (fide CASTELNAU, l. c. p. 99).
- "*Guamaiaçu*, JONSTON, Pisc. tab. xxxvi, fig. 3, tab. xlv, sup. fig. 6," fide Bleeker.
- "*Piscis triangularis cornutus clusii*, WILLUGHBY, Hist. Pisc. 1686, xiv, tab. J."
- Piscis triangulus clusii cornutus*, RAY, Syn. Method. Pisc. 1713, p. 44.
- Ostracion triangulatus 2 aculeis in fronte et totidem in imo ventre*, ARTEDI, Syn. Pisc. 1738, p. 85, No. 9; Genera Piscium, 1738, p. 56, No. 5.
- Toro, PARRA, Desc. Dif. Piez. Hist. Nat. Cuba, ii, 1787, p. 81, pl. xvii, fig. 2.
- Piscis triangularis capite cornutus cui e media cauda cutacea aculeus longus erigitus*, LISTER, in App. Willughby, op. cit. p. 19.—RAY, l. c.
- Ostracion triangulatus, aculeis duobus in capite et unico longiore superne ad caudam*, ARTEDI, l. c. No. 10, Gen. Pisc. p. 56, No. 6.
- "*Piscis triangularis maxime cornutus squamis hexagonis et radiatis donatus*, LISTER, l. c. p. 15," fide Bleeker.

- Crayracina triangularis duobus cornibus curtis in fronte, etc.* KLEIN, Misc. iii, p. 21.
Coffre triangulaire à quatre épines, BONNATERRE, p. 21, pl. xiii, fig. 43.
Toro, Cuba (Anglice "Bull").
Cow-fish, Bermudas.
Cuckold, Jamaica.
Cuckold-fish, BLOCH, Ansl. Fische, p. 21, pl. xiii, fig. 43.

DISTRIBUTION.

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| St. Croix (Cope). | Tortugas (National Museum). |
| St. Martins (Cope). | Cape Florida (National Museum). |
| Bahamas (Cope). | Charlotte Harbor (National Museum). |
| Barbados (Schomburgk). | Pensacola (National Museum). |
| Jamaica (Günther, National Museum). | Mississippi (National Museum). |
| Santo Domingo (Günther). | South Carolina (National Museum). |
| Bahia (Günther, Castelnau). | West Africa (Bleeker). |
| Cuba (Poey, National Museum). | Indian Archipelago (Bleeker). |
| Near mouth of Miss. R. (Mitchill, 1818). | Cape of Good Hope (Bleeker). |
| Chesapeake Bay (Lugger). | |

Ostracions, with triangular carapace approaching to pentagonal form in adults, to tetragonal in young, by reason of extension of base of frontal spines, ventral surface plane, angles obtusely carinate, and with two ventral and two horizontal frontal spines. Color brown, yellow, blue or green, the centres of the scutes often lighter than the margins.

The range of the Cow-fish is much more extended than that of any of the preceding species, including St. Helena, Guinea, the Cape of Good Hope, and Charleston, S. C. A specimen was obtained October 11, 1877, near Gwyn's Island, Chesapeake Bay, by Mr. Otto Lugger. These localities are well authenticated, and the species is also claimed as a member of the fauna of the Indian Ocean. A sketch of *Ostracion quadricorne* by Burkhardt, marked "Mobile, 1853," is in the Agassiz collection. The sketch is also endorsed with a memorandum to the effect that a specimen from Florida was living in Aquarial Garden, Boston, 1860.

Bleeker admits this species to the fauna of the Dutch East Indies, but states expressly that he has never found it, and that he follows the authority of Bennett and Raffles, and that it is uncertain whether it really inhabits the Indian Archipelago.

I have never seen more than one species of this type, and the synonymy at the head of this notice expresses the views of the majority of ichthyologists as well as my own. It seems only fair, however, to quote the opinion of Dr. Bleeker. "It appears to me very evident," wrote he, "that there are at least five species of triangular (or rather pentagonal) *Ostracions* with frontal and preanal spines. Of these this (*O. quadricornis*) is the one longest known, and may be easily distinguished by the nearly vertical profile of the head as well as by the strong spine which terminates the postero-superior dorsal plate. The other species resembling *quadricornis* are *Ostracion notacanthus*, Bleeker, *Ostracion tricornis*, L. (= *Ostracion maculatus*, Hollard), *Ostracion Gronovii*, Bleeker, and *Ostracion guineensis*, Bleeker, but none of these exhibits the remarkable character of the postero-superior dorsal angle developed into a spine. *Ostracion notacanthus* is characterized by the presence of a

spine upon the dorsal crest, by its oblique profile, and by the hexagonal or irregular black ring with large yellowish centre which is plainly visible upon each plate of the back and the flanks; while *Ostracion Gronovii* is easily recognized by the greater length of the frontal and preanal spines, by the absence of the median dorsal spine, and by the very oblique profile of the snout. *Ostracion tricornis*, Linn., which appears to be identical with the species described by Hollard as *Ostracion maculatus*, is marked by its nearly vertical profile and by longitudinal brown bands upon the cheeks. *Ostracion guineensis* is marked by the subvertical profile of *O. tricornis*, but has cheeks without bands, and the plates of the carapace ornamented with a central ocella of pearl color or blue.*

The largest specimens, or the two types *O. quadricornis* and "*O. maculatus*," in the Paris Museum, had, according to Hollard, the following dimensions:

	<i>O. quadricornis.</i>	<i>O. maculatus.</i>
	M.	M.
Total length	0.400	0.390
Height	0.150*	0.120
Cephalic region	0.065	0.050
Tail-stem	0.060	0.080
Caudal	0.080	0.080
Abdominal width	0.090	

The presence of plates upon the caudal peduncle is apparently accidental. They may possibly have some relation to sex, but certainly none to age. Out of fourteen specimens examined five had plates above and below, one had two above, and six had none. In none of the specimens can I distinguish traces of the spine in the middle of the dorsal ridge mentioned by Dr. Günther. The color of young specimens is well described by Günther; the bands on the cheek are, however, of a bright blue. Adult specimens are colored in a rich bright blue or green, lighter in the centre of each hexagonal plate, giving the appearance of annular markings, which quickly vanishes after death. In some individuals the color is worn from the ridges of the carapace, leaving patches of light brown. Bleeker claimed for his species *Ostracion notacanthus* a peculiar system of coloration, but it is in nowise different from that of the ordinary type of *O. quadricornis*.† The largest specimens are 21 inches long.

In the Bermudas the Cow-fish is, I was told, much esteemed for food, and is frequently baked whole in its shell. The popular name, like the Cuban "*toro*" and the Jamaican "*cuckold*," refers to the two horn-like supraorbital spines.

* Misprinted 0.015.

† "Mais en outre le système de coloration de l'espèce que je crois nouvelle est très différent, chaque bouclier de la tête, du dos et des flancs étant orné d'un anneau violet ou noirâtre d'une forme hexagone, pentagone, quadrangulaire ou même ronde, et à centre large orange ou rougeâtre. On ne voit rien de pareil sur le corps du quadricornis. Puis encore, la queue est brunâtre et a taches jaunâtres et les pectorales ont un rayon de plus. Je nomme cette espèce nouvelle *Ostracion notacanthus*."—Mémoire sur le Poissons de la Côte de Guinée par P. Bleeker, p. 21.

OSTRACION QUADRICORNIS, LINN., SUBSP. NOTACANTHUS, (BLEEKER.)

Ostracion notacanthus, BLEEKER, Poiss. Guinée, 1863, p. 21 (St. Helena); Ned. Tyds. Dierk., ii, p. 298, et alibi.

This form, whose relations to *O. quadricornis* are discussed above, p. 267, p. 270, and p. 280, is recorded only from St. Helena. It will only be entitled to subspecific rank if in future it be shown that the dorsal median spine, sometimes observed in the young, remains persistent in the adult.

OSTRACION TURRITUS, Forskaol.

? *Ostracion gibbosus*, LINNÆUS, Syst. Nat. ed. x, 1758, p. 331; ed. xii, 1766, p. 409. (No description.)

Ostracion turritus, FORSKAL, Desc. Anim. Av. Amphib. Piscinum. ect. quae in itinere Orientali observavit, 1775, p. 75, No. 113.—BLOCH, "Ausl. Fische i, p. 113, pl. cxxxvi."—ICHTH. p. 117, pl. cxxxvi.—GMELIN, Linn. Syst. Nat. 1788, p. 1442.—WALBAUM, Artedi, Gen. Pisc. 1792, p. 476.—LACÉPÈDE, Hist. Nat. Poiss. ed. i, 1, 1798, p. 470.—SCHNEIDER, Bloch Syst. Ichth. 1801, p. 500.—BONNATERRE, Encyc. Method. Ichth., 1788, p. 22.—CUVIER, Règne Anim. ed. i, 1817, ii, p. 154, note; ed. ii, 1829, ii, p. 376, note; "ed. iii, Poiss. p. 346."—RUPPEL, "Reis. F. R. M. p. 5."—SWAINSON, Nat. Hist. Fish. Amphib. Rept. 1839, ii, p. 323.—HOLLARD, Ann. Sci. Nat. vii, 1856, p. 156.—BLEEKER, "V. Bat. Gen. xxiv, Bal. Ostr. p. 31; Act. Soc. Sc. Ind. N. vii, Zesde bijds. vischf. Jap. p. 13."

Ostracion (Tetrosomus) turritus, BLEEKER, Atl. Ichth. v, 1865, p. 31, pl. cciii, fig. 3.

Lactophrys camelinus, DEKAY, Zool. N. Y. Fish, 1842, p. 341, p. lviii, fig. 190.

Ostracion gibbosus, KAUP, Arch. für Naturg. Berlin, 1855, p. 218.—GÜNTHER, Cat. Fish Brit. Mus. viii, 1870, p. 258.

"*Ostracion prior* (or *alter*), ALDROVANDUS, De Piscibus, etc. (1638), iv, p. 561" ("copied by JONSTON, tab. xxv, fig. 6").

"*Ostracion alter gibbosus*, RAY, Synopsis, 1713, p. 44."

Ostracion alter gibbosus aldrovandi, WILLUGHBY, Hist. Pisc. 1686, tab. J, 9, fig. 1.

"*Crayracion triangularis gibbosus*, KLEIN, Miss. Pisc. iii, p. 20, No. 17."

Ostracion oblongo-quadrangulus gibbosus, ARTEDI, Gen. Pisc. 1738, p. 55.

Ostracion oblongus quadrangulus gibbosus, ARTEDI, Syn. Pisc. 1738, p. 83.

Ostracion dromadaire, LACÉPÈDE, op. cit.; ed. ii, 1819, p. 344.

DISTRIBUTION.

Indian Ocean and Archipelago (Günther).

I cannot follow Dr. Günther in accepting for this species the Linnæan name *Ostracion gibbosus*, since no description of this species was published by Linnæus. The first intelligible description was that by Foskaol, and although the indirect references to the figures published by Johnston, Willughby, and others, render it probable that this was the fish referred to by Linnæus, still there is no way of definitely ascertaining the meaning.

"Je crois reconnaître," wrote Bleeker,* "l'espèce actuelle dans les figures citées de Jonston, de Willughby, de Valentyn et de Renard. Celles de Jonston et de Willughby, copiées sur le même modèle, ne montrent ni l'épine frontale, ni celles de la carène ventrale, mais la grande épine dorsale y est assez bien rendus. Celles de Valentyn et de Renard, quoique grossières, ne laissent aucun doute par rapport à

* Atlas Ichthyologique, v, p. 32.

Pespèce qu'elles doivent représenter. Cependant c'est à Forskaol qu'on en doit la première description tolerable."

The diagnosis of *Limæus* in the twelfth edition of the *Systema Naturæ* is as follows :

"(Ostracion) gibbosus, 8. *O. tetragonus muticus*, gibbosus.
Art. gen. 55, syn. 83. *Ostracion quadrangulus*, gibbosus.
Habitat in Africa.
Varietatem speciei 1 credit Gronovius."

This species surely has no just claim to a place in the fauna of the United States.

De Kay inserted it in his work on the fishes of New York on very slight evidence. I quote the paragraph relating to the single specimen on which he based his description and figure :

"I know nothing of the origin of this species, except that it is said to have been taken on the shore of Long Island. It is possibly the species named *triqueter* by Dr. Smith, and which he represents as 'inhabiting the vicinity of Long Island, New York, but rarely makes its appearance so far to the north as Massachusetts, unless driven on shore by the violence of storms.' The *triqueter* of Artedi, however, has no spines. It bears a considerable resemblance to the *O. turritus* of Forskaol, from the Red Sea ; but that species is quadrangular." *op. cit.* p. 342.

There can be little doubt that the fish in De Kay's possession was a dried specimen of *O. turritus*, probably from a Chinese insect box.

Dr. Günther remarks that this species is "very closely allied to and probably identical with *O. gibbosus*" (viii, p. 259), but in his diagnosis he does not refer to any specimens intermediate in form between the two typical forms.

OSTRACION ARCUS, Schneider.

Ostracion arcus, SCHNEIDER, Bloch Syst. Ichth. 1801, p. 502 (citing Seba's figure).

Ostracion (Acanthostracion) arcus, BLEEKER, Atlas Ichthyologique, v, 1865, pp. 35-36, tab. ccii, fig. 3 (adult); cciv, fig. 4 (young), et alibi.

Ostracion cornutus, BLOCH (nec Linnaeus), Ansl. Fische, i, p. 105, pl. cxxxix.—BONNATERRE, Tabl. Encyclop. et Method. etc. Ichth. 1788, p. 22, pl. xiv, fig. 44.—LACÉPÈDE, Hist. Nat. Poiss. i, 1798, p. 470.—SCHNEIDER, l. c. p. 500 (?).—SHAW, Gen. Zool. v, 1803, p. 223, pl. clxx.—CUVIER, Règne Anim. 1 ed. 1817, ii, p. 154; 2d ed. 1829, p. 376, note; "3d ed. Poiss. p. 346."—"BENNETT, Life of Raffles, 1830, p. 693."—RICHARDSON, Rep. 15th Meeting Brit. Assoc.; Rep. Ichth. China and Japan, 1846, p. 200.

DISTRIBUTION.

Indian Ocean and Archipelago (Günther).

Micronesia (Günther).

Professor Gill, in his unpublished Bibliography of the Fishes of the West Coast of North America (p. 17), remarks that "a young specimen

(3½ inches long) of this species, dried, was sent (to him for identification) by Dr. Cooper, in behalf of the Geological Survey of the State of California, as having been given to them with the information that it had been obtained in the State." He notes that the appearance of the specimen led him to believe that it came from China, and in this opinion I would fully coincide, having carefully examined it. The species is provisionally included in this list. At some future time individuals may stray into our Pacific waters.

NOVEMBER 11, 1879.

ON THE HABITS OF THE ROCKY MOUNTAIN GOAT.

By DR. JAMES C. MERRILL, U. S. A.

FORT SHAW, MONTANA, *October 21, 1879.*

Professor S. F. BAIRD,

MY DEAR SIR: Since I last wrote to you I have passed two months at Fort Missoula, on the eastern limit of the Bitter-Root Range, and while there, finding that the wild goat was comparatively abundant, I made several attempts to obtain a skin and skeleton for the Smithsonian. I hunted them myself for two weeks, but unsuccessfully, only seeing one, and that I did not obtain. At that season they are in the highest and roughest peaks near and among snow, but in the winter come down to the lower slopes and valleys.

You may be interested in the following items concerning this species, which I obtained from trustworthy sources:

Accounts vary as to the *rutting* season and time of dropping the kids, but agree in the latter being two in number. During the summer the male, female, and kids keep together and until the appearance of the next young, though during the winter two or three of these families unite. At this season it is unusual to see more than a dozen together, though large bands are said to have been seen. The goats in all their movements are heavy and slow. They are most successfully hunted with dogs; when started by them they generally climb up the nearest rock and stand them off; and while so doing are easily approached and shot. When wounded and in close quarters they are rather dangerous, and are apt to use their horns with effect. They feed at sunrise and sunset, passing the day on some smooth flat rock in the sun, from which they can keep a good lookout, but rarely start until closely approached. The one I saw was among large masses of rock above snow-line. He got up within thirty yards of me, stood in full view for a moment, and then walked slowly off, almost hidden by the rocks. At first, though so near, I took him for an albino bear (and several old hunters told me they had made the same mistake!!); his large size, slow, heavy movements, and manner of looking back over the shoulder, with the absence of fear, being very different from my preconceived notions of the "white

goat." I very soon saw my error, but not liking to risk a snap shot, tried to head the animal off, but without success. The tracks are enormous for the size of the animal. I found many of their dusting places. The earth is pawed up until quite a depression is formed, in which they roll and lie by the hour. They are somewhat like those of the bighorn, but the numerous very long white hairs left in the dust show the presence of the goat. I spoke to my guide (Charles McWhirk, Corvallis, near Missoula, Montana,) about getting some skins and skeletons this winter, and he said he would do so if any one "made it worth his while." If you desire them I think you had better write to him personally about it. I tried to explain to him how the skins should be prepared. According to the recent order of the War Department he can turn them over to the quartermaster at Fort Missoula, forty-five miles distant, for shipment to the National Museum.

This account is not so complete as I could wish, but I send it as better than none, as the goat is so little known. What I have written applies to their habits in the Bitter-Root Range. They are also found rather plentifully in the main range of the Rockies near Flathead Lake. Several have been caught alive, and the Indians sometimes bring in the kids, but the latter soon die.

Nothing of special ornithological interest here now, but the winter fauna in this latitude will be worthy of study.

Very truly, yours,

JAMES C. MERRILL.

NOTES ON A COLLECTION OF FISHES FROM EASTERN GEORGIA.

By TARLETON H. BEAN.

The United States National Museum received, December 15, 1879, from Mr. A. Graves, postmaster at McBean, Ga., five species of fresh-water fishes, one of which is here described as new to science. Mr. Graves writes that the fishes were collected in McBean Creek, which "is the dividing line between Burke and Richmond Counties, and is within two hundred yards of McBean Station, on Augusta and Savannah Railroad. It empties into the Savannah River, about seven miles from this station." The local names are those transmitted by Mr. Graves. The species of *Centrarchidae* have all been previously recorded by Prof. D. S. Jordan, from Georgia.

1. *Chænobryttus gulosus* (C. & V.) Gill.—"Warm Mouth Perch"; "Yaw Mouth Perch".

23509 *a.* D. IX, 11; A. III, 9.

23509 *b.* D. X, 10; A. III, 9.

The first ventral ray, the tips of the anal, caudal, and dorsal rays, and of the membranes between the dorsal spines are crimson. Speci-

men 23509 *a* has a crimson spot half as long as the eye on the sheath under the last four dorsal rays. The pectorals of both examples are yellow.

2. *Xystroplites heros* (B. & G.) Jor.—“Bream”.

23510 *a*. D. X, 10; A. III, 10. (Soft dorsal injured.)

23510 *b*. D. X, 12; A. III, 11.

23510 *c*. D. X, 12; A. III, 12.

23510 *d*. D. X, 12; A. III, 12.

These agree with the types of *Pomotis heros* B. & G.

3. *Xenotis sanguinolentus* (Ag.) Jor.—“Red-belly Perch”.

23511 *a*. D. X, 11; A. III, 10.

23511 *b*. D. X, 11; A. III, 10.

23511 *c*. D. X, 12; A. III, 11.

23511 *d*. D. X, 11; A. III, 10.

The throat, the breast, and the belly are orange red; the soft dorsal and the anal have a narrow margin of the same color; the external caudal rays are tipped with the same. The pectorals are yellow. The sides are indistinctly banded with black.

4. *Esox americanus* Gmel.—“Pike”.

23512. B. XII; D. III, 12; A. IV, 10.

Length, $7\frac{3}{10}$ inches (186 millimeters).

All the fins are yellow. The skin covering the dorsal and caudal rays, however, is blackish.

5. *Hudsonius euryopa* sp. nov.

Teeth 1, 4-4, 1, with a narrow grinding surface on the first two of the long series.

23513 *a*. D. III, 7; A. II, 7; V. I, 7; P. I, 13; C. +, 19, +; L. lat. 38; L. trans. 6 + 5.

23513 *b*. D. III, 7; A. II, 6; V. I, 7; P. I, 13; C. +, 19, +; L. lat. 38; L. trans. 6 + 5.

The greatest height of the body equals the length of the longest dorsal ray; it is slightly less than the length of the head, and is contained in the length of body, without caudal, 5 times. The length of the head is contained 4 to $4\frac{1}{2}$ times in the same. In specimen 23513 *a* the length of the pectoral equals the greatest height of the body; in specimen 23513 *b* it equals the length of the head without the snout. The long diameter of the eye equals $\frac{1}{3}$ of the length of the head. The length of the ventral is contained 6 to $6\frac{1}{2}$ times in length of body without caudal. The distance of the origin of the dorsal from the snout equals twice the length of the head, and equals the distance of the ventral from the snout. The longest anal ray equals in length the longest ventral ray. The length of the anal basis equals $\frac{1}{2}$ the greatest height of the body. The length of the upper jaw equals the short

diameter of the eye. The length of the lower jaw and that of the post-orbital portion of the head are equal. There is a black lateral band following the course of the lateral line and continued around the nose, most distinct in the young specimen.

UNITED STATES NATIONAL MUSEUM,
Washington, December 18, 1879.

**DESCRIPTION OF A NEW SPECIES OF AMIURUS (A. PONDEROSUS)
FROM THE MISSISSIPPI RIVER.**

By TARLETON H. BEAN.

The United States National Museum received from Dr. J. G. W. Steedman, of Saint Louis, Mo., chairman of the Missouri Fish Commission, on the 8th of November, 1879, a Catfish which weighed 150 pounds at the time of shipment. After comparing this with the other described species of *Amiurus* I am unable to identify it with any of them. The most distinguishing character of the species is its many-rayed anal, in which it resembles *Ichthalurus* rather than *Amiurus*, though it has the skull-structure of the latter.

The specimen which forms the type of the present description was sent at the request of Prof. Spencer F. Baird, United States Commissioner of Fish and Fisheries, to whom Dr. Steedman wrote the following information: "Your letter requesting the shipment to you of a large Mississippi Catfish was received this morning. Upon visiting our market this P. M. I luckily found two—one of 144 lbs., the other 150 lbs. The latter I ship to you to-night by express. . . . I purchased it from an old fish-dealer of 30 years' experience in our market; and he assures me that the largest Mississippi Catfish he has met in that time weighed 198 pounds. (He says he has *heard* of Catfish weighing 250 and 300 pounds, but he does not believe the stories.) This is the only variety, he says, which reaches 100 lbs. There is another species which sometimes attains 65 lbs. in weight. My informant (and he is *practical* authority among us) enumerates six well-marked varieties of Catfish in the Mississippi waters. . . ."

The admission of this species into the genus *Amiurus* will necessitate a modification of the definition of the genus so far as the limits of variation in the anal rays are concerned; and will leave only the lack of contiguity between the supra-occipital and the second interspinal to distinguish *Amiurus* from *Ichthalurus*. A plaster cast and the skeleton of the type are preserved.

DESCRIPTION.—The catalogue number of the type is 23388; its length, to the origin of the middle caudal rays, is 57.2 inches, to the end of the same rays, 61 inches. The distance from the middle of the base of the caudal to the end of the upper caudal lobe is 8 inches.

The shape of the body resembles that of *A. nigricans*; the caudal, however, is emarginate and not deeply forked as in that species.

In the description and table of measurements the length of body is to be understood to mean the length to the origin of the middle caudal rays—57.2 inches.

The greatest height of the body (.29) is contained $3\frac{1}{2}$ times in its length, and equals twice the length of the external caudal rays (.14). Its greatest width (.18) is contained $5\frac{1}{2}$ times in length of body, and equals $\frac{2}{3}$ of the length of the head (.27). The height of the body at the ventrals (.29) equals the greatest height. The least height of the tail (.084) equals the length of the snout (.084), which is contained $3\frac{1}{4}$ times in the length of the head. The length of the caudal peduncle (.16) equals twice its least height.

The length of the head (.27) is contained $2\frac{2}{3}$ times in length of body, and equals 3 times that of the ventral (.09). The width of the mouth (.168) equals twice the length of the snout (.084), and is contained 6 times in length of body. The extent of the intermaxillary band of teeth (.106) nearly equals the distance from the snout to the orbit (.108). The greatest width of the head (.22) equals $\frac{4}{5}$ of its greatest length. The distance between the eyes (.15) is slightly more than half the length of the head, and equals the length of the mandible (.15). The length of the intermaxillary (.108) equals the distance from the snout to the orbit (.108), and is contained $2\frac{1}{2}$ times in the length of the head. The length of the maxillary barbel of the right side (.16) equals that of the caudal peduncle, and nearly equals the width of the mouth. The remaining barbels except the nasal are too imperfect to admit of description. The distance from the lower nostril to the eye (.06) equals 4 times the long diameter of the eye (.015). The distance from the upper nostril to the eye (.056) is contained slightly more than $4\frac{1}{2}$ times in the length of the head.

The distance of the first dorsal from the snout (.365) is contained $2\frac{2}{3}$ times in length of body, and equals 3 times the length of its first ray (.122). The length of the first dorsal base (.082) nearly equals that of the snout. The length of the dorsal spine (.105) is contained $2\frac{1}{2}$ times in that of the head. The length of the last dorsal ray (.05) equals $\frac{1}{3}$ of the distance between the eyes.

The distance of the adipose dorsal from the snout (.81) equals nearly 3 times the length of the head. Its length of base (.043) is contained 6 times in the distance of the pectoral from the snout (.26). Its greatest height (.06) equals the distance between the lower nostril and the eye (.06), and is contained $4\frac{1}{2}$ times in the length of the head.

The distance of the anal from the snout (.67) is contained $1\frac{1}{2}$ times in length of body, and equals 3 times the greatest width of the head; its distance from the anus (.035) is contained 3 times in the length of the dorsal spine, and 8 times in that of the head. The length of the anal base (.26) equals the distance of the pectoral from the snout (.26), and

is contained $3\frac{1}{5}$ times in length of body. The length of the first anal ray (.01) is contained 8 times in the least height of tail. The ninth and longest anal ray (.077) is nearly as long as the base of the first dorsal (.08). The length of the last anal ray (.033) equals $\frac{1}{2}$ that of the middle caudal rays (.066), which is contained 15 times in the length of body.

The proportion between the middle and external caudal rays (.14) is as $3\frac{1}{2}$ to 8, both being measured from the middle of the origin of the middle caudal rays. The length of the external caudal rays is contained 7 times, and of the middle caudal rays, 15 times in the length of body.

The distance of the pectoral from the snout (.26) is somewhat more than twice the length of the pectoral (.125).

The distance of the ventral from the snout (.56) equals 4 times the length of the external caudal rays. The length of the ventral equals $\frac{1}{3}$ of the length of the head and $\frac{1}{11}$ of the length of body.

Radial formula: B. VIII; D. II, 6; A. III, 32; P. I, 11; V. I, 7.

Color:—Upper part of body and head bluish slate; lower parts whitish.

The length of the ovaries is 17 inches, and the weight 5 pounds avoirdupois. The diameter of the eggs is from $\frac{1}{12}$ to $\frac{1}{10}$ of an inch. They are not readily separable and are apparently far from maturity.

Amiurus ponderosus differs considerably from *A. nigricans* as will be seen in the measurement tables. *A. ponderosus* has (1) a deeper body; (2) a much wider mouth; (3) a wider interorbital space; (4) the intermaxillary and the intermaxillary band of teeth longer; (5) the maxillary barbel only $\frac{2}{3}$ as long as the head instead of $\frac{6}{7}$ as in *nigricans*; (6) the long diameter of the eye contained $17\frac{1}{2}$ times in the length of the head instead of 9 to 11 as in *nigricans*; (7) the first ray of the dorsal less than $\frac{1}{2}$ as long as the head; (8) the longest anal ray less than $\frac{1}{3}$ as long as the head; (9) the caudal rays shorter and the caudal not forked; (10) the pectoral considerably less than $\frac{1}{2}$ as long as the head (more than $\frac{1}{2}$ in *A. nigricans*); (11) the ventral contained 3 times in length of head ($2\frac{1}{4}$ in *A. nigricans*); (12) anal rays, III, 32.

Table of measurements.

Species: *Amiurus ponderosus*.

Current number of specimen	23388 ♀.		
Locality	Mississippi River, near Saint Louis, Mo.		
	Inches and 10ths.	100ths of length without caudal.	Times in length of body.
Length to origin of middle caudal rays	57.2		
Length to end of middle caudal rays	61.0		
Body:			
Greatest height	16.7	29.00	3½
Greatest width	10.5	18.00	5½
Height at ventrals	16.6	29.00	3½
Least height of tail	4.8	8.39	12
Length of caudal peduncle	9.3	16.00	6½
Head:			
Greatest length	15.7	27.44	3½
Width of mouth	9.6	16.78	6
Greatest width	12.5	21.85	4½
Width of interorbital area	8.6	15.00	6½
Length of snout	4.8	8.39	12
Extent of intermaxillary band of teeth	6.1	10.66	9½
Extent of intermaxillaries	6.2	10.84	9½
Length of right maxillary barbel	9.3	16.00	6½
Length of mandible	8.5	15.00	6½
Distance from lower nostril to eye	3.5	6.11	4½ (in head).
Distance from snout to orbit	6.2	10.84	9½
Distance from upper nostril to eye	3.2	5.59	4½ (in head).
Diameter of orbit .....	.9	1.57	17½ (in head).
Dorsal (first):			
Distance from snout	20.9	36.54	23½
Length of base	4.7	8.21	12½
Length of first spine	6.0	10.49	9½
Length of first ray	7.0	12.23	8
Length of last ray	2.8	5.00	20
Dorsal (adipose):			
Length of base	2.5	4.37	23
Distance from snout	46.4	81.11	1½
Greatest height	3.5	6.11	4½ (in head).
Anal:			
Distance from snout	38.4	67.00	13½
Distance from anus	2.0	3.49	8 (in head).
Length of base	15.0	26.22	3½
Length of first ray .....	.6	1.05	26 (in head).
Length of longest ray (9th)	4.4	7.69	13
Length of last ray	1.9	3.32	8½ (in head).
Caudal:			
Length of middle rays	3.8	6.04	15
Length of external rays	8.0	14.00	7
Pectoral:			
Distance from snout	15.0	26.22	3½
Length	7.2	12.58	8
Ventral:			
Distance from snout	32.0	56.00	1½
Length	5.2	9.09	11
Branchiostegals	VIII		
Dorsal	II, 6		
Anal	III, 32		
Pectoral	I, 11		
Ventral	I, 7		

Table of measurements.

Species: *Amiurus nigricans*.

Current number of specimen..... Locality	19092. Saint John's River, Florida. G. B. Goode.		20802. (Skin.) Normal, Illi- nois.		11116. (Skin.) Sandusky, Ohio.		11117. (Skin.) Sandusky, Ohio.	
	Inches and 10ths.	100ths of length without caudal.	Inches and 10ths.	100ths of length without caudal.	Inches and 10ths.	100ths of length without caudal.	Inches and 10ths.	100ths of length without caudal.
Length to origin of middle caudal rays	18.5							
Length to end of middle caudal rays	20							
Body:								
Greatest height		.25						
Height at ventrals		.24						
Least height of tail		.09						
Length of caudal peduncle		16½						
Head:								
Greatest length		27	7.7		7.3		7.8	
Width of mouth		11½						
Greatest width		20						
Width of interorbital area		12½						
Length of snout		10						
Extent of intermaxillary band of teeth		7½	2.5		2.3		2.5	
Extent of intermaxillaries		8½						
Length of left maxillary barbel		21½	*		*		*	
Length of mandible		14	6.6		6.4		6.3	
Distance from lower nostril to eye		7						
Distance from snout to orbit		11½						
Distance from upper nostril to eye		5						
Diameter of orbit		3	.7		.75		.8	
Dorsal (first):								
Distance from snout		37½						
Length of base		8						
Length of first spine		10½						
Length of first ray		15½	4		4		4	
Length of last ray		6						
Dorsal (adipose):								
Length of base		6½						
Distance from snout		78½						
Greatest height		7½						
Anal:								
Distance from snout		63½						
Distance from anus		4½						
Length of base		20½						
Length of first ray		13½						
Length of longest ray		11½	3.3				3.5	
Length of last ray		4½						
Caudal:								
Length of middle rays		8½						
Length of external rays	3.6	20						
Pectoral:								
Distance from snout		24						
Length		16½	4.1		4.1		4.3	
Ventral:								
Distance from snout		52						
Length		12						
Branchiostegals	VIII							
Dorsal	II, 6		II, 6					
Anal	III, 23		III, 24		III, 23		III, 25	
Pectoral	I, 10		I, 9					
Ventral	I, 7		I, 7					

* Extends beyond end of head.

NOTE ON *ENDOTHYRA ORNATA*.

By C. A. WHITE.

Among the fossils obtained by Prof. O. St. John from the Carboniferous strata of the region of the Téton Mountains, southward from the Yellowstone National Park, are some fragments of a dark silicious limestone, adhering to the weathered surfaces of which are some small globular foraminifera. None of them are in an entirely satisfactory condition of preservation, but their internal structure is very well shown in some cases. Samples of these objects have been submitted to Mr. Henry B. Brady, F. R. S., whose labors with the foraminifera are so well known. He mentions in reply the difficulty of being absolutely sure in the determination of weathered specimens, but still thinks, without any doubt, they are samples of *Endothyra ornata* Brady. (See Brady's Monog. Carb. and Perm. Foram. p. 99, pl. vi, figs. 1-4.) The discovery of this form in that far-western region is interesting since it has hitherto been found only in England, Ireland, and Scotland. Another form of *Endothyra*, however, *E. baileyi* (= *Rotalia baileyi* Hall) is found in the lower Carboniferous strata of Indiana.

NOTE ON *CRIOCARDIUM* AND *ETHIOCARDIUM*.

By C. A. WHITE.

The subgenus *Criocardium* was proposed by Conrad to receive the shells of that section of the genus *Cardium* which bear spines upon the interspaces between the ribs. Besides the type indicated by him (*C. dumosum*) which has "long slender spines between the ribs," there are several European forms which are plainly referable to this section, among which are *C. productum* Sowerby; *C. moutonianum* d'Orb., and *C. carolinum* d'Orb. All these shells have distinct spines or tubercles, or both, occupying *all* the interspaces between the ribs; those upon the anterior and posterior portions of the valves being longer and more conspicuous than those upon the middle portion.

In adopting this subgenus Mr. Meek (U. S. Geol. Sur. Terr. vol. ix, 4to ser., p. 169) referred to *Criocardium* the *Cardium speciosum* of Meek & Hayden, supposing it to bear spines or tubercles upon its intercostal spaces. In the An. Rep. U. S. Geol. Sur. Terr. for 1877, p. 183, I took occasion to state that among numerous examples of this shell which I had examined, no trace of either spines or nodes was detected, but that in place of them the test was perforated with minute holes. Subsequent examination of portions of the shell of authentic examples, having the natural surface in a better state of preservation than any before examined, shows that these small perforations are perfect apertures through the whole substance of the test, the border of each one being distinctly

defined upon both the inner and outer surface; the margin of the apertures not being even everted or raised upon the outer surface. Moreover, these perforations exist upon the middle portion of the valve only, the greater part of the rows extending from the umbo to the basal border. In the young state, as shown on the umbo of adult shells, a lesser part of the median interspaces were thus perforated, but as the shell grew perforations were introduced into the next outer adjoining interspaces, so that fully one-half of the surface of the adult shell was occupied by them. Both the anterior and posterior portions of the surface, comprising a considerable proportion of the ribs which mark the surface, are entirely without either holes or spines, and besides the ribs, the surface is marked only by the ordinary lines and imbrications of growth.

This shell therefore differs from the typical forms of *Criocardium* in having perforations only instead of spines or nodes upon the intercostal interspaces; and in having neither spines nor perforations upon either the anterior or posterior portions of the valves, upon which portions in *Criocardium* the spines are more conspicuous than upon the median portion. These differences from *Criocardium* are certainly as great as those which separate any of the other recognized subgenera of *Cardium*, and this shell is therefore as worthy as they of subgeneric designation. I therefore propose for a section of the genus *Cardium*, of which *C. speciosum* Meek & Hayden is the type, the subgeneric name of *Ethmocardium*.

WASHINGTON, December 2, 1879.

DESCRIPTIONS OF NEW CRETACEOUS INVERTEBRATE FOSSILS FROM KANSAS AND TEXAS.

By C. A. WHITE.

Of the fossils described in this paper the two Aviculids were discovered by Prof. B. F. Mudge,* in strata of the Dakota Group, in Saline County, Kansas, and sent by him to the National Museum. The locality of these fossils is only about three miles distant from that at which he obtained a series of fossils which were described and figured in vol. ix, U. S. Geol. Surv. Terr. (4to ser.). They are all from the Dakota Group, and all evidently from the same local horizon, because at least two of the associated species are identical with two which were among those described by Mr. Meek, and just referred to.

All the remainder are from Texas, having been sent respectively by Mr. G. W. Marnoch, from Bexar County; Mr. D. H. Walker from Bell County, and Mr. S. W. Black, from Collin County. The types of all these species are now in the collections of the National Museum.

* While these pages are passing through the press the sad intelligence comes that Professor Mudge is dead. He was a sincere devotee and an intelligent interpreter of nature, and, better still, an honest man. Peace to his ashes.—C. A. W.

MOLLUSCA.

Genus OSTREA Linnæus.

Subgenus ALECTRYONIA Fischer.

Ostrea (Alectryonia) blackii (sp. nov.). Plate 4, figs. 1 and 2.

Shell irregularly subovate in marginal outline, moderately capacious, beaks small, sometimes obscure and sometimes moderately prominent. Lower valve usually moderately deep and capacious, its convexity being more prominent about the middle than elsewhere, often subalate, but this latter feature is usually obscure; scar of attachment at the beak usually present and often moderately large; ligament-area usually short and rather small, but sometimes comparatively large and laterally extended; ligament-furrow well defined and having the usual characteristics of the genus. Upper valve nearly flat and corresponding with the lower in other respects, except that it is not so broad along the hinge-border and never has there the subalations which sometimes mark the lower valve. The adductor scars are moderately large and have the form common to *Alectryonia*, namely, curved-spatulate. Surface of both valves marked by concentric lines and strong imbrications of growth, and each by a dozen or more radiating ribs or plications, which constitute a conspicuous feature of the shell; but they are usually somewhat less distinct upon the upper than upon the under valve.

Length, 68 millimeters; greatest breadth, 62 millimeters; thickness, 32 millimeters.

In form and general aspect this shell approaches that of a typical *Ostrea*; but in the character of its adductor scars, the extent of its plications, and the subalation of its cardinal border it is properly referable to *Alectryonia*. The only shell with which it need be compared is *O. bellaplicata* Shumard, also from Texas. It differs from that shell in being constantly larger, proportionally less capacious, broader toward the base, and in having its hinge-border longer and more oblique.

Position and locality.—Cretaceous strata, Collin County, Texas, where it was collected by Mr. S. W. Black, and sent by him to the Smithsonian Institution. The specific name is given in his honor.

Genus EXOZYRA Say.

Exogyra forniculata (sp. nov.). Plate 4, figs. 3 and 4.

Shell subtrihedral in lateral outline, somewhat compressed vertically. Under, or left valve thick, especially its umbonal half; beak curved strongly toward the posterior border, and in the plane of the free margins of the valve, not forming so much as one complete revolution, its point being free but closely approaching the posterior border of the valve; ligament-area irregularly triangular, moderately large, extending to the apex of the beak, its sulcus well developed; interior surface

having the usual characteristics of the genus. A faint, illy-defined sulcus is apparent on the posterior side, extending from the umbo to the basal border, between which sulcus and the laterally flattened-concave posterior border of the valve there is an equally indefinite radiating curved ridge. The anterior portion of the valve is marked by a strong angular, rough carina or ridge which extends from the beak to the basal border. The prominence of this ridge gives a flattened aspect to the outer surface of the valve, and also produces a flattened space of considerable width between it and the anterior margin. Surface marked by the ordinary coarse lines of growth, often presenting the coarse imbrications so common to the *Ostreidae*; and upon the ridges just described there are occasional nodes or vaulted projections of portions of the shell. Upper valve unknown.

Length, 70 millimeters; breadth across near the base, where it is broadest, 50 millimeters.

In general aspect this shell is much like a *Gryphæa*, but it is referred to *Exogyra* because of its laterally instead of perpendicularly curved umbo and beak. This species therefore affords additional evidence of the well-known fact that the two genera named approach each other very closely. Specifically this shell is well marked by its strong, rough angular carina, its free beak, narrow umbonal region and broad base. In these respects it differs too much from any described form to need detailed comparison. By casual observation it may be mistaken for the variety *navia* Conrad, of *Gryphæa pitcheri*; but a comparison of the beaks of the two forms will show a well-marked difference.

Position and locality.—Cretaceous strata, Bexar County, Texas, where it was collected by G. W. Marnoch, esq., together with many well-known Cretaceous species of that region.

Exogyra winchelli (sp. nov.). Plate 2, figs. 1 and 2; and plate 3, figs. 1 and 2.

Shell of medium size, irregularly subovate in marginal outline; sessile, or attached by a large part of the surface of the lower or left valve, being obliquely inclined so that the anterior border is very much higher than the posterior. Lower valve massive, moderately deep, its front side nearly perpendicular and of considerable height vertically; umbo vertically flattened continuously with the front side, and broadly curving backward; beak closely incurved under the posterior border and there concealed; ligamental groove long and narrow, occupying the whole curvature of the umbo. Upper valve nearly flat, thick; the anterior part being much thicker than the posterior; beak vertically thin or compressed, closely coiled in a plane with that of the valve, making a little more than one entire revolution. Surface marked by coarse lines of growth, and near the anterior borders of both valves, especially the upper, it is usually deeply laciniate.

Length, 90 millimeters; breadth, 66 millimeters; height in front, 55 millimeters.

This species belongs to the same section of the genus *Exogyra* with

E. haliotoidea Sowerby, sp., and *E. walkeri* White. The latter species is larger and proportionally broader than *E. winchelli*, and not properly sessile as the latter species is. *E. haliotoidea*, as figured by d'Orbigny in Pal. Française, t. iii, pl. 478, differs from *E. winchelli* in being proportionately higher in front and narrower in transverse diameter, and in not having the beaks so much incurved. *E. interrupta* Conrad, from Mississippi, also belongs to the same section, but that species is described as having radiating ribs, which ours has not.

Position and locality.—Cretaceous strata, Collin County, Texas, where it was collected and sent to the Smithsonian Institution by Mr. S. W. Black. The collections of the Institution also contain a fine example sent by Prof. A. Winchell many years ago from Prairie Bluffs, Ala., which is believed to be specifically identical with the form here described, but is proportionally more elongate, has a larger muscular scar, and the umbonal curve is a little more abrupt. The specific name is given in honor of Professor Winchell.

Genus GERVILLIA Defrance.

Gervillia mudgeana (sp. nov.). Plate 5, figs. 3 and 4.

This shell is known only by natural casts in brown hematite of the interior, and a few adhering fragments showing the character of the test. It is moderately large, laterally distorted; hinge-line comparatively long, very oblique with the axis of the shell, producing a somewhat prominent posterior alation which is not distinctly defined from the body of the shell; cartilage-pits in the area of each valve six or seven, as indicated by undulations upon the cast; beaks placed very near the anterior end, beyond which there appears to have been no distinct anterior ear; beak of the right valve more prominent than that of the other, although the right valve is less convex transversely than the left; right valve having a somewhat regular and strong longitudinal convexity; but its transverse convexity is very little in the anterior half, while its posterior half is nearly flat; left valve nearly straight, or even slightly concave longitudinally along the axis, but very strongly convex transversely in all parts of the shell, this convexity being more abrupt along the axis than elsewhere; and there is also between the axis and the hinge-margin a slightly raised, rounded fold which extends from behind the beak to the posterior margin; adductor muscular impression large and distinct in each valve. A few fragments show the surface to have been marked by the ordinary concentric lines of growth, and also that the test although firm was not massive.

The dimensions cannot be definitely given, but the largest example discovered indicates a length of at least 80 millimeters.

This shell differs too much from any of the few known Cretaceous species of the genus to need detailed comparison, but it is related to *G. subtortuosa* Meek & Hayden, which it resembles in being tortuous. It differs, however, in being a proportionally much shorter shell, in the

shape and position of the adductor scars, and in the relative position and arrangement of the cartilage-pits. It is less tortuous than *G. tortuosa* Sowerby, and its proportions are different. The relation of this species with *G. subtortuosa* is doubtless genetic, and it presents one more among other now known similar cases of evident genetic relationship between the molluscan fauna of the Dakota Group and that of the later Cretaceous groups of the West, which were formerly unknown, but which the discoveries of Professor Mudge have done more than those of all others to show.

Position and locality.—Strata of the Dakota Group, Saline County, Kansas, where it was discovered by Prof. B. F. Mudge, in whose honor the specific name is given.

Genus PTERIA Scopoli.

Subgenus OXYTOMA Meek.

Pteria (*Oxytoma*) *salinensis* (sp. nov.). Plate 5, figs. 1 and 2.

Shell rather large for a Cretaceous *Pteria*; the body, exclusive of the wings, obliquely subovate, broad at the base, moderately gibbous, distinctly but not very greatly inequivalve; the left valve, as usual, more convex than the right and its beak more prominent; the convexity of the valves somewhat uniform but increasing toward the umbonal region in each, where it is greatest; anterior wing moderately large, defined from the body of the shell by being laterally compressed, but not by any distinct auricular furrow; the byssal sinus under the anterior wing of the right valve having the usual size and shape common to *Oxytoma*; posterior wing not proportionally large, and not distinctly defined from the body of the shell except by a somewhat gradual lateral compression; its posterior angle not greatly produced; hinge-line less than the axial length of the shell; posterior adductor scars not distinct; anterior adductor scars distinct and deep for a shell of this genus, placed immediately in front of the beaks, that of the left valve being more distinct than the other.

This, like the last-described species, is known only by natural casts in brown hematite of the interior of the shell, the imperfection of which will not allow of an accurate measurement of all its proportions. It is, however, known to have reached an axial length of more than 60 millimeters, a transverse width near its base of at least 50 millimeters, and a thickness of about 25 millimeters when both valves were in natural position.

The character of the surface is not known, but it was evidently nearly smooth, as is usual with *Oxytoma*. It is related probably genetically to *P. (O.) nebrascana* Evans & Shumard, but it is a larger and more robust shell, with a proportionally larger anterior wing, more prominent beaks, and broader base.

Position and locality.—Strata of the Dakota Group, Saline County,

EXPLANATION OF PLATE 2.

EXOGYRA WINCHELLI.

Fig. 1, interior view of lower valve, natural size. Fig. 2, inside view of upper valve. (See other figures on Plate 3.)

EXPLANATION OF PLATE 3.

EXOGYRA WINCHELLI.

Fig. 1, front view of lower valve, natural size. Fig. 2, outside view of upper valve. (See other figures on Plate 2.)

EXPLANATION OF PLATE 4.

OSTREA BLACKII.

Fig. 1, outside view of lower valve, natural size. Fig. 2, upper view of the same example.

EXOGYRA FORNICULATA.

Fig. 3, outside view of lower valve, natural size. Fig. 4, inside view of the same.

EXPLANATION OF PLATE 5.

PTERIA SALINENSIS.

Fig. 1, left side view of natural cast of the interior, natural size. Fig. 2, dorsal view of the same.

GERVILLIA MUDGEANA.

Fig. 3, left side view of natural cast of the interior, natural size. Fig. 4, dorsal view of the same.

EXPLANATION OF PLATE 6.

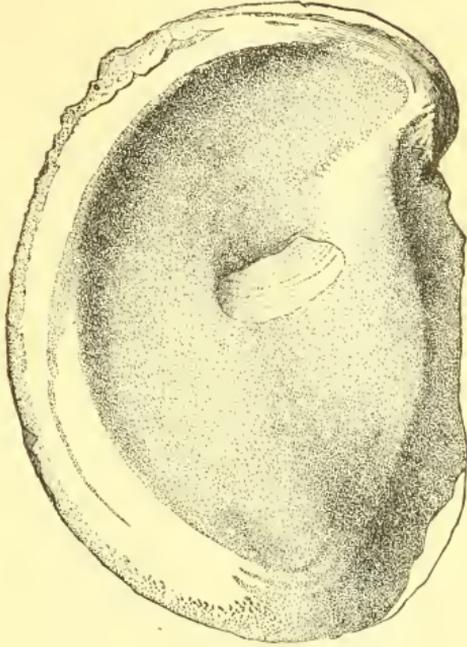
THRACIA MYÆFORMIS.

Fig. 1, right side view, natural size. Fig. 2, dorsal view of the same.

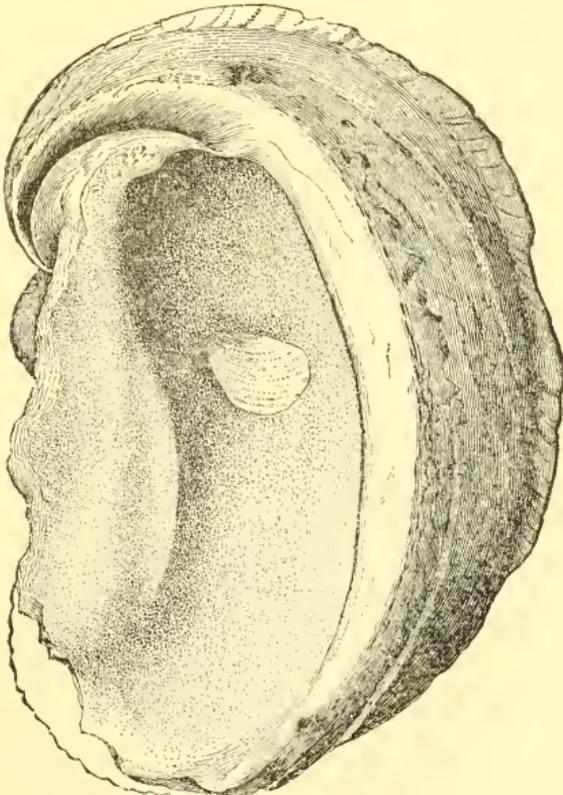
PACHYMYA? COMPACTA.

Fig. 3, right side view, natural size. Fig. 4, dorsal view of the same.

2

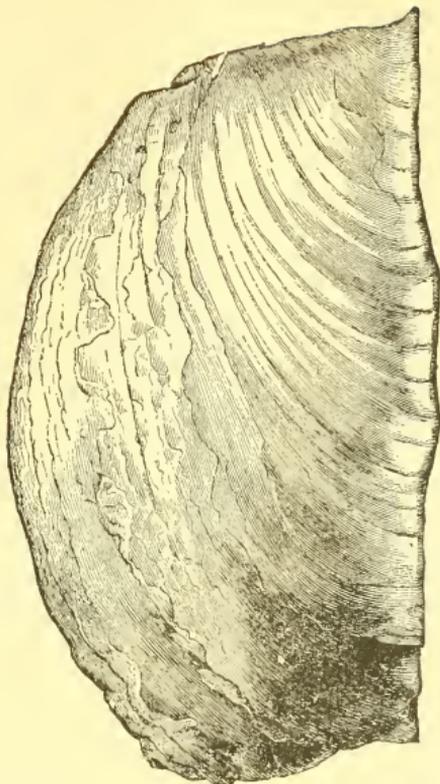


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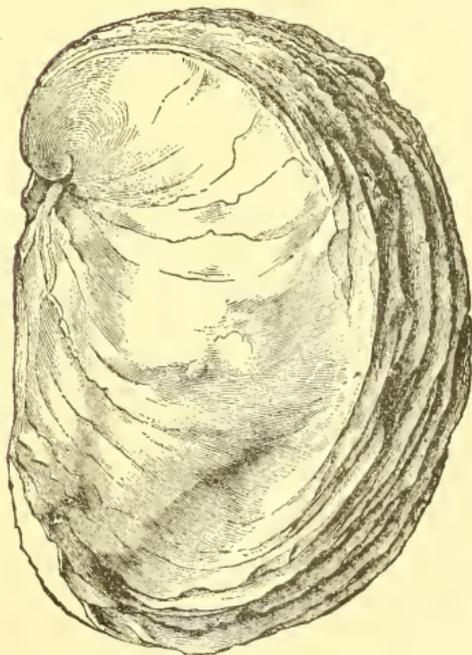


EXOYRA WINCHELLI.

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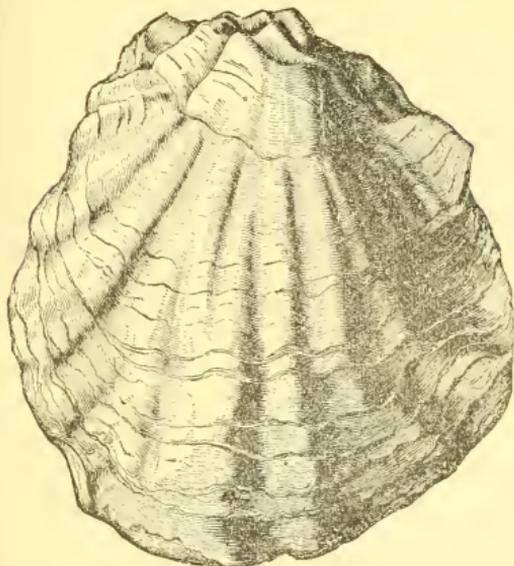


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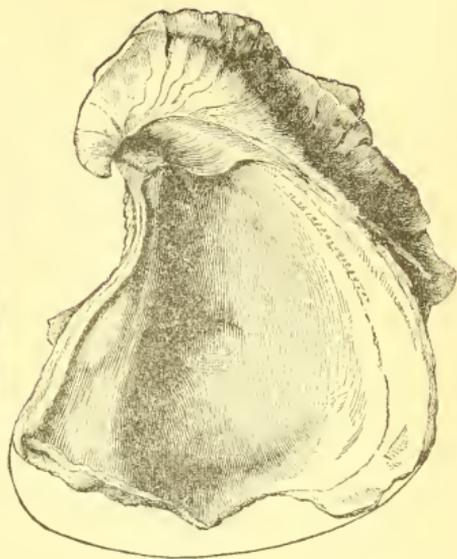


EXOGYRA WINCHELLI.

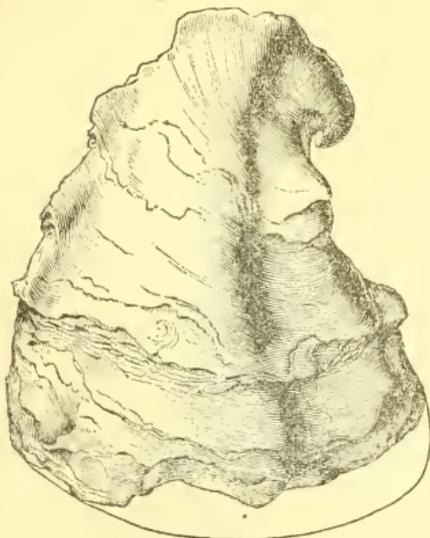
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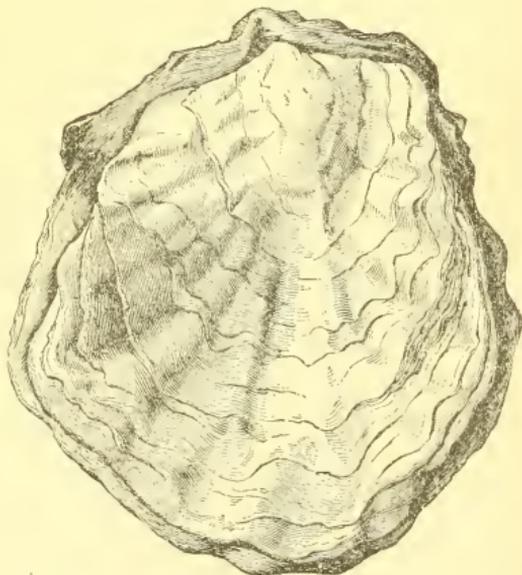
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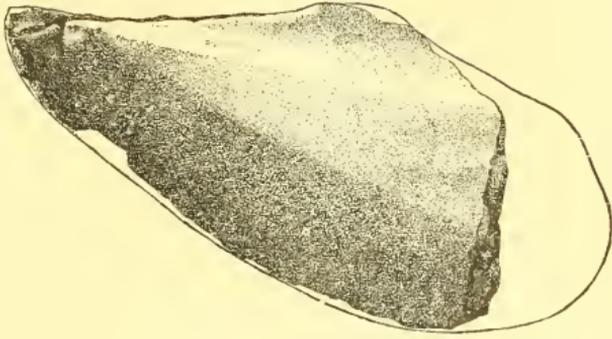
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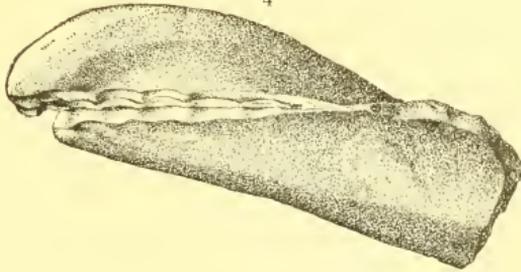
1 and 2.—*OSTREA BLACKII*.

3 and 4.—*EXOGYRA FORNICULATA*.

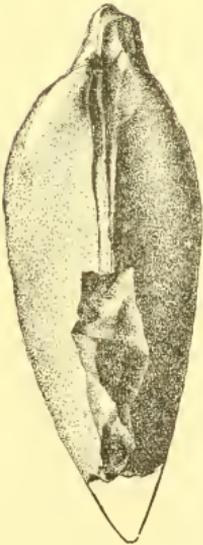
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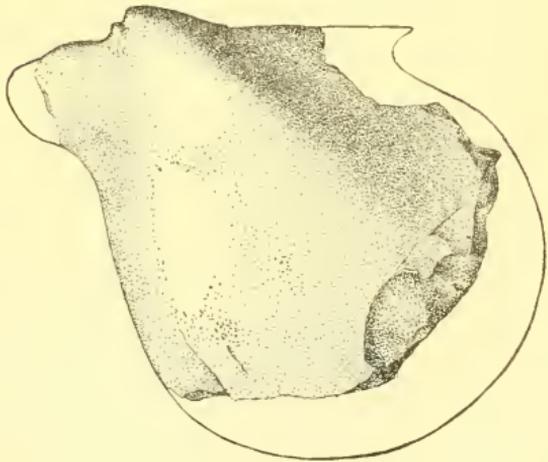
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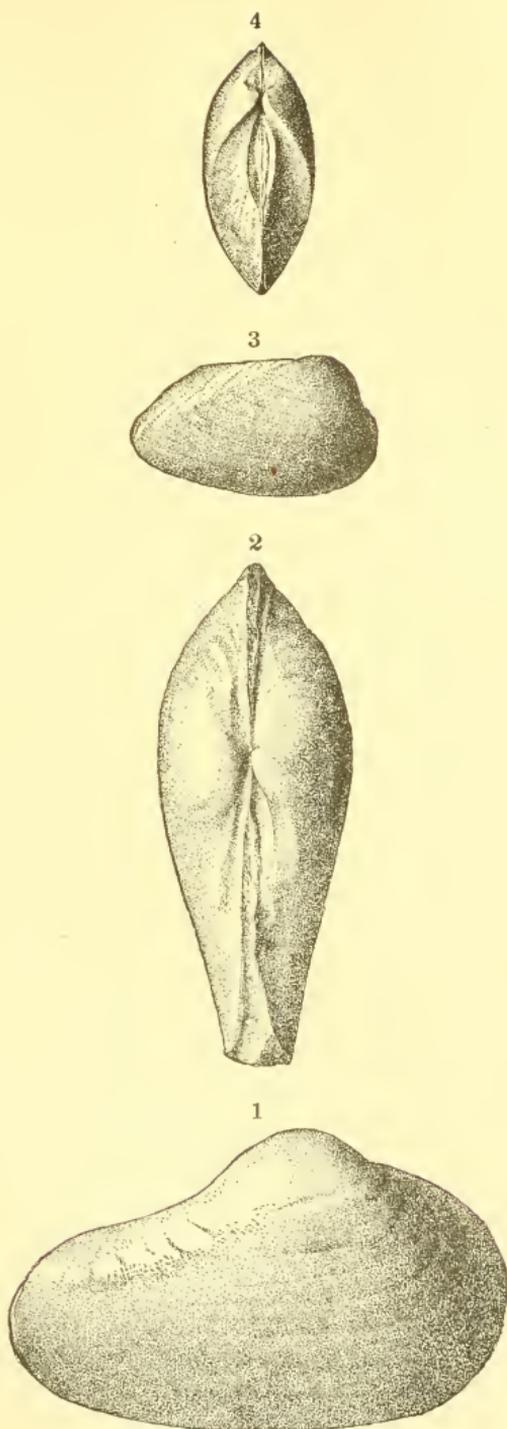
2



1



1 and 2.—*PTERIA SALINENSIS*.
3 and 4.—*GERVILLIA MUDGEANA*.



1 and 2.—*THRACIA MYEFORMIS*.
3 and 4.—*PACHYMYA*? *COMPACTA*.

Kansas, where it was discovered by Prof. B. F. Mudge associated with the preceding species, and also with *Cyrena Dakotensis* Meek & Hayden and *Cardium? kansascense* Meek.

Genus PACHYMYA Sowerby.

Pachymya? compacta (sp. nov.). Plate 6, figs. 3 and 4.

Shell small, narrower posteriorly than anteriorly, slightly gaping behind; beaks depressed, approximate, incurved, directed forward, their position being very near the front; basal margin broadly convex; posterior margin narrowly rounded; postero-dorsal margin forming an oblique downward and backward truncation of that part of the shell; cardinal margin nearly straight, subparallel with the basal margin, much shorter than the full length of the shell; ligament short, its area depressed and sharply defined; front very short, depressed beneath the beaks and narrowly rounded below; umbonal ridges prominent and angular or subangular; the space above and behind them moderately broad and flattened; the remainder of each valve somewhat regularly convex. Hinge and interior markings unknown. Surface marked by the ordinary concentric lines of growth.

Length, 29 millimeters; height, 18 millimeters; thickness, both valves together, 14 millimeters.

This species is evidently congeneric with the shell which in the An. Rep. U. S. Geol. Sur. Terr. for 1877, p. 298, I described as *Pachymya? herseyi*, and also with the *Cypriocardia? texana* of Roemer, but knowing nothing of the hinge of either of these forms, I am not satisfied that they are properly referable to *Pachymya*; yet in all their external characters they seem to agree.

Position and locality.—Cretaceous strata, Bell County, Texas, where it was collected by Mr. D. H. Walker.

Genus THRACIA Leach.

Thracia myæformis (sp. nov.). Plate 6, figs. 1 and 2.

Shell transversely subovate in marginal outline; valves nearly equal; anterior end regularly rounded; wider and thicker anteriorly than posteriorly; posterior portion narrowed vertically and somewhat compressed but gaping at the extremity; basal border broadly convex; posterior border abruptly rounded; cardinal margin slightly convex, but the prominent umbones give the shell a concave appearance behind the beaks; a distinct linear depression is seen in the natural cast upon each side of the ligament; beaks prominent, incurved and directed a little forward; muscular impressions not distinctly shown in our examples, which are natural casts in chalky limestone, but the pallial sinus appears to have been large and subangular at its anterior end. Surface marked by the ordinary lines of growth, and also by more or less distinct irregular concentric wrinkles.

Length, 57 millimeters; height from base to umbo, 37 millimeters; thickness, both valves together, 24 millimeters.

In general aspect this shell approaches *T. prouti* Meek & Hayden, from the Upper Fox Hills Group of the Upper Missouri River region, but it differs in being proportionally narrower and more produced behind the beaks, and in the greater prominence of the umbones.

Position and locality.—Cretaceous strata, Bell County, Texas, where it was collected by Mr. D. H. Walker.

WASHINGTON, December 4, 1879.

NOTES ON A COLLECTION OF FISHES OBTAINED IN THE STREAMS OF GUANAJUATO AND IN CHAPALA LAKE, MEXICO, BY PROF. A. DUGÈS.

By DAVID S. JORDAN.*

The collection which forms the subject of this paper was obtained by Prof. A. Dugès in the streams of the province of Guanajuato in Mexico, and by him forwarded to the Smithsonian Institution. Many of them are extremely interesting as representing the ordinary North American fish fauna at a point near its southern limit, before it gives place to the Central and South American forms.

Chiostoma estor Jordan, sp. nov.

Allied to *Chiostoma humboldtianum* (C. & V.).

Body elongate but rather robust for the genus, the depth about one-sixth the length to the base of the caudal.

Head very large, pike-like, forming more than one-fourth (two-sevenths) the length to base of caudal.

Mouth very large, the maxillary reaching to past the front of the eye. Intermaxillaries forming the edge of the jaw strongly curved, their posterior portions broadly dilated as in *Chiostoma meuidium*. Teeth strong, in several series in each jaw. Two small fang-like teeth on the front of the vomer. Lower jaw considerably projecting beyond the upper. Eye large, anterior, 5 in length of head, shorter than snout, and a little narrower than the interorbital space, which is nearly flat.

Head covered with scales, which are smallest on the occipital region, and largest on the lower part of the cheeks. Smaller scales on the interopercle.

Sides of head vertical, a conspicuous ridge along the edge of the top of the head above and behind the eye.

Scales small, anteriorly crowded, about 72 in a longitudinal series, and 18 in a cross series. Posterior margin of scales strongly crenate, so that the fish feels rough to the touch.

* As Professor Jordan is far distant while this paper is going through the press, the proof has been compared with his manuscript by the editor of these Proceedings. In the description of *Zophendum australe* two verbal additions are indicated in parentheses.

Pectorals moderate, nearly half as long as head, reaching slightly past the base of the ventrals. Ventrals rather short, reaching nearly two-thirds the distance to the base of the anal.

Anal moderate, beginning considerably in front of the dorsal and ending a little behind it. Anal rays I, 18. Dorsal rays V-I, 12.

Spinous dorsal beginning nearly midway between insertion of ventrals and anal, separated from the soft dorsal by a distance equal to about two-thirds the length of the base of that fin.

Caudal somewhat forked.

Coloration uniform in spirits, the silvery lateral band but faintly indicated.

The type of this species, 10½ inches long, was obtained by Professor Dugès in Lake Chapala, Mexico; it is known as *Pesce blanco di Chapala* ("poisson blanc de Chapala") in Guanajuato, according to Professor Dugès.

It is one of the very largest of the *Atherinidae*, resembling a pike in its form, and in the large head and mouth. Its nearest relative is apparently *Chirostoma humboldtianum*, also from Mexico, from which it differs in the much smaller scales, as well as in other characters. In Dr. Girard's arrangement of the *Atherinidae*, this species would be likewise a *Heterognathus*.

The type of *Chirostoma estor* is numbered 23124 in the register of the U. S. National Museum.

***Chirostoma humboldtianum* (C & V.) Jor. (*Atherina vomerina* C. & V.).**

With the preceding is a single specimen of another *Chirostoma*, which seems to be the *humboldtiana* of Cuv. & Val., with which the *vomerina* is doubtless identical. This specimen (No. 23136) has the usual silvery band. D. IV-I, 10; A. I, 15 or 16; lat. l. 50, the scales with entire edges. The long head is 4¼ in length to base of caudal, and the body is rather slender. This example is 3¼ inches in length.

? ***Chirostoma brasiliensis* (Quoy & Gaimard) Jor.**

Numerous specimens (catalogue number 23135) of a small *Chirostoma* allied to *brasiliensis* and *bonanensis* are in the collection. The body is short and compressed, the mouth small and oblique. Lat. l. 36; L. trans. 9. D. IV-I, 9; A. I, 17. Silvery lateral streak very narrow. It does not fully agree with descriptions of either of the above species, and its habitat is remote from both. I do not, however, think it advisable at present to give it a separate name.

***Goodea atripinnis* Jordan, gen. & sp. nov.**

GENERIC DESCRIPTION.—Form of *Hydrargyra* or *Fundulus*, but with the intestinal tract elongate, the dentary bones movable, and the teeth slender, *tricuspid*, movable, attached in a single series on the outer edge of the jaws, not closely set. Fins small, the dorsal and anal similar,

the dorsal slightly in advance of the anal, without spines. Scales moderate. *Limnophagous*. Sexual changes, if any, unknown.

This genus differs from the most of the other *Cyprinodontidae* in its tricuspid teeth. From *Cyprinodon*, *Jordanella*, *Fitzroyia*, *Characodon*, and *Jenynsia*, the genera thus far known with tricuspid incisors, it is distinguished by the elongate intestines, and by the freeness of the dentary bones. The aspect is wholly unlike *Cyprinodon*, resembling rather *Fundulus*.

SPECIFIC DESCRIPTION.—Body oblong, considerably compressed, formed much as in *Hydrargyra*, the back nearly straight, little elevated, caudal peduncle deep. Depth of body 4–4½ in length. Head short, broad, depressed, triangular and rather pointed, when viewed from the side.

Mouth quite small, anterior oblique, the lower jaw projecting. Both jaws with a series of rather slender tricuspid teeth, which are loosely inserted, and somewhat movable, not close enough set to form a continuous cutting edge. Head 4 in length. Eye moderate, directed partly downwards, 3½ in head, rather longer than snout and little more than half the width of the very broad interorbital space. A slight ridge from the occipital region backward.

Scales rather large, 37 to 40 in a longitudinal series, and 13 in a transverse series. Humeral scale somewhat enlarged.

Fins small. Dorsal fin posterior, very slightly in advance of the anal, which is also short and low, the two fins about coterminous and falling far short of the caudal. Caudal short and small. Ventrals small.

Pectorals small, not reaching ventrals. Dorsal rays 12, anal rays 13.

Color bluish above in spirits, sides nearly plain, with a silvery streak along each series of scales. Vertical fins obscurely marked, each of them chiefly black, especially on the distal half. There is no evidence of any modification of the anal fin in any of the specimens, which are, however, apparently adult. One of the two larger ones is apparently a female, the other probably a male.

The intestinal canal is considerably convoluted and filled with mud.

The types of this species, No. 23137, are numerous specimens of various sizes; the two largest nearly 4 inches in length, were obtained by Professor Dugès at Léon in Guanajuato.

***Zophendum australe* Jordan, sp. nov.**

Allied to *Zophendum siderium* (Cope), but with larger scales.

Body rather elongate, formed much as in *Campostoma anomalum*, somewhat compressed, the back somewhat elevated and rounded anteriorly. Depth, 4½ in length to base of caudal.

Head rather large, slightly depressed or flattish above, its length about 4 times (in length) to base of caudal. Mouth moderate, low, the lower jaw slightly included, the premaxillary below the level of the eye, the maxillary just reaching the front of the eye. Lower jaw thin-edged,

and with a slight symphyseal knob as in *Hybognathus*. Eye small, nearly 6 in head.

Scales rather small, 10-55-7 or 8, the lateral line complete, somewhat decurved.

Dorsal fin moderate, slightly behind ventrals, D. 8; A. 7. Anal rather high.

Pectorals not reaching ventrals, the latter (not reaching) to vent.

Teeth 4-4, not hooked, with broad grinding surface as in *Hybognathus*.

Color dark bluish above, scales everywhere with fine black punctulations. Sides without black spots. A black spot at base of caudal fin.

Peritoneum black; intestinal canal considerably elongate.

Types, numerous examples (23130-23131), 5 to 7 inches in length, taken by Professor Dugès in Lake Tupaturo in Guanajuato, Mexico. The less number of scales (55 instead of 88) well distinguishes this species from *Z. siderium*.

Hudsonius altus Jordan, sp. nov.

Allied to *Hudsonius fluviatilis*.

Body moderately elongate, compressed, deep, the back somewhat elevated, the depth $3\frac{3}{4}$ in length to base of caudal.

Head short, somewhat depressed above, moderately pointed, $4\frac{1}{4}$ in length to base of caudal. Eye moderate, shorter than snout, 5 to 6 in length of head. Mouth medium, quite oblique, terminal, the premaxillary on the level of the pupil, the maxillary not reaching the front of the pupil. Jaws equal in the closed mouth. Preorbital large.

Scales rather large, not closely imbricated, 8-46-4. Lateral line strongly decurved, 19 scales in front of dorsal fin.

Dorsal fin high, inserted over the base of the ventrals. Dorsal rays I, 8. Anal I, 8. Caudal fin rather broad, forked, its peduncle deep and compressed.

Ventrals shortish, reaching vent. Pectorals falling just short of ventrals.

Teeth 4-4, hooked, with narrow grinding surface.

Color bluish above, sides silvery, fins plain.

Types, several specimens, numbered 23129, the largest about 8 inches in length, obtained by Prof. A. Dugès in Lake Tupaturo in Guanajuato.

This species differs from its northern relatives, *fluviatilis*, *storerianus*, etc., in the larger head, the oblique mouth, and in the presence of but one row of teeth.

UNITED STATES NATIONAL MUSEUM,

Washington, December 18, 1879.

**DESCRIPTIONS OF TWO SPECIES OF FISHES COLLECTED BY PROF.
A. DUGÈS IN CENTRAL MEXICO.**

By TARLETON H. BEAN.

The larger portion of the fishes presented to the United States National Museum by Professor Dugès in June, 1879, have been reported upon by Prof. D. S. Jordan in a previous paper of these Proceedings.* In all 8 species were transmitted by Professor Dugès, 4 of them being described in the article just mentioned and 2 in the present paper as new to science.

The discovery of *Myxostoma* and *Amiurus* in streams which flow into the Pacific is singular and interesting, and, at the same time, the occurrence of additional genera, *Zophendum* and *Hudsonius*, characteristic of the Eastern United States, makes it desirable to know more of the climatic and statigraphic conditions existing in Guanajuato and adjoining provinces. *Goodea* and two of the *Chirostomas* are from a salt lake in the middle of a little volcanic plain in *Valle de Santiago*, Guanajuato.

Myxostoma austrina Bean, sp. nov.

The type specimens were collected at Piedad, in Morelia (Michoacán), Mexico. They are numbered 23120 and 23121 in the United States National Museum catalogue. The species may belong to *Minytrema* rather than *Myxostoma*; but in the absence of all the abdominal viscera this point cannot now be settled. It has a remarkably small fontanelle.

DESCRIPTION.—Body not elongate, rather stout. Lips plicate, truncate or slightly rounded behind.

The greatest height of the body equals about $\frac{3}{4}$, and the least height of the tail $\frac{1}{10}$ of the length of body.†

The length of the head (.23-.24) is contained $4\frac{1}{3}$ times in length of body. Its width (.15) equals the length of the base of the dorsal. The interorbital distance (.095) equals the length of the snout. The length of the operculum (.07-.075) equals $\frac{1}{2}$ the length of the ventral. The long diameter of the eye (.04) is contained 6 times in the length of the side of the head.

The distance of the dorsal from the snout (.45) equals 3 times the length of its base; the beginning of the dorsal is equally distant from the tip of the snout and the end of the anal. The longest dorsal ray (.16) is twice as long as the last (.08), and its length is contained 5 times in the distance of the anal from the snout.

The length of the base of the anal (.085-.09) is contained twice in the distance from the snout to the nape. The longest anal ray (.22) equals in length the external caudal rays, measuring these from the origin of the middle caudal rays. The last ray of the anal is as long as the snout.

The length of the middle caudal rays (.13) equals about $\frac{1}{2}$ the height of the body.

The distance of the pectoral from the snout (.25) is contained 4 times

* Proc. U. S. Nat. Mus., vol. ii, p. 298.

† Length of body is to be understood as length without the caudal.

in length of body, and the length of the pectoral, 5 times. When extended, the pectoral reaches the 11th or 12th scale of the lateral line.

The distance of the ventral from the snout equals $3\frac{1}{2}$ times the length of the ventral.

Radial formula: D. II, 11; A. II, 6; C. 18 (developed rays); P. I, 16-17; V. I, 8. Scales $6\frac{1}{2}$ -44- $6\frac{1}{2}$.

Colors: Upper portion light brown (in the alcoholic specimens), lower parts yellowish; some scales on the sides of the body are light brown at the base, in which respect the species resembles one of the varieties of *M. macrolepidota*. The ventrals and the right pectoral of specimen 23120 have dark blotches on their lower surfaces, the ventral of the right side being almost banded. The right pectoral and the left ventral of specimen 23121 bear fewer similar blotches. The bellies of both specimens have several markings of the same kind.

Table of measurements.

Species: *Myxostoma austrinum* Bean.

Current number of specimen	23120.		23121.	
	1.		1.	
Collector's number.....	Milli-meters.	100ths of length without caudal.	Milli-meters.	100ths of length without caudal.
Length to origin of middle caudal rays.....	303		285	
Body:				
Greatest height.....		27		24
Greatest width.....		15.5		16.5
Height at ventrals.....		24.5		21.5
Least height of tail.....		9.5		10
Length of caudal peduncle.....		15.5		13
Head:				
Greatest length.....		23		24.3
Distance from snout to nape.....		18		17
Greatest width.....		15		15
Width of interorbital area.....		9.5		9.6
Length of snout.....		9.5		9
Length of operculum.....		7		7.5
Distance from snout to orbit.....		9.5		9.5
Diameter of orbit.....		4		4
Dorsal:				
Distance from snout.....		45.5		45
Length of base.....		15.5		15
Length of longest ray.....		16		16
Length of last ray.....		8		8
Anal:				
Distance from snout.....		80		81
Length of base.....		9		8.5
Length of longest ray.....		22		22
Length of last ray.....		9.5		10
Caudal:				
Length of middle rays.....		13		13
Length of external rays.....		22		22.5
Pectoral:				
Distance from snout.....		25		25.5
Length.....		21		19
Ventral:				
Distance from snout.....		52		54
Length.....		15		15 $\frac{1}{2}$
Branchiostegals.....				III
Dorsal.....	II, 11		II, 11	
Anal.....	II, 6		II, 6	
Caudal.....	+ 18 +		+ 18 +	
Pectoral.....	I, 17		I, 16	
Ventral.....	I, 8		I, 8	
Number of scales in lateral line.....	44		44	
Number of transverse rows above lateral line.....	6 $\frac{1}{2}$		6 $\frac{1}{2}$	
Number of transverse rows below lateral line.....	6 $\frac{1}{2}$		6 $\frac{1}{2}$	

Amiurus Dugèsi Beau, sp. nov.

This species is allied to *A. albidus* (Le Sueur) Gill, but has a much narrower head as is shown in comparing the width (greatest extent) of the intermaxillary band of teeth in the two species. The head of *A. Dugèsi* is also longer in proportion to the length of the fish without caudal, and the humeral process is slightly furrowed, and not strongly rugose as in *A. albidus*. The pectoral spine is not serrate. *Amiurus Dugèsi* has the supraoccipital well separated from the second inter-spinal buckler.

The typical specimens are numbered 23122 and 23123 in the Fish Catalogue of the Museum. They were received from Prof. A. Dugès in June, 1879, and were marked in his invoice as coming from the Rio Turbio in the province of Guanajuato, Mexico.

DESCRIPTION.—The height of the body is contained $4\frac{1}{2}$ to 5 times in its length without caudal. The distance from the end of the anal to the origin of the middle caudal rays is a little more than half the length of the head.

The length of the head (.29) exceeds its greatest width (.21-.23) by one-third. The maxillary barbel can be made to reach the pectoral spine, and is contained 5 times in the length of the body. The distance between the eyes (.125) equals 4 times their long diameter (.03). The length of the snout is about $\frac{1}{3}$ of that of the head (in the smaller example somewhat less). The width (greatest extent) of the intermaxillary band of teeth (.095) is less than $\frac{1}{3}$ of the length of the head (nearly $\frac{1}{2}$ in *A. albidus*). The length of the maxillary (.04-.045) is about $\frac{1}{3}$ of the inter-orbital distance. The posterior nasal barbel is a little less than $\frac{1}{3}$ as long as the maxillary barbel.

The first dorsal begins midway between the end of the snout and the beginning of the adipose dorsal. The length of its spine is about equal to the length of the base of the adipose dorsal. Its longest ray is contained 6 to 7 times in the length of the body.

The distance of the anal from the snout equals 3 times the length of its base. The longest anal ray is as long as the ventral.

The middle caudal rays are one-half as long as the external, measuring from the origin of the former.

The distance of the pectoral from the snout (.26-.27) equals one-half that of the ventral from the snout. The length of the pectoral spine is contained $2\frac{1}{2}$ times in that of the head. The longest pectoral ray (.15-.16) is a little more than $\frac{1}{2}$ as long as the head.

Radial formula : B. VIII; D. I, 6; A. 21-22; C. 17 (developed rays); P. I, 8; V. I, 7.

The lateral line is almost complete.

Colors : Plumbeous above, silvery white beneath and on the sides.

Table of measurements.

Species: *Amiurus Dugèsii* Bean.

Current number of specimen	23123.		23122.	
	13.		13.	
Collector's number.....	Milli- meters.	100ths of length without caudal.	Milli- meters.	100ths of length without caudal.
Extreme length.....	385	-----	356	-----
Length to origin of middle caudal rays	324	-----	300	-----
Body:				
Greatest height.....	66	20.5	67	22.3
Greatest width.....	55	17	53	17.5
Height at ventrals.....	60	18.5	64	21.5
Length of caudal peduncle*.....	56	17.3	47	15.5
Head:				
Greatest length.....	94	29	88	29
Length of maxillary barbel.....	61	19	61	20.5
Greatest width.....	69	21	68	23
Width of interorbital area.....	40	12.5	37	12.3
Length of snout.....	32	10	26	8.66
Extent of intermaxillary band of teeth.....	30	9.5	28	9.5
Length of maxillary.....	14	4.5	13	4
Length of posterior nasal barbel.....	20	6	20	6.66
Distance from snout to orbit.....	37	11	33	11
Diameter of orbit.....	10	3.25	9	3
Dorsal (first):				
Distance from snout.....	124	38.5	116	38.5
Length of base.....	27	8.5	27	9
Length of first spine.....	31	9.5	34	11.5
Length of longest ray.....	47	14.5	47	16
Length of last ray.....	20	6	21	7
Dorsal (adipose):				
Length of base.....	29	9	32	11
Length.....	25	7.66	24	8
Anal:				
Distance from snout.....	206	64	195	65
Length of base.....	71	22	68	23
Length of longest ray.....	37	11.5	39	13
Length of last ray.....	16	5	15	5
Caudal:				
Length of middle rays.....	32	10	30	10
Length of external rays.....	64	20	65	22
Pectoral:				
Distance from snout.....	84	26	80	27
Length of pectoral spine.....	38	12	34	11.33
Length of pectoral.....	48	15	48	16
Ventral:				
Distance from snout.....	164	51	155	52
Length.....	37	11.5	35	12
Branchiostegals.....	VIII	-----	VIII	-----
Dorsal.....	I, 6	-----	I, 6	-----
Anal.....	22	-----	21	-----
Caudal.....	+ 17 +	-----	+ 17 +	-----
Pectoral.....	I, 8	-----	I, 8	-----
Ventral.....	I, 7	-----	I, 7	-----

* From end of anal to origin of middle caudal rays.

UNITED STATES NATIONAL MUSEUM,
Washington, December 20, 1879.

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March 25, 1880.

**REPORT OF EXPERIMENTS UPON THE ANIMAL HEAT OF FISHES,
MADE AT PROVINCETOWN, MASS., DURING THE SUMMER OF 1879,
IN CONNECTION WITH OPERATIONS OF THE UNITED STATES
FISH COMMISSION.**

By J. H. KIDDER, Surgeon, U. S. NAVY.

SIR: The investigation of the manifestation of animal heat by fishes, with which you intrusted me last summer, having been brought to a pause for the time being by the close of the Fish Commission's summer work, I submit the following report of my experiments, so far as they have gone, with a description of the instruments used and the mode of observation.

But little in the way of actual experiment relating to this interesting question seems to have been done by other observers than those connected with the Fish Commission, although numerous allusions to the remarkable adaptability of fishes to extremes of temperature, and occasional records of more or less incomplete experiments, are to be found scattered through scientific literature. A complete bibliography of these fragmentary notes would be voluminous and of questionable value, but a short account of such observations as I have been able to find a record of, either interesting in themselves or of incidental value as throwing light upon the investigation, is appended to this report.

So far as I have been able to learn, all of the observations made hitherto upon the temperature of fishes have been confined to the intestinal canal, the thermometer being passed into the rectum or œsophagus, as is the usual practice in observations upon the body temperature of mammals. But the conditions are by no means the same. The intestinal canal of a fish is thin and scarcely muscular; the walls of the abdomen are also thin, and so sparingly vascular that no blood flows when they are cut through; and consequently, always surrounded as they are by water, against the chilling effect of which there is no sufficient protection, it is by no means in the rectum or stomach that we should reasonably look for the body temperature of a fish. In point of fact, the experiments to be hereinafter detailed show clearly enough that the rectum temperature of a freshly-taken fish rarely exceeds that of the water in which it swims by so much as a degree (Fahrenheit). So that it may be quite safely taken as an index to the latter temperature when there is no deep-sea thermometer at hand.

Another point to be considered is the fact that the gills of most fishes float freely in the surrounding water, and that all of the blood in each individual must, in passing through these organs, be spread out so as to expose the greatest possible surface to the chilling effect of the water quite long enough to reduce it to the same temperature.

From the low organization of fishes, and from the simplicity of their digestive and circulatory functions, considered together with the fact

that their blood itself is chilled by close proximity with the surrounding water at least once in each circuit, and that thus the oxidation of the blood, so important a source of animal heat in mammals, is quite neutralized, we ought not to expect so great a difference in temperature between the blood of a fish and the water in which it swims as obtains between the blood of mammals and the surrounding medium, nor that the limits within which its normal temperature must be confined should be so narrow.

And, while it is difficult to believe that the chemical changes necessary to the nutrition, waste, and repair of the body of a fish, taken together with its active muscular movements, can go on without the evolution of a large amount of animal heat; it is also plain that we are not to expect to find the manifestation of this heat either in the intestinal canal, a mere osmotic tube for the passage and absorption of the food, scarcely vascular and barely separated from the surrounding water by the thin bloodless walls of the abdomen; nor in the arterial blood returning from the gills, chilled down to the temperature of the water with which it has just been in intimate contact.

We should expect to find the blood of a fish at its warmest after having been distributed to the substance of the body, having furnished the material for nutrition, taken up the results of waste, and received the heat developed by these processes and by the conversion of muscular motion; that is to say, in the heart and branchial artery.

The experiments to be described have been tentative for the most part, and accordingly temperatures have been taken in the rectum, the stomach, various parts of the muscular tissue, the large venous trunks, the cavity of the "thorax"* after opening the heart, the interior of the heart and branchial artery, and the young fish in the ovary (of a dog-fish). When the heart was large enough to admit the bulb of the thermometer, the greatest differences between the temperatures of the fish and of the surrounding water were found in that locality.

INSTRUMENTS.

The thermometers used in these experiments were made expressly for the purpose by Mr. John Tagliabue, of No. 66 Fulton street, New York; and have proved to be very satisfactory. They are fifteen in number, viz:

1. Two long thermometers, graduated in fifths of a degree, and covering the range from 32° to 100° F., for use as standards.
2. A set of five short thermometers, graduated in fifths, marking 10° each, and covering all together the range from 40° to 90° F.
3. A second set of six short thermometers, similar to those last named, marking from 7° to 15° each, and covering the range from 30° to 100° F.
4. A short thermometer with the end carrying the bulb curved upon

*The term "thorax" is used for convenience' sake, as indicating the anterior part of the body cavity, in the neighborhood of the heart.

itself like a crook, graduated in fifths and marking from 55° to 74° F. (self-registering).

5. A Negretti-Zambra deep-sea thermometer, graduated in degrees only, and ranging from about 25° to 100° F.

All of these excepting the Negretti-Zambra are graduated upon the stems. The three highest in range of lot 2, one of the long standards, and the crooked instrument were made at first self-registering, on the principle of clinical thermometers, by a break in the column of mercury. They were so ordered in the hope that it would be possible to make some of the experiments upon living fish in tanks where the water could be artificially warmed above the temperature of the air. Such experiments not being possible (for reasons known to you) the self-registration was destroyed by reuniting the broken mercury column, and the necessary small correction applied. The curved thermometer was intended for use in a living fish, the bulb to be inserted either into the rectum or into an incision in the muscular tissue, and the stem to be secured to the body of the fish, which was then to swim free in the water. The highest temperature reached would be registered by the thermometer. This instrument, like the other self-registering thermometers operating on the same principle, can only be made available when the temperature of the water is above that of the air, and there has, therefore, as yet been no opportunity to make use of it.

Owing to the curious molecular change which occurs in the glass of which thermometers are made, whereby, after from six months to a year, the instruments show an error of excess of from half a degree to a degree, these thermometers, which were necessarily "pointed" as soon as made, are not strictly accurate. They should be returned to the maker and rated again before being used next summer, so that the necessary correction may be applied. For the time being the error has been to some extent met by Mr. Tagliabue, who has "overpointed" the scale about half a degree. I would also suggest the propriety, in case you conclude to continue temperature-observations, of ordering in advance one or two long thermometers, marking from 30° to 100° F., to be "pointed" after six months and used as absolute standards. Since, however, in these observations, absolute temperature is less important than *relative* accuracy, I have taken much pains to rate all the instruments together, comparing them with the standard, and applying such corrections as will reduce all the readings to its scale. The same error, if any, will then be present in all observations, and *relative* accuracy will be preserved. In Table A, which contains the corrections deduced from more than three hundred separate comparisons taken at nearly every degree on the scale, the small thermometers in daily use are numbered from 1 to 5 for the first set, and from 6 to 12 for the second set (which has not yet been used), No. 1 being the thermometer of lowest scale. The comparisons were made by immersing the thermometers in water, artificially cooled or heated. Only the means of each 10° are given in the table.

No. 1 of the small thermometers and Negretti & Zambra's Nos. 43230 (between 70° and 80°), 38982, 40007, 42666, and 43227 (between 70° and 90°), are the only ones to which it is worth while to apply a correction in practice. The other differences, being less than half a degree, may be disregarded as not likely to exceed the ordinary errors of observation.

TABLE A.—*Thermometer corrections.*

Thermometer.	30°-40°	40°-50°	50°-60°	60°-70°	70°-80°	80°-90°	90°-100°
No. 1		Add 0.88°					
No. 2			} Subtract 0.65°				
No. 3					} Subtract 0.125°		
No. 4						Correct.	
No. 5						} Subtract 0.13°	
No. 6	Correct.						
No. 7		Correct.					
No. 8			Correct.				
No. 9				Correct.			
No. 10					} Subtract 0.7°		
No. 11							Correct.	Correct.
N. & Z., 38982		Add 0.86°	Add 1°	Add 0.7°			
N. & Z., 40007	Correct.	Add 0.5°	Add 0.5°	Add 0.5°	Add 0.5°	Correct.	Add 1°
N. & Z., 42666	Correct.	Add 0.5°	Add 1°	Add 1°	Add 0.5°	Correct.	Add 1°
N. & Z., 43230		Add 0.125°	Add 0.07°	Add 0.366°	Add 0.425°	Add 0.5°	
N. & Z., 43227		Add 0.35°	Add 0.65°	Add 0.236°	Add 0.5°	Add 0.5°	

There are some practical difficulties in the use of these delicate instruments, which it is well to mention.

1. The bulbs are long and large compared to the diameter of the column of mercury. Hence the latter is very sensitive and responds quickly to the heat of the hand, even through the walls of the heart, or, in small fishes, of the abdomen. Thus in a small living blue-fish (*Pomatomus saltatrix* (Linn.), Gill), observed September 8, in an aquarium-tank, the water being at 67° F., a thermometer passed into the stomach by way of the gullet showed 68.8°; but, holding the fish in my left hand, I observed that the mercury was slowly rising and had reached 73° in two minutes. This accession of heat was communicated through the thin walls of the abdomen from my hand.

2. Owing to the extreme fineness of the mercurial column it is quite difficult to distinguish it at all from the empty part of the tube, unless the light falls upon it at exactly the proper angle. When taking the temperature of a struggling fish on the deck of a vessel, in the full glare of the sun, and with the thermometer perhaps smeared with blood, it is impossible to be too careful in guarding against errors of observations.

3. A difference of several tenths may be apparent in the reading according to the position of the observer. Looking down upon the column he reads too low; looking up, too high. His eye should be exactly opposite the top of the mercurial column. After use, the thermometer should be wiped perfectly clean and laid back in its proper bed in the case, lest in the hurry of the next observation the wrong one be taken up, and time lost.

4. The Negretti-Zambra deep-sea thermometers, which depend for their self-registration upon the breaking of the mercurial column at a certain place when the instrument is overset in pulling it up, have sometimes a trick of breaking the column in the wrong place, and so giving a false indication. In one instance I noticed that the break was diagonal, instead of being directly horizontal, as it should have been. Professor Hind, of Halifax, informs me that he has noticed the same defect and has brought it to the notice of the makers, who have assured him that it has been corrected in their more recent form of instrument. It should also be always remembered that the temperature recorded by these instruments is not that of the bottom, but of about a fathom above it, owing to the play of line required in attaching them to the sounding-line so that they may overset easily and not strike against the lead.

MODE OF OBSERVATION.

The circumstances of the summer's work are too well known to you to require repetition here. In explanation of the small number of observations (ninety-seven for the whole summer) it will be sufficient to refer to the unusual inclemency of the season, permitting not more than an average of two excursions a week; and to the remarkable scarcity of fish, which made a large proportion of the excursions blank as to results. Many fishes were brought up in the trawl-net of the *Speedwell* (the naval steamer used by the Fish Commission), but had been so long in the net, pressed upon by each others' weight, as to come up for the most part dead; and always showing by their rectum temperature (which should be near that of the bottom) that they were not in their normal condition as to animal heat. Such observations as were taken from these specimens are entered in the table (B), but are not trustworthy for the purposes of this investigation. On one occasion I set a trawl-line furnished with some four hundred hooks, and took it in as soon as set. Although not more than twenty minutes had elapsed between setting and hauling, however, most of the fishes taken were already drowned, and all had lost a large proportion of their animal heat. Since, therefore, no tanks of sufficient size for keeping fishes alive under observation were available, there remained only line fishing, which was carried on during the latter part of the summer as actively as the weather would permit, from the yacht *Phantom*, belonging to the Engineer Corps of the United States Army, and lent to the Fish Commission for the summer. The fish were all taken in Cape Cod Bay, and within ten miles of Provincetown, the two favorite localities being the steep edge of a shoal known as "Shank-Painter Bar," between Wood End and Race Point lights, and a ledge in 15 fathoms of water some seven miles southwest of Wood End light.

The rectum temperatures indicate, and I have no reason to doubt, that a fish caught with a line and hauled rapidly from the bottom to the

vessel's deck has not had time to materially change its temperature. The rectum usually showed from half a degree to a degree above the temperature near the bottom as indicated by a deep-sea thermometer.

Having arrived on the ground and anchored, the first proceeding was to sound and take the temperature of the water near the bottom by means of a Negretti-Zambra thermometer attached to the sounding-line, about half a fathom above the lead. The temperatures of the surface water and of the air were then taken with the same thermometer, and, where the depth exceeded 20 fathoms, another observation was made at 15 fathoms for subsequent comparison. As soon as a fish had been taken it was seized and held firmly by an assistant, his right hand grasping the throat under the gill-covers and his left holding the narrowest part of the tail, while I passed a thermometer into the rectum and observed the temperature of that part. I then cut the fish open from the isthmus between the gills toward the belly, exposing the heart, through the walls of which the thermometer was passed into the branchial artery and the temperature taken again. In this last manœuvre the heart should not be held between the finger and thumb of the left hand any longer than necessary to pass the thermometer-bulb into the artery, lest heat be communicated from the hand through the walls of the heart and give too high a reading. Then followed observations upon the temperature of the muscular tissue or other parts, when such were taken. When the fish was too small to admit the bulb of the instrument within the heart an effort was made to take the temperature of the blood as it flowed from it, or the temperature of the liver was taken, or, in very small fishes, the thermometer was passed into the stomach, through the œsophagus.

The above procedure is that finally adopted, after reflection upon the unsatisfactory results following observations made in the ordinary way (in the rectum). As to the cruelty of the operation, I am inclined to believe that it is more apparent than real, the fish showing no consciousness of pain, by struggling, &c., after the first incision.

RESULTS.

This summer's work must be considered to be, as I have said, only experimental. The subject had to be studied from the beginning, with no records of previous similar experiments to go by, and many observations were wasted in learning how to proceed. Enough has been ascertained, I think, to show that fishes do develop animal heat by their own vital processes in the same manner as, but to a less degree than, other vertebrate animals. In other words, it appears from these experiments that when proper precautions have been observed in making the experiments all living freshly-caught fishes will be found to manifest a body temperature differing considerably from that of the water in which they swim; the degree of difference varying with the perfection of the organization of the fish (and hence the activity of its nutrition), and with the temper-

ature of the water in which it swims. Thus the dogfish (*Squalus acanthias*, Linnæus) possessing a far more perfect digestive and circulatory system than the cod, shows a much greater excess of blood temperature above that of the surrounding water; and cod taken at the depth of 15 fathoms in water at 52° F., show a less excess than others taken in 25 fathoms at 41°, but a greater excess than blue-fish (*Pomatomus saltatrix* (Linn.) Gill) taken at the surface, at 69° and 70°, which is presumably nearer the normal temperature of the last named fish.

Upon this question of normal temperature, my observations have not thrown much light, owing to the fact that nearly all the fishes observed have come from water at about the same temperature, and that blue-fish, from which the most valuable results were to be expected on account of their activity and the warmth of the water which they inhabit, could not be taken with a line after the two days of their first appearance. It is reasonable to suppose, from the fact that the cod, for instance, shows a less difference when taken from warmer than from cold water, that a point would soon be reached at which the temperature of the blood of the fish would coincide with that of the surrounding water, and that this point would be near the "normal" for that family, or in other words the limit above which it could not live.*

The experiments are set forth at length in Table B, but some of the conclusions for which they furnish a reasonable basis may be conveniently stated here, considering each species separately.

1. COD (*Gadus morrhua*, Linnæus). Twelve observations. The fishes were taken with a hand-line, either at the edge of "Shank-Painter Bar," a sand-bank about half a mile wide which makes out along the end of Cape Cod from Race Point to Wood End light-house, in 22-25 fathoms of water, or on the "Ledge," a small rocky shoal lying about seven miles WSW. from Wood End light, where there are from 13 to 15 fathoms of water, according to the state of the tide. The rectum showed an average excess of 0.97° above the temperature of the water near the bottom. In the bloody fluid resulting from the mixture of water with the blood escaping from the heart into the "thorax," the average excess of temperature was 3°, and in the heart itself 4.63°. In one instance an incision was made into the side of a very large cod, from which *arterial* blood gushed forth. A thermometer plunged into this incision showed only 1.5° excess over the temperature of the water near the bottom. It was this observation which suggested the thought that the venous blood might be warmer than the arterial.

*Prof. G. Browne Goode, who has been investigating the question of the temperatures preferred by different fishes, concludes that the cod and its congeners seek water at 38° to 42° F.; that the temperature range of menhaden lies between 50° and 75°; that blue-fish are rarely to be found in water below 40°, or mackerel below 45°; while black bass (*Micropterus*) thrive in the water of the northern lakes, frozen over for three months in the year and never rising above 65°, as well as in that of the Florida rivers, which becomes as warm as 90° in summer. Different families, as thus appears, show very different powers of adaptation to extremes of temperature.

2. HADDOCK (*Melanogrammus aeglefinus* (Linn.), Gill). Eight observations. The rectum showed an average excess of 1.3° over the temperature of the water near the bottom, and the circulation an average of 5.3° . One fish, after ten minutes spent in a tub of water at 64.2° , showed an increase of temperature in the rectum of 7° . Another, which had been tied by the tail and allowed to swim 15 minutes at the surface (at 69.5°) showed an increase (in the rectum) of 16.8° ; still 11.5° below the temperature of the water. On the 6th September, fishing on the "Ledge," the temperature of the water near the bottom at $15\frac{1}{2}$ fathoms was 51.5° , while the recta of the first two or three fishes caught showed as low a temperature as 45° . Those caught later, after fishing in the same place for an hour or more, showed a rectum temperature of 51° . I suppose that the individuals first taken (the tide having just turned to flood) came up on the ledge from deeper water, the ledge being of small extent, and showed the low temperature of the water from which they had come, gradually approximating that of the shallower water as they remained longer in it. These first temperatures are left out of the account in determining the above averages, as untrustworthy, owing to the uncertainty of the temperature of the water by which they had been surrounded. Haddock were spawning as early as the first observations (July 30), which fact may account for their somewhat higher temperatures than those of cod taken at the same time.

3. POLLACK (*Pollachius carbonarius* (Linu.), Bonaparte). A single full-grown specimen, weighing about 25 pounds, was taken on the "Ledge" in 15 fathoms. The rectum temperature was 2.4° above that of the water near the bottom (42°), and that of the fluid in the thorax after opening the heart, 4.5° . Several of the young of this species were taken from the wharves of Provincetown at different times and examined. Seven specimens taken from a depth of 8 feet (temperature of water 60°), and measuring about 8 inches in length, showed an excess of 0.5° in the rectum, 0.6° in the stomach (passing the thermometer through the gullet), and 3.12° by the thermometer in the mass of intestines, &c., next the liver. They were in company with "tinker mackerel" (*Scomber Dekayi*, Storer), of a species not observed in this harbor for more than thirty years.

4. HAKE (*Phycis chuss* (Walb.), Gill). This fish was often taken at the same time with cod and haddock. Specimens were frequently brought up, dead, in the trawl-net. Those taken with a line were often too small for trustworthy experiment, but a very large individual, weighing over 35 pounds, taken August 11, in 25 fathoms of water, at 42° , furnished the most satisfactory observation of the season, owing to the large size of the heart and the sluggishness of the fish, which made it much easier than usual to be sure of the readings. In this instance the difference in temperature of the water near the bottom and that of the rectum was 2.4° , and between the bottom water and the heart, 9.8° . There was an ulcerated patch about 2 inches square on the side of the

head. Could this have been the cause of the unusually high temperature? The presence of spawn in the abdomen protected the rectum to some extent, no doubt, from the chilling effect of the water. Another specimen taken in 15 fathoms on the "Ledge" gave a difference of 3° between the temperatures of the rectum and heart, the bottom temperature being uncertain for reasons already stated. (See page 313.)

5. BLUE-FISH (*Pomatomus saltatrix* (Linn.), Gill). These were caught on only two occasions, although often fished for unsuccessfully. Four specimens on the first day and one on the second were taken by trolling, and brought in after violent resistance. The average rectum temperature of the first four was 0.25° higher, and the temperature obtained by an incision into the muscles of the side 1.55° lower than that of the surface water from which the fish came (73.2°). The surface water was unusually warm on this occasion, and the fishes may have come from a deeper and colder stratum. Otherwise the indication would appear to be that they *resisted* in some way the higher temperature than that to which they were accustomed. They were taken from different schools and at different times. The single fish taken on the following day showed a rectum temperature of 0.5° , and in the muscles of the side 1.7° above that of the surface water (70.5°). The muscles of the side of this last fish, however, were only 0.5° warmer than the average (71.5°) of the four taken the day before. At this time I had not yet begun to observe the temperature of the blood in the heart and branchial artery. Young blue-fish, 3 or 4 inches long, have been caught from the wharves at different times, but have been too small to afford trustworthy observations.

6. "TINKER MACKEREL" (young of *Scomber scomber*, Linnaeus, and *Scomber Dekayi*, Storer). No fully-grown mackerel have been taken with the line in the neighborhood of Provincetown for several years. The "tinkers," however, from 6 to 8 inches long, abounded toward the last of the season, and upon these several observations were made at different times, the temperature of the surrounding water being taken at 6 feet below the surface, the length of line required in fishing. The anus was too small to admit the bulb of my thermometers, and temperatures were therefore taken in the stomach through the gullet, and in the immediate neighborhood of the liver after dividing the larger blood-vessels. The average of twelve observations gives an excess of temperature over that of the surrounding water of 4.1° in the stomach, and 5.25° in the neighborhood of the liver. The individual temperatures were surprisingly uniform. Three specimens of young *Scomber Dekayi*, taken from the wharf in 8 feet of water at 60° , showed an average excess of 2.3° in the neighborhood of the liver.

7. CHOGSET (*Tautogalabrus adspersus* (Walb.), Gill). Two observations were made upon a single small specimen in an aquarium-tank, the water being at 65.9° , and the thermometer passed into the stomach through the gullet. The excess of temperature over that of the water was 1.2° .

8. SCULPIN (*Cottus octodecimspinosus*, Mitchill). A single specimen showed an excess in the rectum of 0.8° , and in the neighborhood of the liver of 3.2° over the temperature of the surrounding water.

9. SEA-RAVEN (*Hemitripterus americanus* (Gmel.), Storer). A specimen kept alive in a tub on board of the Speedwell for three-quarters of an hour (the water marking 70.6°) showed an excess in the temperature of its circulation over that of the water of 4.4° . Another specimen brought up in the beam-trawl-net showed an excess in the rectum of 17.7° and in the heart of 18.9° over the temperature of the bottom water, but had been half an hour in the trawl, pressed closely on every side by a mass of fishes and sponges. So that the observation is valueless excepting in that it shows that even under abnormal conditions, so long as the fish lives, there is a difference between the temperature of the rectum and of the venous blood.

10. GOOSEFISH (*Lophius piscatorius*, Linnaeus). This fish is admirably constructed for temperature experiments, being provided with a very large heart and branchial artery, and, moreover, with a highly organized digestive system. Unfortunately the only two specimens observed were brought up in the trawl-net with the above-named sea-raven, and had their body temperatures abnormally raised in the same manner. The difference in temperature between the rectum and the circulation was 4.4° .

11. EEL-POUT (*Zoarces anguillaris* (Peck), Storer). Two specimens taken in the trawl-net at the same time and under the same circumstances as the preceding showed a difference between the temperatures of the rectum and the circulation of only 0.5° , the fishes being almost dead. A single specimen taken afterwards with the hand-line showed an excess in the rectum of 3° , and in the neighborhood of the liver of 6° , over that of the surrounding water.

12. FLOUNDER (*Hippoglossoides platessoides* (Fabricius), Gill). In a single specimen taken on a trawl-line the temperature of the circulation was 3° above that of the water near the bottom.

13. DOGFISH (*Squalus acanthias*, Linnaeus). This species was much the most abundant of any near Provincetown. Owing to the high organization of the digestive system of the order to which this fish belongs, it was to be expected that the heat resulting from the processes of nutrition would be found in it to be highest. Accordingly, as the table shows, the differences between the body temperatures and those of the surrounding water are here greater than those manifested by other fishes. In a series of five taken from cold water (40.4°) the average rectum temperature was 4.4° and that of the circulation 12° above that of the water near the bottom. The greatest difference occurred in a female, the ovaries of which contained well-developed young, in which case the circulation was 16.6° warmer than the surrounding water. A young dogfish about 9 inches long, with umbilical vesicle still attached, taken from this specimen, gave an excess of 20.6° in the heart above the temperature of the water, the greatest difference observed during the summer. In this young fish there was of course no cooling of the blood during its

passage through the gills (those organs not having yet come into use), nor otherwise than mediately through contact with the body of its mother. Another adult female with young in her ovisac showed an excess of 9.4° in the rectum (oviduct?) and 15.6° in the heart over the temperature of the water. In another series of fourteen observations upon specimens taken with a trawl-line, and half drowned when drawn up, the body temperatures had approximated that of the surrounding water. In this observation, too, the Negretti-Zambra thermometer failed to act, the column breaking in the wrong place, so that the temperature of the bottom water had to be guessed at from that of the recta of the fishes and from previous observations in the same neighborhood. It was probably not higher than 42° . Above this supposed bottom temperature the fourteen half-drowned dogfish gave an excess of 2.2° in the rectum and of 4.8° in the heart and "thorax." The greatest excess was 6.7° . Still another series of seven taken with a line on the "Ledge," when the indicated bottom temperature could not be relied on, for reasons already given (see p. 313), showed an average difference between the rectum and heart temperatures of 6.7° , while in another specimen the difference between the rectum and muscles was only 1.6° .

14. SKATE (*Raia erinacea* and *R. levis*, Mitchill). Three individuals of the former species, which had been half an hour with a number of other fish in the trawl-net, and were therefore useless for comparison with the bottom water, showed an excess in the temperature of the blood over that of the rectum of 3.1° . Four individuals of the latter species (*R. levis*) taken on the "Ledge," when the temperature of the water from which the fish came was unknown, gave a difference between rectum and circulation of 2.9° .

SUMMARY.

Throwing out doubtful and imperfect observations, the results of those experiments in which the circumstances were most favorable to accuracy, may be summed up as follows:

Fish.	Temperature of surrounding water.	Temperature of rectum above water.	Temperature of circulation above water.	Remarks.	
Cod	39° - 42°	0.98°	4.63°	Spawning.	
Haddock		1.3°	5.3°		
Pollack	42°	2.4°	4.5°		
Hake	42°	2.4°	9.8°		
Blue-fish	73.2°	0.25°	1.55° below.		
Do	70.5°	0.5°	1.7° above.		
"Tinker" mackerel	65°	4.1°	5.25°		"Thorax."
"Tinker," <i>S. Dekayi</i>	60°		2.3°		
Sculpin	60°	0.8°	3.2°		Do. Stomach.
Sea Raven	70.6°		4.4°		
Eel Pout		3.0°	6.0°		
Flounder	42°		3.0°		
Dogfish	42°	4.4°	12.0°		
Dogfish, young in ovary	42°		20.6°		

Ninety-seven fishes have been observed during the summer, but many of the observations are of doubtful value, as has been explained in the foregoing pages. Such as the experiments are they appear to me to point to the following conclusions:

First. All fishes develop animal heat, its quantity varying according to the organization rather than the habits of the family.

Second. This heat results from the processes of nutrition (chemical) and from the conversion of muscular motion (mechanical). That resulting from the oxidation of the blood is lost in the gills; hence the venous blood is decidedly warmer than the arterial.

Third. Spawning and breeding fishes develop more heat than those not carrying on these processes.

Fourth. Elasmobranchs and, generally, fishes with a highly differentiated digestive apparatus develop more heat than those of simpler organization, and (probably) very active surface fishes more than sluggish bottom fishes.

Fifth. The intestinal canal and arterial blood do not correctly indicate the animal heat of fishes.

Sixth. The question of "normal range of temperature" remains unanswered.

SUGGESTIONS.

Should you think it desirable to continue this investigation I would suggest that the inquiry include the following details, indicated by last summer's experiments:

First. The range of temperature through which living fishes may be carried. This might be observed by subjecting different species in tanks to varying temperatures produced by ice or steam introduced into the water, and noting the body temperature of the fish when it begins to show signs of distress. Each experiment would expend a fish, but the importance and practical bearing of this question of "normal range" of temperature might justify the expense. Much could be learned by observing the temperature of the water at which the fish begins to show signs of distress. In such a harbor as that of Provincetown a considerable difference in the temperature of the water can be got by towing a wooden-latticed tank into shallow water at ebb-tide and into suitable positions at flood-tide.

Second. Amount of oxygen required by different fishes. This may be approximated by keeping different species under observation in separate tanks without a fresh supply of water.

Third. Length of life after being withdrawn from the water, and subsequent duration of muscular irritability. Also the number of respirations per minute in different species when at rest.

Fourth. Influence of muscular movements on temperature. This may be observed by tying a fish by the tail, in the water, until it exhausts itself by struggling, and then taking the temperature, to be compared with an observation upon another individual of the same species under similar circumstances, but at rest.

Fifth. Comparative activity of nutrition as indicated by the percentage of nitrogenous matter in the excreta.

Sixth. The repetition of similar observations on the plan of those made last summer.

TABLE B.

Number of observation.	Date.	Number of instrument.	Depth.	Fish.	Temperature, bottom.	Temperature, surface.	Temperature, air.	Temperature, rectum.	Temperature, circulation.	Remarks.
1	1879.									
2	July 30	5	22 fathoms.	Cod	40	69.5	69.5	40.7	o.	
3	July 30	5	do	Haddock	40	69.5	69.5	42.1	o.	
4	July 30	4	do	do	40	69.5	69.5	48	o.	After 10 minutes in warm water.
5	July 30	5	do	do	40	69.5	69.5	44.7	o.	
6	July 30	4	Surface.	do	40	69.5	69.5	58	o.	
7	July 30	5	22 fathoms	Cod ♂	40	69.5	69.5	42.4	44	No. 4, after 15 minutes swimming at surface.
8	July 30	5	do	Haddock	40	69.5	69.5	40.9	o.	
9	Aug. 2	2	Surface	Blue-fish.	40	73.5	73.5	75.6	o.	
10	Aug. 2	2	do	do	40	73.5	73.5	73.3	70	Temperature of circulation from incision in side; vein opened.
11	Aug. 2	2	do	do	40	73	73	73.3	72.6	Vein not opened.
12	Aug. 4	4	15 fathoms	Dogfish	44.5	70.6	70.6	72.2	71	Incision in side; vein opened.
13	Aug. 4	4	Tub	Searaven	44.5	70.6	70.6	53.2	50.8	After 20 minutes in a tub on deck.
14	Aug. 6	3	Surface	Blue-fish	40.4	70.5	70.5	71	72.2	Thermometer in stomach. Fish had been 1 hour in tub at 76.6°.
15	Aug. 6	4-5	17 fathoms.	Dogfish ♀	40.4	70	70	49.8	56	Temperature of circulation from incision in side.
16	Aug. 6	4	do	do	40.4	70	70	61	57	Temperature of circulation taken in heart and branchial artery.
17	Aug. 6	4	do	do	40.4	70	70	69	44.8	Do.
18	Aug. 11	5	23 fathoms.	Dogfish, young	42	64.5	69	43.4	44.8	Young taken from ovary of No. 16.
19	Aug. 11	5	do	Cod	42	64.5	69	43.6	45.8	Temperature of circulation from incision in side.
20	Aug. 11	5	do	do	42	64.5	69	43.6	45.8	Temperature of circulation from bloody fluid in thorax.
21	Aug. 11	5	do	do	42	64.5	69	43.6	45.8	Do.
22	Aug. 11	5	do	Dogfish	42	64.5	69	43.8	47.8	Temperature of circulation in heart.
23	Aug. 11	5	do	Pollack	42	64.5	69	44.4	46.5	Temperature of circulation from fluid in thorax.
24	Aug. 18	6	do	Hake ♀	42	64.5	69	44.4	51.8	Temperature of circulation in heart.
25	Aug. 18	5	do	Chogset	43.5	65.8	65.8	67.2	67.2	In aquarium; thermometer in stomach by œsophagus.
26	Aug. 25	3	31 fathoms.	do	66	66	66	67	63.6	Same specimen as 24.
27	Aug. 25	3	do	Eel-pout	43.5	43.5	43.5	62	62.6	After ½ hour in trawl-net.
28	Aug. 25	3	do	do	43.5	43.5	43.5	62	62.6	Do.
29	Aug. 25	4	do	Goosefish	43.5	43.5	43.5	50	55.8	Do.
30	Aug. 25	4	do	Skate	43.5	43.5	43.5	56.6	59.2	Do.
31	Aug. 25	3	do	do	43.5	43.5	43.5	61.2	62.6	Do.
32	Aug. 25	4	27 fathoms.	Searaven	43.5	43.5	43.5	61.6	64.8	Do.
33	Aug. 25	4	do	Skate	43.5	43.5	43.5	53.2	58.4	Do.
	Aug.	4	do	Goosefish	43.5	43.5	43.5	52	55	Do.

Taken on trawl-line and nearly drowned when examined. Deep-sea thermometer failed to act on this occasion, and bottom temperature is estimated from the temperatures of the rectum of the fish, and subsequent observations in same locality.

Taken at 6 feet below surface, temperature at which depth is given as "bottom temperature." Thermometer was inserted into stomach through oesophagus, and into thorax after division of vessels; results are given as "temperature of rectum" and "temperature of circulation."

Muscles of side.
Heart and branchial artery.

Taken on ledge, and presumed to have come from a deeper stratum of water of a probable temperature of 44.3°.

34	Aug. 28	5	24 fathoms	Dogfish	41.9(0)	61.5	68	42.4	44.4
35	Aug. 28	5	do	do	41.9(0)	61.5	68	42.2	45
36	Aug. 28	5	do	do	41.9(0)	61.5	68	42.4	47
37	Aug. 28	5	do	do	41.9(0)	61.5	68	45.2	46.8
38	Aug. 28	5	do	do	41.9(0)	61.5	68	44.8	46.8
39	Aug. 28	5	do	Flounder	41.9(0)	61.5	68	44.8	46.8
40	Aug. 28	5	do	Haddock	41.9(0)	61.5	68	47.9	47.9
41	Aug. 28	5	do	Eel-pout	41.9(0)	61.5	68	47.3	47.3
42	Aug. 28	5	do	Dogfish	41.9(0)	61.5	68	42	44
43	Aug. 28	5	do	do	41.9(0)	61.5	68	44	44
44	Aug. 28	5	do	do	41.9(0)	61.5	68	47	47
45	Aug. 28	5	do	do	41.9(0)	61.5	68	45.9	45.9
46	Aug. 28	5	do	do	41.9(0)	61.5	68	44.5	44.5
47	Aug. 28	5	do	do	41.9(0)	61.5	68	46.5	47.9
48	Aug. 28	5	do	do	41.9(0)	61.5	68	42.7	48.5
49	Aug. 28	5	do	do	41.9(0)	61.5	68	45.9	49.7
50	Aug. 28	5	do	do	41.9(0)	61.5	68	69.5	70.1
51	Sept. 3	3	Near surface	Tinkermackerel	65	68-69	68.1	68.1	69.3
52	Sept. 3	3	do	do	65	68-69	68.9	68.9	70.1
53	Sept. 3	3	do	do	65	68-69	68.9	68.9	70.1
54	Sept. 3	3	do	do	65	68-69	68.9	68.9	70.9
55	Sept. 3	3	do	do	65	68-69	69.1	69.1	70.9
56	Sept. 3	3	do	do	65	68-69	69.3	69.3	70.3
57	Sept. 3	3	do	do	65	68-69	69.7	69.7	70.1
58	Sept. 3	3	do	do	65	68-69	68.9	68.9	70.1
59	Sept. 3	3	do	do	65	68-69	69.3	69.3	70.1
60	Sept. 3	3	do	do	65	68-69	69.3	69.3	70.1
61	Sept. 3	3	do	do	65	68-69	69.3	69.3	70.1
62	Sept. 6	5	15½ fathoms	Dogfish	51.5(0)	64.5	68	45.3	46.9
63	Sept. 6	5	do	do	51.5(0)	64.5	68	45.9	51.9
64	Sept. 6	5	do	Skate	51.5(0)	64.5	68	48.4	48.4
65	Sept. 6	5	do	Dogfish	51.5(0)	64.5	68	46.3	48.7
66	Sept. 6	5	do	Hake	51.5(0)	64.5	68	45.5	48.5
67	Sept. 6	5	do	Skate	51.5(0)	64.5	68	45.9	48.3
68	Sept. 6	5	do	Haddock	51.5(0)	64.5	68	44.4	48.5
69	Sept. 6	5	do	Dogfish	51.5(0)	64.5	68	48.5	48.9
70	Sept. 6	5	do	do	51.5(0)	64.5	68	52	52.9
71	Sept. 6	5	do	do	51.5(0)	64.5	68	52.9	52.9
72	Sept. 6	5	do	do	51.5(0)	64.5	68	51.9	51.9
73	Sept. 6	5	do	Skate	51.5(0)	64.5	68	51.5	51.5
74	Sept. 6	5	do	Cod	51.5(0)	64.5	68	49.9	49.9
75	Sept. 6	5	do	do	51.5(0)	64.5	68	49.1	49.1
76	Sept. 6	5	do	Skate	51.5(0)	64.5	68	48.5	48.5
77	Sept. 6	5	do	Haddock	51.5(0)	64.5	68	50.9	50.9
78	Sept. 6	5	do	Cod	51.5(0)	64.5	68	49.9	49.9
79	Sept. 6	5	do	Haddock	51.5(0)	64.5	68	52.9	52.9
80	Sept. 6	5	do	Cod	51.5(0)	64.5	68	53	53
81	Sept. 6	4	do	do	51.5(0)	64.5	68	53.2	53.2
82	Sept. 6	4	do	do	51.5(0)	64.5	68	53.2	53.2
83	Sept. 6	4	do	Hake	51.5(0)	64.5	68	51	51

*Standard.

TABLE B—Continued.

Number of observation.	Date.	Number of instrument.	Depth.	Fish.	Temperature, bottom.	Temperature, surface.	Temperature, air.	Temperature, rectum.	Temperature, circulation.	Remarks.
84	1879.									
85	Sept. 6	4	15½ fathoms.	Cod	51.5(?)	64.5	68	50	54.8	Thorax.
86	Sept. 6	5	do	Haddock	51.5(?)	64.5	68	50.5	52.7	Do.
87	Sept. 6	4	do	Cod	51.5(?)	64.5	68	51	55	Do.
88	Sept. 22	3	8 feet	Tinker	60	60	60	60.5	62	Temperature taken in neighborhood of liver.
89	Sept. 22	3	do	Pollack, young	60	60	60	60.5	62	Do.
90	Sept. 22	3	do	Tinker	60	60	60	60.5	62	Do.
91	Sept. 22	3	do	do	60	60	60	60.5	63	Do.
92	Sept. 22	3	do	Pollack, young	60	60	60	60.5	63.2	Do.
93	Sept. 22	3	do	do	60	60	60	60.5	62	Do.
94	Sept. 22	3	do	do	60	60	60	60.5	63	Do.
95	Sept. 22	3	do	do	60	60	60	60.5	62.8	Do.
96	Sept. 22	3	do	do	60	60	60	60.5	63	Do.
97	Sept. 22	3	do	do	60	60	60	60.5	43.7	Do.
97	Sept. 22	3	do	Sculpin	60	60	60	60.8	63.2	Do.

PREVIOUS INVESTIGATIONS.

Dr. John Davy, in a paper read before the Royal Society, in 1835, on the temperature of some fishes allied to the mackerel, observed that the bonito had a temperature of 90° F. when the surrounding medium was 80.5° ; and that it therefore constituted an exception to the generally-received rule that fishes are universally cold-blooded.

*Yarrell says: "The consumption of oxygen, however, is small; and the temperature of the body of fishes that swim near the bottom, and are known to possess but a low degree of respiration, is seldom more than two or three degrees higher than the temperature of the water at its surface." This statement does not appear to be founded upon actual observation, since the temperature of a bottom-feeding fish taken from water at any considerable depth might be, and usually is, much below that of the surface water, and still considerably above the temperature of the water inhabited by the fish. Thus, in the waters about Provincetown, the difference between the bottom and surface water temperatures at 20 fathoms is frequently as great as 30° F. At the time of Yarrell's writing but little was known of the temperature of the water at considerable depths, the deep-sea thermometer being an instrument of comparatively recent use. The quotation illustrates sufficiently well the mistaken theory which underlies the universal belief in the cold-bloodedness of fishes, and which looks to the consumption of oxygen only for the source of animal heat. As has already been shown, whatever heat is developed by this process in fishes is quite lost to its body temperature by the contact of water with the aerated blood in the gills.

The attention of this excellent observer (Yarrell) was strongly attracted to the question of the animal heat of fishes, and he has collected a large number of quotations bearing upon the adaptive power of fishes to extremes of heat and cold, which will be referred to later on. He attached a great deal of importance to the correlation of muscular irritability and "quantity of respiration" in this connection, upon which subject he says: † "Physiologists have shown that the quantity of respiration is inversely as the degree of muscular irritability. It may be considered as a law that those fish which swim near the surface of the water have a higher standard of respiration, a low degree of muscular irritability, great necessity for oxygen, die soon, almost immediately when taken out of the water, and have flesh prone to rapid decomposition. Mackerel, salmon, trout, and herring are examples. On the contrary those fish which live near the bottom of the water have a low standard of respiration, a high degree of muscular irritability and less necessity for oxygen; they sustain life long after they are taken out of the water, and their flesh remains good for several days. Carp, (cod?), tench, eels, the different sorts of skate, and all the flat fish may be quoted." As against

* History of British Fishes. London, John Van Vorst, 1841. Introduction, p. xx.

† Yarrell, *op. cit.* pp. xv and xvi.

the above statement respecting the speedy death of surface swimmers is the fact observed by myself, that a blue-fish (*Pomatomus saltatrix* (Linn.) Gill), taken August 5, showed distinct signs of life after fifteen minutes spent upon the deck of the yacht, and that a fragment comprising rather more than half the heart continued to pulsate for eight minutes after being separated from the body, and to respond to artificial stimulus for fifteen minutes longer.

Prof. G. Brown Goode, of the Fish Commission, has been engaged for some years in the investigation of the relations of our Atlantic fishes to water temperatures. Last year (1878) he made several direct experiments upon body temperatures, testing the temperature of the rectum with a thermometer and comparing it with that of the water as indicated by a deep-sea (Miller-Casella) thermometer. The experiments were made upon cod and haddock for the most part, and the differences between the rectum of the fish and the water from which it had been taken were found to be inconsiderable, rarely exceeding one degree Fahrenheit, as was the case in the similar experiments made by myself last summer. In the cursory examination which I have made of the literature of the subject I have found no other records of exact experiments upon the animal heat of fishes.

There seems to be, however, no lack of authority for the general belief that these animals are cold-blooded, in the sense that they take on the temperature of the medium which surrounds them, and have not, like the higher vertebrates, a limited normal range of temperature, beyond which life cannot be long sustained. Professor Owen lends the weight of his great name to this opinion (in his general division of vertebrates into *Haematotherma* and *Haematoctrya*), and the instances which I now quote of the endurance by fishes of extremes of heat and cold without apparent injury are sufficient to establish incontestably the fact that they do possess such endurance to a remarkable degree. The earlier citations are taken at second-hand from Yarrell (*Introduction to History of British Fishes*).

* Mr. Jesse (*Gleanings in Natural History*, 2d series, p. 277) tells of a friend who saw a goldfish which had been frozen into a block of ice, and afterwards thawed into life.

* Dr. Richardson relates that the gray sucking carp, common in the fur countries of Arctic America, may be frozen and thawed out again without injury. (*Fauna Boreali Americana*, vol. 3.)

* Perch have been frozen and transported for miles, returning to life when thawed (T. S. Buchanan, *Introduction to the Study of Nature*); and John Hunter says (*Animal Economy*): "that these (fishes) after being frozen still retain so much of life as when thawed to resume their vital actions, is a fact so well attested that we are bound to believe it."

† Mr. J. W. Milner (Assistant Fish Commissioner), had a mud minnow

* Quoted by Yarrell, *loc. cit.*

† Goode *On the Migration of Fishes*. Read before the American Fish Cultural Association, February 28, 1878.

(*Umbra limi* [Kirt.] Günther) which was frozen within solid ice in an aquarium-globe, three or four times, and each time regained its vitality upon being thawed out. Instances similar to the foregoing can be adduced indefinitely.

*The only *hibernation* which is definitely known to occur among fishes, says Professor Goode, takes place in the fresh-water lakes and streams of cold regions. The fishes are driven by cold into the deeper waters, and there remain in a state of torpor, proportional in degree to the amount of cold which they experience. Hibernation does not appear to be in any case a voluntary act. The fishes do not become torpid of their own accord. They avoid it as long as they can, and only succumb when they are deprived of the means of escape. They never become torpid when there are greater depths to which they can retreat.

†Dr. C. C. Abbott reports of the fresh-water mullet (*Myxostoma oblongum*): "No degree of cold seems to affect the movements of this species, and hundreds can frequently be seen under the ice, moving slowly along the bed of the stream, feeding upon the wilted remnants of pond-lily and splatter-dock plants. * * * This applies also to our common roach (*Stilbe americana*), which, to a less extent, braves the chilling waters of our streams throughout the winter, and, in consequence, suffers from the persecutions of the three species of pike (*Esox reticulatus, fuscatus, porosus*) inhabiting our streams."

‡See also Mr. Rudolph Hessel's observations upon the winter torpor of the carp. This appears to be a true hibernation, during which, although the fish takes no food in some climates from October until March, there is no diminution in weight.

On the other hand, fishes have been reported as living and thriving in water at an exceedingly high temperature; high enough to produce death by coagulation of the albumen in their blood and tissues, unless there is some provision by which their interior parts are maintained at a temperature lower than that of the surrounding water. As the existence of any protection analogous to that afforded to mammals by the function of perspiration and evaporation seems obviously impossible to animals living in the water, it is difficult to understand in what way such a reduction in temperature can be produced and kept up.

§Thus, Humboldt and Bonpland observed living fishes in hot water thrown up from a volcano and showing a temperature of 210° F.

§Desfontaines found a *Chromis* in the hot springs of Cafsa, in Bombay, the water in which showed 30° R. (97.5° F.), and Shaw afterwards saw small mullet and perch in the same springs. (*Travels in Bombay*, folio, Oxon. 1738, p. 231.)

* Goode, *loc. cit.*

† Notes on some Fishes of the Delaware River. United States Fish Commissioner's Report for 1875-76, p. 825.

‡ The Carp and its Culture. Fish Commissioner's Report for 1875-76, p. 869.

§ Quoted by Yarrell, *loc. cit.*

* Saussure saw eels, rotifera, and infusoria in hot springs of Aise, in Saxony, in 1790, at a temperature of 113° F.

* Bruce says that at Feriana, the ancient Thala, are springs of warm water without the town, where he saw small fishes, 4 inches long, not unlike gudgeons. The temperature is not noted, but he says: "Upon trying the heat by the thermometer I remember to have been much surprised that they could have existed, and even not been boiled, by continuing so long in the heat of this medium."

* Facts mentioned by Somerset induced Broussonnet to make some experiments on the degree of heat which river fish are capable of enduring. Details of the degrees of heat are not stated, but many species lived several days in water too hot for the hand. (This and the preceding citation from Dr. Hodgkin's additions to the translation of Dr. W. F. Edwards' work "On the Influence of Physical Agents on Life.")

† Professor Goode writes: "In warm countries an analogous phenomenon (to hibernation) takes place, which has been called *astivation*. When the lakes and streams are dried up by the heat, the fish seek refuge in the deepest pools, and when they too are dried, they bury themselves in the mud at the bottom and remain torpid until the rainy season refills the reservoirs and revives them."

‡ Day reports that on January 18, 1869, he visited a large tank which was then almost dry, having only about four inches of water in the center, while the circumference was hard enough to walk on. The soil was a thick and tenacious bluish clay, from which, fully thirty paces from the water and two feet below the surface, were taken five living fishes. Two were *Ophiocephalus punctatus*, and three were *Rhincobdella aculeata*. They were covered with a thick adherent slime. "All were lively and not in the least torpid." Day also reports *Amphipnous cuchia* as having been dug up under similar circumstances. Mr. Whiting, chief officer of the western province of Ceylon, informed Sir Emerson Tennent that he had been twice present when the peasants had been digging up fish of nine to twelve inches long, full-grown and healthy, which *jumped on the bank* when exposed to the light.

Batrachians, tortoises, and land-snails are commonly found in a torpid state during the hot and dry months, a state which may truly be called *astivation*, but which differs decidedly from the condition of activity described above as observed in buried fishes, and for which there is no very obvious explanation.

The instances cited are sufficient to show that the popular belief that fishes possess no animal heat of their own rests upon well-attested observations. At first sight it is difficult to understand otherwise how these animals can undergo the extremes of heat and cold which they have been known to undergo and continue to live. Yet, when the adaptability of birds and mammals, whose normal range of body temperature is so extremely narrow compared with that of fishes, to extremes

* Quoted by Yarrell, *loc. cit.*

† Goode, *op. cit.*

‡ "Fresh Water Fishes of India," p. 28.

of heat and cold is fairly considered, the necessity for this inference seems to be not so very obvious. And no one appears to have tried the experiment of subjecting the *same individuals* to great differences of temperature, whereby the immense effect of inherited adaptation would have been thrown out of the account.

With the exception of the often-quoted paragraph from Humboldt and Bonpland, none of the foregoing observations attest a higher temperature than 113° F., noted by Saussure as endured by eels in the hot springs of Aise. This is but little above the temperature observed at Fort Yuma, in California, which is occupied as a military post.

I have not yet found the original passage from which the statement credited to Humboldt and Bonpland, as to living fish in water at a temperature of 210° Fahr., is quoted. Yarrell gives no indication of the precise place from which he cites. In an essay* "*Sur une nouvelle espèce de pimelodus*" (*P. cycloptum*), however, Humboldt writes: "L'hasard a voulu que ces inondations volcaniques n'eussent pas lieu l'année que j'ai passée dans les Andes de Quito; mais les poissons vomis par les volcans sont un phénomène si commun et si généralement connu de tous les habitans de ce pays, qu'il ne peut pas rester le moindre doute sur son authenticité." From which it appears that, on the occasion referred to at least, he was obliged to rely upon second-hand testimony; especially upon that of M. de Larrea, of Quito, who had collected a cabinet of minerals, was instructed in chemistry, and had looked into the records of many villages around Cotopaxi. From this gentleman he learned that in 1691 myriads of the fishes in question were vomited up from the volcano of Imbabarri, causing a fever among the neighboring people. Some Indians assured him ("quelques Indiens m'ont assuré") that the fishes were living as they came down the side of the mountain, "*mais ce fait ne me paroit assez aréré.*" Very few of the specimens that he saw were sufficiently disfigured, in his opinion, to indicate exposure to very great heat, and the specimens came out of the mountain mixed with an argillaceous mud. Humboldt conjectures the existence of subterranean lakes whence he supposes the fishes to have come. Not having found the original passage, I cannot, of course, say how far its context might modify the inferences which have been drawn from it as quoted, but it is evident that at the time here referred to, at least, he had no idea that the fishes were alive when thrown out from the mountain, nor did he make any record of the temperature (210° Fahr.) named in the citation.

The instances of frozen fishes thawed into life again differ in kind rather than in degree from familiar experiences with frozen fingers, toes, and ears restored to their integrity by gradual thawing, *when they have not been frozen too long*. In no case, so far as I know, has any attempt been made to ascertain whether the frozen fish retains in its interior parts a temperature above the freezing-point; nor is it stated that

* *Recueil d'observations de zoologie et d'anatomie comparée*, Paris, 1811, tome 1^{er}, p. 22.

fishes have been thawed into life after having been frozen for any great length of time.

* Dr. Richardson's remarks in a recent communication to *Nature*, upon "Suspended Animation," are pertinent to this inquiry. "It is hard to say whether an animal, like a fish, frozen equally through all its structure, is actually dead in the strict sense of the word, seeing that if it be equally and uniformly thawed it may recover from a perfect glacial state. In like manner it may be doubted whether a healthy, warm-blooded animal suddenly and equally frozen through all its parts is dead, although it is not recoverable, because in the very act of trying to restore it some inequality in the direction is almost certain to determine a fatal issue, owing to the transition of some vital centre into the pectous state of colloidal matter. I do not, consequently, see that cold can be of itself and alone utilized for maintaining suspended animation in the larger warm-blooded animals of full growth. * * * It is worthy of note that cold is antiseptic, as though whatever suspended living action, suspended also by some necessity or correlative influence the process of putrefactive decay."

Respectfully submitted.

J. H. KIDDER.

Hon. SPENCER F. BAIRD,

*United States Commissioner of Fish
and Fisheries, Washington, D. C.*

FEBRUARY 10, 1880.

**DESCRIPTIONS OF NEW GENERA AND SPECIES OF FISHES FROM
THE COAST OF CALIFORNIA.**

By W. N. LOCKINGTON.

1. *Leurynnis paucidens*, gen. et sp. nov.

GENERIC CHARACTERS.—Family *Zoarcida*, allied to *Lycodes*. Ventral fins present, short; no teeth on vomer and palatines; dorsal and anal fins continued without interruption around the tail. Scales small, but evident. The name is from *λεπρός*—smooth; *ῥινος*—vomer, in allusion to the character which chiefly distinguishes the genus from *Lycodes*.

SPECIFIC CHARACTERS.—Body elongate, eel-like; extremity of snout subtruncate; profile of remainder of snout and head conic, slightly convex over the eyes; highest part of the dorsal outline and deepest part of the fish perpendicular to a point about midway between the posterior end of the lower jaw and the base of the pectoral; from this point to the slightly rounded end of the caudal the body tapers regularly both above and below. Head broad, the sides (viewed from above) almost straight from the opercula to about half-way between the eye and the tip of the snout, thence rapidly approaching and meeting in an obtuse point.

Greatest depth of body from a little more than ten to a little less than eleven times; length of head $4\frac{1}{3}$ — $4\frac{2}{3}$ times in the total length; snout $2\frac{1}{8}$

* Quoted from *Forest and Stream*, September 4, 1879.

—3 times; eye $5\frac{2}{5}$ — $6\frac{1}{4}$ times in the length of the head; lower jaw $\frac{11}{8}$ — $\frac{13}{2}$ of the head. Pectoral fin $\frac{9}{2}$ — $\frac{1}{2}$ the length of the head, and $4\frac{1}{2}$ to almost 6 times the length of the ventrals; anus situated at the end of the second fifth of the total length.

Nostrils much nearer to the extremity of the snout than to the eye and below the horizon of the lower margin of the orbit; provided with a short tube.

Eyes elliptical, directed obliquely upwards and outwards; the interocular space only about $\frac{1}{5}$ of the total width of the head, the sides of which continue to shelve outwards at the same angle with the eye-balls as far as the lower margin of the suborbital ring. Interorbital space concave to about the center of the orbit, at which point the two ridges bordering the eyes meet with the central ridge, separating again posteriorly.

Mouth large, slightly oblique, the cleft straight, its angle reaching about to a vertical from the center of the pupil; intermaxillaries and maxillaries very slender; lower jaw received within the upper; lower margin of mandible straight, with a small symphysial knob, and a prominent articulation. In the females the mouth is smaller; maxillary with its posterior extremity enveloped in the skin of the angle of the mouth. Tongue large and thick.

Teeth small, slender, bluntly pointed, those of the mandible in about four irregular rows in front, those of the inner row largest and farthest apart. The outer row disappears at about $\frac{1}{4}$ of the length of the cleft of the mouth from the tip of the mandible, but the inner row continues to about $\frac{1}{2}$ the length of the cleft of the mouth. The outer row slopes outward, but the inner is much recurved, and the three or four posterior teeth of the inner row on each side are the largest and strongest in the jaws. Teeth of the intermaxillary in a single row, extending about half-way along the sides of the mouth, the largest in front, gradually diminishing posteriorly. No vomerine or palatine teeth.

Gill-openings narrow, inclined forwards, and broadly attached to the isthmus; branchiostegals six, sometimes only five. Pseudobranchiæ. Operculum very small, with radiating ridges; cheeks fleshy, very long, so that the eye is nearly midway between front of opercle and tip of snout. Upper and lower pharyngeal bones covered with villiform teeth; the posterior upper pharyngeal smallest; the lower pharyngeals separate, subtriangular. Gill-rakers quite short, pointed, flexible.

Vertical fins continuous, long and low, and formed of soft rays throughout, dorsal commencing at a vertical from a little before the center of the length of the pectoral, caudal somewhat rounded, anal commencing very near to the anus. Dorsal with about 90 rays; anal with about 70.

Ventrals very small, jugular, consisting of two rays; their insertion slightly posterior to the lower extremity of the branchial opening.

Upper axil of pectorals below the center of the height of the body,

their base vertical, and extending to the abdominal outline; the fin consisting of 18 rays, the fifth or sixth longest, the lowest about $\frac{2}{3}$ as long as the fifth; first three or four rays simple, the others bifurcate.

No lateral line. Scales roundish, smooth, separate, embedded in the skin, uniform over the whole of the body, except upon an area on the upper surface in front of the dorsal, where they are smaller, and region near base of pectorals scaleless. Head scaleless, the ridges somewhat prominent.

Color olivaceous, the scales lighter than the skin; the color formed by numerous dark points, which are continued also upon the head. Upper surface of head darker, abdominal surface lighter than other portions. Vertical fins margined with black.

This species is not uncommon in the markets at San Francisco. Two specimens, 10 to 12 inches in length, have been forwarded to the United States National Museum, where they are numbered 23502. They may be considered as the types of the species.

2. *Odontopyxis trispinosus*, gen. and sp. nov.

GENERIC CHARACTERS.—Family *Agonidae*, allied to *Agonus* (*cataphractus*), from which it differs chiefly in the presence of teeth on the vomer and palatines. It is distinguished from *Agonopsis*, Gill, by its smaller fins and slenderer form.

SPECIFIC CHARACTERS.—Body octahedral, the lower flat side terminating behind the anal fin, the upper side a little behind the second dorsal. Posterior portion of body hexagonal. Body anteriorly very much broader than deep, the upper side, from the head to its termination, concave; lower side slightly concave; the other surfaces flat. Lateral surfaces (traversed by the lateral line) wider anteriorly than those separating them from the upper and lower surfaces; posterior to the second dorsal the lateral surfaces are narrowest.

Greatest depth, above pectoral, 10–12 times in length; greatest width, at gill-covers, $7\frac{2}{3}$ –8; length of head, $5\frac{2}{3}$ – $5\frac{1}{2}$ times in the total length; eye, $3\frac{1}{2}$ – $3\frac{1}{3}$; snout, $3\frac{1}{2}$ – $3\frac{1}{3}$; interorbital width, $6\frac{1}{3}$ –7 times in length of head.

Head triangular, depressed. A sharp, rather long, movable spine upon the tip of the snout, its triangular base projecting beyond the jaws; behind this central spine, on the highest point of the snout, is a pair of similar, but recurved, fixed spines. Snout posterior to these spines nearly level to orbital region. A prominent supra-orbital ridge ending posteriorly in a backward-directed spine. Forehead strongly convex longitudinally, and strongly concave transversely. Occiput slightly depressed between the par-occipital ridges, its posterior border deeply emarginated. Supra-occipital ridge but slightly marked above, but very conspicuous on the hinder margin of the head, where there is a deep cavity in front of the first series of body-plates, this cavity longitudinally divided by the supra-occipital ridge. A slightly-marked ridge from the center of the hinder margin of the eye to the lateral keel of

the upper surface. A backward-directed spine on each pre-orbital. Nostrils in a depression on each side of the snout. Lower jaw received within the upper both on front and sides. Jaws, vomer, and palatines armed with minute, sharp, closely set teeth.

Maxillary almost entirely concealed by the free edge of the pre-orbital when the mouth is closed. Two minute barbels at each angle of mouth. Orbit large, almost circular, occupying far the larger portion of the height of the head, the upper margin of the pupil touching a line drawn from the upper part of the snout to the occiput.

Gill-membranes attached to a broad isthmus; branchiostegals seven.

Pectoral shorter than head, broadly rounded on lower margin, and composed of fourteen simple rays.

Ventrals inserted posterior to the insertion of the pectorals, close together, consisting of a spine and two unbranched rays.

Vent a conspicuous elliptical opening, situated at about the middle of the length of the ventrals.

First dorsal of four spines, the second longest, the fourth shortest, the third slightly longer than the first; its base occupying the posterior portion of the seventh, and the whole of the eighth and ninth series of plates.

Second dorsal of six unbranched rays, the second slightly longer than the first; its base occupying the fifteenth to the nineteenth series of plates, inclusive.

Anal of six rays, opposite and similar to the soft dorsal.

Caudal elongate, rounded on posterior margin, and consisting of eleven unbranched rays. Fin-membranes delicate.

Thirty-five to thirty-seven series of plates from occiput to base of caudal, each series strongly keeled, each keel ending in a spine; a circlet of horizontal spines around the base of the caudal. The two elongate, subrectangular shields at the base of the ventrals are in the line of the second series of dorsal plates, the first series terminating above the pectorals. Twenty-seven irregular plates on the under surface of the body in front of the ventral plates. Lateral line simple, along the center of the lateral surfaces.

Color olivaceous or yellowish, with six or seven darker bands of brown on the dorsal surfaces. Under side uniform whitish. Fins blotched with blackish.

Three specimens of this species are known to me; two of them were obtained in the markets of San Francisco. One of these, which may be considered as the type of the species, has been forwarded to the United States National Museum, and is numbered 23504 on the Museum Register. The third specimen was procured on the coast of Alaska by the United States Coast Survey. The aspect of this fish is that of *Agonus*, but the presence of teeth on the vomer and palatines excludes it from that genus.

Dimensions.

	No. 1.	No. 2.
Total length	2.05	3.23
Length of head to gill-opening .....	.38	.56
Length of head to center of occipital emargination .....	.33	.48
Width at gill-openings (greatest width) .....	.27	.405
Greatest depth .....	.205	.27
Tip of snout to pectoral base .....	.40	.62
Tip of snout to ventral base .....	.46	.75
Tip of snout to origin of 1st dorsal .....	.65	1.03
Tip of snout to origin of 2d dorsal .....	.94	1.50
Tip of snout to origin of anal .....	.94	1.50
Tip of snout to anterior margin of vent .....	.53	.82
Length of snout .....	.10	.16
Longitudinal diameter of orbit .....	.10	.16
Interocular width .....	.06	.08
Length of gape of month .....	.08	.12
Length of pectoral .....	.31	.52
Length of ventral .....	.13	.24
Height of longest (2d) spine of 1st dorsal .....	....	.29
Height of longest (2d) ray of 2d dorsal .....	....	.32
Height of longest ray of anal .....	....	.26
Number of series of plates (on back) and of tubes of lateral line	35	37
Fin-formula: B. 7; P. 14; VI, 2; D. IV—6; A. 6; C. 11.		
The dimensions are all taken along the axis of the fish.		

3. *Artedius quadriseriatus*, sp. nov.

B. 5; D. $\frac{IX-X}{14}$; A. 12; P. 16; V. 4; C. 2, 11, 2; Lat. line 35—37.

Snout straight, rising at an angle of about 45°, forehead strongly curved, occipital region slightly concave, depth of body at origin of dorsal only slightly exceeding that at posterior margin of orbit. A conspicuous supra-orbital barbel about half as long as diameter of eye. Dorsal outline from origin of dorsal to caudal peduncle straight and deflected regularly downwards.

Gape of mouth very slightly oblique, rest of abdominal profile straight. Greatest width (at preopercles) $6\frac{1}{11}$ to nearly 7, greatest depth (at origin of dorsal) about equal to greatest width; length of head (to tip of operculum) $2\frac{2}{3}$ times, in total length to end of caudal. Snout about equal to longitudinal diameter of orbit which is about $3\frac{2}{3}$ times in head; interocular width $12\frac{1}{2}$ — $14\frac{1}{2}$ times in length of head. Depth of caudal peduncle $3\frac{1}{2}$ times in greatest length, pectoral about $1\frac{1}{3}$ in length of head.

Head large, deep; ascending processes of premaxillaries forming two converging ridges, ending above in a blunt projection, on each side of which, in a line with the nostrils, is a long sharp spine. A pair of spines on occiput, the interval between them concave transversely. A transverse sulcus between the anterior pair of spines and the forehead.

Eyes directed obliquely upwards, interocular space concave, narrow, less than $\frac{1}{3}$ the width of the eye.

Gape of mouth slightly oblique, maxillary reaching to the middle of the pupil, its end with a slender barbel; mandible straight; jaws even when the mouth is closed.

A band of closely set, sharp, nearly straight, cardiform teeth in both jaws, the largest teeth in the front of the jaws, where there are more rows than at the sides. Similar teeth on vomer and palatines. Cushions of villiform teeth on pharyngeals.

Gill-rakers tubercular; branchiostegals five, gill-membranes broadly connected below the throat; no isthmus. Pseudobranchiæ present.

Preoperculum with a large process which has four curved spines above and ends in a spine directed backwards. Sometimes there is a fifth spine on the upper margin, or the tip is bifid. Three other preopercular spines, the uppermost a little below the spine-bearing process, and directed backwards, the next pointing downwards, the lowest obliquely forwards, the three last equidistant. Supra-seapula with a ridge, in a line with the first scale of the lateral line. Upper surface and sides of the head with numerous pores, the most conspicuous of which are on the anterior portion of the forehead. Top and sides of head with some minute, smooth, imbedded scales. Opercle small, ending posteriorly in a flat, bluntish spine, behind which is a large membranous flap.

First five spines of first dorsal sub-equal, the others diminishing rapidly, last very short. Two dorsals entirely separate, interval short.

Second dorsal increasing in height to fourth or fifth ray, first ray about $\frac{3}{4}$ as long as second. From the longest ray the upper margin inclines regularly to the last (14th), which is about $\frac{1}{2}$ the length of the longest.

Anal similar to soft dorsal, but the rays shorter, fourth ray longest. Origin of 1st dorsal opposite the center of the supra-seapular ridge, that of 2d opposite the 11th scale of the lateral line, anal arising opposite the 2d, and terminating opposite the 13th ray of the 2d dorsal.

Pectoral base oblique, broad, pectoral broadly lanceolate, 5th ray longest and extending back to the 2nd ray of the 2d dorsal.

Ventrals small, four-rayed, inserted slightly behind the posterior axil of the pectoral base; length to that of pectoral as 3.8. All fin-rays unbranched.

Each side of the body with two bands of large, strongly ctenoid scales; the lower bearing the lateral line, composed of 35 to 37 scales, beginning at the upper angle of the gill-openings, thence strongly decurved over the pectorals, thence running straight to the base of the caudal. Many of the scales on the posterior part of this band are provided with slender cirri. The upper band of scales begins further back, in front of the middle of the dorsal, and runs along the base of the dorsal fins, stopping before reaching the caudal. This band is composed of two series of alternating scales, closely wedged in together. Between and above these bands are a few small scattered imbedded scales. Like the scales on the head these small scales can only be seen with the aid of a magnifying-glass.

Color olivaceous, with darker spots formed of black punctulations; four or five dark blotches along the lateral line. Branchiostegal mem-

brane sometimes black. Two black spots on the spinous dorsal, one in front, the other at the tips of the posterior rays. Other fins olivaceous.

Pectorals and caudal barred; ventrals and anal sometimes black, sometimes colorless. Under surface creamy-white.

Several specimens obtained in San Francisco market among heaps of *Pandalus Danu*. Two of these now in the United States Museum are numbered 23503 on the register.

As the specimens obtained vary less than is the case with many species, and are of very nearly the same dimensions, I subjoin measurements of two only.

The principal variations are in the height of the dorsals and in the color of the paired fins and of the anal, which are much darker in some than in others. The dimensions are all axial, unless otherwise stated.

	Inches.	Inches.
Total length, to tip of caudal	3.38	3.50
Total length, without caudal	2.80	2.90
Length of head, to tip of operculum .....	.95	.99
Greatest depth of body at origin of 1st dorsal .....	.47	.55
Greatest width at preopercles .....	.49	.55
Depth of caudal peduncle .....	.14	.16
Tip of snout to insertion of ventrals .....	.75	.82
Tip of snout to origin of 1st dorsal .....	.80	.83
Tip of snout to origin of 1st dorsal along dorsal outline .....	.90	.95
Tip of snout to origin of 2nd dorsal	1.44	1.54
Tip of snout to origin of anal	1.46	1.56
Height of longest ray of 1st dorsal .....	.46	.41
Height of longest ray of 2nd dorsal .....	.45	....
Length of base of 1st dorsal .....	.56	.58
Length of base of 2nd dorsal .....	.85	.85
Length of base of anal .....	.68	.68
Width of pectoral base .....	.28	.30
Length of pectoral, from center of base .....	.80	.80
Length of ventrals .....	.31	.31
Longitudinal diameter of orbit .....	.26	.26
Length of snout .....	.24	.26
Interocular width .....	.065	.08
Tip of snout to end of maxillary .....	.31	.32
Length of preopercular process .....	.21	.22

SAN FRANCISCO, *December*, 1879.

CATALOGUE OF A COLLECTION OF FISHES OBTAINED IN THE GULF OF MEXICO, BY DR. J. W. VELIE, WITH DESCRIPTIONS OF SEVEN NEW SPECIES.

By G. BROWN GOODE and TARLETON H. BEAN.

MALTHEIDÆ.

1. *Halieutichthys aculeatus* (Mitchill), Goode.

Lophius aculeatus, MITCHILL. Amer. Monthly Mag. II, 1878, p. 325 (Straits of Bahama).

Halieutichthys reticulatus, POEY. Proc. Acad. Nat. Sci., Phil., 1863, p. 91 (Cuba).

Halieutichthys aculeatus, GOODE. Proc. U. S. N. M., II, 1879, p. 109 (calling attention to Mitchill's description).

A single specimen, No. 23552, 5 centimeters long, was collected by Dr. Velie, at Key West.

DIODONTIDÆ.

2. *Chilomycterus geometricus* (Linn.), Kaup.

Two specimens (No. 23542) collected at Key West. They belong to Günther's var. *a*, but are much lighter than any specimens among the hundreds we have seen from the North Atlantic coast, the width of the brown longitudinal stripes being comparatively small in relation to those of light color.

OSTRACIONTIDÆ.

3. *Ostracion trigonus*, LINNÆUS.—*Shell-fish*.

A single specimen in salt (No. 23645) from the west coast of the peninsula.

BALISTIDÆ.

4. *Monacanthus occidentalis*, Günther.

A single specimen (No. 23551), 63 millimeters long, from Key West. The specimen has the scales upon the posterior portion of the body hispidate, also a pair of strong recurved spines on each side of the caudal peduncle. Four indistinct longitudinal brown bands upon the side, and a fifth much deeper in color at the base of the ventral flap, triangular in form, the base of the triangle extending from base of the ventral spine to the vent. The outer half of the ventral flap is white with a submarginal stripe and three or four lines of ocellæ of light brownish gray.

D. 30, A. 30.

SYNGNATHIDÆ.

5. ? *Syngnathus louisianæ*, Günther.

A single specimen (No. 23549), 64 millimeters long, was collected by Dr. Velie at San Marco Island, Florida.

D. 32 (?). Osseous rings 17 + 32.

The specimen corresponds closely with Günther's description. Its principal points of distinction from *S. fuscus* are the low, somewhat short dorsal fin and the short snout.

BATRACHIDÆ.

6. *Batrachus tau*, Linnaeus, *subsp. beta*, Günther.

A specimen (No. 23541), 22 centimeters long, was collected by Dr. Velie at Punta Russa, the most southern locality on record for this species.*

This fish, like all other Gulf of Mexico specimens inspected by us, agrees closely with var. β , as defined by Günther,† in the tendency to expansion of the dark areas; the presence of small whitish spots upon the body; the greater average number of bands on the anal, approximating in number those of the dorsal, and the marking of the pectorals and caudal in white spots upon dark ground, rather than in brown upon white. The coloration of the southern specimens appears to be due to a tendency toward melanism, the dark areas being intensified as well as expanded. In the Punta Russa specimen (No. 23541) the main color is nearly black, the lines and marblings being of light shades of brown and brownish white, sharply and beautifully defined against the dark body-color. In the Pensacola specimen, No. 21477, the melanistic tendency is less evident. We consider the Gulf specimens as, for the present, constituting a distinct subspecies, founded entirely upon color.

Radial formula of No. 23541, D. III, 24. A. II, 19. The first and second dorsal fins are continuous in 23541, but this is evidently accidental.

That the number of bands on the fins and their tendency to confluence is a character of little importance is shown in the following color notes: No. 4637 *a*. Beesley's Point. S. F. Baird.

Light brown, finely marbled with darker, and not white spotted (*a* and *b*). Dorsal with eight bands. Anal with seven bands. Caudal with six bands. Pectorals irregularly brown spotted.

4637 *b*. Beesley's Point. S. F. Baird.

Light brown, coarsely marbled with darker. Dorsal with six bands, anal with six bands, caudal with four bands, pectorals with the brown spots arranged in four bands.

* The National Museum has a specimen from Pensacola, Fla., collected by Silas Stearns in 1878 (No. 21477); another from West Florida, collected by Kaiser and Martin (No. 5149), and two collected at Indianola, Tex., by J. H. Clark (No. 746). No species of *Batrachus* is now recognized from the eastern coast of South America, though it seems certain that some species, closely allied to *B. tau*, or perhaps even this very species, occurs in Brazil. Compare *Batrachus Gronorii*, CUV. & VAL., Hist. Nat. Poiss., xii, 1837, p. 482.—*Batrachus cryptocentrus*, CUV. & VAL., l. c., p. 485, from Bahia, rejected by Günther as incompletely described.

† Cat. Fish Brit. Mus., iii, 1861, p. 167.

4637 *c.* Beesley's Point. S. F. Baird.

Dorsal with eight, anal with seven, caudal with five, pectoral with five bands.

4637 *d.* Beesley's Point. S. F. Baird.

Dorsal with eight, anal with six, caudal with four, pectoral with spots arranged in irregular, almost complete, bands.

4637 *e.*

Dorsal with nine bands, the second and third and sixth and seventh confluent. Anal with nine bands. Pectoral with irregularly arranged quadrangular spots of brown and white, in a sort of checkerboard arrangement.

3441. Norfolk, Va. Dr. Jeffries.

Body as usual. Dorsal with seven, anal with eight, caudal with four bands. Pectorals irregularly spotted with brown, arranged approximately in five bands.

23541. Punta Russa, Fla. Dr. J. W. Velie.

Body brown, marbled with very dark brown, and spotted with whitish. Dorsal with nine very regular blackish bands of uniform width, sharply separated by white. Anal with nine regular bands. Caudal with five. Pectoral brownish black dotted with white.

20632. Wood's Holl, Mass. U. S. F. C.

Young specimen. White, with sides coarsely reticulated with brown. Dorsal with seven irregular confluent bands. Anal with nine irregular bands. Caudal irregularly marbled with broad penciling of brown. Pectoral with three or four very irregular lines of brown blotches.

D 26. A 21.

Others in the same bottle correspond in markings and radial formulæ.

746. Indianola, Texas. J. H. Clark.

Faded alcoholic specimens show a general agreement with the other Gulf specimens in the presence of seven to nine bands in both dorsal and anal, and in the white spots on pectoral and caudal.

D. III. 25; A. 20 (in two specimens).

21477. Pensacola, Fla. Silas Stearns.

Body nearly black, but agreeing in general with the descriptions, and with tendency to white maculation on body, pectoral, and caudal. Three bands on dorsal, eight on anal, not clearly separated as in the Key West specimen.

Table of measurements.

Batrachus tau, subsp. *beta*.

Current number of specimen.....	21477	
Locality.....	Pensacola, Fla.	
	Millime- ters.	100ths of length.
Extreme length.....	242	
Length to origin of middle caudal rays.....	205	
Head:		
Greatest length, obliquely to gill-opening.....		42
Greatest width.....		29½
Width of interorbital bone.....		4
Length of snout (oblique).....		8
Length of operculum to end of longest spine.....		8
Length of upper jaw.....		20½
Length of mandible.....		26
Diameter of orbit.....		5
Dorsal (spinous):		
Distance from snout.....		37
Length of base.....		9
Height at first spine.....		3½
Height at second spine.....		6
Dorsal (soft):		
Length of base.....		53
Anal:		
Distance from snout.....		60
Length of base.....		42
Caudal:		
Length of middle rays.....		18
Pectoral:		
Distance from snout.....		41
Length (without peduncle).....		16
Ventral:		
Distance from snout.....		31
Length.....		17½
Dorsal.....	III, 24	
Anal.....	22	
Pectoral.....	18	
Ventral.....	I, 2	

7. *Batrachus tau*, subsp. *pardus* Goode & Bean.

Two specimens of a very remarkable form of *Batrachus* were collected in Pensacola in 1878 by Mr. Silas Stearus. They are mentioned on p. 127, in our paper on the fishes of Pensacola, September 19, 1879. Our suspicions as to their specific individuality then expressed have not been confirmed by more careful study. The characters by which they are separated from typical *Batrachus tau* are extremely difficult to define. Yet, unless other specimens are obtained which shall bridge the chasm between the two Pensacola specimens and all others of *B. tau* from Pensacola and elsewhere in the Museum, we cannot but consider them as representing two distinct subspecies. The melanistic tendency of the typical *B. tau* in the South, as observed by Günther and illustrated by all our Gulf specimens, should be taken into consideration, for the types of *B. pardus* are lighter in color than any specimens of *B. tau* in the Museum.

The vertebræ number 12-22 (the modified vertebra at the base of the caudal fin not being included). These fish were called in Pensacola by the names "Sea Robin" and "Sapo"; the latter being doubtless a corruption of the Spanish "Sapo", meaning "toad".

Color.—Body very light yellowish brown, gray beneath, thickly spotted with dark brown. The spots on the head are smaller than those on the body. Those on the under side of the body are numerous, circular, the largest equalling the eye in size. On the upper part of the back are many large oblong blotches of brown, interspersed with numerous smaller circular spots. The markings of the dorsal and anal fins remotely resemble those in *Batrachus tau*, subsp. *a* and *β*. In No. 22337*a* there are nine interrupted bands on the dorsal and six on the anal, two distinct bands on the anterior half of the caudal, and on its posterior half numerous blotches of the body color or dark brown grayish. Pectorals grayish at the base, yellowish brown elsewhere, and thickly blotched with dark brown.

In No. 22337*b* the oblique bands on the dorsal fin are obsolete, replaced by irregular blotches and an irregular marginal band of black. The anal exhibits obsolescent bands, perhaps eight in number. Caudal dark brown with a few light blotches. Pectoral as in 22337*a*, but with a wide brownish black margin.

Table of measurements.

Batrachus tau, subsp. *pardus*.

Current number of specimen	22337 <i>a</i> .		22337 <i>b</i> .	
	Pensacola, Fla.		Pensacola, Fla.	
Locality	Millime- ters.	100ths of length.	Millime- ters.	100ths of length.
Extreme length	379			
Length to origin middle caudal rays	320		320	
Head:				
Greatest length, obliquely to gill-opening		36½		37½
Greatest width		31		32
Width of interorbital bone		4½		4½
Length of snout (oblique)		7½		8
Length of operculum to end of largest spine		7		8½
Length of upper jaw		18		19½
Length of mandible		24		23½
Diameter of orbit		5		5
Dorsal (spinous):				
Distance from snout		35½		35½
Length of base		8½		6½
Length of first spine		4½		4
Length of second spine		6		5
Dorsal (soft):				
Distance from snout		46½		
Length of base		54		
Anal:				
Distance from snout		61		63
Length of base		38		40
Caudal:				
Length of middle rays		18½		
Pectoral:				
Distance from snout		35½		38
Length (without peduncle)		17		16
Ventral:				
Distance from snout		23		26
Length		18½		21
Dorsal*	III, 26		III, 26	
Anal	22		22	
Pectoral	21		21	
Ventral	I, 2		I, 2	

* Fin injured; some of the rays are missing—III, 26 present.

TRIGLIDÆ.

8. *Prionotus punctatus* (Bloch), Cuvier.

A single young specimen (No. 23550), 61 millimeters in length, was collected by Dr. J. W. Velie, at Clear Water Harbor, Fla.

D. X, 13; A. I, 11.

SCORPÆNIDÆ.

9. *Scorpæna* sp.

A small specimen in bad condition (No. 23556), 45 millimeters long, from Clear Water Harbor, Fla. It agrees in most particulars with *Scorpæna plumieri*, Schu., but appears to have much larger scales. The scales are rubbed off from the posterior part of the body, but the indications are that they did not exceed 30 or 35 in number, while *S. plumieri* has 45. The count is not sufficiently certain to be of value, but the occurrence of the genus at this locality should be noted.

D. XI, 1, 10; A. III, 5.

LABRIDÆ.

10. *Chærojulis humeralis* (Poey).

A single young specimen (No. 23626), 60 millimeters long, collected at Clear Water Harbor, Fla. It agrees with Poey's type of *Julis humeralis* except in the absence of the nuchal band, the band upon the dorsal fin, and the dark corners of the caudal fin. These may possibly be acquired with age. The three Cuban specimens examined all exceeded 120 millimeters in length.

D. IX, 11; A. III, 12. L. lat. 2 | 27 | 9.

POMACENTRIDÆ.

11. *Pomacentrus leucostictus* M. & T.

Three specimens (No. 23627), 46 millimeters to 55 millimeters long, were collected by Dr. J. W. Velie, at Clear Water Harbor, Fla. The species is a strongly-marked one, and the specimens before us agree in every particular with Dr. Günther's excellent description. They are of the brown type of coloration, and are sufficiently young to show traces of the black ocella on the tail, though the blue ring is not very distinct, and of the convergent blue lines on the snout. Specimens of the same size from the Bermudas show them much more clearly.

D. XII, 15; A. II, 13; L. Lat. 3 | 28 | 9.

12. *Glyphidodon concolor* (Gill), Günther.

A single specimen (No. 23652), 38 millimeters long, was taken at Marquesas Keys, Florida. The radial formula is as follows:

D. XII, 12; A. II, 8 $\frac{1}{2}$; V. I, 5; Scales 2 $\frac{1}{2}$ —25—9 $\frac{1}{2}$.

There are six dark bands on the body and tail.

CARANGIDÆ.

13. *Oligoplites occidentalis* (Linn.), Gill.—*Herring*.

Two or three specimens (No. 23646) in salt from "West Florida."

14. *Trachynotus ovatus* (Linn.), Günther.

Six young specimens (No. 23638), 22 millimeters to 32 millimeters long, were obtained at Marquesas Keys, Florida. The radial formulæ are as follows:

(a.) D. vi, i, 18.	A. ii, i, 17.
(b.) D. vi, i, 18.	A. ii, i, 17.
(c.) D. vi, i, 19.	A. ii, i, 18.
(d.) D. vi, i, 18.	A. ii, i, 17.
(e.) D. vi, i, 18.	A. ii, i, 17.
(f.) D. vi, i, 19.	A. ii, i, 17.

15. *Trachynotus gorensis*, Cuv. and Val. Permit; Crevallé.

A large specimen (No. 23647), in salt, about 20 inches long, was sent from West Florida by Dr. Velie. It agrees with the form which we at present call *Trachynotus gorensis*.

Several small specimens (No. 23637), 27 millimeters to 50 millimeters long, apparently of the same species, were obtained at Marquesas Keys.

(a.) D. VI, 1, 19: A. II, 1, 17. (b.) D. VI, 1, 19: A. II, 1, 17. (c.) D. VI, 1, 17; A. II, 1, 17.

The figure given by Girard in the Ichthyology of the Mexican Boundary, plate xi, fig. 4, under the name *Doliodon carolinus*, is pretty certainly taken from a young specimen of this species, though the number of rays in the dorsal has perhaps been changed to make the figure correspond with the description on page 22.

The young *T. gorensis* is distinguished from *T. carolinus* of the same size by the greater height of the spinous dorsal, the smaller number of dorsal and anal rays, and the stronger black blotch upon the lobe of the dorsal.

16. *Carangus pisquetus* (Cuv. and Val.), Girard.—*Leather Jacket*.

Caranx pisquetos, CUVIER and VALENCIENNES, Hist. Nat. Poiss., ix, p. 97.

Carangus pisquetus, GIRARD. Proc. Acad. Nat. Sci., Phila., x, 1858, p. 168.

Paratractus pisquetus, GILL, Proc. Acad. Nat. Sci. Phila., 1862, p. 432.

Three specimens (No. 23642), in salt, from West Florida, apparently belonging to this species.

17. *Selene argentea* (Lacép.), Brevoort.—*Moonfish*.

A single specimen in salt (No. 23641), from West Florida.

GERRIDÆ.

18. *Diapterus harengulus*, Goode & Bean.

Eucinostomus harengulus, GOODE & BEAN, Proc. U. S. Nat. Mus., II, p. 132.

Two specimens (No. 23630), 65 and 66 millimeters long, from Clear Water Harbor, Fla.

D. IX, 10; A. III, 7; P. 15; V. I, 5; C. + 17 +. L. lat. 44; L. transv. $\frac{5}{10}$.

The back has a slight tawny hue, interrupted as it blends with the white of the sides by five or six indistinct, scollopy incursions of the body color, giving the upper part of the side of the fish a marbled appearance.

19. *Diapterus homonymus*, n. sp. Goode & Bean.

Eucinostomus argenteus, GIRARD, U. S. & Mex. Bound. Surv., Vol. II, Part II, 1859. Ichth. p. 17, pl. IX, figs. 9-12 (not Baird & Girard, 1854).

Gerres argenteus, GÜNTHER, Cat. Fish Brit. Mus., IV, 1862, p. 256.

Three specimens (No. 23639), 57-70 millimeters long, from Clear Water Harbor.

D. IX, 10; A. III, 7. L. lat. 47; L. transv. $\frac{5}{10}$.

This species is distinct from *Diapterus argenteus* (*Eucinostomus argenteus* of Professor Baird's Report on Fishes of New Jersey coast), though specifically identical with the forms credited to *Gerres argenteus* by Günther, on the testimony of specimens distributed, under the name *Eucinostomus argenteus*, by the Smithsonian Institution.

SPARIDÆ.

20. *Sparus*, sp.—*Sheepshead*.

A large specimen in salt (No. 23641), from "West Florida," too dilapidated for identification.

D. XII, 10 $\frac{1}{2}$; A. III, 9. L. lat. 55.

PRISTIPOMATIDÆ.

21. *Hæmulon fremebundum*, n. sp. Goode & Bean.

Two specimens (No. 23628), 60 millimeters and 62 millimeters long, were collected by Dr. J. W. Velie, at Clear Water Harbor, Fla. Their general appearance is similar to that of *Hæmulon trivittatum* (Schn.) Goode (*H. capeuna* of the Bermuda catalogue), but the body is higher, the number of spines and rays in the dorsal fin is different, and the scales are much larger, particularly upon the sides, and the second anal spine much stronger. The form may possibly correspond to that called by Cuvier, *H. caudimacula*, but the description of this species is so vague that it does not seem justifiable to thus sanction the use of the name; particularly since Cuvier's species came from Brazil. The diagnosis here presented is not a complete one, but none better could be prepared from our specimens.

Diagnosis.—Height of body contained 3 times in total length without caudal, $3\frac{1}{2}$ in length of fish, caudal included. Length of head equals height of body. Length of snout less than diameter of eye (the specimens being young), and contained about four times in the length of the head, and equalling length of operculum. Eye contained in length of head less than three times. Posterior extremity of maxillary extends beyond the vertical through the anterior margin of the orbit, but not

to that through the middle. Preoperculum with numerous sharp denticulations upon its posterior margin and around the angle, the latter the largest. Dorsal fin moderately notched, the fourth spines the longest, contained twice in the length of the head. Second anal spine very strong, and longer than the fourth dorsal spine; longer also than third anal spine. Pectoral fin reaches to vertical from 11th spine of dorsal, its length contained $4\frac{1}{3}$ in length of body without caudal, $5\frac{1}{2}$ in total length. Length of ventral equal to that of caudal peduncle, and extending as far back as does the pectoral.

Scales very large, and so irregularly arranged that it is impossible to make a close enumeration of them; there are about forty-eight to fifty-two rows.

Color.—Pale, with a pair of bands as broad as the pupil extending from the snout, where they unite, following the dorsal line at a distance about equal to their own width and connecting with the same at the end of the base of the second dorsal where they reunite; a second broad pair of bands, extending from the snout through the middle of the eye, in a straight line below the lateral line to the base of the caudal; traces, on the head, of a pair of narrower bands between the two pairs already mentioned; also a single stripe, on the mesial line of the body, from a point in advance of the eyes to the region of the dorsal. A very prominent blotch at the base of the caudal fin.

D. XI, 1, 15. A. III, 8. Scales, 5 | (50) | 10.

SERRANIDÆ.

22. *Rhypticus pituitosus*, n. sp. Goode & Bean.

A single young specimen (No. 23555), 47 millimeters long, collected at Key West, Fla. Although immature, its characters seem to distinguish it from all described species. Its nearest ally is the *Rhypticus nigripinnis* of Gill, from Panama,* but we do not feel justified in referring the Key West specimen to this species, in view of the differences in color and the remoteness of the two localities. In radial formulæ and proportions it agrees sufficiently well with Gill's diagnosis.

Diagnosis.—One continuous dorsal. The height of the body is less than the length of the head, being contained $3\frac{1}{2}$ times in length of body without caudal, $4\frac{2}{3}$ times in total length. Length of head, exceeding $\frac{1}{3}$ of length of body without caudal, contained $3\frac{1}{2}$ times in total length. Diameter of eye double the length of the snout and half as long as the lower jaw. Upper jaw reaches nearly to vertical from posterior margin of orbit. Width of posterior expansion of maxilla equals one-third length of lower jaw. Length of upper jaw contained $2\frac{1}{2}$ times in length of head. Length of pectoral equals that of postorbital portion of head. Pectorals extend beyond the tips of the ventrals a distance equal to length of ventrals. Dorsal and anal fins higher posteriorly, the longest

* 1861. GILL, THEODORE N. Synopsis generum Rhyptici et affinium. < Proc. Acad. Nat. Sci. Phila. 1861, pp. 52-54 (p. 53).

rays in the two fins being equal. The longest anal rays reach to, and the longest dorsal rays reach beyond, a vertical through the origin of the middle caudal rays. Pectoral rounded. Ventral short. Scales moderate.

Color.—Very light brown, with numerous small brown spots, the diameter of the largest one-third that of the eye, absent on the abdomen and throat. Traces of light margins to vertical fins.

D. II, 27; A. 15; V. I, 5; P. 14; C. 15. Lateral line 9-90-30.

SPHYRÆNIDÆ.

23. *Sphyræna picuda*.—*Barracoudu*.

Specimens in salt (No. 23644) from "West Florida."

MUGILIDÆ.

24. *Mugil brasiliensis*, Agassiz.—*Mullet*.

A single specimen (No. 23643) in salt from West Florida.

ATHERINIDÆ.

25. *Atherina Velieana*, n. sp. Goode & Bean.

A single specimen (No. 23629), 45 millimeters long, was collected by Dr. Velie in Clear Water Harbor, Fla.

Diagnosis.—Height of body contained $4\frac{2}{3}$ times in total length of body, without caudal, the length of the head $3\frac{1}{2}$ times. The spinous dorsal begins behind the vertical from the tip of the pectoral fin, and its origin is in the vertical from the tips of the rather long ventrals. The diameter of the orbit is contained twice in the length of the head, being greater than the width of the interorbital area and more than twice the length of the snout. Snout obtuse, the top of the head being broad and very flat. The cleft of the mouth somewhat oblique, the jaws equal anteriorly. The maxilla extends beyond the vertical from the anterior margin of the orbit, the mandible reaching nearly to that from its middle. Teeth very small in the jaws and on the vomer. The silvery band occupies the third row of scales (the dorsal mesial row not being included in the count); its width is less than half that of the eye.

D. V, 1, 9; A. 1, 10 $\frac{1}{2}$; V. I, 5; P. 15. L. lat. 36; L. trans. 6 $\frac{1}{2}$.

CYPRINODONTIDÆ.

26. *Mollienesia latipinna*, Le Sneur.

Three specimens (No. 23554), about 5 centimeters long, were collected in Clear Water Harbor, Fla., male and females.

SYNODONTIDÆ.

27. *Synodus fœtens* (Linn.), Gill.

A single specimen (No. 23552), 68 millimeters long, was obtained at Key West by Dr. Velie.

D. 13. A. 12. L. lat. 63.

CLUPEIDÆ.

28. *Harengula pensacolæ*, Goode & Bean.

Harengula pensacolæ, GOODE & BEAN, PROC. U. S. N. M., II, p. 153, Nov. 5, 1879.

A single specimen (No. 23631), 90 millimeters long, was obtained by Dr. Velie at Clear Water Harbor. It agrees perfectly with the published description (*sup. cit.*) except that there are 14 abdominal scutes. This character then is demonstrated to be of no value in separating the species of this genus. The pectoral rays number 14 (instead of 15, as in the *Pensacola* specimens).

ENGRAULIDIDÆ.

29. *Engraulis hiulcus*, n. sp. Goode and Bean.

A single specimen, in bad condition (No. 23632), 47 millimeters long, was collected by Dr. J. W. Velie at Clear Water Harbor, Fla.

Diagnosis.—Height of body contained $5\frac{1}{2}$ times in its length without caudal, $6\frac{1}{2}$ times in total length. Length of head contained $3\frac{2}{3}$ in length without caudal, $4\frac{1}{2}$ in length with caudal. Diameter of the eye greater than length of snout, and one-third the length of the head. Snout somewhat compressed. Minute teeth in both jaws. Maxillary slightly dilated, ending in an acute point extending back to the gill-opening; toothed to the extreme posterior angle of the straight inferior edge. Gill rakers not very numerous, the longest as long as the eye. Origin of the dorsal fin midway between the posterior margin of the orbit and the root of the caudal fin. Distance of ventral from snout equal to length of maxilla. Anal fin inserted under posterior third of dorsal (12th or 13th ray). Pectorals a little longer than ventrals (half as long as head); their tips falling short of reaching the origin of ventrals by a distance equal to half the diameter of the orbit. The ventrals are half as long as the lower jaw. Lateral stripe one-third of the height of the body at the ventrals. Scales in the lateral line not counted.

D. 15. A. 22.

SILURIDÆ.

30. *Ariopsis felis* (LINN.), Gill & Jordan.

Several young specimens (23633), 25 millimeters long, were obtained by Dr. Velie from Marco Island near Cape Romano, Fla.

The umbilical sacs are still attached, and are 13 millimeters in diameter.

MURENIDÆ.

31. *Sphagebranchus scuticaris*, n. sp. Goode & Bean.

A specimen (No. 23636), 750 millimeters long, from Cedar Key, Fla. It appears to belong to the group *Sphagebranchus* as limited by Günther in his key to the species in the genus *Ophichthys*.

The occurrence of this genus in the Gulf of Mexico, or indeed in the Atlantic is noteworthy. All the species recognized by Günther are from Eastern seas, except two from the Mediterranean.

Diagnosis.—Teeth small, conical; gill-openings close together. The dorsal fin commences far in advance of the gill-opening, a little nearer to the top of the snout than to the gill-opening, at a distance from the former equal to three times the length of the snout. The length of the head is contained $8\frac{1}{2}$ times in distance between gill-opening and vent, and 8 times in length of tail. Snout pointed, contained 6 times in length of head. Teeth biserial in jaws and on vomer. Pectorals extremely small. Color, brownish, lighter below.

Measurements.

	Millimeters.
Length of body	750
Length of tail	345
Length of head	43
Width of interorbital area	5
Length of snout	$6\frac{1}{2}$
Angle of mouth from tip of upper jaw	$10\frac{1}{2}$
Angle of mouth from tip of lower jaw	8
Diameter of orbit	$1\frac{1}{2}$
Distance of dorsal from snout	21
Width of gill-opening	$5\frac{1}{2}$
Length of pectoral (right side)	2
Length of pectoral (left side)	$1\frac{1}{8}$

32. *Gymnothorax ocellatus*, Agassiz.

A single specimen (No. 23634), 325 millimeters long, was sent from Clear Water Harbor. The markings are of the typical character.

33. *Crotalopsis mordax* (Poey), Goode & Bean.

Two specimens (No. 23635), 265 and 232 millimeters, were sent by Dr. J. W. Velie from Clear Water Harbor, Fla. They are young, and have the eye contained about $1\frac{1}{2}$ times in the length of the snout. The spots are large, the longest with diameter less than half the length of the head.

TRYGONIDÆ.

34. *Dasybatis sabina* (LESUEUR).—*Sting Ray*.

Three specimens (No. 23648) in salt, each about two feet long, tail included, were sent by Dr. Velie; also, a large skin of a Sting Ray, probably *D. tuberculatus*, or perhaps *D. hastatus* or *D. Sayi*.

GALEORHINIDÆ.

35. *Hypoprion brevirostris*, Poey.—*Man-eater Shark*.

A large specimen (No. 23649) in salt was sent by Dr. Velie. This species was incorrectly cited by us, *lapso calami*, in the American Journal of Science and Arts, October, 1877, under the name *Hypoprion longirostris*.

SPHYRNIDÆ.

36. *Reniceps tiburo* (Linn.), Gill.—*Shovel-nose Shark*.

A single small specimen in salt (No. 23650) was sent by Dr. Velie.

GINGLYMOSTOMATIDÆ.

37. *Ginglymostoma cirratum*.—*Nurse Shark*.

A large specimen (No. 23651), about nine feet long, in salt, was sent by Dr. Velie.

NOTE.—The following new species are described in this paper:

Diapterus homonymus, Goode & Bean.

Batrachus tau (Linn.), Cuv., subsp. *pardus*, Goode & Bean.

Hemulon fremebuudum, Goode & Bean.

Rhypticus pituitosus, Goode & Bean.

Atherina Velicana, Goode & Bean.

Engraulis hiuleus, Goode & Bean.

Sphagebranchus scuticaris, Goode & Bean.

UNITED STATES NATIONAL MUSEUM,

Washington, December 31, 1879.

NOTICE OF A NEW SPECIES OF THE 'WILLEMOSIA GROUP OF CRUSTACEA' (RECENT ERYONTIDÆ).

By SIDNEY I. SMITH.

Among the very interesting collections of marine invertebrate animals made during the past two years by the fishermen of Gloucester, Mass., and presented to the United States Fish Commission, for the National Museum, there are two species of podophtalmous Crustacea of peculiar interest. One of these is a remarkable Paguroid which I have already described (*Trans. Connecticut Acad.*, v, p. 50, 1879), but of which several additional specimens have been received since the description was published: the other, which is the subject of this notice, belongs to the "Willemoesia group of Crustacea," first brought into prominent notice by the researches in connection with the Challenger Expedition. Of the latter species I have seen only a single specimen, which was taken at a depth of 250 fathoms, off the coast of Nova Scotia, southeast of Sable Island, latitude $43^{\circ} 10'$ north, longitude $61^{\circ} 20'$ west, by Captain Thomas Olsen, of the schooner *Epes Tarr*. This specimen is not in very good condition, having been dried (probably after being taken from the stomach of some fish, though there is very little evidence of digestion having begun), and the internal organs consequently destroyed, but it is still sufficient to throw considerable light upon the structural peculiarities of the group to which it belongs, and on this account particularly I am induced to publish a special notice of it.

Of the three genera into which Bate* has recently separated the forms of the "Willemoesia group," our species should unquestionably be referred to *Pentacheles*, but, on account of the at present uncertain

* On the Willemoesia Group of Crustacea. < *Annals and Magazine Nat. Hist.*, V, ii, pp. 273-283, pl. 13, 1878.

tenure of these genera,* I prefer to refer it provisionally to Heller's genus *Polycheles*.† It is apparently very distinct from any of the Atlantic species described by Heller, Willemoes-Salm,‡ or Bate, but, judging from the very short descriptions given by the last author, it appears to be very closely allied to his *Pentacheles auriculatus* obtained by the Challenger Expedition off the Fiji Islands. In fact I am not able to point out any characters by which the two forms could be distinguished, but, in view of their wide geographical separation, I take it for granted that they are distinct species, and that it would be easy to point out specific characters were Bate's species fully characterized.

Polycheles sculptus, sp. nov.

Male.—The sides of the carapax are nearly parallel posteriorly, but arenately convergent anteriorly, and the greatest breadth is just in front of the cervical suture, and is about three-fourths of the length along the median line. As seen from above, the anterior margin is concave in outline, so that the lateral angles, which are acute and spiniform, are much in advance of the rostrum, which is armed with two spines close together and projecting obliquely upward and forward. About a third of the space between the median line and the lateral angle each side is occupied by a very deep orbital sinus nearly parallel with the lateral margin, considerably deeper than broad, somewhat narrowed and evenly rounded posteriorly, and completely filled by a large ophthalmic lobe (figure 1, *e*). On the inner side of this sinus the frontal margin projects in a small spiniform tooth, but outside, the margin is unarmed and curves regularly to the lateral angle. Just behind the orbital sinus there is a smooth and evenly curved depression in the surface of the carapax exposing a small area on the posterior part of the ophthalmic lobe, more fully described beyond. The cervical suture divides the dorsal surface of the carapax into two pretty nearly equal portions, and is deep and conspicuous, but is indicated in the lateral margin, each side, by a slight emargination only, which is scarcely deeper than the emargination between the anterior and posterior lobes of the hepatic region. The lateral margin is armed, on the anterior lobe of the hepatic region, with (including the anterior angle) six small and slender spiniform teeth directed forward, and on the posterior lobe with three more. The lateral margin, behind the cervical suture, is armed with seven similar teeth

* NORMAN.—“On the Willemoesia Group of Crustacea.” < Annals and Magazine Nat. Hist., V, ii, pp. 382-385, 1878.

† BATE.—On the Willemoesia Group of Crustacea. < Annals and Magazine Nat. Hist., V, ii, pp. 484-489, 1878.

NORMAN.—Remarks on recent Eryontiæ. < Annals and Magazine Nat. Hist., V, iv, pp. 173-182, 1879.

‡ Beiträge zur näheren Kenntniss der Macrouren. < Sitzungsberichte Akad. der Wissenschaften, Wien, math.-nat. Classe, xlv, Abth. i, pp. 389-393, pl. 1, figs. 1-6, 1862. Die Crustaceen des südlichen Europa, pp. 209-212, pl. 7, figs. 1, 2, 1863.

§ On some Atlantic Crustacea from the Challenger Expedition. < Trans. Linnæan Soc. London, II, i, pp. 50-56, pls. 12, 13, 1875.

which become successively more remote posteriorly. There is a slight median carina extending the whole length of the carapax, and armed, behind the two rostral spines, first with a single small spine directed forward, then with two, side by side and very close together, then with one, then with two on the posterior edge of the cervical suture, then with two more, and finally with two somewhat larger and more widely separated spines projecting forward from the anterior edge of the broad and prominently raised posterior margin. In front of the cervical suture there is an irregular longitudinal dorso-lateral line of five minute spines each side, and back of these a single spine each side on the posterior edge of the cervical suture. Extending from the posterior margin nearly to the cervical suture, there is a sharp sublateral carina parallel to the lateral margin, about a third of the way from it to the median carina, and armed with five small spines on one side and six on the other. The extra spine is on the left side, and next to the last in the series, but is accidentally omitted in figure 5.

The ventral regions of the carapax are inflected each side at a very acute angle with the dorsal surface, and, the sternum being narrow in front, the ventral regions are very broad in the middle, being broadest opposite the bases of the first and second pereopods. The ventral region each side is divided longitudinally into three approximately equal parts by two prominent carinæ; the outer carina (marking the pleurotergal suture?) extends from the anterior margin at the base of the antenna, in a slightly sinuous line, toward the postero-lateral margin of the carapax; the anterior half is very prominent and armed with numerous small spines directed outward, while the posterior half is much less conspicuous, unarmed, and disappears entirely before reaching the posterior angle of the carapax. The inner carina extends along the branchial region from near the base of the first pereopod quite to the postero-lateral angle of the carapax; the extreme anterior portion is not prominent, but from opposite the third pereopod posteriorly it is very prominent, acute, and armed with ten to fifteen sharp spines. The outer of the three longitudinal regions thus marked out is divided transversely by the cervical suture, and the anterior portion (subhepatic region) is divided transversely into an anterior and a posterior lobe by a groove nearly or quite as conspicuous as the cervical. In the frontal margin of this anterior lobe (figure 2), and near its inner side, there is a deep sinus corresponding to the orbital sinus of the dorsal surface, but not quite as wide, and open nearly to the dorsal surface, except where it is crossed by a protuberance from the ventral portion of the ophthalmic lobe (c, figure 2).

On the upper surface of the carapax, the orbital sinus, each side, is completely filled by the dorsal part of the ophthalmic lobe, of which the anterior margin is slightly concave in outline and continuous with the anterior margin of the carapax, but has a small tubercle near the middle. The dorsal surface of the lobe is smooth, calcareous and opaque,

and on a level with the adjacent surface of the carapax except posteriorly, where a small oval area of the extremity of the lobe is exposed by a depression in the carapax. This oval area is thin, semitranslucent, and not calcareous, and has every appearance of being a true corneal area, although I am unable to detect any evidence of facets. The carapax along the margins of the sinus is in close contact with the ophthalmic lobe but is not really connected with it. From the lower portion of each ophthalmic lobe there is an elongated, cylindrical and somewhat conical, but obtuse and pointed, protuberance, of which the base rests in a transverse groove in the base of the antenna, while the terminal portion extends well across the open, ventral side of the orbital sinus. Upon the obtuse extremity of this protuberance there is a nearly circular area similar to the cornea-like area at the posterior extremity of the dorsal part of the lobe.

Unfortunately the specimen is not in sufficiently good condition to enable me to determine positively in regard to the structure of these cornea-like areas, but that they are connected with the optic nerves and are sensitive to light there is, I think, no chance for reasonable doubt. While it seems probable that all four of these areas are really faceted like the eyes of ordinary Podophthalmia, it is possible that they may be large, simple, or nearly simple eyes, like the eyes of some Amphipoda and Cumacea. The division of the ophthalmic lobe each side into two or more "eyes" has not, I think, before been noticed among the Decapoda, and is certainly an interesting fact in morphology, but it is apparently not a character of much systematic or phylogenetic value. Among the Schizopoda, the lamellar expansion of the ophthalmic lobes in *Amblyops*, and their broad expansion and partial union in *Pseudomma*, are quite as remarkable and apparently somewhat similar modifications; and *Ampelisca* and *Biblys*, among the Amphipoda, are cases in which there are two simple eyes each side, while in the closely allied *Haploops* the number apparently varies in the different species.

The peduncles of the antennulae (figures 1, 2) are very stout, being stouter even than the peduncles of the antennae. The basal portion of the proximal segment is longer than the two distal segments, is armed on the distal portion of the outer margin with two spiniform teeth, and the inner side is broadly expanded and prolonged into an acute scale-like appendage upturned and densely ciliated along the inner margin, and extending considerably beyond the distal segment and nearly as far as the tip of the antennal scale (*b*, figure 2). The second and third segments are subcylindrical, and, as seen from above, are each about as broad as long, the second being somewhat larger than the third. The inner or major flagellum is about as long as the carapax. The minor flagellum is about as long as the peduncle of the antenna, about half as thick as the base of the major flagellum, of nearly uniform thickness for two-thirds its length, then tapers rapidly to a very slender tip, and is thickly ciliated along the inner margin distally.

The three first segments of the peduncle of the antenna are very short, the three together being scarcely longer than the fifth segment. The first segment is loosely articulated with the sternum of the antennal segment, so as to be freely movable upon it; it is very short upon the outside, but expands somewhat on the inner side, which terminates distally in a thin tubular process (*a*, figure 2) arising from the oral side of the segment and directed upward to a level with the dorsal side so that, in the ordinary position of the appendages, its orifice is closed by contact with the first segment of the peduncle of the antennula. This tubular process readily admits a large bristle which can be pushed through it round into the cavity of the segment itself. It undoubtedly contains the canal of the green gland. The second segment is small, closely united with the third, and bears upon its outer side a slender scale-like appendage (*a*, figure 1) which reaches nearly to the tip of the peduncle, is about five times as long as broad, and thickly ciliated along both edges. The third segment, as seen from below, is almost wholly internal to the second, and is armed on the distal part of the inner margin with a small spiniform tubercle. The fourth and fifth segments are subcylindrical, the fourth is slightly longer than the fifth, and both are ciliated each side. The flagellum is about as thick at base as the major flagellum of the antennula, but tapers rather more rapidly and is probably considerably shorter.

The buccal opening is nearly square. The branchiostergites extend forward quite over the sternum of the antennary somite, and their anterior extremities are applied to the basal segments of the antennæ, which, however, are freely movable upon the antennary somite. The epistome is short, not extending at all in front of the bases of the antennæ, is nearly on a level with the dorsal wall of the efferent passages from the branchial chambers and on a plane above the bases of the antennæ, so that the efferent passages terminate in the space between the upturned edges of the squamiform processes of the inner sides of the basal segments of the antennulæ and just beneath the short two-spined rostrum. In the middle of the slightly raised and regularly arcuate posterior edge of the epistome there is a slight elevation with a tuft of hairs, as described and figured by Willemoes-Suhm in *Willemoesia leptodactyla*. The anterior part of the endostome is on a plane somewhat above the plane of the epistome, but the space below is filled by the soft and fleshy labrum which projects considerably below the raised posterior edge of the epistome, and does not differ essentially from the labrum in Astacidae or Scyllaridae.

The mandibles are apparently wholly without molar areas, and expand into very broad and thin lamellæ sharply serrated along the cutting edges. The mandibular palpus is short and apparently composed of only two segments, the distal being shorter than the proximal. There may be an additional short basal segment, which I am unable to discover without injuring the specimen, so that the palpus may prove to be triarticulate.

The lobes of the metastome (labium) are very narrow and widely separated at base.

The two lobes of the first maxilla are very much as described and figured by Willemoes-Suhm in *Willemoesia leptodactyla*, the two lobes being very slender and strongly incurved, the anterior being the larger and having at its base a minute rudimentary appendage.

The second maxilla has two small and very slender endognathal lobes and a very large scaphognath, the anterior, or exognathal, portion of which reaches nearly forward to the base of the antenna.

The inner or endognathal lobes of the maxilliped are small and rudimentary, but there is a very large and terminally bilobed lamella, apparently representing the exognath, which extends forward considerably in front of the epistome, where its terminal lobes are somewhat upturned and serve as the lower wall of a tube from the efferent branchial opening. This lamella is continuous posteriorly with the very large epignath which extends far back into the branchial chamber.

Both pairs of gnathopods are apparently entirely without exognathal or epignathal branches. The first pair (second maxillipeds) reach scarcely beyond the ischia of the second pair, and the three distal segments are very short, the carpus being narrow at base but expanded and somewhat flattened distally, while the propodus and dactylus taken together form a conical tip much shorter than the carpus.

The second pair of gnathopods (external maxillipeds) are very slender, ciliated but unarmed with teeth or spines, and, when extended, reach nearly to the distal ends of the peduncles of the antennule. The ischium is about as long as the three succeeding segments and only a little stouter than the merus, which is a little more than half as long, and the three distal segments are subcylindrical, of about equal length, and taken together are about as long as the merus.

The terminal portion of each of the first pair of pereopods is wanting in the specimen examined, but the one on the left side is perfect to near the distal end of the merus. The coxa is very stout, far stouter than the succeeding segments. The basis is completely ankylosed with the ischium, which reaches to the tip of the second gnathopod, is much expanded distally, but at the same time very much compressed dorso-ventrally, and is smooth and naked. The portion of the merus which is still present is about 20^{mm} long, is smooth and compressed like the ischium, is of equal width with the ischium where it articulates with it, but is slightly expanded for about half its length, then slightly narrowed distally, and is armed near the middle of the outer edge with two small spines.

The second pereopods (figure 3) are slender, densely ciliated along the edges, and reach to the tips of the peduncles of the antennae. The basis is ankylosed with the rather short ischium. The merus is considerably longer than the ischio-basis and reaches to the edge of the carapax. The carpus is a little shorter than the merus. The basal part of the propodus is a very little longer than the carpus, and is flattened

and somewhat expanded distally, where it is fully a third as broad as long; the digital portion is very slender, nearly as long as the basal portion, nearly straight to the slender, acute, and chitinous tip which is strongly curved, and the prehensile edge is thin and very minutely serrate. The dactylus is almost exactly of the same form as the digital portion of the propodus, and its prehensile edge is armed in the same way, but the cilia upon the outer edge are much longer than on the corresponding part of the propodus.

The third and fourth pairs of pereiopods are successively a very little shorter than the second and have very nearly the same form. From the coxal to the meral segment they are very nearly as stout as in the second pair, but the three distal segments are much more slender. The basal part of the propodus is subcylindrical and only very slightly expanded and flattened distally, while the digital part and the dactylus are equal in length, very slender and weak, straight throughout, without incurved or chitinous tips, and densely ciliated along the prehensile edges.

The fifth or last pair of pereiopods (figure 4) are considerably shorter and more slender than the fourth, and all the segments except the propodus and dactylus have very nearly the same relative proportions as in that pair. The basal portion of the propodus is a little longer than the carpus, subcylindrical and slightly tapering distally; the digital portion is about as long as the proximal thickness of the propodus, very slender, and tapers to a rounded tip. The dactylus is fully twice as long as and much stouter than the digital part of the propodus, and straight and subcylindrical.

As seen from above the sides of the pleon are nearly straight, and form, with the telson, a regular acute triangle. The first five segments are carinated dorsally, and the carina projects forward from each segment in an acute tooth, but the carina and tooth are small and low on the first segment, increase rapidly to the fourth, while on the fifth they are scarcely as prominent as on the fourth, and on the sixth the carina is inconspicuous and there is no tooth, but the top of the carina is traversed by a narrow longitudinal sulcus. On the first segment there are, in addition, two slender spines each side projecting forward above the articulations with the carapax. The dorsal surface of the pleon, either side of the median carina, is smooth and scarcely at all sculptured, but along the lateral margin, where the pleura bend abruptly and nearly perpendicularly downward, there is a series of deep longitudinal sulci, except upon the narrow first segment, which is unsculptured, and upon the sixth, where the sulcus is replaced by a simple carina. Of the pleura themselves, the first is nearly obsolete, the second is broader than deep, projecting back over the third with a broadly rounded margin, and forward in a prominent but rounded angle, and has a central circular depressed area; the succeeding pleura decrease regularly in size posteriorly, scarcely overlap when the abdomen is extended, are convex in outline posteriorly but straight or slightly concave anteriorly, and the third, fourth, and fifth are ornamented with a median curved

carina extending two-thirds of the length, but not well marked upon the fifth.

The telson is pretty regularly triangular, about twice as long as broad, is convex and slightly grooved longitudinally above, and terminates in an acutely rounded tip unarmed with spines. The lamellæ of the uropods scarcely reach the tip of the telson; the outer is nearly as broad as long, regularly rounded in outline, and stiffened by two slightly diverging ribs in addition to the thickening of the outer margin; the inner lamella is stiffened by a single median rib, is nearly twice as long as broad, the lateral margins are approximately straight and parallel, and the tip is regularly rounded in outline.

The first pair of pleopods are about 15^{mm} long with an imperfect articulation at about a third of the way from the base to the tip; the basal portion is somewhat triquetral, and the terminal portion expands into a smooth, naked, and thin lanceolate lamella slightly concave posteriorly. The second pair of pleopods are about 24^{mm} long, and the base and lamellæ are of about equal lengths. The lamellæ are narrow, lanceolate, and thickly ciliated along the edges; the inner lamella is slightly broader than the outer, and bears the two styliform processes usually characteristic of males among the *Macrura*. These styliform processes are about 3^{mm} long, and arise together at about a third of the way from the base to the tip of the lamella; the inner, like that upon the three succeeding pairs of pleopods, arises from the slightly thickened inner edge of the lamella, is ridged, of nearly equal width to the rounded tip, and nearly naked except a line of cilia along the posterior margin. The outer process arises just in front of the inner, and its base is at a right angle to that of the inner; it is more slender than the inner, tapers distally, and is ciliated on both edges and on the anterior surface. The three succeeding pairs of pleopods are similar to those of the second pair, but are successively a little shorter, and they want the outer of the two styliform processes on the inner margin of inner lamella.

The single specimen examined affords the following measurements:

	mm.
Length from front of carapax to tip of telson	92
Length of carapax along median line	39
Length of carapax between extremities of lateral margin.....	45
Breadth between lateral spines of anterior margin.....	20
Breadth between postero-lateral angles (about).....	22
Greatest breadth (in front of cervical suture).....	30
Length of first pereopod to near distal end of merus.....	40
Length of second pereopod.....	33
Length of fifth, or last, pereopod.....	20
Length of peduncle of antennula.....	9
Length of major flagellum	45
Length of minor flagellum	13
Length of peduncle of antenna.....	12
Length of antennal scale.....	9
Length of flagellum (at least)	30
Length of pleon.....	53
Length of telson	16

PLATE VII.

POLYCHELES SCULPTUS.

Fig. 1, dorsal view of the anterior portion of the right side of the carapax: *a*, antennal scale; *b*, proximal segment of antennula; *c*, ophthalmic lobe.

Fig. 2, ventral view of the anterior portion of the right side of the carapax: *a*, tubular process containing the canal from the green gland; *b*, process of the ophthalmic lobe; *c*, base of the first pereopod.

Fig. 3, terminal portion of the second pereopod of the right side.

Fig. 4, terminal portion of the fifth pereopod of the left side.

Fig. 5, dorsal view of the entire specimen.

Fig. 6, lateral view of the pleon.

(Figs. 1 to 4 from drawings by S. I. Smith; Figs. 5 and 6 from drawings by J. H. Emerton.)

Fig. 5.

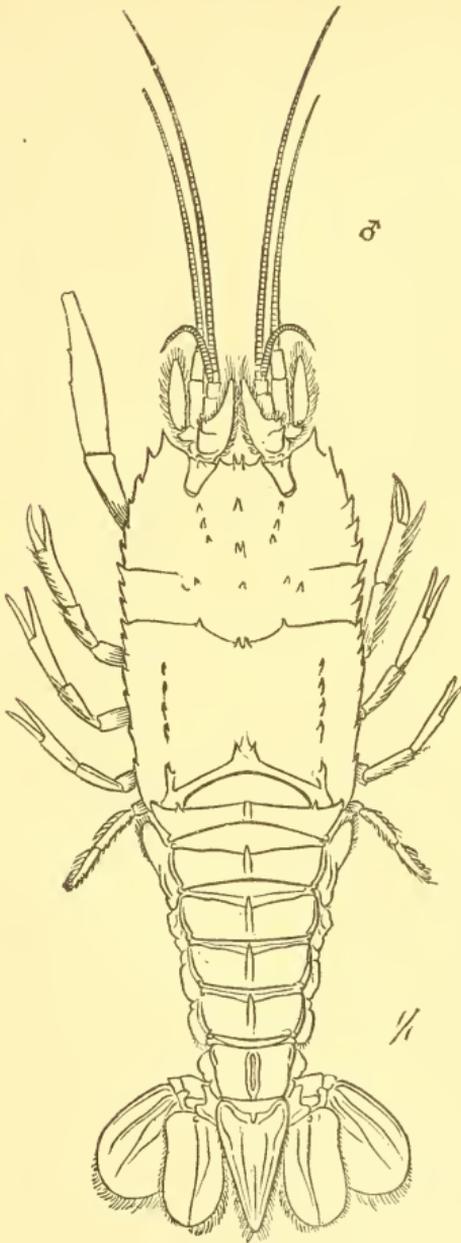


Fig. 1.

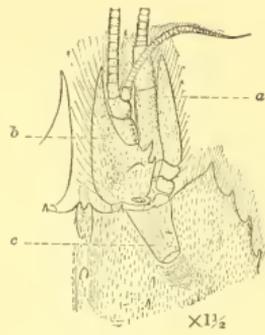


Fig. 2.

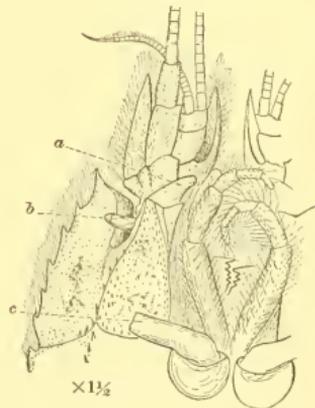


Fig. 3.



Fig. 4.

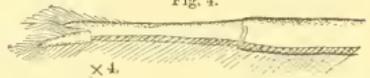
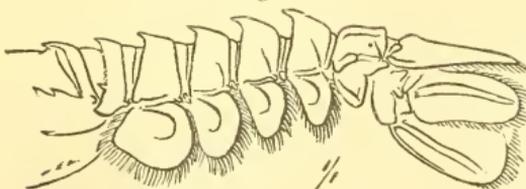


Fig. 6.



POLYCHELES SCULPTUS.



Owing to the imperfections of the descriptions of the species of the "Willemoesia group," already known, it is useless to attempt to point out which of the characters above alluded to are common to all the species or only specifically or generically (if there be more than one genus among the species now known) characteristic.

In regard to the openings of the green glands it may be well to notice that Willemoes-Suhm was unable to discover them in *Willemoesia leptodaetyla*. He might easily have overlooked them, however, if they were, as is probable, situated as in our species. One of Bate's figures of *Pentacheles anthrax* (Annals and Mag. Nat. Hist., V, ii, pl. 13, fig. 2, 1878) apparently shows the tubular process just as it exists in our species, although I find no reference to it in the accompanying text. Bate subsequently, however, appears to allude to this same process as "the olfactory tubercle of the second or outer antenna," though I cannot find that he anywhere alludes to Willemoes-Suhm's inability to discover the openings of the green glands.

NEW HAVEN, CONN., December 30, 1879.

DESCRIPTIONS OF SOME GENERA AND SPECIES OF ALASKAN FISHES.

By TARLETON H. BEAN.

The collections of the United States National Museum contain many Alaskan fishes, two of which are here described as new to science.

Cottus polyacanthocephalus Pallas.

This species has some points in common with *Boreocottus axillaris* Gill. I cannot find, in the description of the genus *Boreocottus*, anything to separate it from *Cottus*. The specimens here described are numbered 23499 in the Museum register. They were collected at Unalaska, by Mr. William H. Dall, and were catalogued in his notebook at No. 900.

LIST OF SPECIMENS.

- 23499 *a*. Length 185 millimeters without caudal.
D. X, i, 14; A. 13; V. I, 3; P. 18.
- 23499 *b*. Length 138 millimeters without caudal.
D. X, i, 13; A. 11; V. I, 3; P. 18.
- 23499 *c*. Length 142 millimeters without caudal.
D. X, i, 14; A. 12; V. I, 3; P. (right) 18, (left) 16.

DIAGNOSIS.

B. VI. D. X. I, 13 to 14. A. 11-13. V. I, 3. P. 18.

Two small spines above the snout; one above each orbit, with four obscure ones behind it. A pair of small spines on the occiput. Three

preopercular spines, two of which are at the angle; the longer of these is half as long as the upper jaw, and extends nearly as far back as the opercular spine. The distance between the eyes equals their long diameter. The fourth spine of the first dorsal is as long as the intermaxillary band of teeth of either side, and is nearly $\frac{1}{3}$ as long as the head. The ventral terminates at a distance from the vent, and is equal in length to the maxillary bone. The pectoral reaches to the end of the spinous dorsal, and to the vent. The length of the head is contained $2\frac{1}{3}$ to $2\frac{1}{2}$ times in the total length without caudal. The length of the upper jaw equals half the length of the head; the lower jaw is slightly longer, but is received within the upper. The ground color is dark brown; the sides and tail are more or less distinctly mottled and banded with yellowish. The spinous dorsal has two and the soft dorsal three oblique dark bands. The anal has four oblique dark bands, the first and last being very narrow. The pectoral has three irregular bands of dark brown intermingled with yellowish. The caudal is indistinctly banded with dark brown and tipped with yellowish.

Melleles gen. nov. *Cottidae*.

GENERIC CHARACTERS.—Head broad, depressed, rounded in front; body subcylindrical, compressed posteriorly; head naked, with a small number of cutaneous flaps, the two on the chin simulating barbels; a narrow band of scales following the dorsal outline of the body and uniting with its fellow around the origin of the spinous dorsal; body elsewhere naked with the exception of a few prickles on its anterior part below the lateral line; sides between the anal fin and the lateral line furnished with numerous small, pointed flaps covering minute depressions in the skin: lateral line as in *Cottus*. Two contiguous dorsals separated by a notch, the spinous dorsal being the higher; the membrane behind the second, third, and fourth spines deeply cleft; membrane extending higher than the spines. Pectorals subelliptical when fully expanded, the rays all single. Ventrals thoracic, immediately behind the pectorals, elongate, furnished with stiff setæ on their inner surface along the course of the rays. Jaws, vomer, and palatines armed with villiform teeth. Air-bladder absent. Stomach cæcal. Pyloric appendages in moderate number (6 in the type species). Branchiostegals 6.

Melleles papilio sp. nov.

The only specimen of this species in the Museum collection is the type of the present description; it is catalogued at number 23751 of the Museum Fish Register. The length of the example, measured to the origin of the middle caudal rays, is 185 millimeters. It is an alcoholic specimen in excellent condition.

DESCRIPTION.—By length of the body is to be understood its length from the tip of the snout to the origin of the middle caudal rays. The

* Μηλλήνηρος, a loiterer, from its habit of remaining in shallow pools when the tide recedes, where it is taken by hand in great quantities by the natives (*vide* Elliott).

body is moderately elongate, rather slender, somewhat compressed posteriorly, has a narrow band of scales close to its dorsal outline, and is otherwise naked with the exception of a few prickles on the sides. The head is naked; it has two small cutaneous appendages on the chin, one near the end of each maxillary, two above the eyes, two on the vertex, and one near the upper angle of each gill-opening. The branchiostegal membrane is free from the isthmus posteriorly.

The greatest height of the body (.25) is one-fourth of its length, and equals the length of the external caudal rays (.25); its height at the ventrals (.23) is contained $4\frac{1}{3}$ times in the length. The least height of the tail (.07), equals the distance between the eyes (.07), and the length of the antecedent spine of the second dorsal (.07). The length of the caudal peduncle, measured from the end of the second dorsal to the origin of the middle caudal rays, equals half the length of the maxillary (.16).

The greatest length of the head to the end of the opercular flap (.37) is contained $2\frac{2}{3}$ times in the length of the body, and equals twice the length of the mandible (.185); its greatest width (.23) equals the length of the base of the spinous dorsal (.23). The distance between the eyes (.07) is contained 3 times in the length of the second (.21) and third dorsal spines. The length of the snout (.09), or the distance from the end of the snout to the orbit (.09), equals the long diameter of the eye (.09), and half the length of the upper jaw (.18). The length of the maxillary (.16) equals twice the length of the caudal peduncle, and half the length of the anal base (.32). The length of the mandible (.185) equals half the length of the head, and is contained $5\frac{1}{2}$ times in the length of the body.

There are two obtuse spines on the snout, two above the posterior parts of the orbits, and two on the vertex, the last four being provided with short filaments. I can find none on the spines of the snout. There are two minute, barbel-like filaments on the chin, and there is one short cutaneous tag close to the end of each maxilla and on the membrane at the upper angle of the gill-opening. The type is well preserved, but a little stiffened by long immersion in very strong alcohol.

The distance of the spinous dorsal from the snout (.30) equals $2\frac{1}{2}$ times the length of its first spine (.12). Its length of base (.23) equals the greatest width of the head (.23). The second and third dorsal spines are equal, their length (.21) being contained nearly 5 times in the length of the body. The fourth dorsal spine is the longest (.22); its length is contained $4\frac{1}{2}$ times in the length of the body. The length of the fifth dorsal spine (.20) is contained 5 times in the length of the body. The last dorsal spine (.055) is shorter than the antecedent spine (.07) of the second dorsal. The longest ray of the second dorsal (.175) is half as long as the distance of the pectoral from the snout (.345); the last ray (.035) is half as long as the antecedent spine.

The distance of the anal from the snout (.59) is nearly twice that of the spinous dorsal from the same point. The length of the anal base (.32) is twice that of the maxillary. The longest anal ray (.15) is twice

as long as the last (.075). The tips of the anal rays are free from the membrane, some of them for a distance equal to one-half the diameter of the orbit.

The length of the middle caudal rays (.235) is contained $4\frac{1}{2}$ times in that of the body; the length of the external rays, four times.

The length of the longest pectoral ray (.395) is nearly twice that of the fifth dorsal spine; it extends to the vertical through the root of the sixth anal ray.

The distance of the ventral from the snout (.27) equals three times the long diameter of the orbit. The length of the longest ventral ray (.49) is nearly one-half that of the body; it extends to the vertical through the root of the seventh anal ray. The tips of the rays extend beyond the membrane, in one case about a third the length of the fin. The ventrals are furnished with stiff setæ on their under surface, following the course of the rays.

Radial formula: B. VI; 1st D. XI; 2d D. I, 20; A. 17; C. 11 (developed rays); P. 17; V. I, 4.

Color.—The ground color of the upper part of the body is a light grayish brown, on which are four markings of a darker brown, of which the first three are band-like and extend below the lateral line, while the fourth is widest below and sends only a narrow point below the lateral line. Between the third and fourth large body-markings there is a small blotch of similar color beginning at the lateral line and extending downward a distance equal to about $\frac{1}{3}$ the long diameter of the orbit. At the base of the caudal is a band-like marking similar in color to the body-markings, and the posterior half of the caudal bears two obscure bands of brown; between the brown markings there is an area of yellowish white. The top of the head is sienna brown. The cheeks are brown of a darker tint than the rest of the head. The lower parts of the head are yellowish white, as are the bases of the pectoral and the anterior part of the belly. The lower parts of the body are grayish white, dotted here and there with spots of milky white. The largest of these milky white spots are not more than $\frac{1}{2}$ as long as the orbit. The belly has some similar spots, resembling in this respect the male of *Cottus scorpius* subspecies *grönlandicus*, but the spots are much smaller than in that species. The spinous dorsal is mainly very dark brown with two light areas in its anterior and posterior parts. The second, third, and fourth body-markings are continued upon the soft dorsal; that proceeding from the fourth body-marking, however, is continued forward forming a margin for the upper posterior part of the soft dorsal. The ground color of the pectorals is a grayish brown. On this ground color the upper portion of the fin, on its anterior surface, has several bands of milky white bordered with sienna brown; the lower part of the anterior surface is mottled with nearly linear markings of sienna brown bordered with milky white. The markings of the posterior surface of the pectoral correspond in the main with those of the anterior surface; but the tips of the membrane between many of the rays are

milky white. The ventrals are streaked and spotted with sienna brown and milky white on both surfaces, the membrane close to the third ray having a regular alternation of these brown and white spots. The anal is grayish brown sparsely mottled with spots similar to those on the ventrals. The peritoneum is silvery white.

The length of the intestine is equal to the distance from the tip of the snout to the end of the anal fin. The genital papilla is short, about equal in length to the opening of the vent.

TABLE OF MEASUREMENTS.

Melletes papilio Bean.

Locality.....	Saint Paul's Island, Alaska, 1872. H. W. Elliott.		
	Milli- meters.	100ths of length to origin of middle caudal rays.	Times in length to origin of middle caudal rays.
Length to origin of middle caudal rays.....	185		
Body:			
Greatest height.....		25	4
Greatest width.....		18	
Height at ventrals.....		23	4 $\frac{1}{3}$
Least height of tail.....		7	14
Length of caudal peduncle.....		8	12 $\frac{1}{2}$
Head:			
Greatest length.....		37	2 $\frac{3}{4}$
Greatest width.....		23	4 $\frac{1}{3}$
Width of interorbital area.....		7	14
Length of snout.....		9	11
Length of operculum to end of flap.....		12	8 $\frac{1}{2}$
Length of upper jaw.....		18	5 $\frac{2}{3}$
Length of maxillary.....		16	6 $\frac{1}{2}$
Length of mandible.....		18 $\frac{1}{2}$	5 $\frac{1}{2}$
Distance from snout to orbit.....		9	11
Diameter of orbit.....		9	11
Dorsal (spinous):			
Distance from snout.....		30	3 $\frac{1}{2}$
Length of base.....		23	4 $\frac{1}{3}$
Length of last spine.....		5 $\frac{1}{2}$	
Length of first spine.....		12	8 $\frac{1}{2}$
Length of second spine.....		21	nearly 5
Length of third spine.....		21	nearly 5
Length of fourth spine.....		22	4 $\frac{1}{2}$
Length of fifth spine.....		20	5
Dorsal (soft):			
Length of base.....		42	
Length of antecedent spine.....		7	14
Length of first ray.....		14 $\frac{1}{2}$	7
Length of longest ray.....		17 $\frac{1}{2}$	nearly 6
Length of last ray.....		3 $\frac{1}{2}$	
Anal:			
Distance from snout.....		59	
Length of base.....		32	3 $\frac{1}{2}$
Length of first ray.....		13	nearly 8
Length of longest ray.....		15	6 $\frac{2}{3}$
Length of last ray.....		7 $\frac{1}{2}$	
Caudal:			
Length of middle rays.....		23 $\frac{1}{2}$	4 $\frac{1}{2}$
Length of external rays.....		25	4
Pectoral:			
Distance from snout.....		34 $\frac{1}{2}$	nearly 3
Length.....		39 $\frac{1}{2}$	2 $\frac{1}{2}$
Ventral:			
Distance from snout.....		27	3 $\frac{2}{3}$
Length.....		49	2
Branchiostegals.....	VI		
Dorsal.....	XI, i, 20		
Anal.....	17		
Caudal.....	11		
Pectoral.....	17		
Ventral.....	I, 4		

*Dallia** gen. nov. *Umbrida*?

Body oblong, covered with cycloid scales of small size with radiated striae; lateral line not conspicuous; eye smaller than in *Umbrida*; cleft of the mouth of moderate width. Ventrals inserted in front of the beginning of the dorsal, composed of three rays. Basis of anal as long as, or longer than, that of dorsal. Caudal fin rounded and many-rayed. Villiform teeth on the intermaxillaries, the mandible, the vomer, and the palatines. Pectoral rounded and many-rayed.

Dallia pectoralis sp. nov.

B. VII-VIII; D. 12-14; A. 14-16; V. 3; P. 33-36; C. 30-33.

The height of the body is contained 4 to $4\frac{1}{2}$ times in its length without caudal; length of head $4\frac{1}{4}$ to $4\frac{1}{2}$ times. The eye is $\frac{1}{7}$ to $\frac{1}{6}$ as long as the head. The pectoral is $\frac{1}{2}$ as long as the head to end of upper jaw, the ventrals $\frac{1}{3}$ as long. The origin of the dorsal is twice as far from the end of the snout as from the origin of the middle caudal rays. The longest dorsal rays are a little more than half the length of the head. The anal begins almost directly under the origin of the dorsal and has nearly the same extent; its longest rays equal or slightly exceed the longest dorsal rays. The ventrals originate in advance of the dorsal and can be made to reach to or slightly beyond the origin of the anal. The vent is immediately in front of the beginning of the anal. About 77 scales in lateral line; 11 rows between the dorsal and the lateral line and 11 between the lateral line and the anal.

Color.—Dusky brown mottled with whitish, all the fins similarly colored, the dusky spots sometimes becoming confluent on the caudal and simulating bands; belly mainly whitish, but in some specimens thickly covered with small dusky spots.

LIST OF SPECIMENS.

- 23498 *a-g*. (collector's number, 1430) 7 specimens. St. Michaels, Alaska, Feb., 1877. L. M. Turner.
- 23498 *a*. D. 13; A. 16; V. 3; P. 36; C. 33; B. 8. Length 205 millimeters.
- 23498 *b*. D. 13; A. 14; V. 3; P. 33; C. 31; B. 7-8. Length 200 millimeters.
- 23498 *c*. D. 14; A. 15; V. 3; P. 33; C. 31; B. 8. Length 180 millimeters.
- 23498 *d*. D. 14; A. 14; V. 3; P. 33; C. 30; B. 7-8. Length 184 millimeters.
- 23498 *e*. D. 13; A. 14; V. 3; P. 35; C. 30; B. 8. Length 175 millimeters.
- 23498 *f*. D. 14; A. 14; V. 3; P. 35; C. 30; B. 8. Length 170 millimeters.

*Dedicated to Mr. W. H. Dall, of the United States Coast Survey, in appreciation of his contributions to the zoölogy of Alaska.

23498 *g.* D. 13; A. 14; V. 3; P. 35; C. 31; B. 8. Length 167 millimeters.

6661. 17 specimens. St. Michaels, Alaska. H. M. Bannister.

a. Length 210 millimeters. D. 13; A. 14; V. 3; P. 33; C. —; B. 8.

b. Length 200 millimeters. D. 14; A. 14; V. 3; P. 35; C. —; B. 8.

c. Length 135 millimeters. D. 12; A. 14; V. 3; P. 35; C. 30; B. 8.

The remaining fourteen specimens vary in length from 110 to 180 millimeters.

UNITED STATES NATIONAL MUSEUM,
Washington, January 5, 1880.

**FOURTH INSTALMENT OF ORNITHOLOGICAL BIBLIOGRAPHY:
BEING A LIST OF FAUNAL PUBLICATIONS RELATING TO BRITISH BIRDS.**

By **DR. ELLIOTT COUES, U. S. A.**

The Appendix to the "Birds of the Colorado Valley" (pp. 567 [1]-784 [218]), which gives the titles of "Faunal Publications" relating to North American Birds, is to be considered as the *first* instalment of a "Universal Bibliography of Ornithology".

The *second* instalment occupies pp. 239-330 of the "Bulletin of the United States Geological and Geographical Survey of the Territories", Vol. V, No. 2, Sept. 6, 1879, and similarly gives the titles of "Faunal Publications" relating to the Birds of the rest of America.

The *third* instalment, which occupies the same "Bulletin", same Vol., No. 4 (in press), consists of an entirely different set of titles, being those belonging to the "systematic" department of the whole Bibliography, in so far as *America* is concerned. Here come the titles of all publications relating to particular species, genera, or families of American Birds, systematically arranged, *by families*, and in chronological order.

These three previous instalments represent a nearly complete Bibliography of *American* Ornithology.

This present, *fourth*, instalment of the work is of the same character as the first two: that is, it relates to "regional" or "faunal" as distinguished from "systematic" ornithology; and it undertakes to do for *British* Birds what the first two did for *American*.

That is to say: here belong the titles of all publications treating of British Birds as such, exclusively, and indiscriminately or collectively. In publishing these preliminary instalments, it is necessary to draw a hard and fast line between those titles which are and those which are not to be found in each one of them—a line which would be very evident to one cognizant of the plan of the whole Bibliography, though by no means obvious at first sight. It is therefore necessary for me to be explicit here.

In order to fall within the scope of this fourth instalment, a publica-

tion must relate to British Birds as such. Secondly, it must relate to British Birds exclusively. Thirdly, it must relate to British Birds of more than one species, genus or family. For, first, a publication on, say, *Larus glaucus* and *Tringa canutus* as observed in Greenland does not belong here, though both these species are British Birds. For, secondly, a work on the Birds of Europe does not belong here, though including all British Birds. For, thirdly, a paper on the occurrence of *Phalaropus hyperboreus* in Great Britain, or one on the habits of *Lagopus scoticus*, does not belong here, as the scheme of the whole work carries one of these to *Phalaropodidae*, the other to *Tetraonidae*, in the "systematic" department of the whole Bibliography; though a paper on *Phalaropus hyperboreus* and *Lagopus scoticus* as observed in Great Britain would belong here, being a "faunal" publication, and a "British" one.

This instalment, like those which have preceded it, is to be considered only in the light of published proof-sheets, to be canceled on the final appearance of the whole work. They are thus published in advance for several reasons—among others, both to render available certain departments of the Bibliography which approach completion, and are therefore useful as far as they go, and to invite suggestions and criticisms for the bettering of the whole work. This British list is prepared with the same great care to secure good results which was bestowed upon previous instalments, and it is hoped that the severe tests to which it will doubtless be subjected will prove it to be no less accurate than its predecessors have been found to be. Accurate, as far as it goes, I believe it to be; but I know it to be very incomplete. I do not think that it contains more than one-half as many titles as belong to this department of the Bibliography. I earnestly hope that the omissions, as well as any other defects that publication of my manuscript discloses, may be brought to my notice by those interested in the completion of the work.

There are numberless historical, statistical, geographical, agricultural, even political publications, which contain lists or other notices of British Birds, no hint of the fact being given in their respective titles; and it is my aim to include everything that claims to be ornithological by a formal heading of any sort. Very few of these "by-ways of bibliography" have been accessible to me in America. Nor have I ever been able to lay hands on a file of *The Field*, nor have I indexed certain periodicals past 1874. These sources, to say nothing of others I could mention, should yield upwards of a thousand titles not here given. I am so fully aware of the deficiencies of this instalment that criticism on this score would be futile. My manner of arranging the titles, moreover, is according to the plan of the whole work, scarcely to be appreciated as yet. But these two points aside, I ask for, and hope to receive, the severest criticism to which such literary work can be subjected. I should esteem it a great favor to receive back this pamphlet from its possessor with any errors corrected, any omissions supplied, or any bettering of my comments on the publications the titles of which are here given;

and I should be happy to recognize such courtesy by returning a copy of the whole Bibliography as soon as published.

In conducting this work, I habitually regard THE TITLE as inviolable, —to be transcribed *in full, verbatim, literatim et punctuatim*. In the case of a book, this means a transcript of the title-page, with vertical bars (|) to indicate the adjustment of the typography. With this is given the complete collation. In the cases of papers published in periodicals, I give the full title, with the page on which the article ends as well as that on which it begins, with illustrations if any—in short, all customary or requisite bibliographical data. Different editions of the same work, even if identical, are regarded as separate publications.

Except in certain cases, where the contrary is expressly stated, *no title in this Bibliography has been taken at second-hand*.

Many friends, both in England and in my own country, have been pleased to express their interest in this work, and their hope for its successful completion. To each of them, I beg to tender my sincere thanks; and I may be permitted here to refer, in an especial manner, to the encouragement, advice and assistance which I have constantly received, during years of toil, from Professor Alfred Newton, of Magdalene College, Cambridge.

SMITHSONIAN INSTITUTION,
Washington, January 20, 1880.

1666. MERRETT, C. Pinax | Rerum Naturalium | Britannicarum, | continens | Vegetabilia, Animalia | et | Fossilia, | In hac insulâ repperta in- | choatus. | — | Autore | Christophoro Merrett | Medicinæ Doctore utriusque Societatis Regiæ | Socio primoque Musæi Harveani custode. | — | Μή τῶ λόγῳ μῦνον ἀλλὰ | ἔργῳ δεῖ νομίζεσθαι τοῖς ἰητροῦς. | Hipp. | — | Londini Impensis Cave Pulleyi Insigne Rosæ | in Cæmeterio Divi Pauli, Typis F. & | T. Warren, Anno 1666. Vol. unie. 16mo. Tit., 1 fol. Epist. dedicat., 3½ fol. Epist. ad Lect., ½10 fol. pp. 1-221 + 1.

Editió princeps. Ed. alt., 1667, *q. v.* Ed. nova, 1704.

Aves Britannicæ, pp. 170-184.

Arium Catalogus Britannicarum, adjectis nominibus incolarum, locis habitationum, auctorumque citationibus, necnon notis diversis.

"As to Animals, he finds of them about 340. kinds in England, whereof of the fourfooted are about 50. Birds 170. . . ." (*Philos. Trans.*, i. p. 364.)

1667. MERRETT, C. Pinax | Rerum Naturalium | Britannicarum, | continens | Vegetabilia, Animalia. | et | Fossilia, | In hac Insula reperta inchoatus. | — | Autore | Christophoro Merrett, | Medicinæ Doctore utriusque Societatis | Regiæ Socio primoque Musæi Harveani Custode. | — | Μη τῶ λόγῳ μῦνον ἀλλὰ | ἔργῳ δεῖ νομίζεσθαι τοῖς ἰητροῦς. Hipp. | — | Londini, | Typis T. Roycroft, Impensis Cave Pulleyi. | MDCLXVII. Vol. unie. 16mo. Tit., 1 fol. Epist. dedic., 5 fol. Epist. ad Lect., 10 fol. pp. 1-223 + 1.

Editi. altera. Ed. princeps, 1666, *q. v.* Ed. nova, 1704.

Aves Britannicæ, pp. 170-184.

The matter of these two editions is substantially the same, if not identical, but the type appears to have been reset throughout: the title and collation differ, as will be seen on comparing them. The Government Printing Office has no font that will exactly reproduce the Greek quotation of the 1666 ed., though coming very near it; moreover, the orthography and accentuation of the motto differ in the two eds.—The orig. ed. must be very rare; Engelmann does not give it, citing the ed. of 1667 as the first, and noting another of 1704. There is a copy of each of the two earlier eds. in the Phila. Acad. Libr.

1676. P[LOT], R. The | Natural History | of | Oxfordshire, | Being an Essay toward the Natural History | of | England. | — | By R[obert]. P[lot]. LL. D. | [Greek quotation, 3 lines.] | [Engraving.] | Printed at the Theater in Oxford, and are to be had there: And in London at Mr. S. Millers, at the Star near the | West-end of St. Pauls Church-yard. 1677. | The price in sheets at the Press, nine shillings. | To Subscribers, eight shillings. 1 vol. folio. fly-leaf with imprimatur; title, backed blank, 1 leaf; to Charles II, 1 leaf; to reader, 3 leaves; text, pp. 1-358; errata, 1 leaf; index, 5 leaves; map, and pl. 16.

We have no Greek font that will reproduce the motto of the title.

Chap. VII. Of Brutes. pp. 175-179, ¶ 3-17, relate to Birds, in the author's "learn'd and curious manner." Fig. of a bird, pl. x, f. 3.

1678. MORAY, R. A Description of the Island Hirta. < *Philos. Trans.*, xii. 1678, pp. 927-929.

With reference to the Birds.

1684. SIBBALD, R. Scotia Illustrata, | sive | Prodrömus | Historiæ Naturalis | in quo | Regionis natura, Incolarum Ingenia & Mores, Morbi iisque medendi Methodus, & | Medicina Indigena accuratè explicantur; | et Multiplices Naturæ Partus in triplice ejus Regno, Vegetabili scilicet, Animali & Minerali | per hanc Borealem Magnæ Britanniæ Partem, quæ Antiquissimum Scotiæ | Regnum constituit, undiquaque diffusi nunc primum in Lucem eruntur, & | varii eorum Usus, Medici præsertim & Mechanici, quos ad Vitæ | cum necessitatem, tum commoditatem præstant, cunctis | perspicue exponuntur. | — | Cum figuris æneis. | Opus viginti Annorum | Serenissimi Domini Regis Caroli. II. Magnæ Britanniæ, &c. | Monarchæ Jussu editum. | Auctore Roberto Sibbaldo M. D. Equite Aurato, Medico & Geographo | Regio, & Regii Medicorum Collegii apud Edinburgum Socio. | [Fig.] | Edinburgi, | Ex Officinâ Typographicâ Jacobi Kniblo, Josue Solingensis | & Johannis Colmarii, Sumptribus Auctoris. | — | Anno Domini M. DC. LXXXIV. 1 vol. folio. 5 p. ll., + 3 ll. Pars Secunda specialis, tomus primus, 3 p. ll., pp. 1-114, 3 ll. Pars Secunda specialis, tomus secundus, 3 p. ll., pp. 1-56, 2 ll., pll. 1-22.

Ipsum verò opus prodromum in duas Partes divisum est; Prima Generalis duos continens Libros. Secunda Pars specialis est, et quatuor Libris constat; quorum Tertius de Animalibus Scotiæ tam feris quam domesticis agit; ejus Sectio Tertia de Avibus, pp. 11-22, tractat: Caput I, de avibus in genere; II, de avibus terrestribus carnivoris; III, de avibus granivoris; IV, de aviculis; V, de avibus aquaticis fissipedibus; VI, de avibus palmipedibus; VII, de avibus quibusdam, quæ incertæ classis sunt.

1686. PLOT, R. The | Natural History | of | Stafford-Shire. | By | Robert Plot. LL.D. | Keeper of the | Ashmolean Musæum | And Professor of Chymistry | in the | University | of | Oxford. | — | Ye shall Describe the Land, and bring the Description hither to Me. Joshua 8 v. 6. | — | [Engraving.] | Oxford. | Printed at the Theater, Anno M. DC. LXXXVI. 1 vol. folio. Title, backed with imprimatur, 1 leaf; to James II, 1 leaf; preface, 1 leaf; poetry to James II, 2 leaves; to Dr. Plot, 1 leaf; same in Latin, ½ leaf; directions, ½ leaf; index, 1 leaf; text, pp. 1-450; index, 5 leaves; map, and pl. 37.

Chap. VII. Of Brutes, in which the ingenious and curious author considers such as "1. either wholly undescribed, by any Author I have yet met with; or 2. have not been noted by the learned Mr. Willughby or Mr. Ray to be indigenæ of this Comty; or 3. have had very extraordinary accidents attending them." Birds are treated, ¶ 2-17, pp. 228-236, pl. xix; also pl. xxii, f. 1.

1698. MARTIN, M. A late Voyage to St. Kilda, . . .

Not seen: contains ornithological matter. See the ed. of 1818. There are many eds., in various places; it had reached a 4th in 1753.

1700. LEIGH, C. The | Natural History | of | Lancashire, Cheshire, | and the | Peak, in Derbyshire: | with an | Account | of the | British, Phœnician, Armenian, Gr. and Rom. | Antiquities in those Parts. | — | By Charles Leigh, | Doctor

1700. LEIGH, C.—Continued.

of Physick. | — | Oxford: | Printed for the Author: and to be had there at Mr. George West's, | and Mr. Henry Clement's, Booksellers there; Mr. Edward Evet's, | at the Green Dragon, in St. Paul's Church-yard; and Mr. John | Nicholson, at the King's-Arms, in Little Britain, London. MDCC. 1 vol. sm. folio. frontisp. portrait, eleven prel. ll., pp. [1-4], 1 l., pp. 1-190, 1 l.; Book II, pp. 1-97, 1 l.; Book III, pp. 1-112, 15 ll. Index. Many plates.

Book I, chap. ix, pp. 157-164, Of Birds: summary notice.

1704. MERRETT, C. Britannicarum Rerum Naturalium Pinax, . . . Londini. Roycroft. 1704.

Not seen: title from Engelmann, who, citing the 1667 ed., says that it was reissued in 1704, under the above title. Compare the eds. of 1667 and of 1666.

1709. ROBINSON, T. An | Essay | towards a | Natural History | of | Westmorland | and | Cumberland. | Wherein | An Account is given of their several Mineral | and Surface Productions, with some Dire- | ctions how to discover Minerals by the Ex- | ternal and Adja-cent Strata and Upper Co- | vers, &c. | To which is Annexed, | A Vindication of the Philosophical and Theological | Paraphrase of the Mosaick System of the | Creation, &c. | — | By Tho. Robinson, Rector of | Ousby in Cumberland. | — | London: | Printed by J. L. for W. Freeman, at the | Bible against the Middle-Temple-Gate in Fleetstreet, 1709. 1 vol. 8vo. 8 prel. ll., pp. 1-118.

After his paraphrase of Genesis I, the author presents some "moral conclusions" which Birds help him to draw.

1710. SIBBALD, R. History, ancient and modern, of the Sheriffdoms of Fife and Kinross, with the description of both, and of the Firths of Forth and Tay, and the Islands in them. Edinburgh. 1710.

Not seen: said to contain ornithological matter. See the ed. of 1803.

1712. LHUYD, E. A Letter from the late Mr. Edward Lhwyd, Keeper of the Ashmolean Museum in Oxford, to Dr. Tancered Robinson, F. R. S. containing several observations in Natural History, made in his Travels thro' Wales. < *Philos. Trans.*, xxvii, 1712, pp. 462-465.

Notices the Grey and Red Game, Cranes, and some unknown red birds, conjectured to be Virginia nightingales.

1712. LHUYD, E. An Extract from a Letter of Mr. Edw. Lhwyd to Dr. Tancered Robinson; giving some farther Account of the Birds mentioned in the foregoing Letter. < *Philos. Trans.*, xxvii, 1712, p. 466.

Relating to the same scarlet birds, on which, however, no further light is thrown.

1713. RICHARDSON, R. Several Observations in Natural History, made at North-Bierley in Yorkshire, by Dr. Richard Richardson (M. D.) Communicated in a Letter to Dr. Hans Sloane, R. S. Secr. < *Philos. Trans.*, xxviii, 1713, pp. 167-171.

Observations on the "Nut-hatch" or "Nut-jobber" (*Sitta*) and on the nest of *Regulus cristatus*.

1737. ALBIN, E. A Natural History of English Song-Birds, . . .

This is the date of the *original* edition, which I have not seen. There are at least five: see the third, 1759. See also the anonymous piracy, 1791.

1747. ALBIN, E. A Natural History of English Song-Birds, . . .

This is the date of the *second* edition, which I have not seen. There are at least five of them: see the third, 1759. See also the anonymous piracy, 1791.

1759. ALBIN, E. A | Natural History | of | English Song-Birds, | and | Such of the Foreign as are usually brought | over and esteem'd for their Singing. | To which are added, | Figures of the Cock, Hen, and Egg of | each Species, exactly copied from Nature, | By Mr. Eleazar Albin, | And curiously engraven on Copper. | Also | A particular Account how to order the | Canary-Birds in Breeding; likewise their | Diseases and Cure. | — | The third Edition. | — | London: | Printed for C. Ware, at the Bible and Sun, on | Ludgate-Hill.

1759. ALBIN, E.—Continued.

M. DCCCLIX. | Price . . . 1 vol. 8vo. 2 p. ll. (title and preface), pp. 1-96, + 2 ll. (index and advts.), frontisp. and 23 plates.

This was a considerable treatise in its day, going through at least five editions, of which the present is the third. The original was 1737; the second, 1747; the fourth 1776, Edinburgh; the fifth, 1778; with anonymous piracy, 1791.

1759-63. MARTIN, B. The | Natural History | of | England; | or, | a Description of each particular County, | In regard to the curious Productions of | Nature and Art. | — | Illustrated by a Map of each County, and Sculptures | of Natural Curiosities. | — | Vol. I [II]. | Containing, | . . . | — | By Benjamin Martin. | — | London: | Printed and sold by W. Owen, Temple-Bar, and by the | Author, at his House in Fleet street. | — | MDCCLIX [MDCCLXIII]. 2 vols. 16mo. Vol. I, 1759, pp. i-iv, 1-410 + 8. Vol. II, 6 prel. ll., pp. 1-392. Maps in both vols.

I do not find any ornithology to speak of in either of these vols.

1766. [PENNANT, T.] British Zoology. . . . folio. 1766.

This, which I have not seen, is said to be the original edition of the famous work. Six editions have come to my knowledge, whereof I have handled only the so-called fourth and the later one of 1812. According to my imperfect information these are as follows:

1766. *Editio princeps, ut supra.*

1768 (to 1770?). *Second* edition. 8vo.

1768 (to 1770?). *Third?* edition. (How about this?)

1771-76. *Murr's* edition, in Latin and German. (This is not included in the regular enumeration of the editions.)

1776-77. The so-called "*Fourth*" edition. 4 vols. in two issues, one in 8vo and the other in 4to; copies also differing slightly in the collation of the unpagged leaves, but typography identical.

1812. *Another* edition. 4 vols. 8vo. (First ed. with author's name on the title.)

All of these are noted, or fully given, beyond, at their respective dates.

Cf. J. A. Harvie-Brown. Capere. in Scotland, 1819, p. 23, note.

1768-70? [PENNANT, T.] British Zoology. . . . 8vo. 1768-70?

See what is said under head of the original folio ed., 1766. Is this the 2d or the 3d ed.? Are there two of this date? See the so-called fourth ed., 1776-77.

1769-72. BERKENHOUT, J. Outlines | of the | Natural History | of | Great Britain | and | Ireland. | Containing | A systematic Arrangement and concise Description of | all the Animals, Vegetables, and Fossils which have | hitherto been discovered in these Kingdoms. | — | By John Berkenhout, M.D. | — | In Three Volumes. | — | Vol. I [—III]. | Comprehending the Animal [mut. mut.] Kingdom. | — | London: | Printed for P. Elmsley (Successor to Mr. Vaillant) | facing Southampton-street, in the Strand. | M DCC LXIX [M DCC LXXII]. 3 vols. 16mo. Vol. I, 1769, pp. i-xiv, 1-233. (Vol. II, 1770, Botany; Vol. III, 1772, Fossils.)

Class II. Birds. pp. 10-58. A descriptive list of species, in Linnaean system. There is said to be a second edition. There is a third edition, differently titled, 2 vols., 1795, *q. v.*

1769. WALLIS, J. The Natural History | and | Antiquities | of | Northumberland: | And of so much of the County of | Durham | As lies between the Rivers Tyne and Tweed; | commonly called, | North Bishoprick. | In two volumes. | By John Wallis, A. M. | Vol. I [II]. | — | London: | Printed for the Author, by W. and W. Strahan; | and sold by S. Bladon, in Pater-noster-Row. | — | M D CCLXIX. 2 vols. sm. 4to. Vol. I, 2 p. ll., pp. i-xxviii, 2 ll., pp. 1-438, 1 l. Vol. II, 2 p. ll., pp. 1-562, 1-22, 1 l.

Vol. I. Chapter IX. Of Birds. pp. 309-346. The author calls it, in his preface, "short descriptions and synonyms of the most curious birds observed with us. . . . with no other embellishments than those of nature and truth." It treats of some fifty species.

1771-76. [PENNANT, T.] (*Ed. C. G. v. Murr.*) Zoologia Britannica. Class I. Quadrapeda. II. Aves. Latine donavit C. Th. de Murr.—Britische Thiergeschichte. . . . in das Latein. und Deutsche übers. u. mit einigen Anmerkgn. begleitet von C. G. v. Murr. . . . Augsburg. J. Haid und Sohn. 1771-1776. pp. 178, pll. 132.

Not seen: title abridged from Engelmann. Said to be taken from 2 vols. of the 2d ed., 1768.

1771. [TUNSTALL, M.] Ornithologia Britannica: seu Avium omnium britannicarum tam terrestrium, quam aquaticarum Catalogus, sermone latino, anglico et gallico redditus; cui subicitur Appendix. Aves alienigenas, in Angliam raro advenientes, complectens. [Auctore Marnaduke Tunstall.] Londini: J. Dixwell. 1771. folio. pp. 4, 1 pl.

Not seen.—I observe late citation of Tunstall as authority for the name *Falco peregrinus*.

1772. RUTTY, J. An | Essay | towards a | Natural History | of the | County of Dublin, | Accommodated to the | Noble Designs of the | Dublin Society; | Affording a summary View | [etc., 17 lines.] | — | By John Ratty, M. D. | — | Vol. I [II]. | — | Dublin: printed by W. Sleater, in Castle-street. | For the Author. 1772. 2 vols. 8vo. Vol. I, pp. i-xiv, 1-4, 1-392, pll. i-v. Vol. II, pp. i-vi, 1-488, several folded tables.

Vol. I. Of Birds. pp. 295-344, pll. ii-v. A considerable account, illustrated with 4 folded plates, but of no apparent value.

1775. HAYES, [WM.] A | Natural History | of | British Birds, | &c. | With their Portraits, | Accurately drawn, and beautifully coloured from Nature, | By Mr. [William] Hayes. | London: | Printed for S. Hooper, No 25, Ludgate-Hill, | M. DCCC. LXXV. 1 vol. folio. Title and pp. 1-24, with 47 unnumbered col'd pll.

The following is a list of these plates: 1. Hen harrier. 2. *Falco torquatus*. 3. Sparrowhawk. 4. Kestrel. 5. *Milvus regalis*. 6. Chough. 7. Jay. 8. Magpie. 9. *Picus varius major*. 10. *Picus viridis*. 10*. Wryneck. 11. Lapwing. 12. Sea Pie [*Hæmatopus*]. 11. Turtle. 14. *Turtur torquatus*. 15. Ringdove. 16. *Columba tabellaria*. 17, 18. Cuckoo. 19. Bittern. 20, 21. Pheasant. 22. Gold Pheasant. 23. Bantam Cock. 24. Bernacle. 25. Brent. 26. Tufted Duck, *Glaucium minus*. 27. Shoveller. 28. Shieldrake. 29. *Querquedula minor*. 30. Water hen. 31. Fieldfare. 32. Starling. 33. *Parus longicaudus*. 34. Goldfinch. 35. *Hortulanus arundinaceus*. *36. Bramble finch. 37. Bullfinch. 38. Wren. 38*. Willow wren. 38*. Golden Crested Wren. 38***. Great Titmouse. 38****. Blue Titmouse. 39. Whin Chad (sic). 39*. Stone chatter. 40. Redstart. 40*. Redbreast.—47 plates in all. To some are given quasi-binomial names; but the author is out of the true fold, and his text is worthless. The plates are far from being as bad as some I have seen.

- 1776? ALBIN, E. A Natural History of English Song Birds, . . .

This is the fourth edition, which I have not seen. There are at least five of them: see the third, 1759.

- 1776-77. [PENNANT, T.] British Zoology. | [By Thomas Pennant.] | Vol. I [-IV]. | Class I. Quadrapeds. | II. Birds. | Fourth Edition. | Warrington: | printed by William Eyres, | for Benjamin White, at Horace's Head, | Fleet Street, London. | MDCCLXXVI [MDCCLXXVII]. 4 vols. 8vo. Vol. I, 1776, engr. title, 1 l.; pp. i-xxxiv (incl. printed title), 2 ll. (list of plates), pp. 1-152, pll. i-xiv (Mammals); pp. 153-418, pll. xv-lix (Land Birds). Vol. II, 1776, engr. title (=pl. lx), 3 p. ll. (printed title and list of plates), pp. 419-786, pll. lxi-ciii, i-ix, 1 folded sheet of music. (Vol. III, 1776, Reptiles and Fishes. Vol. IV, 1777, Crustacea, Mollusca, and Testacea.)

The orig. ed. was 1766, *q. v.* The 2d ed. is said to date 1768.—There appears to have been really no 3d ed., but only a second issue of one of the others, doubtless the 2d.

Obs.—It is said that there were two issues of date 1776-77, one in 8vo, the other in 4to, both entitled "Fourth edition". The difference is probably only in the size of the paper, the typography and impression being identical. I find among my slips two titles, both relating to this same 4th ed., but taken at different times from different copies; both "8vo", but the collation not identically the same (there being pp. i-viii and 5 unpagged leaves in one, not in the other). There are several unpagged pages in the work, which may be bound in different places in different copies, or left out of some. So I let both titles stand, though they refer to the same edition of the same work. The main text, pp. 1-418 in Vol. I, and pp. 419-786 in Vol. II, together with the plates i-ciii, + i-ix + 1 sheet of music, are absolutely the same. See next title.

It is not easy to cite the title of this work, as every line of it, excepting the first, changes with successive volumes. The eng. titles to Vols. I and II differ again from each other and from the printed titles. The work is ostensibly anonymous, but few authors are better known than Thomas Pennant. This edition, being the fourth, makes many changes in collation from an earlier one. Vols. I and II include the Birds, preceded by the Mammals in Vol. I.

1776-77. [PENNANT, T.] *British Zoology*. | [By Thomas Pennant.] | Vol. I [-IV]. | Class I. Quadrupeds. | II. Birds. | Fourth Edition. | Warrington: | printed by William Eyres, | for Benjamin White, at Horace's Head, | Fleet street, London. | MDCCLXXVI [MDCCLXXVII]. 4 vols. 8vo. Vol. I, 1776, eng. title, 1 l., pp. i-xxxiv (incl. printed title), 2 ll., pp. i-viii, 5 ll., pp. 1-418, 4 ll., pll. i-lix. Vol. II, 1776, eng. title (=pl. lx), 3 p. ll. (printed title and list of plates), pp. 419-786, pll. lxi-ciii, i-ix, 1 folded sheet of music. (Vol. III, 1776, and Vol. IV, 1777, do not relate to Birds. Place of publ. changed to "London" in later vols.)

Vol. I, Class II, Birds. Div. I, Land Birds, pp. 153 to end, pll. xv-lix. Vol. II, Class II, Division II, Water-fowl, the whole volume, pll. lx-ciii, and of the appendix pll. i-ix, with the music sheet, pl. lx being the frontispiece or eng. title-page, as you please. The unpagged leaves at end of Vol. I (in copy examined; they may be bound elsewhere in other copies) are also ornithological. (Compare last title, and see what is said under it.)

Besides the systematic account of the species, there are some pieces requiring mention: Vol. I, pp. 158-160, expl. of technical terms; the unpagged leaves (ordered to be inserted immediately before the index) are additions and corrections. Vol. II, appendix, pp. 623-626, Birds now extinct in Great Britain, or such as wander there accidentally; also, the bullfinch music sheet. pp. 637-646 of appendix is mammalogical. pp. 647, 648, of the choice of His Majesty's Hawks. pp. 649-659, of the small Birds of Flight, by Daines Barrington. pp. 660-708, Experiments on Singing Birds, by Daines Barrington. pp. 709-725, on the migrations of British Birds. pp. 725-730, Extracts from old English writers. pp. 731-760, Systematic Arrangement of the Birds of Great Britain, with names in the ancient British.

The sheet of music is from *Philos. Trans.*, lxxviii, pl. xi.

1778. ALBIN, E. *A Natural History of British Song-Birds*, . . .

This is the date of the fifth edition, which I have not seen. See the third, 1759.

1780. [EDWARDS, G.] *A | Discourse | on the | Emigration of British Birds: | or, | This Question at last Solv'd: | Whence come the Stork and the Turtle; the | Crane and the Swallow, when they know | and observe the appointed Time of their coming? | Containing | A Curious, particular, and circumstantial Account of the | respective Retreats of all those | Birds of Passage | Which visit our Island at the Commencement of Spring, and | depart at the Approach of Winter; as, the | [etc., 6 lines, in triple columns.] | Also, | A copious, entertaining and satisfactory Relation of | Winter Birds of Passage, | Among which are the | [etc., 2 lines, in triple column.] | Shewing | The different Countries to which they return, the Places where they | breed, and how they perform their Annual Emigrations, &c. | With a short Account of those Birds that migrate occasionally, | or only shift their Quarters at certain Seasons of the Year. | To which are added, | Reflections on that truly admirable and wonderful | Instinct, the Annual Migration of Birds! — | By a Naturalist [George Edwards]. — | Salisbury: | Printed and sold by Collins and Johnson, | For the Author. | Sold also by Fielding and Walker, in Pater-noster Row, London. | M DCC LXXX. 1 vol. 8vo. pp. i-vi, 1-45.*

There is another ed., 1795.

The title of this work, by one of the most distinguished naturalists of that day, is sufficiently explicit.

1787. LATHAM, J. *A List of the Birds of Great Britain; Comprehending all such as either visit us at uncertain Seasons, or are usually domesticated, as well as those which are known to be constant Inhabitants.* < *Latham's Gen. Syn. Birds, Suppl.*, i, 1787, pp. 281-298.

Briefly annotated; especially valuable for its indication of the stragglers.

1789. MARSHAM, R. *Indications of Spring, observed by Robert Marsham, Esquire, F. R. S. of Stratton in Norfolk. Latitude 52° 45'.* < *Philos. Trans.*, lxxxix, pt. ii, 1789, pp. 154-156.

Tabular statement of observations upon the appearance, etc., of various birds.

1789. WALCOTT, J. *Synopsis | of | British Birds. | — | By John Walcott, Esq. | — | The Works of the Lord are great: | Sought out of all them that have Pleasure therein. | Psalms, cxi. 2. | — | London: | Printed by W. Justins, Shoe-*

1750. WALCOTT, J.—(Continued.)

maker Row, Blackfriars, [For the Author:] And sold by Mess. White and Son, Fleet Street; [Robson and Clarke, New-Bond Street; [And J. Mathews, Strand.]—] M. DCC. LXXXIX. 2 vols. sm. 4to. Not paged; with some 250 illustrations, in the text, not numbered.

There is said to be another edition, 1792. (?)

"The following Work contains the description and manners of nearly all our British birds, with a figure of each, copied by the Author from nature. . . . The particular merit this Work is entitled to, lies in the figures being faithful copies of nature; and that it adds a little to our knowledge of the manners of birds." (*Extract from Preface.*) A few of the plates are copies from Brisson, and others. The author drew most of them from fresh specimens; others from specimens in the Parkinson and Latham museums; the descriptions of these latter being from Latham's "Synopsis." The engravings are of half-page size, heading a page, the rest of the page being text, backed blank; many leaves of generic characters are interpolated. There is no pagination, printer's signature or numeration of the plates. Some 250 species are thus treated, the work thus consisting of as many sheets, plus the interpolated sheets of generic details. The sequence of the species appears to be nearly that of the Linnæan Systema Naturæ, beginning with *Vultur*, and ending with *Caprimulgus*.

1750. [WHITE, G.] The [Natural History] and [Antiquities] of [Selborne,] in the [County of Southampton [by Gilbert White];] with [Engravings, and an Appendix.] London: [printed, by T. Bensley;] for B. White and Son, at Horace's Head, Fleet street. [M. DCC. LXXXIX. 1 vol. 4to. pp. i-vi, 1-468, 7 unnumbered ll. (index and errata), eng. title-p., and 7 copper-plt., besides one in text of p. 307.]

Not seen: title from Newton, *Notes and Queries*, 5th ser., vii, Mar. 31, 1877, p. 241; which see, especially, for a bibliography of G. White's published writings.

This is the editio princeps of "White's Selborne"; from which, with or without the "Calendar" and "Observations," which were incorporated in 1802, flow numberless editions, variously edited and modified. I give nearly all of them in this bibliography; but see especially Newton, as just cited.

The famous work is ostensibly anonymous: but the author's name, "Gil. White," appears on p. v. of the "Advertisement." The pl. opp. p. 259 represents *Charadrius hiemantopus*.

"Many as our English Naturalists have been, and among them men endowed with so much excellence as to ensure their taking and holding a rank not inferior to that enjoyed by the naturalists of any other nation, there is but one whose writings have placed him among English classical authors. This one is Gilbert White; and his best known work, The Natural History and Antiquities of Selborne, has only to be named to ensure its respectful if not rapturous reception by all classes."—*Nat. 13 July*, 1720; *ob. 26 June*, 1793.

A summary notice of the editions of Selborne, etc., is given under 1877, NEWTON, A., *q. v.*

The following memoranda give the dates of publication of nearly all of White's published writings, exclusive of the two Swallow papers in *Philos. Trans.*

1789, *Nat. Hist. Ant. Selb.*, orig. ed.—1792, German, ed. *Meyer*.—?1793, *Nat. Hist. Ant.—1795, Nat. Calend.*, ed. *Aikin*.—1802, *Works (Nat. Hist. Ant. Calend. and Misc. Obs.)*, ed. *Markwick*.—1813, Same, with Poems.—?1822 (—?—1802?)—?1825—?—1829, *Nat. Hist. Selb.*, ed. *Jardine*.—1829, *Nat. Hist. Selb.*, ed. *Jardine*.—?1830, *Nat. Hist. Ant.*—?—1832, *Nat. Hist. Ant.*, ed. *Jardine*.—1833, *Nat. Hist. Ant.*, notes by several, ed. *Rennie*.—1833, *Nat. Hist.*, ed. *Lady Dover*.—1833, *Nat. Hist. Obs. and Calend.*, ed. *Brown*.—?1833, *Nat. Hist. Ant.*, ed. *Jardine*.—1834, *Nat. Hist. Obs. and Calend.*, ed. *Brown*.—1834, *Jesse's Gleanings*.—?1835, *Nat. Hist. Obs. Calend.*, ed. *Brown*.—1836, *Nat. Hist. Ant. Calend.*, etc., notes by *Blyth*.—1836, *Nat. Hist. Ant.*, ed. *Jardine*.—1837, *Nat. Hist. Ant. Calend. Misc. Obs.*, notes by *Bennett*.—1840, *Nat. Hist.*, etc., ed. *Brown*.—1841, *Nat. Hist.*, ed. *Lady Dover*, American reprint.—1843, *Nat. Hist.*, notes by *Jenyns*.—1843, *Nat. Hist.*, etc., ed. *Brown*.—1845, *Nat. Hist.*, etc., ed. *Brown*.—?1851, *Nat. Hist.*, etc., ed. *Jesse*, suppl. *Jardine*.—1853, *Nat. Hist. Ant. Obs. and Calend.*, notes by *Jardine*.—1854, *Nat. Hist.*, etc., notes by *Wood*.—1858, *Nat. Hist.*, etc., ed. *Blyth*.—1860, *Nat. Hist.*, ed. *Lady Dover*, American reprint.—?1860, *Nat. Hist.*, ed. *Lady Dover* (Pub. Soc. Diff. Christ. Knowl.).—1870 or 1871, the same.—1875, *Nat. Hist. Ant.*, etc., ed. *Bennett*, notes by *Harting*.—1875, *Nat. Hist. Ant.*, ed. and notes by *Buckland*.—1876, the same.—1876, Correspondence with *Marsham*.—1877, *Nat. Hist. Ant.*, etc., 2 vols., ed. *Bell*.—1879, *Nat. Hist. and Calend.*, with notes by *Davies*.—Besides these, there are some half-dozen reissues, separately dated, of the Harper (American) reprint; and I also hear of one or two editions, character unknown to me, between 1876 and 1879.

1751. ANON. (ALBIN, E., *stolen from.*) The [History of] Singing Birds [containing [An exact Description of their] Habits & Customs] & their manner of constructing their nests [their times of Incubation] [With the peculiar excel-

1791. ANON.—Continued.

lencies of their several Songs. | the Method of rearing them in Cages | & the preparation and choice of their | Food | Also the disorders they are subject to | with the mode of treatment, | Including the history & management | of | Canary Birds | translated from the | French of the | Count de Buffon. | the whole ornamented with Copper Plates | from Drawings after | Nature, | Edinburgh | Printed for Silvester Doig Royal Exchange | 1791 1 vol. 2 engr. titles; advt., and contents, each one leaf; pp. 1-192; many plates.

This is clearly a "bookseller's book", made out of Albin's "Natural History of English Song Birds", with nearly the same plates, and the text almost word for word in various places, as I ascertain by direct comparison: variously padded in other places. The illustrations are substantially the same, but with the eggs mostly erased from the plates. One may always suspect an anonymous book which parades some great man's name on the title-page, as Buffon's in this case.—Compare 1759, ALBIN, E.

1791-96. LORD, T. Lord's, | Entire New System of | Ornithology. | Or | Occumenical History, of | British Birds. | [Fig.] | Under the Inspection and Patronage, of the Rev.^d M.^r Peters. | Chaplain, to His Royal Highness the | Prince of Wales. | The whole accurately copied, from the Original Paintings, | now in the possession of the | Artist. | With a brief account of their Characters, & Properties. | The writing Corrected, & Embellish'd, by the | Rev.^d D.^r Dupree, | Master of the King's, Free Grammar School, at | Berkhamstead. | London. | Published as the Act directs, May, 30,th 1791 [-1796]. by the Author. | 1 vol. folio. Engr. title, dedication, introduction, pp. i-vi; plates 1-114. with as many sheets of letterpress. Pub. in 38 parts, of 3 plates and sheets each, from May 30, 1791 to Oct. 1, 1796.

Each plate is dated, so that the dates of publication, may be ascertained for the whole series—the redeeming feature of the work. Engelmann gives "(96) 108" plates: but I find in the copy examined the series of (3×38=) 114 complete, though some of the sheets are wrongly numbered, being corrected in msc.

Given a sub with an "entire new system of ornithology,"—a royal chaplain for a patron,—and a reverend pedagogue to correct and embellish the text, all together on one engraved title-page—and the infallible result estops criticism. The Canary bird, and some pigeons and poultry, are included in the "Occumenical History, of British Birds."

1791. MARKWICK, W. On the Migration of certain Birds, and on other Matters relating to the feathered Tribes. < *Trans. Linn. Soc.*, i, 1791, pp. 118-130, pl. xi.

General considerations. Tabular view of the appearance and disappearance of 25 spp. of British Birds, from observations in Sussex, 1768 to 1783; further commentary on the same; special description and orig. fig. of *Tringa glareola*.

1792. WHITE, G. (*German ed., Meyer.*) White's Beyträge | zur | Naturgeschichte von England. | Aus der Englischen übersetzt | und | mit Anmerkungen begleitet | von | Friedrich Albrecht Anton Meyer, | der Weltweisheit und Arzneygelehrtheit Doctor und Privatdocent | zu Göttingen. | Berlin, 1792. | Bey Heinrich August Rottmann. 16mo. pp. 8 (unnumbered), 168.

Not seen: title and comment from A. Newton.

"According to the youthful translator's preface, the original has much chaff (*Spreu*) in it, but also some corn that is worth transplanting into German soil, which he therefore condescends to extract, warning his readers, however, that the book is not for the learned, but only for such as wish to entertain themselves with a little knowledge. The extracts so put together entirely lose their epistolary character, though the translator keeps up the name. Thus White's first six letters to Pennant are condensed by Meyer into his "Erster Brief," while the last and "Vierzehnter Brief" is compounded of part of White's fifty-eighth to Barrington, with a single paragraph from his next, and the final paragraph of the whole *Nat. Hist. Selb.* The translation is not very accurate, and the editor's remarks are inserted in the text, between brackets, often with a sneer."

† 1793. WHITE, G. The Natural History and Antiquities of Selborne, . . .

There is said (by Ag. and Strickl., *Bibl.*, iv, p. 560) to be an edition of this year (that of the author's death); "but probably in error", adds Prof. Newton. It may be a misprint for 1792, the date of the German ed., which Ag. and Strickl. do not give, unless this be intended for it.

1794-93. BOLTON, J. *Harmonia Ruralis*; | or, | an Essay | towards | a Natural History | of | British | Song Birds. | — | Volume the first [second]. | — | Illustrated | with Figures of the Size of Life, of the Birds, Male and Female, | in their most natural Attitudes; | their Nests and Eggs, Food, favourite Plants, Shrubs, Trees, &c. &c. | Faithfully drawn, engraved, and coloured | after Nature. | By the Author, | on forty [forty] copper-plates. | — | [Quotation, 4 lines.] | — | *Natura semper eadem, sed Artes sunt varia.* | — | By James Bolton. | — | [Design.] | Printed for and sold by the author, at Stannary, near Halifax; | sold also by B. and J. White, in London, and may | be had of all other booksellers. | 1794 [1793]. 2 vols. folio or 4to. Vol. I, 1794, frontisp., pp. i-viii, 1-40 col'd pll., with 1-40 sheets of text. Vol. II, 1796 (some verbal modifications in the title), 3 p. ll. (title, dedication, and note), 41-80 col'd pll., with 41-80 sheets of text, and pp. 81, 82 (Index).

There are said to be other editions, of 1824 and 1845.

This is perhaps the most ornate, or luxurious, work on British Song Birds of the last century, and it ought to remain in some sort a "standard" treatise, notwithstanding N. Wood's fiat. The text is prepared with great care for accuracy, and the plates are highly coloured—too highly, in fact. They would not be tolerated now, but we should always remember dates, for other than purely bibliographical purposes.

1794-95. DONOVAN, E. The | Natural History | of | British Birds; | or, a | selection of the most rare, beautiful, and interesting | Birds | which inhabit this country: | the descriptions from the | *Systema Naturæ* | of | Linnaeus; | with | general observations, | either original, or corrected from the latest | and most esteemed | English Ornithologists; | and embellished with | Figures, | drawn, engraved, and coloured from the original specimens. | — | [Vol. I—] Vol. II. | — | By E. Donovan. | — | London: | printed for the author; and for F. and C. Rivington, | No. 62, St. Paul's Church-Yard. 1794 [1795]. 2 vols. in one. 8vo. Vol. I, 1794, 9 p. ll. (title, advt., contents), pp. [3]–[16] and many more unpagged leaves, pll. 1-24. Vol. II, 1795, title and many unpagged leaves, pll. 25-48.

This is a well known and notable treatise, not common now. It was probably published in parts; but of this I do not know. The text is general, being in fact a description or other account of the species of British Birds selected for illustration. The plates are very good considering the date of their publication; in fact they still look well. There are 48 of them, all coloured.

1795. BERKENHOUT, J. Synopsis | of the | Natural History | of | Great-Britain and Ireland. | Containing | a systematic arrangement | and | concise description | of all the | Animals, Vegetables, and Fossils, | which have hitherto been discovered | in these Kingdoms. | — | By John Berkenhout, M. D. | — | Being a | third edition of *The Outlines, &c.* | corrected and considerably enlarged. | — | Vol. I [II]. | Comprehending the Animal and Fossil [the Vegetable] Kingdoms. | — | London: | Printed for T. Cadell, and sold by T. Cadell, junior, | and W. Davies, (Successors to Mr. Cadell) | in the Strand, | MD CC XCV. 2 vols. 16mo. Vol. I, 1 p. l., pp. i-xii, 13-334. (Vol. II, Botany.)

Orig. ed. 1769-72, q. v. The second ed. I have not seen.

Class II, Birds. pp. 10-54, substantially the same as in the orig. ed.

1795. [EDWARDS, G.] A | Discourse | on the | Emigration of British Birds; | or, | This Question at last Solv'd: | Whence came the Stork and the Turtle, the | Crane and the Swallow, when they know and | observe the appointed Time of their Coming? | Containing | A curious, particular, and circumstantial Account of the | respective Retreats of all those | Birds of Passage, | Which visit our Island at the Commencement of Spring, | and depart at the Approach of Winter; as the | [etc., 6 lines, in triple columns]. | Also, | A copious, entertaining, and satisfactory Relation of | Winter Birds of Passage: | Among which are the | [etc., 2 lines]. | Shewing the different Countries to which they retire, the | Places where they breed, and how they perform their | Annual Emigrations, &c. | With a short Account of those Birds, that migrate occasionally,

1795. [EDWARDS, G.]—Continued.

or only | shift their Quarters at certain Seasons of the Year. | To which are added, | Reflections on that truly admirable and wonderful Instinct, the | Annual Migration of Birds! — | By a Naturalist [George Edwards]. — | London: | Printed for J. Walker, No. 44, Paternoster-row. | 1795. 8vo. in size, but only 4 ll. to a sig. Title-p., pp. v-xv, 1 p. advt., pp. 1-64.

This is a later issue: orig. ed. 1780. To judge by the make-up of the copy handled, it may be only other copies of the original, furnished with new title-leaf; for after the title-leaf, which is backed blank, comes unpagcd p. v, then pagcd p. vi.—The contents of the treatise are sufficiently indicated in the title. Much space is devoted, in particular, to the migration and alleged hibernation of Swallows, the allegation being discussed and refuted. The author's eminence, no less than his treatment of the subject, makes this a very notable tract. It has become a rare and valuable book. My copy is copiously annotated by a hand unknown to me: it was presented to me in 1879 by S. S. Haldeman, and contains some msc. of his on the fly-leaf.

1795. WARNER, R. The | History | of the | Isle of Wight, | Military, | Ecclesiastical, Civil, & Natural: | — | to which is added | a view of its agriculture. | — | By the Rev. Richard Warner; [etc., 13 lines.] | — | Southampton. | Printed for T. Cadell, jun. and W. Davies, (successors | to Mr. Cadell) in the Strand, London; | and T. Baker, Southampton. | — | MDCXCXV. 1 vol. 8vo. pp. i-xiv, 1-312; 2 leaves of coins; appendix, pp. 1-14; 1 l. errata; 9 ll. index.

Chap. IV. Of the Ornithology of the Isle of Wight. pp. 225-246. A considerable account, particularly of the water-fowl.

1795. WHITE, G. (*Ed. Aikin, J.*) A | Naturalist's Calendar, | with | Observations in various branches | of | Natural History; | extracted from the papers | of the late | Rev. Gilbert White, M. A. | of Selborne, Hampshire, | Senior Fellow of Oriel College, Oxford. | — | Never before published. | — | London: | printed for B. and J. White, Horace's Head, | Fleet Street. | — | 1795. 1 vol. 8m. 8vo or 16mo. pp. i-iv (title and advt., by J. Aikin), pp. 5-170, + 3 ll. (contents and advt.), with coloured frontisp. ("a hybrid bird", in other copies said to face p. 65).

Copy in the Phila. Acad. Library, handled by me.

"THE Reverend Mr. White, so agreeably known to the public by his *Natural History of Selborne*, left behind him a series of yearly books, containing his diurnal observations on the occurrences in the various walks of rural nature, from the year 1768 to the time of his death in 1793. From these annals he had already extracted all the matter comprised in the work above mentioned, down to the middle of 1787, but several curious facts in the preceding numbers had not been thus employed; and all the subsequent ones remained untouched. It was thought a mark of respect due to his memory, and to the reputation he had acquired as a faithful and elegant observer, not to consign these relics to neglect. The manuscripts were accordingly put into my hands for the purpose of selecting from them what might seem worthy of laying before the public. The present small publication is the fruit of my research. . . ." (Editor's advertisement.)

The "Calendar" and "Observations" were thus originally printed as a separate book, but were incorporated in many of the subsequent editions of the *Nat. Hist. Ant. Selborne*.

It contains the following bird-matter: "Observations on Birds": pp. 57-91:—Birds in general—Rooks—Thrushes—Poultry—Hen Partridge—A hybrid Pheasant (frontisp. or opp. p. 65)—Land Rail—food of the Ring Dove—Hen Harrier—Great Speckled Diver, or Loon—Stone Curlew—Smallest Willow Wren—Fern Owl or Goat Sucker—Sand Martins—Swallows, congregating, and disappearance of—Wagtails—Wryneck—Grosbeak. This matter comes in the part of the book entitled "Observations on various parts of nature", following the "Calendar".

1797-1804. BEWICK, T. History | of | British Birds. | The Figures engraved on wood by T[homas]. Bewick. | Vol. I [II]. | Containing the | History and Description of Land [Water] Birds. | Newcastle: | printed by Sol. Hodgson, for Beilby & Bewick: sold by them, | and G. G. and J. Robinson, London. | [Price 18s. in Boards.] | 1797 [1804]. 2 vols. 8vo. Vol. I, Land Birds, 1797, pp. i-xxx (title, preface, introduction, contents), 1-335, figg. 115. Vol. II, Water Birds, 1804, pp. — — —, figg. 113.

I have seen few editions of "Bewick", and for the titles of most of them, as well as for nearly all that I have to remark respecting them, I am indebted to Prof. A. Newton, in epist.

1797-1804. BEWICK, T.—Continued.

Vol. I, Land Birds, 1797, of the *editio princeps*, originally appeared in two issues. Vol. II, Water Birds, 1804, appeared in one issue of a number of copies equal to the number of copies of both issues of Vol. I. The text of Vol. I is by Beilby; that of Vol. II by Bewick. The two vols. are thus really two separate works; but as they both together make up the *editio princeps*, I have combined the titles of the two in one, hypothetically; not knowing, however, that the title of Vol. II may not be worded more differently from that of Vol. I than as indicated above. The bracketed statement of price, in the title, no doubt varies in different copies. Also, was not Vol. II printed by E. Walker? Vol. I is said to contain 115 figures; Vol. II, 113; making 228 in all. About 50 of the figures are said to have been drawn from subjects in the Wycliffe Museum.

It appears that there have been *eight regular editions* of "Bewick" (exclusive of three editions of the cuts alone). They are as follows:

1797-1804. *Editio princeps, ut supra.*

1805. *Second Edition.* Newcastle. E. Walker. 2 vols. 8vo.

1809. *Third Edition.* Newcastle. E. Walker. ?

1806. *Fourth Edition.* Newcastle. E. Walker. 2 vols. 8vo.

1821. *Fifth Edition.* Newcastle. E. Walker. 2 vols. 8vo. (With Supplement, Part I, Land Birds, and Supplement, Part II, Water Birds.)

1826. *Sixth Edition.* Newcastle. E. Walker. 2 vols. 8vo.

1832. *Seventh Edition.* Newcastle. C. H. Cook. 2 vols. 8vo.

1847. *Eighth Edition.* Newcastle. J. Blackwell & Co. 2 vols. 8vo. (With Synopsis, by J. Hancock.)

"Supplements", one to each vol., were introduced with the 5th ed., 1821. Each successive edition, or each to the 6th, has accessions; thus, the 6th, 1826, contains 300 (157 Land, 143 Water) figures of British Birds, besides 14 of exotic Land Birds.

The separate issues of figures only are three in number, viz:

1800. *First issue.* Cuts of Land Birds only, without text. 8vo. (How many copies?)

1817. *Second issue.* Cuts of Land and Water Birds, without text. 4to. (25 copies.)

1825. *Third issue.* Cuts of Land and Water Birds, without text. . . . (100 copies.)

There is an autobiographical memoir of Bewick. Cf. *Ibis*, iv, 1862, pp. 368-—.

All these editions, both of the text, and of the plates only, are duly noted in the present Bibliography, under their respective dates, *which see*, for further particulars.

1797. LAMBERT, E. Observations relating to the Migration of [certain British] Birds. < *Trans. Linn. Soc.*, iii, 1797, pp. 12-15.
Notes on the movements of 9 spp.

1797. MATON, W. G. Observations | relative chiefly to the | Natural History, | Picturesque Scenery, | and | Antiquities, | of the | Western Counties of England, | Made in the Years 1794 and 1796. | — | Illustrated by | A Mineralogical Map, and sixteen Views in Aquatinta by Aiken. | — | By William George Maton, M. A. | Fellow of the Linnaean Society. | — | Vol. I [II]. | — | Salisbury, | printed and sold by J. Easton; | [etc., 3 lines.] | — | 1797. 2 vols. 8vo. Vol. I, pp. iii-xii, 1-333, 8 plates. Vol. II, pp. 1-216, 8 ll. (index, &c.), 7 plates, map.

Notices of various birds, *passim*.—See especially the *Critical Review*, Apr., 1798, pp. 369-378, and June, 1798, pp. ———.

1798. ANON. Observations relative chiefly to the Natural History, Picturesque Scenery, and, . . . By William George Maton. . . . < *Critical Review*, Apr., 1798, pp. 369-378; also June, 1798, pp. ———.

A review of Maton's book, 1797. The anonymous writer slashes the author with great severity, and in a tone of pique and ill-humor savoring of personal antipathy. Mr. Maton's remonstrance met with no mercy in 'answers to correspondents' in the June number of the *Review*.

1798. MARKWICK, W. Aves Susssexiensis; or, A Catalogue of Birds found in the County of Sussex, with Remarks. < *Trans. Linn. Soc.*, iv, 1798, pp. 1-30, pl. 1.
175 spp. marked whether summer or winter, or casual bird of passage, or resident. Extended commentary on many of the species. Pl. I, *Tringa maritima*.

1798. MONTAGU, G. Descriptions of three rare Species of British Birds. < *Trans. Linn. Soc.*, iv, 1798, pp. 35-43, pl. 2.
Sylvia sylvicola, p. 35, pl. 2, f. 1 (egg). *Tringa nigricans*, p. 40, pl. 2, f. 2. *Alauda petrosa*, p. 41, pl. 2, f. 3 (egg).

- 1799? ANON. Our [British] Song Birds. | [Quotation, 8 lines.] | London: | Religious Tract Society, | Instituted 1799. 1 vol. 24mo (32 pages to a signature). pp. 1, 2 (advs.), i-vi, 7-192.

One of the monthly issues of the Society named. The date at the bottom need not be that of publication, though the book is named in the advt. as No. 5 of the "issue of the first year". But it may mean the first year in which they published these tracts, not that of the existence of the Society. The book does not look to me like so old a one as 1799.

1799. PULTENEY, R. "Catalogues of the Birds, Shells and rare Plants of Dorsetshire, from the new and enlarged ed. of Mr. Hutchins History of that County, by Rd. Pulteney, M. D. fol. 1799."

Not seen.

1800. BEWICK, T. [Figures of British Land Birds. 1 vol. 8vo. Newcastle. S. Hodgson. 1800.]

Not seen. I know not what title to give this, if any. It is a set of the cuts (figures of Land birds and vignettes), from Vol I of the "History of British Birds", issued without text. See 1797-1804, BEWICK, T.

1802. MONTAGU, G. Ornithological Dictionary; | or, | Alphabetical Synopsis | of | British Birds. | By | (George Montagu, F. L. S. | In two volumes. | Vol. I [II]. | London: | printed for J. White, Fleet street, | by T. Bensley, Bolt Court. | 1802. 2 vols. 8vo, not paged. Vol. I, plate of Cirl Bunting, title-leaf, pp. i-xliv, and sheets B to Y (near 400 pages). Vol. II, 2 title-pages, sheets B to Y, and erratum slip.

Vol. I has the Introduction, and the Dictionary A to L, inclusive; Vol. II, Dictionary M to Y, and Appendix in the letter S; also, "a List of British Birds, systematically arranged into orders, genera, and species," occupying 17 pages, and a catalogue of the principal authors referred to.

This is the *ed. princeps*, and the only one in 2 vols. There is a Supplement, Exeter, 1813; a 2d ed., Rennie, 1831; a 3d ed., Newman, 1866. It is one of the most notable of treatises on British Birds, as a *vade mecum* which has held its place at a thousand elbows for three-quarters of a century.

Colonel Montagu died June 20, 1815.

1802. WHITE, G. (*Ed. Markwick*.) The Works, | in | Natural History, | of the late | Rev. Gilbert White, A. M. | Fellow of Oriel College, Oxford. | Comprising | the Natural History of Selborne; | the Naturalist's Calendar; | and Miscellaneous Observations, | Extracted from his Papers. | To which are added, | A Calendar and Observations, | By W. Markwick, Esq., F. L. S. | In Two Volumes. | London: printed for J. White, Fleet Street, | by T. Bensley, Bolt Court. | 1802. 2 vols. 8vo. Vol. I, pp. i-viii, 1-392, pl. 2. Vol. II, pp. 1-330, pl. 2, col'd, representing *Charadrius himantopus* (frontisp.), and "a hybrid bird" (to face p. 173, wrongly lettered 123).

Not seen: title and comment from Newton, 1877, *q. v.*

This is often quoted as Aikin's or Markwick's ed., but the advt. is signed "J. W[hite]", the author's nephew, and gives a brief sketch of his life. The "Antiquities" are omitted; the "Calendar" and enlarged "Observations" are included. See the orig. ed., 1789; the orig. ed. of the "Calendar" and "Observations", 1795; also the ed. of 1813.

1803. SIBBALD, R. The | History, | ancient and modern, | of the Sheriffdoms of | Fife and Kinross, | with a description of both, | and of the | Firths of Forth and Tay, | and the islands in them; | [etc., 4 lines.] | With an account | of the natural products of the | Land and Waters. | By | Sir Robert Sibbald, M. D. | — | [Quotation, 2 lines.] | — | A new edition, | with notes and illustrations. | — | Embellished with elegant engravings. | — | Cupar-Fife: | — | Printed by and for R. Tullis, the publisher; | [etc., 4 lines.] | London. | — | 1803. 1 vol. 8vo. pp. i-xvi, 1-468, 3 ll., 4 engravings.

Date of an earlier ed. is 1710. Compare same author, 1684.

Chap. III.—Concerning the Animals or living Creatures in these two Firths; of which pp. 106-115 are devoted to birds, giving a general notice of a few species of sea-fowl. Of those species not described by Sibbald, the editor adds a short notice, with Linnæan and English names from Pennant.

1804. BEWICK, T. History of British Birds. . . . Vol. II. Water Birds. 8vo. 1804.

This is the date of Bewick's second volume, published seven years after the first. See 1797-1804. BEWICK, T.

1804. MONTAGU, G. Observations on some Species of British Quadrupeds, Birds, and Fishes. < *Trans. Linn. Soc.*, vii, 1804, pp. 274-294.

Chil Bunting, Dartford Warbler, Ringed Plover, Black-headed Gull, miscellaneous notes on, including habits, plumages, &c.

1805. BEWICK, T. A | History | of | British Birds. | — | The Figures engraved on wood by T. Bewick. | — | Vol. I [H]. | Containing the | History and Description of Land Birds [Water Birds]. | — | [Cut.] | — | Newcastle: | printed by Edward Walker, for T. Bewick; sold by him, and | Longman and Rees, London. | — | 1805. 2 vols. 8vo. Vol. I, pp. i-xxxviii, 1-346. Vol. II, pp. i-xxii, 1-400. Numberless cuts in both vols.

This is the second edition; I have handled it. See the orig. ed., 1797-1804.

1806. GRAHAM, J. The | Birds of Scotland, | with other | Poems. | By | James Graham. | — | Edinburgh: | Printed by James Ballantyne & Co. | for Longman, Hurst, Rees, and Orme, Paternoster-row, | London; and William Blackwood, South Bridge | Street, Edinburgh. | 1806. 1 vol. Sq. 24mo. prel. title, 1 leaf; pp. 1-7 (title and preface); contents, 1 leaf; text, pp. 1-248.

Birds of Scotland, in 2 Parts to p. 86, and some other bird-poems; the rest miscellaneous.

1807. SIMMONS, T. W. Observations respecting a Species of Phalarope, and some other rare British Birds. < *Trans. Linn. Soc.*, viii, 1807, pp. 264-269.

Phalaropus williamsii, sp. n., p. 264 [= *hyperboreus*], and miscellaneous notes on 11 other British Birds.

1807. TURTON, W. British Fauna, | containing | a Compendium | of | The Zoology | of the | British Islands: | arranged according to the | Linnean System. | — | By W. Turton, M. D. F. L. S. | — | Vol. I. | Including the classes | Mammalia, Birds, Amphibia, | Fishes, and Worms. | — | [Quotation, 4 lines.] | — | Swansea: | printed by J. Evans, Wind-street. | — | 1807. 1 vol. 18mo. or sm. 12mo., pp. 1-230, i-viii.

No more published. This author's incompetent performances with Linnaeus and Gmelin are well known. The present volume has no more authority than that attaching to the same person's English version of the *Systema Naturæ*.

Class II, Aves. Birds. pp. 18-77. A descriptive systematic list of 294 spp.

1808. MONTAGU, G. Some interesting Additions to the Natural History of Falco cyaneus and pygargus, together with Remarks on some other British Birds. < *Trans. Linn. Soc.*, ix, 1808, pp. 182-199.

F. cyaneus; *F. cinerareus*, p. 188; *Sylvia dartfordiensis*, with notes on 4 spp. rare British Birds.

1808. MONTAGU, G. Some interesting Additions to the Natural History of Falco cyaneus and pygargus, together with Remarks on some other British Birds. < *Tilloch's Philos. Mag.*, xxxii, 1808, pp. 315-329.

From *Linn. Trans.*, ix, 1808, pp. 182-199, *q. v.*

1809. BEWICK, T. History of British Birds. . . .

The third edition, not seen by me. See the original, 1797-1804.

1809. MARTIN, M. A voyage to St. Kilda. By M. Martin, Gent. < *Pinkerton's Voy.*, iii, 1809, pp. 700-729.

This is from the fourth ed., London, 1753, 8vo.

1811-1821. GRAVES, G. British Ornithology: | being | The History | with a coloured representation | Of every known Species of | British Birds. | — | By George Graves, assisted by several eminent ornithologists [mut. mut.]. | — | Vol. I [-III]. | — | London: | printed for the author, | by Stephen Couchman, Throgmorton-street [mut. mut.], | and sold by | Sherwood, Neely, and Jones, Paternoster-row. | — | 1811 [1813, 1821]. 3 vols. 8vo. Vol. I, 1811, not paged, 48 col'd plates. Vol. II, 1813, not paged, 48 col'd plates. Vol. III, 1821, not paged, 48 col'd plates.

1811-1821. GRAVES, G.—Continued.

Impressed with the conviction that most previous works on British Birds had not "taken the necessary pains to mark out the different species", and being in possession of a considerable number of excellent drawings executed for the late William Curtis, the author submitted these pages to the public.

- 1-12. PENNANT, T. British Zoology, | by | Thomas Pennant, Esq. | A New Edition. | In Four Volumes. | Vol. I [–IV]. | — | Class I. Quadrupeds. | II. Birds. Div. I. Land. | [Div. II. Water.] | — | London: | printed for Wilkie and Robinson; [and eleven other booksellers.] | — | 1812. 4 vols. 8vo. Vol. I, prel. title, 1 l.; engr. title, 1 l.; printed title, 1 l.; pp. i–xlvi (dedication, preface, &c.); pp. 1–188, pll. i–xiv (mammals); pp. 189–568, pll. xv–lxvi (Land Birds). Vol. II, eng. title, pp. i–viii (incl. titles), pp. 1–452, pll. i–xlvi (Water Birds). (Vol. III, Reptiles and Fishes. Vol. IV, Crustacea, Mollusca, Testacea.)

This is supposed to be the 5th edition (not counting Murr's Latin-German version); 4th, 1776–7; 3d and 2d, both 1768–70; 1st, 1766, *qq. vv.*—It is notable as the first edition in which the author's name appears on the title. The pagination is entirely different from that of earlier eds., and the pll. are renumbered.

1813. BULLOCK, W. An Account of four rare Species of British Birds. < *Trans. Linn. Soc.*, xi, pt. i, 1813, pp. 175–178.

Strix nyctea, *Tringa calidris*, *Hirundo (?) pratineola*, *Anas africana*.

1813. LOW, G. Fauna Orcadensis: | or, | the Natural History | of the | Quadrupeds, Birds, Reptiles, and Fishes, | of | Orkney and Shetland. | By | the Rev. George Low, | Minister of Birsá and Haray. | — | From a Manuscript in the possession of Wm. Elford Leach, M. D. F. L. S. &c. | — | Edinburgh: | printed by George Rausay and Company, | for Archibald Constable and Company, Edinburgh; and for Longman, | Hurst, Rees, Orme, and Brown,—and White, Cochrane, and Co. | London. | — | 1813. 1 vol. 4to. pp. i–xvi, 1–230.

Class II, Birds. pp. 31–152. Thus more than half the work is devoted to ornithology. It is a systematic treatise on the subject, in due form, and has the appearance of being a valuable contribution.

"Mr Low's merits, as a laborious and accurate observer of Nature, were, it is believed, scarcely known beyond the narrow circle of his particular friends; and it is to be regretted, that a recent historian* [*the Rev. George Barry, D. D. in his History of Orkney, 4to. 1805.] has not scrupled to avail himself of the advantages which this obscurity offered to a plagiarist. It having been the Editor's fortune to procure the MS. *Fauna Orcadensis* of Mr Low, he now begs leave to lay it before the public, in the form in which it was left by its Reverend Author. It appears to have been revised by the late Mr PENNANT, as it contains a few corrections in that gentleman's handwriting. The Editor trusts that it will be found to afford an interesting and valuable addition to the Natural History of the British Islands, and prove far more useful than the closet compilations of some modern zoologists." (*Extr. from Editor's Preface.*)

1813. MONTAGU, G. Supplement | to the | Ornithological Dictionary, | or | Synopsis of British Birds. | — | By George Montagu, Esq., F. L. S. & M. W. S. | — | Printed by S. Woolmer, Exeter; | [etc., 7 lines.] | — | 1813. 1 vol. 8vo. Not paged; title, 1 leaf, backed blank = pp. i, ii; introduction, pp. iii–vi; list of plates, 1 leaf; text, sheets B to Ff. (about 472 pages); 1 page errata; with 24 full-page plates.

Eleven years after the appearance of his celebrated Dictionary, Montagu issued this Supplement, in similar style and spirit. It runs through the alphabet, A to Y, as before (sheets B to Bb.). Then an appendix retraces the alphabet again, A to S (to sheet Ff.). Following is Definition of the parts of extraordinary tracheæ belonging to some species of aquatic birds, with a plate; and Direction for amputating the Wing of a Bird in a Menagerie. A "Catalogue of additions and alterations to be made in the original list of British Birds". &c., finishes the volume. It is illustrated by 24 plates—23 of birds, 1 of anatomical details.

Sterna anglica, sp. n., first page of sheet Y, with a plate. Also, *Ardea lentiginosa*, sp. n.

1813. WHITE, G. (*Ed. Markwick.*) The | Natural History | of | Selborne, | by the late | Rev. Gilbert White, A. M. | Fellow of Oriel College, Oxford. | To which are added, | The Naturalist's Calendar, | Miscellaneous Observations, and Poems. | A New Edition, with engravings. | In two volumes. | London: | printed for White, Cochrane, and Co. | Longman, Hurst, Rees, Orme, and Brown; | J.

1813. WHITE, G.—Continued.

Mawman; S. Bagster; J. and A. Arch; | J. Hatchard; R. Baldwin; and | T. Hamilton. | 1813. 2 vols. 8vo. Vol. I, pp. i-viii, 1-352, pl. 3. Vol. II, pp. 1-331.

Not seen: title and comment from Newton, 1877, *q. v.*

"The plate of *Charadrius himantopus* has been re-engraved, and is not coloured; that of the 'Hybrid Bird' is omitted. With these exceptions and those of the change of the title, and the addition of the 'Poems' and of 'Observations on some Passages of Mr. White's *Natural History of Selborne*' (vol. ii, pp. 307-316), signed 'J. M.' (Mitford, cf. Bennett's ed., 1837, pref. pp. xiv, xv), this edition differs but little from that of 1802, *q. v.* Bennett indeed says (*loc. cit.*) that it was published in 4to. I have not met with such a copy, but some may very likely have been printed in that form."

1815-22. HUNT, J. British Ornithology; containing portraits of all the British Birds, including those of foreign origin which have become domesticated; drawn, engraved and coloured by John Hunt. Norwich. 1815-1822. 8vo. Pub. in 15 parts, each of 12 pl. col'd.

Not seen.

1816. BEWICK, T. A | History | of | British Birds. | — | The Figures engraved on wood by T. Bewick. | — | Vol. I [II]. | containing the | History and Description of Land[Water] Birds. | — | [Cut.] | — | Newcastle: | printed by Edward Walker, for T. Bewick: sold by him, and | Longman and Co. London. | — | 1816. 2 vols. 8vo. Vol. I, pp. i-xxxviii, 43-330. Vol. II, pp. i-xxii, 19-362. Numberless cuts of birds, scenery, tail-pieces, &c. in each volume.

This is the *fourth* edition; handled by me. See the orig. ed., 1797-1804.

1816. GRAVES, G. Ovarium Britannicum; | being | a correct delineation | of | The Eggs | of such | Birds | as are natives of, or domesticated in | Great Britain. | — | By | George Graves, F. L. S. | Author of British Ornithology, &c. | — | London: | Printed for the Author, and sold by Sherwood, | Neeley, & Jones, Paternoster-Row, and | J. Harding, St. Jame's-Street. | — | 1816. 1 vol. 8vo. pp. i-vi, with 15 coloured plates.

It is a mere fragment of a work never completed. The text is nothing more than the title, preface and list of the plates, on which the eggs of 46 British Birds are figured in colors.

1816. LEACH, W. E. Systematic Catalogue of the Specimens of the indigenous Mammalia and Birds that are preserved in the British Museum, with their localities and authorities. To which is added, a list of the described species that are wanting to complete the collection of British Mammalia and Birds. London. 1816. 4to.

Not seen! It is a very scarce tract; I know of no copy in America. It acquires importance from the many new names, generic and specific, or new compounds of old names, which it contains. Stephen's Continuation of Shaw's *Gen. Zool.*, 1817, *et seq.*, gives various new names of Leach's, some cited as if from his MS.

1816. SHARP, C. History of Hartlepool. . . . By Sir Cuthbert Sharp. 1816.

Not seen.—Contains "A List of Birds observed at Hartlepool": 68 spp. See the reprint, 1851.

1817. BEWICK, T. [Figures of British Land and Water Birds. 4to. 1817.]

Not seen.—I know not what title to give this, if any. It is said to be a set of the cuts from both vols. of the "History of British Birds", without the text, and printed in 4to, in an edition of only 25 copies. See 1797-1804, Bewick, T.

1817 (*prior to*). FORSTER, E., *Jr.* Catalogue of British Birds, . . .

Not seen.

1817. FORSTER, T. A | Synoptical Catalogue | of | British Birds; | intended | to identify the species mentioned by different names | in several catalogues already extant. | Forming | a book of reference to observations | on | British Ornithology. | — | By Thomas Forster, F. L. S. | Corresp. Memb. Acad. Nat. Sciences at Philadelphia, | &c. &c. | — | London: | printed by and for Nichols, Son, and Bentley, | Red Lion Passage, Fleet-street. | 1817. 1 vol. 8vo. pp. i-iv, 1-64.

Several copies I have handled differ (immaterially) in collation: thus, some begin with 4 pp. of advts., and end with 2 pp. of advts.; some have a leaf of advts. interpolated between

1817. FORSTER, T.—Continued.

p. 38 and p. 39, others not. The regular pagination is simply i-iv, 1-64: pp. i, ii, title-leaf; pp. iii, iv, preface: pp. 1-64, text. The "Synoptical Catalogue" runs pp. 1-37 (38 blank), giving 283 spp., under 55 genera, with author's names in Roman capitals. Leach's names opposite in Roman lower case, and vernacular synonyms under both. Then follows, p. 39, "Observations on British Ornithology. Article I. Division and Arrangement of British Genera and Species of Birds, with references to plates: serving for reference to the descriptive part intended to follow." Such caption implies that the work is a fragment: for nothing follows.

The author having found Dr. W. E. Leach's Catalogue of 1816 difficult to use, on account of the newness of many names, he thought that a Catalogue with Leach's and more customary names put together would be useful: hence this work. Some of the names here given are curious: for the author says: "I have attended to generic and specific differences, and thereon founded a nomenclature, regardless of modern names, whenever they appeared to disagree with facts; but at the same time adhering as much as possible to the views of Aristotle, Ælian, Pliny and others of the antient writers."—On the use of *Bubo ignavus*, p. 3, cf. *Ibis*, 1879, p. 349; *Ann. Mag. Nat. Hist.*, Aug., 1879, p. 159.

1817. PITT, W. A | topographical | History of Staffordshire; | including its | Agriculture, Mines, and Manufactures. | Memoirs of eminent natives; | Statistical tables; | and every species of information connected with the local | history of the county. | With a succinct account of the rise and progress of the | Staffordshire Potteries. | — | Compiled from the most authentic sources, | By William Pitt, | [etc., 2 lines.] | — | Newcastle-under-Lyme: | printed by and for J. Smith, | [etc., 4 lines.] | — | 1817. 1 vol. 8vo. pp. i-xxvi, 1-450, 5 unpagged leaves of tables, pp. [1-319], 1 p. errata, 8 ll. index.

Contains, pp. [145-158], a formal list of birds, annotated.

1817. YOUNG, G. A | History | of | Whitby, | and | Streoneshalh Abbey; | with a | statistical Survey of the vicinity | to the | Distance of Twenty-Five miles: | By the Rev. George Young, . . . Vol. II. | — | Whitby: | printed and sold by Clark and Mead, . . . 1817. 8vo.

Vol. II.—II. Zoology. II. Birds; pp. 797, 798; a paragraph, of no consequence.

1818. MARTIN, M. A | Voyage | to | Saint Kilda, | The remotest of all the Hybrides, | or | Western Islands of Scotland; | [etc., 15 lines.] | — | By M. Martin, Gent. | — | Printed in the year MDCXCVIII. | — | Glasgow: | re-printed for John Wylie & Co. | By R. Chapman. | — | 1818. 12mo. pp. i-iv, 5-77.

Forming one of the tracts in *Miscellanea Scotica*, Vol. II; orig. ed., 1698, q. v. It contains, pp. 26-36, a considerable account of wild fowl, as "Gairfowl", Solan Goose, Fulmar, etc.

1820. ATKINSON, J. A Compendium | of the | Ornithology | of | Great Britain | with a reference to the | Anatomy and Physiology of | Birds. | — | By John Atkinson, F. L. S. | Member of the Royal College of Surgeons in London, &c. | Curator of the Museum, and Librarian of the Philosophical and | Literary Society at Leeds. | — | "Milvus in cælo cognovit tempus suum; turtur, et | hirundo, et ciconia custodierunt tempus adventus | sui." Jer. — | — | London: | printed for Hurst, Robinson and Co. No. 90 Cheapside; and | Robinson and Co. Leeds. | — | 1820. 1 vol. 8vo. pp. i-xii, 1-232.

A systematic descriptive synopsis, with occasional anatomical matter: appendix on taxidermy.

"The intention of the author, in forming this compendium, was to collect the information scattered through extensive treatises, and the transactions of learned societies,—to state the species which have been recently discovered,—and to correct those errors in synonymia, which the difference of feather in different ages, or at certain times in the year, has frequently produced." (*Extr. from Preface.*)

1820. [EDITORIAL.] [Notice of the proposed publication of] Selby's Natural History of British Birds. < *Edinb. Philos. Journ.*, iv, 1820, p. 210.

1821. BEWICK, T. A | History | of | British Birds. | The Figures engraved on wood by T. Bewick. | Vol. I [11]. | Containing the | History and Description of Land [Water] Birds; | and | a Supplement, with additional figures. | Newcastle: | printed by Edward Walker, Pilgrim Street, | for T. Bewick: sold by him, and E. Charnley, Newcastle: | and Longman and Co. London. | 1821.

1821. BEWICK, T.—Continued.

2 vols. 8vo. Vol. I. Land Birds, pp. i-xi (title, preface, introduction and contents), 1-330, figg. — Vol. II, Water Birds, pp. i-xxii (title, preface, introduction and contents), 1-360, figg. —

A | Supplement | to the | History | of | British Birds. | The Figures engraved on wood by T. Bewick. | Part I [II]. | Containing the | History and Description of Land [Water] Birds. | Newcastle: | printed by Edward Walker, Pilgrim Street, | for T. Bewick: sold by him, and E. Charnley, Newcastle; | and Longman and Co., London. | 1821. 8vo. Part I, Land Birds, title-p., and pp. 1-46, 1 p. (contents), figg. — Part II, Water Birds, title-p., and pp. 1-43, 1 p. (contents), figg. —

Not seen: title obligingly furnished by Prof. A. Newton, in epist.

This is the *fifth* edition, notable for the introduction of a separately full-titled and separately paged "Supplement" to each vol. See the orig. ed., 1797-1804.

1821. GRAVES, G. British Ornithology, . . .

There is said to be a "2d. edit." of this date. Is it anything more than the final issue of the whole work, in 3 vols.? Compare 1811-21, GRAVES, G.

1821. MACGILLIVRAY, W. List of Birds found in the district of Harris, part of the outer range of the Hebrides. < *Edinb. Philos. Journ.*, v, 1821, pp. 257-261.

About 87 spp., classed according to localities they frequent, preceded by general observations on the subject.

1821-34. SELBY, P. J. Illustrations of British Ornithology. . . . 2 vols. Elephant folio. Edinburgh. Pub. in 19 Parts, 1821-1834. Vol. I. Land Birds. Vol. II. Water Birds. Said to be 228 plates, of 383 figures, plain or coloured.

Not seen as published at these dates. See 1841, same author. For text, see 1825, 1825-33, and 1833.

There is great difficulty in arriving at the dates of this work. I have handled a complete set of the plates, but that one is dated 1841, being thus a reissue: it is furnished with a new title-page, worded differently from any of the earlier titles. I have not been able to see the work in the parts in which it appeared, nor even as first issued on its completion in 1834. According to information accessible to me (including Lizars' own advt. sheets, pub. with *Nat. Libr.*, Vol. I. 1833), these folios were published in 19 parts, at intervals of about six months, from 1821 to 1834, both inclusive. This gives the date of each, approximately. They form two series: I. Land Birds, in 8 parts; II. Water Birds, in 11 parts; designed to form two vols. On their completion, in 1834, the series were bound in two vols., with a title said to run as follows:

"The Figures of British Birds, containing an exact and faithful representation, in their full natural size, of all the known species found in Great Britain." etc.

The two series together are said to consist of 228 plates, of 383 figures; but they are numbered in such a slovenly manner, with so numerous interpolations, including some lettered instead of numbered, that the number can only be ascertained by actual count. (See the enumeration which I give under date of the reissue, 1841.)

1822. EDMONSTON, L. Remarks on the Larus Parasiticus or Arctic Gull; and on the Larus Rissa or Kittiwake; with an Account of the Greenland Kittiwake;—and on Colymbus Grylle. < *Edinb. Philos. Journ.*, vii, 1822, pp. 90-105.

Chiefly on the habits of these birds.

1822. "[H.]" The History of British Birds; the Figures engraved on Wood, by T. Bewick; and a Supplement with additional Figures. < *Thomson's Ann. of Philos.*, new ser., iv, 1822, pp. 294-308.

A notice of the 5th ed. of the work, followed by an annotated catalogue of the species.

1822? WHITE, G. The Natural History and Antiquities of Selborne. . . . 2 vols. 4to. 1822.

Not seen: is there any such ed.? Given by Engelmann, *Bibl.*, i, p. 202: most likely a mistake—perhaps a typographical error for 1802, *q. v.* Cf. Newton, 1877.

1823. FLEMING, J. Gleanings of Natural History, gathered on the Coast of Scotland during a voyage in 1821. < *Edinb. Philos. Journ.*, viii, 1823, pp. 294-303; ix, 1823, pp. 247-254; x, 1823, pp. 95-101.

Very slightly ornithological; the second article has nothing on birds; the third notices *Alca inpenis*, living, from St. Kilda.

1823. SWEET, R. The | British Warblers. | — | An | account of the genus | Sylvia; | illustrated by | six[teen] beautifully colored figures, | taken from | Living Specimens in the Author's Collection; | with | directions for their treatment according to the | author's method; | in which is explained, | how the interesting & fine singing birds belonging | to this genus may be managed, | and kept in as good health as any common | birds whatever. | — | By Robert Sweet, F. L. S. | Author of Hortus Suburbanus Londinensis. Botanical Cultivator. | Geraniaceae, British Flower Garden, &c. &c. | — | The Drawings by E. D. Smith, Artist for the Geraniaceae. | — | London: | published for the author, | by W. Simpkin and R. Marshall, | Stationers'-Hall Court, Ludgate Street. | 1823. | — | Tilling, printer, Grosvenor Row, Chelsea. 1 vol. 8vo. Title, pp. 1-24, + 14 unpagcd pages. + 6 unpagcd pages. pll. 1-16.

After the title and six pages devoted to the genus *Sylvia*, come 16 plates, each with its leaf (2 pages) of text, paginated only to p. 24; then 14 unpagcd pages belonging to the last 7 plates, and then 6 pages of "Additional Remarks". The sixteen species treated and figured are: 1, *Sylvia rubetra*. 2, *S. phoenicurus*. 3, *S. luscinia*. 4, *S. hortensis*. 5, *S. cinerea*. 6, *S. trochilus*. 7, *S. hippolais*. 8, *S. sylvicola*. 9, *S. atricapilla*. 10, *S. sylvicola*. 11, *S. provincialis*. 12, *S. locustella*. 13, *S. phragmitis*. 14, *S. arundinacea*. 15, *S. ananthe*. 16, *S. rubicola*. These, of course, do not all belong to the genus *Sylvia*, as now understood. The plates are numbered to correspond with the figures here given. The mistake on the title-page is notable; it must have pleased the author to see his 16 plates cut down to 6!

1823. [SYME, P.] A | Treatise on British | Song-Birds. | Including | observations on their natural habits, man- | ner of incubation, &c. with remarks on | the treatment of the young and | management of the old birds | in a domestic state. | With | fifteen Coloured Engravings. | [By Patrick Syme.] | John Anderson, jun. Edinburgh, | 55, North Bridge-street; | and Simpkin & Marshall, London. | — | MDCCCXXXIII. 1 vol. 8vo. pp. i-vi, 1-231, 15 coloured plates.

Treating of 33 species of thrushes, larks, starlings, warblers, finches, buntings, etc.

1824. BLACKWELL, J. Tables of the various species of periodical Birds observed in the neighbourhood of Manchester; with a few remarks tending to establish the opinion that the periodical birds migrate. < *Mem. Lit. and Philos. Soc. Manchester*, 2d ser., iv, 1824, pp. 125-150.

Not seen.

1824. [EDITORIAL.] Notice regarding the Island of Grimsey, off the North Coast of Iceland, and the Isles of St. Kilda, on the North-West Coast of Scotland. < *Edinb. Philos. Journ.*, xi, 1824, pp. 132-140.

More particularly the latter; considerable notice of the birds.

1824. FLEMING, J. Remarks illustrative of the Influence of Society on the Distribution of British Animals. < *Edinb. Philos. Journ.*, xi, 1824, pp. 287, 305.

1824. NASH, J. A | practical Treatise | on | British Song Birds; | in which is given | every information relative to their | Natural History, Incubation, &c. | Together with | the method of rearing and managing both | old and young birds. | By Joseph Nash. | — | Illustrated with Engravings. | — | London: | printed for Sherwood, Jones, and Co. | Paternoster-row; | Sold by Joseph Nash, 39, Great Windmill-Street, | Haymarket. | — | 1824. 1 vol. 12mo. pp. i-vi. 1 l., pp. 1-102, with pp. 1-28 of advts., and 8 col'd pll.

Treating 21 spp., several of which are figured in colours. "I do not profess to offer the following treatise as showing either elegance of thought, or purity of diction, but merely as the result of many years' experience, which, from time to time, I have put together at my leisure moments."

1825. BEWICK, T. [Figures of British Land and Water Birds, 1825.]

Not seen: title hypothetical, upon information furnished by A. Newton. It is a set of the cuts of both vols. of the "History of British Birds," without any text, printed in an edition of 100 copies. See 1797-1804, BEWICK, T.

1825. COLE, J. The | History and Antiquities | of | Ecton, | in the | County of Northampton. | By John Cole, | Editor of 'Herculeana,' &c. | [Quot., 3 lines.] | Scarborough: | published by John Cole; and | Longman, Hurst, Rees, Orme,

1825. COLE, J.—Continued.
Brown, and Green, | London. | 1825. 1 vol. 16mo size, 4to by sigs.; frontisp., title, dedic., each 1 leaf; preface, pp. i-iv; text, pp. 1-60; index, pp. i-iv; a few cuts in text.
Four "scarce birds shot at Ecton", p. 48; with note on Royston Crow.
1825. DONOVAN, E. The Natural History of the Nests and Eggs of British Birds. . . .
< *Féruss. Bull.*, 2^e sect., v, 1825, pp. 271, 272.
Prospectus de cet ouvrage.
1825. LESSON, R. P. Notice sur la rencontre de quelques Oiseaux rares en Angleterre; par M. W. Yarrell. . . . < *Féruss. Bull.*, 2^e sect., vi, 1825, p. 413.
Extrait du *Zoolog. Journ.*, avril 1825, pp. 24-27.
1825. SELBY, P. J. Illustrations of British Ornithology, . . . Vol. I. Text. 8vo. Edinburgh. W. H. Lizars. 1825.
Not seen.
This is the date of the original edition of the letter-press of Vol. I, Land Birds, being the text to Series I, Land Birds, of the elephant folio plates.
A second edition of this, "remodelled" and "with additions", was issued in 1833, when Vol. II, completing the text of the work, appeared.
See next title. See also 1833, SELBY, P. J.
- 1825-33. SELBY, P. J. Illustrations of British Ornithology. . . . Vols. I. and II. Text. 8vo. Edinburgh. W. H. Lizars. 1825 and 1833.
Not seen.
These are the dates of the two editions of Vol. I, Land Birds, and of the only edition of Vol. II, Water Birds, of the letter-press to the elephant folio plates. Vol. I is thus of two dates: orig. ed., 1825; 2d ed., 1833. Vol. II has but one date: 1833, *which see*.
These 8vo vols. of letter-press, though belonging to, are not to be confounded with, the 2 vols. of elephant folio plates, namely, in 19 semi-annual parts, dating 1821-1834, *which see*.
1825. VIGORS, N. A. A description of a new Species of *Scelopax* lately discovered in the British Islands; with observations on the *Anas gloecitans* of Pallas, and a Description of the Female of that Species. < *Trans. Linn. Soc.*, xiv, pt. iii, 1825, pp. 556-562, pl. xxi.
Scelopax sabini, sp. n., p. 557, pl. xxxi. The *Querquedula* very fully treated with history, synonymy, and characters.
1825. V[IGORS, N. A.] Ornithology. < *Zool. Journ.*, i, 1824, pp. 589, 590.
Instances of occurrence of *Merops apiaster*, *Pastor roseus*, *Bombycilla bohemica*, *Oriolus galbula*, and *Tantalus igneus* in Ireland.
- ?1825. WHITE, G. The Natural History and Antiquities of Selborne, . . .
"An edition is ascribed to this year by Jardine (introd. p. vii to his ed. of 1829), but it is not mentioned in his account in his ed. of 1853; and though the statement of an 1825 ed. is also made by Bennett in his ed. of 1837, it is probably an error." See Newton, 1877.
1825. YARRELL, W. Notice of the Occurrence of some [16 spp.] rare British Birds. < *Zool. Journ.*, ii, 1825, pp. 24-27.
1826. BEWICK, T. A | History | of | British Birds. | By | Thomas Bewick. | Vol. I [II]. | Containing the | History and Description of | Land [Water] Birds. | Newcastle: | Printed by Edw. Walker, Pilgrim-Street, | for T. Bewick: sold by him, Longman and Co. London: | and all Booksellers. | 1826. | 2 vols. 8vo. Vol. I, Land Birds, pp. i-xliv (title, preface to the sixth edition, the original preface, introduction, technical terms and contents), 1-382, figg. —. Vol. II, Water Birds, pp. i-xxii (title, preface, introduction and contents), 1-432, figg. — (pp. 422-432 being devoted to figures of "Foreign Birds").
Not seen: title from Prof. A. Newton, in epist.
This is the *sixth* edition: The number of illustrations it contains is said to be 300 of British (157 Land, 143 Water) Birds, besides 14 of Exotic Birds. See the orig. ed., 1797-1804.
1826. [CROSTHWAITE, D.] Catalogue | of | Crosthwaite's | Museum. | — | Keswick: | printed by Thomas Bailey. | — | 1826. 1 vol. 18mo. pp. 66.

1826-27? DONOVAN, E. The Natural History | of the | Nests and Eggs of British Birds; | The | Descriptions, | which are calculated for the naturalist as well as for the general observer, | Are intended to comprehend every useful Trait of Information respecting the Nidification, Eggs, and Incubation of | the numerous Species of the Feathered Tribes that inhabit the British Isles: | and are throughout accompanied by | A Series of elegantly-coloured Plates, | comprising figures | of the eggs of every species, with their most singular varieties, so far as they can be correctly ascertained. | The whole exclusively executed from Nature, and disposed according to their respective genera, | by E. Donovan, F. L. S. W. S. &c. | Author of the Natural History of British Birds, in ten volumes, and other approved works. — | London: | printed for the author, and sold by all booksellers. | 1826. Oblong roy. 8vo, unpagged, with unnumbered col'd plates. Pub. in Parts.

I have only seen the first four parts of this curiously gotten up affair—was it ever completed? There is some regular text, in double column, but much of the print consists of labels pasted on blank pages opposite the several plates, the execution of which calls for no special remark. Parts 1-3 are dated 1826, but some of the plates themselves are dated 1825; part 4 is not dated. I doubt that anything appeared before 1826; the prospectus was only issued in 1825 (*Féruss. Bull.*, v, pp. 271, 272). Prospectus announces intended completion in 24-36 parts. See *Loudon's Mag.*, ii, 1829, p. 205.

1826. SELBY, P. J. Catalogue of the various Birds which at present inhabit or resort to the Farn Islands, with Observations on their habits, &c. < *Zool. Journ.*, ii, 1826, pp. 454-465.

18 spp., with synonymy.

1826. SHEPPARD, R., and WHITEAR, W. A Catalogue of the Norfolk and Suffolk Birds; with Remarks. < *Trans. Linn. Soc.*, xv, pt. i, 1826, pp. 1-61.

Very fully annotated. Followed by a table of migration of summer birds (18 spp.) from 1812 to 1821.

1827. BRACKENRIDGE, G. W. Yearly appearance of the Swallow and Cuckoo [1801-1826, near Bristol]. < *Zool. Journ.*, iii, 1827, p. 319.

1827. HOGG, J. Natural History of the Vicinity of Stockton. . . . By John Hogg. 1827.

Not seen.—Contains an extended list of the Birds "frequenting the country near Stockton"; 126 spp. The same article is said to have appeared as an appendix to Brewster's history of that town.

1827. JENYNS, L. Observations on the Ornithology of Cambridgeshire. < *Trans. Camb. Philos. Soc.*, ii, pt. ii, 1827, pp. 287-324.

Not seen.

1827. YARRELL, W. On the occurrence of some [9 spp.] rare British Birds. < *Zool. Journ.*, iii, 1827, pp. 85-88.

1827. YARRELL, W. Some Observations on the Anatomy of the British Birds of Prey. < *Zool. Journ.*, iii, 1827, pp. 181-189, pl. vi.

1828. ———. Memorandum from the Right Honourable the Lord President, containing some facts relating to the Natural History of the Swallow and Partidge. < *Edinb. New Philos. Journ.*, iv, 1828, pp. 290-292.

1828. ANON. Sur quelques oiseaux rares de la Grande-Bretagne; par W. Yarrel[1]. < *Féruss. Bull.*, 2^e sect., xiv, 1828, p. 116.

Extrait du *Zool. Journ.*, iii, 1827, pp. 85-88.

1828. FLEMING, J. A History of British Animals, exhibiting the descriptive characters. . . . 1 vol. 8vo. Edinburgh, 1828.

Not seen.

"Prior to 1828 the only complete hand books of British Ornithology were the valuable but somewhat obsolete 'Ornithological Dictionary' of Montagu, and the fascinating, though not always accurate, 'British Birds' of Bewick. In the above year appeared the 'British Animals' of Dr. Fleming, a work which had no small share in introducing into this country the improved systems of modern zoology. The genera adopted are for the most part those of Cuvier's 'Règne Animals', and the specific descriptions and remarks, though brief, are in general accurate." (*Strickl. Rep. Brit. Assoc. for 1844*, p. 181.)

1828. FOX, G. T. Notice of the appearance of some rare Birds of England. < *Zool. Journ.*, iii, 1828, pp. 491-497.
Falco lagopus, Cursorius isabellinus. Gallinula baillonii, Procellaria leachii, Anas gambensis, A. rutila, Vultur fulvus?, Sylvia suecica.
1828. LESSON, [R. P.] Catalogue de divers Oiseaux qui appartiennent à la Faune des îles Farn, avec quelques observations sur leurs habitudes; par [P.] J. Selby.
 . . . *Féruss. Bull.*, 2^e sect., xiii, 1828, p. 433.
 Extrait du *Zool. Journ.*, ii, 1826, p. 454.
1828. PITHIE, —. Sea Birds, &c. of the Isle of May. < *Edinb. New Philos. Journ.*, vi, 1828, pp. 189, 190.
 Merely a note alluding to the arrival and departure of some species.
1828. YARRELL, W. On the occurrence of some rare British Birds. < *Zool. Journ.*, iii, 1828, pp. 497-500.
Lestris pomarinus, Upupa epops, Procellaria leachii, Sylvia dartfordiensis, Emberiza hortulana, Podiceps rubricollis, Larus minutus.
1829. "A. C. R." Donovan's Eggs of British Birds. < *Loudon's Mag. Nat. Hist.*, ii, 1829, p. 205.
 A bibliographical note. Nothing heard of the work after Feb., 1827.
1829. "A. C. R." Birds on the Sea Coast of Gornie, in Aberdeenshire. < *Loudon's Mag. Nat. Hist.*, ii, 1829, pp. 392-394.
1829. BLACKWALL, J. Manchester Museum. < *Loudon's Mag. Nat. Hist.*, ii, 1829, pp. 273-275.
 Notice of a few of the rarer British Birds in the collection, with remarks on the habits of some of them.
1829. BLACKWALL, J. Extracts from a Zoological Journal, kept at Crumpsall Hall, near Manchester. < *Zool. Journ.*, v, 1829, pp. 10-14.
 Nidification of some British Birds; roosting of Fieldfares on the ground; anecdote of Falcon and Pigeon.
1829. "CORRESPONDENT." Notice of the Arrival of some of the Winter Birds of Passage, as well as of a few of the occasional Visitants in the Neighborhood of Carlisle, during the Winter of 1828-1829; with Observations, &c. < *Philos. Mag.*, vi, 1829, pp. 110-114.
1829. "CORRESPONDENT." Table of the Arrival of some of the Summer Birds of Passage in the Neighborhood of Carlisle, during the Years 1827 and 1828; with Observations, &c. < *Philos. Mag.*, v, 1829, pp. 196-198.
1829. "CORRESPONDENT." Notice of the Arrival of Twenty-four of the Summer Birds of Passage in the Neighborhood of Carlisle, during the Year 1829; with Observations, &c. < *Philos. Mag.*, vi, 1829, pp. 276-281.
1829. HUNT, J. A | General History | of the | County of Norfolk, | intended | to convey all the information | of a Norfolk Tour, | with the more extended details of | antiquarian, statistical, pictorial, architectural, | and | Miscellaneous Information; | including | Biographical notices, | original and selected. | — | Volume I [-III]. | — | [Quotation, 7 lines.] | — | Norwich: | printed by and for John Stacy. | London: | sold by Longman, Rees, Orme, Brown, and Green. | MDCCCXXIX. 3 vols. 16mo.
 The introduction to Vol. I contains a "List of Birds", which we are informed is contributed to the work by John Hunt, taxidermist, of Norwich, editor of an illustrated work on British Birds then in course of publication. The present list runs from p. lix to p. lxxii, and is annotated throughout.
1829. JENNINGS, J. Ornithology of the Metropolis. < *Loudon's Mag. Nat. Hist.*, ii, 1829, p. 264.
 Notes on a few birds observed in London, England.
1829. "J. D. M." Rare Birds killed in different Parts of Ireland. < *Loudon's Mag. Nat. Hist.*, ii, 1829, pp. 394, 395.
1829. LEYLAND, R. Rare Birds observed in the Neighborhood of Halifax, in Yorkshire. < *Loudon's Mag. Nat. Hist.*, i, 1829, pp. 395, 396.

1829. SALMON, J. D. British Birds' Eggs. < *London's Mag. Nat. Hist.*, ii, 1829, p. 205. Query and answer respecting Graves' *Ovarium Britannicum*.
1829. SHEPPARD, R., and WHITEAR, W. Ein Catalog der Vögel in Norfolk und Suffolk, nebst Bemerkungen, von R. Sheppard und W. Whitear. (Linn. Trans. Vol. XV. P. 1. 1826, p. 1.) < *Oken's Isis*, Bd. xxii, 1829, pp. 1089-1097. Abkürzung: „Von den Bemerkungen können wir nur das Wesentliche ausheben.“
1829. STANLEY, J. Birds in the Neighbourhood of Whitehaven, Cumberland. < *London's Mag. Nat. Hist.*, ii, 1829, pp. 275, 276. Mere mention of many species.
1829. VIGORS, N. A. Beschreibung einer neuen Gattung *Scelopax* [Sabini] der britischen Inseln, und des Weibchens von *Anas glochitans*, von N. A. Vigors. (Linn. Transact. xiv. 3. p. 556.) Gelesen 1824. < *Oken's Isis*, Bd. xxii, 1829, pp. 1107-1109.
1829. WHITE, G. (Ed. Jardine.) The | Natural History | of | Selborne. | By the late | Rev. Gilbert White, A. M. | Fellow of Oriel College, Oxford. | With additions | by | Sir William Jardine, Bart. F. R. S. E. F. L. S. M. W. S. | Author of "Illustrations of Ornithology." | A new Edition. | Edinburgh: | printed for Constable and Co. | and Hurst, Chance, and Co. London. | 1829. 1 vol. 12mo. pp. i-xvi, 1-343. N. B.—There may be some little confusion respecting the two titles I give of the 1829 Jardine edition: one of them formed Vol. XLV of Constable's *Miscellany*: the other apparently did not: which is which?
1829. WHITE, G. (Ed. Jardine.) The | Natural History | of | Selborne. | By the late | Rev. Gilbert White, A. M. | Fellow of Oriel College, Oxford. | With additions | by Sir William Jardine, Bart. Edinburgh: | printed for Constable and Co. | and Hurst, Chance, and Co. London. | 1829. | "Six pages of Introduction, 330 pp. of text." Not seen: title from Newton in epist. to Coles, from J. Dixon in epist. to Newton. This formed Vol. XLV of "Constable's *Miscellany*." The frontisp., supposed to represent White in his study, on the floor of which "Timothy", the tortoise, is crawling, has no apparent connection with the subject. No other illustrations are introduced: the "Calendar," "Observations," and "Poems" are omitted.
1829. "W. J." Rare Birds shot in Dumfries-shire. < *London's Mag. Nat. Hist.*, ii, 1829, pp. 282, 283. 2 spp. of *Scelopacidae*, 2 of *Phalaropodidae*.
1830. ANON. Tableau sur l'arrivée de quelques oiseaux d'hiver dans les environs de Carlisle, pendant les années 1827 et 1828; par . . . < *Féruss. Bull.*, 2^e sect., xxii, 1830, p. 120. *Philos. Mag.*, August, 1829, pp. 110-114.
1830. ANON. Tableau sur l'arrivée de quelques oiseaux d'été dans les environs de Carlisle, pendant les années 1827 et 1828; par . . . < *Féruss. Bull.*, 2^e sect., xxii, 1830, p. 120. *Philos. Mag.*, March, 1829, pp. 196-198.
1830. "C." Notice of the Arrival of Twenty-four of the Summer Birds of Passage in the Neighborhood of Carlisle, during the Year 1829, with Observations, &c. < *London's Mag. Nat. Hist.*, iii, 1830, pp. 172-174.
1830. "CORRESPONDENT." Notice of the Arrival of Twenty-six of the Summer Birds of Passage in the Neighborhood of Carlisle, together with some of the scarcer Species that have been met with in the same Vicinity during the Year 1830; with Observations. < *Philos. Mag.*, viii, 1830, pp. 444-449.
- 1830-31. DROSER, R. Account of an Ornithological Visit to the Islands of Shetland and Orkney, in the Summer of 1828. < *London's Mag. Nat. Hist.*, iii, 1830, pp. 321-326; iv, 1831, pp. 193-199.
1830. FOX, G. [T.] Beiträge zur britischen Fauna. < *Oken's Isis*, Bd. xxiii, 1830, pp. 1239, 1240. *Zool. Journ.*, 1828, iii, pp. 491-497, q. v.

1830. HOY, J. D. Rare Birds, killed during the Autumn and Winter of 1829 and 1830, in Suffolk, and on the Borders of Norfolk and Essex. < *London's Mag. Nat. Hist.*, iii, 1830, p. 436.
 With list of some early arrivals in Spring of 1830.
1830. HURST, J. C. Birds (some of them rare) shot and collected in the immediate Vicinity of Dartford, during the last Winter. < *London's Mag. Nat. Hist.*, iii, 1830, p. 435.
1830. JACKSON, C., COUCH, J., and LAKES, J. Rare or uncommon Birds observed in Cornwall, particularly in the southern parts of the county. < *London's Mag. Nat. Hist.*, iii, 1830, pp. 175-177.
1830. SELBY, P. J. Verzeichniss der Vögel, auf den Farn-Inseln an der Nordküste von Northumberland 55½ N. B. < *Oken's Isis*, Bd. xxiii, 1830, pp. 1057-1060.
Zool. Journ., Nro. viii, Januar 1826 (Vol. II), p. 454.
1830. STANLEY, J. Birds in the Neighbourhood of Whitehaven. < *London's Mag. Nat. Hist.*, iii, 1830, pp. 171, 172.
 Nominal list.
1830. WHITE, G. (*Ed. Jardine.*) The Natural History and Antiquities of Selborne. . . . London, 1830. 12mo.
 Not seen; not cited by Newton, 1877. Such an ed. is cited by Ag. & Strickl., *Bibl.* iv, p. 561. Any eds. of the 'Jardine' in 12mo or 18mo, from 1829 to 1836, are probably reprints or mere reissues of the Constable ed. of 1829.
1830. YARRELL, W. Vorkommen einiger seltner britischer Vögel. < *Oken's Isis*, Bd. xxiii, 1830, pp. 830, 831.
 Aus der *Zool. Journ.*, Vol. II. Nr. 5, Apr., 1825, pp. 24-27.
1830. YARRELL, W. Ueber das Vorkommen einiger seltenen britischer Vögel. < *Oken's Isis*, Bd. xxiii, 1830, pp. 1150, 1151.
Zool. Journ., No. ix, Vol. II. 1827, pp. 85-88, und Vol. III. No. xii, 1828, pp. 497-500, q. v.
1830. "Z. Z." Facts and Queries as to Birds in the West of Scotland. < *London's Mag. Nat. Hist.*, iii, 1830, p. 194.
1831. ACTON, E. List of scarce Birds killed in Suffolk since the Autumn of 1827. . . . < *London's Mag. Nat. Hist.*, iv, 1831, p. 163.
1831. AXON. Notices respecting New Books. < *Philos. Mag.*, x, 1831, pp. 370-379, 420-433, — ?
 Marked to continue; no more found. An elaborate review of Rennie's ed. of Montagu's *Orn. Diet.* Mr. Rennie is mercilessly assailed.
1831. BLOXHAM, A. Land Birds met with at Sea, on a Voyage from England to South America, in the Years 1824-5. < *London's Mag. Nat. Hist.*, iv, 1831, pp. 145, 146.
1831. BREE, W. T. The Resident and Visiting Birds of Renfrew [England] and its Neighbourhood. < *London's Mag. Nat. Hist.*, iv, 1831, p. 464.
1831. "D. S." and "J. D." [Review of J. Rennie's edition of Montagu's Ornithological Dictionary.] < *London's Mag. Nat. Hist.*, iv, 1831, pp. 422-426.
1831. FAYRER, —. [On the Passage of Birds between Scotland and Ireland.] < *P. Z. S.*, i, 1831, p. 145.
1831. GOULD, J. [Exhibition of *Thalassidroma pelagica* and *Lestris pomarinus* from England.] < *P. Z. S.*, i, 1831, p. 151.
1831. HEADLAM, E. Birds shot in the Winter of 1829-30, at Greenhow, North Shields [England]. < *London's Mag. Nat. Hist.*, iv, 1831, pp. 448, 449.
 Nominal list.
1831. "H. N." Birds at and near Londonderry [Ireland]. < *London's Mag. Nat. Hist.*, iv, 1831, pp. 269, 270, 452, 453.
1831. [MAIN, J.] Some Account of the British Song Birds. < *London's Mag. Nat. Hist.*, iv, 1831, pp. 118-124, 412-420.

1831. MONTAGU, G. (*Ed. Rennie, J.*) Ornithological | Dictionary | of | British Birds. | By Colonel G. Montagu, F. L. S. | Second edition. | With | a plan of study, and many new articles and original | observations. | By James Rennie, A. M., A. L. S., | Professor of Natural History, King's College, London; Author of "Insect Architecture," "Insect | Transformations," Architecture of Birds, &c. | London: | Hurst, Chance, and Co. St. Paul's Church-yard. | — | 1831. 1 vol. 8vo. 1 p. l., pp. i-lx, 1-592, numberless cuts.

This edition differs from the first in the dispersion of the original Introduction through the volume in alphabetical order of subjects treated; in substitution of a new Introduction (pp. i-lx) which presents a "Plan of study", discusses various systems very pointedly, and gives an eclectic List of works recommended, their authors being classified as 1) rudimental, 2) literary, 3) philosophic, naturalists; in very considerable alterations in the arrangement of the body of the work; in addition of much new matter marked between asterisks; in alphabetical index of scientific names; and changes of five names, viz: *Anorthura*, p. 6; *Nyctichelidon*, p. 33, gg. m.; *Fringilla spiza*, p. 78; *Motacilla lotor*, p. 377; *Corvus prædatorius*, p. 429; *Anorthura communis*, p. 570, spp. m. *Anorthura* and *Nyctichelidon* are proposed as substitutes for *Troglodytes* and *Caprimulgus* respectively, on the ground of the inapplicability of the latter names.

Supposing a new edition of Montagu to have been advisable, I must confess that I do not see that Rennie did not edit it in a satisfactory manner, or why the critics attacked him so promptly and so pointedly. See *Philos. Mag.*, x, 1831, pp. 370-379, 429-433; *Loudon's Mag.*, iv, 1831, pp. 422-426, and 516-520.

1831. NICHOLLS, J. Birds in the Neighborhood of Great Finborough Hall [Suffolk, England.]. < *Loudon's Mag. Nat. Hist.*, iv, 1831, p. 449.

Nominal list.

1831. SELBY, P. J. A Catalogue of the Birds hitherto met with in the Counties of Northumberland and Durham. < *Trans. Nat. Hist. Soc. Northumb. Durh. and Newc.-u.-Tyne*, i, 1831, pp. 244-290.

Not seen. I find that I have two copies of this title, both at second-hand, and differently worded; one reads as above; the other ". . . on the coast of . . ."; which is right! The list is said to give 214 spp. It was the first list of this locality of any authority, or approaching completeness (*vide* Wallis, Sharp, Hogg); and remained single for over 40 years, until the appearance of Hancock's, in 1874, *q. v.*

1831. "T. G." Late Appearance of the Swift, Swallow, and Marten [in England]. < *Loudon's Mag. Nat. Hist.*, iv, 1831, p. 431.

1831. WATERTON, C. Remarks on Professor Rennie's Edition of Montagu's Ornithological Dictionary. < *Loudon's Mag. Nat. Hist.*, iv, 1831, pp. 516-520.

1831. WHITE, W. H. The Cuckoo and the Swift (*Cuculus canorus* and *Cypselus Apus*). < *Loudon's Mag. Nat. Hist.*, iv, 1831, pp. 184, 185.

1831. "X. Y. Z." Birds either resident or occasional Visitors of Renfrew [Scotland] and its Neighborhood, from November to February 1, 1831. < *Loudon's Mag. Nat. Hist.*, iv, 1831, p. 269.

Nominal list of 39 spp.

1831. YARRELL, W. Additions to the Catalogue of British Birds, with Notice of the Occurrence of several rare Species. < *Loudon's Mag. Nat. Hist.*, iv, 1831, pp. 116-118.

Falco rufipes, *Alauda alpestris*, *Anas stelleri*, *Sterna caspia*.

1831. YARRELL, W. [On the occurrence of North American Birds (*Anas sponsa*, *A. occidentua*, and *Alauda alpestris*) in England.] < *P. Z. S.*, i, 1831, p. 35.

1832. "A. R. Y." [Review of The British Naturalist.] < *Loudon's Mag. Nat. Hist.*, v, 1832, pp. 49-71.

"Our author's forte evidently lies in ornithology"; and this review is largely occupied with this subject.

1832. BARKER, W. G. Additions to M. P.'s "List of Birds found in the Neighbourhood of Wensleydale, in the North Riding of Yorkshire." < *Loudon's Mag. Nat. Hist.*, v, 1832, pp. 723-725.

1832. BEWICK, T. A | History | of | British Birds. | By Thomas Bewick. | Vol. I [II]. Containing the | History and Description | of | Land [Water] Birds. | Newcastle : | printed by Charles Henry Cook, | for R. E. Bewick : sold by him, Longman and Co., London ; | and all Booksellers. | 1832. 2 vols. 8vo. Vol. I, Land Birds, pp. i-xl (title, preface, introduction, technical terms and contents), 1-386, figg. —. Vol. II, Water Birds, pp. i-xxii (title, preface, introduction and contents), 1-424 (pp. 414-424 being devoted to figures of "Foreign Birds"), figg. —.
- Not seen: title from A. Newton, in epist.
This is the seventh edition: see the orig. ed., 1797-1804.
1832. BREE, W. T. Remarks on the Spring of 1832, as compared with that of 1831, together with a Calendar showing the Difference of the Two Seasons [in England]. < *Loudon's Mag. Nat. Hist.*, v, 1832, pp. 593-596.
Partly ornithological.
1832. "CORRESPONDENT." Notice of the Arrival of Twenty-six of the Summer Birds of Passage in the Neighbourhood of Carlisle, together with some of the scarcer Species that have been met with in the same Vicinity during the Year 1831; with Observations, &c. < *Philos. Mag.*, xi, 1832, pp. 82-86.
1832. D[ENSON], J. [Notes on several species of British Birds.] < *Loudon's Mag. Nat. Hist.*, v, 1832, pp. 596, 597.
1832. DOVASTON, J. F. M. Chit-Chat. < *Loudon's Mag. Nat. Hist.*, v, 1832, pp. 497-505.
Imaginary dialogue concerning some British Birds, etc. Continued, *op. cit.*, vi, 1833, pp. 1-11.
1832. DUNCAN, G. The Birds of Renfrew and its Neighbourhood. < *Loudon's Mag. Nat. Hist.*, v, 1832, pp. 571-573.
Annotated list.
1832. ELLIS, D. Beytragen von Schwalben u. Repphühnern. < *Oken's Isis*, Bd. xxv, 1832, p. 696, 697.
Auszug aus d. *Edinb. New Philos. Journ.*, Bd. iv, Heft 8, 1828, p. 290.
1832. EDMONSTON, L. Bemerkungen über *Larus parasiticus*, L. *rissa* (Kittiwake) et *Colymbus gryllc.* < *Oken's Isis*, Bd. xxv, 1832, p. 597, 598.
Auszug aus d. *Edinb. Philos. Journ.*, Bd. vii, 1822, Heft 13, p. 90.
1832. FLEMING, J. Ueber den Einfluss der Menschen auf die Verbreitung der britischen Thiere. < *Oken's Isis*, Bd. xxv, 1832, p. 606.
Auszug aus d. *Edinb. Philos. Journ.*, xi, 1824, p. 287.
1832. FLEMING, J. Aehrenlese an den schottischen Küsten, in August. < *Oken's Isis*, Bd. xxv, 1832, p. 662.
Auszug aus d. *Edinb. Philos. Journ.*, Bd. x, 1823, Heft 17, p. 95.
1832. GREENHOW, E. H. Birds of Passage visiting the Parish of Tynemouth, in Northumberland. < *Loudon's Mag. Nat. Hist.*, v, 1832, pp. 566-569, fig. 102.
1832. GREENHOW, E. H. The Dates of Appearance, Breeding, and Disappearance of some Birds and Insects, in the Parish of Tynemouth, during the Year 1831. < *Loudon's Mag. Nat. Hist.*, v, 1832, p. 566.
1832. "J. A. H." The Forked-tail Petrel (*Procellaria Leachii*), and a species of Tern found dead inland [in England]. < *Loudon's Mag. Nat. Hist.*, v, 1832, p. 283.
1832. "J. D. M." List of Rare Birds killed near Belfast [Ireland]. < *Loudon's Mag. Nat. Hist.*, v, 1832, p. 577.
1832. "J. D. M." Linnaeus, as reflected on in Rennie's "Montagu's Ornithological Dictionary." < *Loudon's Mag. Nat. Hist.*, v, 1832, pp. 193-195.
1832. "J. W." Rarer Birds taken near Worcester. < *Loudon's Mag. Nat. Hist.*, v, 1832, pp. 379, 380.
1832. "M. P." Birds and Mammalia found in the Neighbourhood of Wensleydale, in the North Riding of Yorkshire. < *Loudon's Mag. Nat. Hist.*, v, 1832, p. 723.
With Note by "J. D."

1832. "M. R." [*i. e.*, M. P.] Birds found in the Neighbourhood of Wensleydale, in the North Riding of Yorkshire. < *Loudon's Mag. Nat. Hist.*, v, 1832, pp. 553-555.
Nominal list.
1832. "RUSTICUS." Something about [British] Birds and Birdnesting. < *Loudon's Mag. Nat. Hist.*, v, 1832, pp. 601-603.
1832. SALMON, J. D. Observations on the Eggs and Birds which were met with in a Three Weeks' Sojourn (from May 30. to June 21. 1831) in the Orkney Islands. < *Loudon's Mag. Nat. Hist.*, v, 1832, pp. 415-425.
Cf. *tom. cit.*, p. 675.
1832. STEWART, J. V. A List of, and Remarks on, some of the Mammalious [*sic*] Animals, and the Birds, met with in the Three Years preceding December 4. 1828, on the Northern Coast of Donegal [Ireland]. < *Loudon's Mag. Nat. Hist.*, v, 1832, pp. 578-586.
Extended and interesting commentary.
1832. "SUBSCRIBER." European Singing-Birds in India. < *Loudon's Mag. Nat. Hist.*, v, 1832, p. 734.
1832. "T. G." The Forked-tail Petrel and Gray Phalarope taken near Chipping Norton, Oxon. < *Loudon's Mag. Nat. Hist.*, v, 1832, pp. 282, 283. With Note by "J. D.", p. 283.
1832. "T. K." Rarer Birds taken in Ireland, principally in the Vicinity of Dublin, in the Winter of 1831-2. < *Loudon's Mag. Nat. Hist.*, v, 1832, pp. 576, 577.
1832. WHITE, G. (*Ed. Jardine.*) The | Natural History | of | Selborne. | By the late | Rev. Gilbert White, A. M. | Fellow of Oriol College, Oxford. | With additions | by | Sir William Jardine, Bart. F. R. S. E. F. L. S. M. W. S. | Author of "Illustrations of Ornithology." | — | New Edition. | — | Printed for | Whittaker, Treacher, & Co. London; | & Waugh & Innes, Edinburgh. | — | 1832. 1 vol. 12mo (half sheets), eng. title-p., pp. i-xvi, 1-343, many full-page figg., not numbered.
Forming Vol. XLV of *Constable's Miscellany*.
This I have seen. It is apparently the same as the 1829 Jardine ed., which also forms Vol. XLV of the *Miscellany*, reissued with a new title-page (compare that of 1829), and some additional full-page wood-cuts; the collation otherwise identical (pp. i-xvi, 1-343).—Examine the two 1829 titles which I give above.
1833. ANON. History of british Birds. The figures engraved on wood by Bewick, New-Castle. Vol. I. 1797. 8. 355. II. 1816. 361. < *Oken's Isis*, Jahrg. 1833, p. 906.
Short notice, titled with abominable inaccuracy, as usual with the *Isis* reviewers.
1833. BLACKWALL, J. On the Instincts of Birds. < *Edinb. New Philos. Journ.*, xiv, 1833, pp. 241-261.
From *Mem. Lit. and Philos. Soc. Manchester*, 2d ser., Vol. V.
1833. BREE, W. T. Remarks on the Spring of 1833. < *Loudon's Mag. Nat. Hist.*, vi, 1833, pp. 488-491.
Notes on various British Birds.
1833. BREE, W. T. Instances of singular Nidification in [British] Birds. < *Loudon's Mag. Nat. Hist.*, vi, 1833, pp. 32-36, figg. 5, 6. With Note by "J. D.", pp. 36, 37.
1833. "CORRESPONDENT." Notice of the Arrival of Twenty-six of the Summer Birds of Passage in the Neighbourhood of Carlisle, during the Spring of 1832, together with some of the scarcer Species that have been obtained in the same Vicinity from the 10th of November 1831, to the 10th of November, 1832; with Observations, &c. < *Lond. and Edinb. Philos. Mag.*, ii, 1833, pp. 96-102.
1833. DOVASTON, J. F. M. Chit-Chat. No. II. < *Loudon's Mag. Nat. Hist.*, vi, 1833, pp. 1-11.
Continued from *op. cit.*, v, 1832, pp. 497-505.

1833. "G. W." Notes on Butterflies, and other Natural Objects; made in Cumberland, through the Mouth of May, 1832. < *Loudon's Mag. Nat. Hist.*, vi, 1832, pp. 192-202.
 Various Birds.
1833. HILL, W. H. Notes on, and a Description of, the Black-headed Gull (*Larus ridibundus*), as the same has been observed near Southminster, on the Coast of Essex; also a List of the Birds seen, in the Course of Twelve Months, in the Neighbourhood of Southminster. < *Loudon's Mag. Nat. Hist.*, vi, 1833, pp. 450-452.
1833. HOY, J. D. The Rose-coloured Ouzel, the Hoopoe, and the Great Bustard, in Suffolk, in 1832. < *Loudon's Mag. Nat. Hist.*, vi, 1833, p. 150.
1833. JOHNSTON, G. Address to the Members of the Berwickshire Naturalists' Club, Sept. 19, 1832. < *Loudon's Mag. Nat. Hist.*, vi, 1833, pp. 11-21.
 On British Birds, pp. 12-14.
1833. "RUSTICUS." Something about Sea Birds. < *Loudon's Mag. Nat. Hist.*, vi, 1833, pp. 25-32.
 Observed in the Isle of Wight.
1833. "RUSTICUS." Notices on Natural Objects observed in a Ramble on St. Valentine's Day. < *Loudon's Mag. Nat. Hist.*, vi, 1833, pp. 193-198.
 Notes on various British Birds.
1833. "RUSTICUS." More about [British] Birds. < *Loudon's Mag. Nat. Hist.*, vi, 1833, pp. 111-116.
1833. SELBY, P. J. Illustrations | of | British Ornithology. | By | Prideaux John Selby, Esq. | Fellow of the Royal Society of Edinburgh; Fellow of the | Linnean Society; and Member of the Wernerian | Natural History Society, &c. | Vol. I [II]. | Land [Water] Birds. | Edinburgh: | Printed for the Proprietor, and Published by | W. H. Lizars, Edinburgh; | Longman, Rees, Orme, Brown, Green and Longman, | London; and W. Curry Jun. & Co. Dublin. | — | MDCCCXXXIII. 2 vols. 8vo. Vol. I, pp. i-xxxviii, 1-450. Vol. II, pp. i-xii, 1-538.
 This is the date of completion of the 2 vols. 8vo of text accompanying the elephant folios. At this date, Vol. I, which originally appeared in 1825, was reissued "with additions", and redated. So both vols. bear the same date, 1833. As to Vol. I, this is the date of the 2d edition; as to Vol. II, it is the date of the original edition.
 See same author, at 1825; 1825-33; 1821-34; 1834; 1841.
1833. SLANEY, R. A. An | Outline | of the | smaller British Birds, | intended for the use of | ladies and young persons. | — | By Robert Slaney, Esq. M. P. | — | Second Edition. | London: | printed for | Longman, Rees, Orme, Brown, Green, & Longman, | Paternoster-row. | 1833. 1 vol. 16mo. pp. i-viii, 1-168, many cuts.
 Date of orig. ed. unknown to me.
 "The author, having often derived pleasure from watching the habits of birds, thought that a familiar introduction to this branch of Natural History might prove useful to ladies and young persons, who were not desirous to enter on scientific descriptions, or to encounter works of greater length. With this intention the following pages have been written, comprising extracts from several writers on the subject, together with a few original observations."—(*Preface*.)
1833. "SUBSCRIBER." Notices on a few rarer Birds observed about the Vale of Alford, Aberdeenshire. < *Loudon's Mag. Nat. Hist.*, vi, 1833, pp. 151, 152.
1833. "T. G." Dates of the Appearance of some Spring Birds, in 1832, in the Neighbourhood of Clitheroe, Lancashire. < *Loudon's Mag. Nat. Hist.*, vi, 1833, pp. 72, 73.
1833. THOMPSON, W. [Remarks on several species of British Birds.] < *Loudon's Mag. Nat. Hist.*, vi, 1833, pp. 447, 448.

1833. WHITE, G. (*Ed. Brown, T.*) The | Natural History | of | Selborne; | Observations on various parts of Nature; | and the Naturalist's Calendar. | By the late | Rev. Gilbert White, A. M. | Fellow of Oriel College, Oxford. | With Notes, | by Captain Thomas Brown, F. L. S. M. K. S. &c. | President of the Royal Physical Society. | [Design.] | Edinburgh: | published, for the proprietors, | by James Chambers, Edinburgh; W. Orr, London; | and W. Curry, jun. & Co. Dublin. | MDCCCXXXIII. 1 vol. 16mo. Advt., 1 leaf; pp. i-xii, 1-356, several full-page illust., and cuts in text.

Forming the first of the series entitled the "British Library".

This forms Vol. I of the series called the "British Library", and seems to be the first issue of Brown's edition. The "Antiquities" are omitted, and the woodcuts are few in number and of moderate quality.

There are many more editions of the *Capt. Brown* series: see 1834, 1835?, 1840, 1843, 1845.

1833. WHITE, G. (*Ed. Lady Dover.*) The | Natural History | of | Selborne. | By the | Rev. Gilbert White, A. M. | Fellow of Oriel College, Oxford. | Arranged for young persons. | London: | printed for N. Hailes, 168, Piccadilly. | 1833. 1 vol. 12mo. pp. i-x, 1-316, figg. —.

Not seen: title and comment from Newton, 1877.

This is now known to have been edited by Lady Dover, and is dedicated to her son, H. A[gar] E[llis], subsequently Lord Clifden. It is the first "Bowdlerized" edition, chiefly remarkable for the omission of several letters (as Nos. 28, 30, 32 and 33 to Barrington) and shorter passages. But the intention was good, and the book has consequently found its way into boys' and girls' hands, who have derived much profit from it. The woodcuts also are pretty.

- †1833. WHITE, G. (*Ed. Jardine.*) The Natural History and Antiquities of Selborne. London. 1833. 12mo.

Not seen: not cited by Newton, 1877: cited by Ag. and Strickl., *Bibl.*, iv, p. 561, most likely by misprint for 1832, which is the date of one of the Jardine eds., not noted by Ag. and Strickl., unless this "1833" be meant for it. See what is said under the alleged ed. of 1830.

1833. WHITE, G. (*Ed. Rennie.*) The | Natural History and Antiquities | of | Selborne. | By the late | Rev. Gilbert White. | A New Edition, | with Notes, by several eminent Naturalists. | And an enlargement of | the Naturalist's Calendar. | London: | printed for J. and A. Arch [and fifteen other booksellers whose names need not be transcribed]. n. d. (1833). 1 vol. 8vo. pp. i-xii, 1-562, figg. —.

Not seen: title and comment from Newton, 1877.

The names of the contributors of the "Notes" are given on p. xii, and are Herbert ("W. H."), Sweet ("R. S."), and Rennie ("J. R."), whose initials are appended thereto. The title-page bears no year, but on the fly-leaf immediately preceding is "1833". This is the best edition published up to that date, and is commonly known as *Rennie's*. Some of the woodcuts are very well executed.

1834. ANON. Ankunft einiger Wintervögel bey Carlisle. < *Oken's Isis*, Bd. xxvii, 1834, pp. 802, 803.

Auszug aus *Philos. Mag.*, Bd. vi, 1829, pp. 110-114.

1834. BLYTH, E. Notes on the Arrival of the British Summer Birds of Passage in 1834, with incidental Remarks on some of the Species. < *Loudon's Mag. Nat. Hist.*, vii, 1834, pp. 338-348.

1834. CONWAY, C. Sketches of the Natural History of my Neighbourhood [Monmouthshire]. No. 2, Fragments of Ornithology. < *Loudon's Mag. Nat. Hist.*, vii, 1834, pp. 333-338.

Continued with No. 3, in *op. cit.*, viii, 1835, pp. 545-549.

1834. "CORRESPONDENT." Notice of the Arrival of Twenty-six of the Summer Birds of Passage in the Neighbourhood of Carlisle, during the Spring of 1833, together with Notices of some of the scarcer Species that have been obtained in the same Vicinity from the 10th of November 1832, to the 10th of November 1833; with Observations, &c. < *Lond. and Edinb. Philos. Mag.*, iv, 1834, pp. 336-340.

1834. HOY, J. D. A Notice of some rare Species of Birds observed or killed in the County of Suffolk, and adjoining Borders of Essex, during the Winter Months of 1832 and 1833. < *Loudon's Mag. Nat. Hist.*, vii, 1834, pp. 52-56. Note by "J. D.", p. 56.
1834. JESSE, W. Gleanings | in | Natural History. | Second Series. | To which are added | some extracts from the unpublished MSS. of | the late Mr. White, of Selborne. | By Edward Jesse, Esq., | Surveyor of His Majesty's Parks, Palaces, &c. | London: | John Murray, Albemarle Street | MDCCCXXXIV.
Not seen: title and comment from Newton, 1877.
The portion relating to White begins at p. 144, where a fac-simile copy (mentioned beyond under Mr. Harting's edition) of a page of his journal is introduced, and his "Miscellaneous Observations" extend from p. 147 to p. 210. It is not stated how Jesse acquired the original MSS.
1834. "J. G." Remarks on the Natural Productions of Lixden and its Neighbourhood. < *Loudon's Mag. Nat. Hist.*, vii, 1834, pp. 17-19.
Chiefly ornithological.
1834. MARTIN, M. Dates of the Arrival, Breeding, and Departure of the Rock Birds at the Island of St. Kilda, with some other Facts relative to them, as ascertained by M. Martin, Gent., during a Visit to that Island in the Spring of 1697. < *Loudon's Mag. Nat. Hist.*, vii, 1834, pp. 574-576.
This is extracted from Martin's *Voyage to St. Kilda* (orig. ed. 1698, q. v.), to form part of an article by J. D. Salmon, suggesting accumulation of information respecting the British Rock Birds. See 1834. SALMON, J. D.
1834. MORRIS, F. O. A Guide | to an | Arrangement of British Birds; | being | a Catalogue | of all the species hitherto discovered | in Great Britain and Ireland: | and | intended to be used for labelling cabinets or | collections of the same. | By | — | The Reverend Francis Orpen Morris, B. A. | — | of Worcester College, Oxford. | — | London: | published by | Longman, Rees, Orme, Brown, Green, & Longman, | Paternoster-row. | — | Price, 1s. 6d. n. d. [1834.] 1 vol. 8vo. pp. 20, 4 ll.
This is, in fact, a set of labels of British Birds, in large type and with bars, printed only on one side of the page.
1834. MORRIS, B. R. An Attack of a large Sea Gull, in the Manner of a Species of rapacious Bird, upon a Kittiwake Gull. < *Loudon's Mag. Nat. Hist.*, vii, 1834, pp. 512, 513.
The article concludes with a list of some rare birds met with in the neighbourhood of Charmouth, Dorsetshire.
1834. PAGET, C. J., and PAGET, J. Sketch | of the | Natural History | of | Yarmouth | and its neighbourhood, | containing | Catalogues of the Species | of | Animals, Birds, Reptiles, Fish, Insects, and | Plants, at present known. | — | By C. J. and James Paget. | — | Yarmouth: | printed and published by F. Skill, Quay; | sold in London | by Longman, Rees, and Co., Paternoster row; and Simkin | and Marshall, Stationers' Court. | — | 1834. 1 vol. 8vo. pp. i-xxxii, 1-88.
Birds, pp. 3-13: an annotated list of species.
1834. SALMON, J. D. The Accumulation of all possible Information respecting the Habits of the Rock Birds of Britain, by the cooperative Agency of Naturalists residing near Headlands on the Coasts, suggested. < *Loudon's Mag. Nat. Hist.*, vii, 1834, pp. 573, 577.
Includes an article entitled: "Dates of the Arrival, Breeding, and Departure of the Rock Birds at the Island of St. Kilda, with some other Facts relative to them, as ascertained by M. Martin, Gent., during a Visit to that Island, in the Spring of 1697."
1834. THOMPSON, W. [Catalogue of seventeen species of Birds new to the Irish Fauna.] < *P. Z. S.*, ii, 1834, pp. 29-31.
1834. WHITE, G. (*Ed. Jesse.*) [Unpublished MSS.]
See 1834. JESSE, W.

1834. WHITE, G. (*Ed. Brown.*) The | Natural History | . . . | A New Edition. | . . . | London: | published by Allan Bell & Co. and | Simpkin & Marshall; | Fraser & Co., Edinburgh; | and W. Curry, Jun. & Co., Dublin. 1834.
Not seen: title and comment from Newton, 1877.
This seems to be a (stereotyped?) re-issue of the *Brown* ed. of 1833, *q. v.*, with the unimportant difference of a new title-page. How many more re-issues succeeded I cannot say, but I have evidence of 1835?, 1840, 1843, 1845.
1835. ANON. Anknunft von 26 Zugvögeln bey Carlisle 1832. < *Oken's Isis*, Bd. xxviii, 1835, pp. 569-571.
1835. BLYTH, E. Instances of the Occurrence [in England] of Summer Migrant Birds in the Winter Months:— < *Loudon's Mag. Nat. Hist.*, viii, 1835, p. 512.
Corn Crane, Water Crane, Quail.
1835. CONWAY, C. Sketches of the Natural History of My Neighbourhood. No. 3. Fragments of Ornithology. < *Loudon's Mag. Nat. Hist.*, viii, 1835, pp. 545-549.
Continued from No. 2, *op. cit.*, vii, 1834, pp. 333-238. The locality is Monmouthshire, England.
1835. "CORRESPONDENT." Notice of the Arrival of Twenty-six of the Summer Birds of Passage in the Neighbourhood of Carlisle, during the Spring of 1834, to which are added a few Observations on some of the scarcer Birds that have been obtained in the same Vicinity from the 10th of November 1833 to the 10th of November 1834. < *Lond. and Edinb. Philos. Mag.*, vi, 1835, pp. 424-427.
1835. COTTON, J. The resident | Song Birds | of | Great Britain; | containing | delineations of seventeen birds | of the size of life, | (together with the egg of each species,) | with | a short account of their general habits, and occasional | directions for their treatment in confinement. | By John Cotton, F. Z. S. | — | London: | M. DCCC. XXXV. Part of 1 vol., large 8vo, not pagged, 17 coloured plates.
The above is a temporary half-title issued with what is really Part I of a treatise completed the same year, the present publication being intended to form a portion of one giving 33 plates. It comprises 17 plates of the *resident* Song Birds, the other part giving 16 plates of the *summer migrant* Song Birds. See what is said under the other head of this date and author. See also same author at 1836.
1835. COTTON, J. The | Song Birds | of | Great Britain; | containing | delineations, of the natural size, | of thirty-three Birds, | coloured from living specimens, | with | some account of their habits, and occasional directions | for their treatment in confinement. | By John Cotton, F. Z. S. | "Nature's sweet voices, always full of love, | And joyance." Coleridge. | — | London: | M. DCCC. XXXV. 1 vol. large 8vo, not pagged, 33 coloured plates.
This is the complete edition of the whole work. The first Part, published 1835 with a half-title-page, contained 17 illustrations and text, of as many of the "Resident Song Birds." On the appearance of the second Part, with 16 illustrations of the "Summer Migrant Birds", in 1835, it was directed that the title of the first Part be canceled, the above title substituted, and the two books merged in one, containing the 33 plates. The two books, nevertheless, are found separately bound, and are citable separately. It will be seen, however, that the above title, issued with Part II, covers *both*, Part II having no title of its own, and Part I having no other than its own title, to be canceled. The general preface, published with Part II, is to precede the preface to Part I in the make-up.
The whole work was reissued in 1836, *q. v.*
1835. GOULD, [J.] [Vogelbälge von den Orkney-Inseln.] < *Oken's Isis*, Bd. xxviii, 1835, p. 454.
P. Z. S., Pt. ii, 1832, p. 189, *seq.*
1835. HILL, W. H. Species of Birds seen in the immediate Neighbourhood of Southminster Vicarage, Essex; additional to those seen there noted in [*op. cit.*] vi, 452. < *Loudon's Mag. Nat. Hist.*, viii, 1835, pp. 573, 574.
1835. JENYNS, L. A | Manual | of | British Vertebrated Animals: | or | Descriptions | of | all the Animals belonging to the classes, | Mammalia, Aves, Reptilia, Amphibia, | and Pisces, | which have been | hitherto observed in the British Islands: | including the | domesticated, naturalized, and extirpated species: |

1835. JENYNS, L.—Continued.

the whole systematically arranged. | By the | Rev. Leonard Jenyns, M. A. | Fellow of the Linnean, Zoological and Entomological Societies | of London; and of the Cambridge Philosophical Society. | Cambridge; | printed at the Pitt Press, by John Smith, | printer to the University. | Sold by J. & J. J. Deighton; and T. Stevenson, Cambridge; | and Longman & Co., London. | — | M. DCCC. XXXV. | 1 vol. 8vo. pp. i-xxxii, 1-560.

Class II, Aves, pp. 49-286. This is a considerable work, which was well received and which filled a real want of the time, for a convenient reliable hand-book which should give a fair idea of a classification, and describe species recognizably. It treats of upwards of 300 species, with diagnosis, a few leading references, description and general comment on habits, distribution, &c. Preceding the treatment of the species is a concise characterization of the genera and higher groups; the full genera recognized being 111, with numerous subgenera. The whole matter is very faithfully executed. However moderate a performance it may appear to-day, it was a great boon to the student, who had then mostly to rely upon his Fleming or his Montagu.

I am under the impression that there are some new names—at any rate some new combinations of generic and specific terms—in this Manual.

1835. JENYNS, [L.] Bemerkungen über die Vögel von Cambridgeshire. < *Oken's Isis*, Bd. xxviii, 1835, pp. 1008-1016.

Uebersetzung: *Trans. Cambridge. Philos. Soc.*, ii, 1827, p. 287.

1835. LORD, W. [30 Vogelbälge von Schotland.] < *Oken's Isis*, Bd. xxviii, 1835, p. 356.

P. Z. S., 1830, p. 149, *seq.*

1835. MARSHALL, J. D. Observations on the Zoology of the Island of Rathlin, Off the Northern Coast of Ireland. < *Lond. and Edinb. Philos. Mag.*, vii, 1835, pp. 492, 493.

From *Rep. Brit. Soc. Adv. Sci.*, Dublin, 1835. See same author, 1836.

1835-43. MEYER, H. L. Coloured Illustrations of British Birds and their Eggs. 4 vols 4to. Pub. in 78 Parts. 1835-43.

This is said to be the date of the original edition, which I have not seen. See what is said under head of the 2d ed., 8vo, 1842-1850.

1835. MORRIS, F. O. [Tippet Grebe, Peregrine Falcon, and Hoopoe, in Britain.] < *Londons Mag. Nat. Hist.*, viii, 1835, pp. 510, 511.

1835. "S. D. W." Notices of Birds in Plumage of an unusual Colour. < *Londons Mag. Nat. Hist.*, viii, 1835, pp. 110-112.

The instances are chiefly of British Birds. The article continues to p. 113, with notices of additional instances by J. D. Salmon.

1835. SELBY, P. J. Notice of Birds observed in Sutherlandshire, June 1834. < *Rep. Brit. Assoc. Adv. Sci.* for 1834, 1835, pp. 610-613.

Annotated list of 85 spp.

1835. THOMPSON, W. [On two rare Irish Birds (*Scelopax Sabini* and *Larus Sabini*).] < *P. Z. S.*, iii, 1835, pp. 82, 83.

1835. THOMPSON, W. Notices of some Additions to the British Fauna. < *P. Z. S.*, iii, 1835, pp. 77-82.

Of birds, 9 spp.

1835. THOM[P]SON, [W.] Ueber neue Vögel in Irland. < *Oken's Isis*, Bd. xxviii, 1835, p. 1026.

Proc. Zool. Soc. Lond., Part ii, 1834.

1835? WHITE, G. (*Ed. Brown.*) The Natural History of Selborne. . . .

There is said to be a Brown ed. of this date by Engelmann, *Bibl.* p. 202. See the orig. Brown ed., 1833.

1836. AXON. A | Catalogue | of the | Ashmolean Museum, | descriptive of | the Zoological Specimens, | Antiquities, Coins, | and | Miscellaneous Curiosities. | [Cut.] | Oxford, | printed by S. Collingwood. | MDCCCXXXVI. 1 vol

1836. ANON.—Continued.

large 8vo. 2 p. ll. (title, contents), pp. i-viii (history of the museum), 1-188, frontisp. and 1 other plate.

Systematic list of Birds, pp. 15-65. List of specimens of heads and beaks of Birds, pp. 72-77. Here occurs, p. 74, No. 81, "Head and Leg of the Dodo;" to which circumstance the whole work owes its special value now.

1836. ANON. A Catalogue of the Collection of British Quadrupeds and Birds, in the Museum of the Cambridge Philosophical Society. Cambridge. 1836. 12mo. Not seen.

1836. BLYTH, E. On the Species of Birds observed, during the last Four Years, in the Vicinity of Tooting, Surrey; with a few Remarks on their comparative Numbers and Distribution. < *Loudon's Mag. Nat. Hist.*, ix, 1836, pp. 622-638.1836. BLYTH, E. [On the Occurrence of the Carrion Crow and Nightingale in Ireland.] < *Loudon's Mag. Nat. Hist.*, ix, 1836, pp. 546-548.1836. "C. J." Some Remarks on Mr. N. Wood's British Song Birds. < *Loudon's Mag. Nat. Hist.*, ix, 1836, pp. 515-519.1836. "CORRESPONDENT." Notice of the Arrival of Twenty-six Species of the Summer Birds of Passage in the Neighbourhood of Carlisle, Cumberland, during the Spring of 1835; to which are added a few Observations on some of the scarcer Species of Birds that have been obtained in the same Vicinity from Nov. 10. 1834, to Nov. 10. 1835; and a few Meteorological Remarks on the Spring, Summer, and Autumn of 1835, at Carlisle. < *Loudon's Mag. Nat. Hist.*, ix, 1836, pp. 185-187.

Many titles like this one, covering articles of similar character, and all signed "Correspondent", are given in the present Bibliography. They are, I believe, by J. D. Salmon, who long preserved this pseudonym, as Edward Newman did that of "Rusticus".

1836. COTTON, J. The | Song Birds | of | Great Britain; | containing | delineations of thirty-three Birds, | of the natural size, | (including the genus *Sylvia* of Latham,) | coloured principally from living specimens, | with | some account of their habits, and occasional directions | for their treatment in confinement. | By John Cotton, F. Z. S. | "Nature's sweet voices, always full of love | And joyance." Coleridge. | — | London: M.DCCC.XXXVI. | 1 vol. 8vo, not pagged, 33 coloured pll., not numbered.

This is a reissue, or 2d. ed.; orig. ed. 1835, 1835 *bis*. which see.

The volume treats very pleasantly of the subject, and gives a coloured plate of the thirty-three species included by the author among the "song birds" of Great Britain.

1836. DALE, J. C. Egret, Pratincole, Black Woodpecker, Blackchin Grebe [as British Birds]. < *Loudon's Mag. Nat. Hist.*, ix, 1836, pp. 598, 599.1836. [EDITORIAL.] Remains of birds in the strata of Tilgate Forest, Sussex, England. < *Sillim. Am. Journ. Sci.*, xxix, 1836, p. 362.

1836. EYTON, T. C. A | Catalogue | of | British Birds. | — | By T. C. Eyton, Esq. | London: | Longman, Rees, Orme, Brown, Green, and Longman: | and Houlston and Son, Paternoster-row. | — | M.DCCCXXXVI. 1 vol. 8vo. pp. i-iv, 1-67.

Names, with some little synonymy: arrangement nearly that of Cuvier. The piece also forms a part of the same author's "A History of the Rarer British Birds." 1836, *q. v.*

1836. EYTON, T. C. A History | of the | Rarer British Birds. | By T. C. Eyton, Esq. | [Figure.] | Illustrated with Woodcuts. | London: | Longman, Rees, Orme, Brown, Green, and Longman; | and Houlston and Son, Paternoster-Row. | — | M.DCCCXXXVI. 1 vol. 8vo. pp. i-vi, 1 l., pp. 1-101, many woodcuts.

With which belongs: A | Catalogue | of | British Birds. | — | By T. C. Eyton, esq. | London: | [Same imprint and date.] | pp. i-vi, 1 l., pp. 1-67.

The "History" and "Catalogue" are entirely distinct, being separately titled and pagged and also published separately; but together form the volume, the Catalogue being included in the table of contents of the History. The History treats of 43 spp., of each of which a fine woodcut is given, and the work is further copiously illustrated with miscellaneous woodcut

1836. EYTON, T. C.—Continued.

tail-pieces, often very spirited. In the Catalogue, the author endeavors to replace the names of the older writers on Ornithology; the arrangement is nearly that of Cuvier. The first division of the Catalogue is the regular list; the second, the extinct species; the third, the principal introduced one; the fourth, the doubtful ones. The Catalogue is synonymic to a degree, but not otherwise annotated. The species are not numbered, nor is the total stated.

1836. LINGWOOD, R. M. A List of Species of Birds and Mammiferous and Amphibious Animals, observed in Connamara, in August 1835. < *London's Mag. Nat. Hist.*, ix, 1836, pp. 128, 129.

1836. MACGILLIVRAY, W. Descriptions | of the | Rapacious Birds | of | Great Britain. | By William Macgillivray, A. M. | Conservator of the Museum of the Royal College of Surgeons | of Edinburgh, | Fellow of the Royal Society of Edinburgh, Member of the | Wernerian Natural History Society, of the Academy | of Natural Sciences of Philadelphia, of the Lyceum of New York, &c. | — | MacLachlan & Stewart, Edinburgh: | Baldwin & Cradock; London; and | Hodges & Smith, Dublin. | MDCCCXXXVI. 1 vol. sm. 8vo. (half sheets, 4 ll. to a sig.), pp. i-viii, 1-482, with 2 ll. advts., pll. i, ii, numerous woodc.

Extended descriptions of 27 spp., with biographical and synonymic matter, and characters of the genera and families; with a short prefatory essay on the study of natural history from a zealous, ingenious, and sensitive naturalist, in precarious health, smarting under a real or fancied grievance, and facing a probability of defeated ambition. The pll. are anatomical; the figg. illustrate the heads of various species.

1836. MARSHALL, J. D. Observations on the Zoology of the Island of Rathlin, off the Northern Coast of Ireland. < *Rep. Brit. Assoc. Adv. Sci. for 1835, 1836 (Misc. Comm.)*, pp. 68, 69.

32 land and 28 water birds noticed, with observations on some of the commonest ones.—See same author, 1835.

1836. SALMON, J. D. Notice of the Arrival of Twenty-nine Migratory Birds in the Neighbourhood of Thetford, Norfolk; together with some of the scarcer Species that have been met with in the same Vicinity, during the Years 1834 and 1835, and the Spring of 1836; with Observations, &c. < *London's Mag. Nat. Hist.*, ix, 1836, pp. 520-528.

1836. SELBY, P. J. On the Quadrupeds and Birds inhabiting the County of Sutherland, observed there during an Excursion in the Summer of 1834. < *Edinb. New Philos. Journ.*, xx, 1836, pp. 286-295.

Running commentary on about one hundred species of birds in the 2d instalment of the article; the former (*ibid.*, pp. 156-161) on the mammals.

1836. WHITE, G. (*Ed. Blyth.*) The | Natural History | of | Selborne, | with its | Antiquities; Naturalist's Calendar, &c., | By | the Rev. Gilbert White, A. M. | A New Edition, | with Notes by Edward Blyth. | London: | Published by Orr & Smith, Paternoster Row. | MDCCCXXXVI. 1 vol. 8vo. pp. iv-xx, 418.

Not seen: title and comment from Newton, 1877.

In this is inserted, between the "Advertisement" and the text, an interesting account of Selborne by Mudie, who gathered the particulars on the spot, and some notes on the "Antiquities" are supplied by Dixon. In spite of its very small type and poor woodcuts, this edition, owing to Blyth's excellent notes, is a very valuable one. There is a stereotyped re-issue of 1858.

1836. WHITE, G. (*Ed. Jardine.*) The Natural History and Antiquities of Selborne London. 1833. 18mo. figg.

An issue of the Jardine ed. of this date is cited by Ag. & Strickl. *Bibl.*, iv, p. 361, and alluded to by Newton, 1877.

1836. WILLIAMSON, W. C. [Notes on the appearance of rare Birds in the vicinity of Scarborough.] < *P. Z. S.*, iv, 1836, pp. 76, 77.

1836. WOOD, N. Natural History of British Song Birds. London. Parker. 1836. 12mo.

Not seen.

1836. WOOD, N. Reply to C. J.'s Remarks on Mr. Neville Wood's British Song Birds. < *London's Mag. Nat. Hist.*, ix, 1836, pp. 566-568.
1836. YARRELL, W. [Notice of the Dottrell (*Charadrius morinellus*, Linn.) breeding at Skiddaw, and of the Gray Snipe (*Macrorhamphus griseus*, Leach) having been obtained near Carlisle.] < *P. Z. S.*, iv, 1836, pp. 1, 2.
1837. ANON. A Manual of british Vertebrate animals by L. Jenyns. London, Deighton. 1835. 8. 559. < *Oken's Isis*, Bd. xxx, 1837, pp. 825, 826.
1837. BLYTH, E. On Woodcocks, Fieldfares, and Redwings building within the British Islands. < *Charlesw. Mag. Nat. Hist.*, i, 1837, pp. 439-441.
1837. CLARKE, W. B. Signs of Spring, 1837. < *Charlesw. Mag. Nat. Hist.*, i, 1837, p. 279. Observations on British Birds, etc.
1837. [CORNISH, W. F.] Observations | on the | Habits | of | Exotic Birds; | that is, | those which visit England in the spring | and retire' in the autumn, | and those which appear in the autumn | and disappear in the spring. [By the Rev. W. F. Cornish.] | — | Exeter: | published by W. Curson, High-street; | and Whittaker and Co. London. | — | 1837. 1 vol. 16mo. cover-title, pp. i-iv (title and preface), pp. 1-79.

This little treatise on British migrants is, we are told, but a fragment of nearly 200 chapters on Natural History which the author had prepared, when he put it out as a feeler; designing to commit the rest of "the labour of Thirteen Years" "ad finem et piparem" if it should not be well received. I may add that I have seen none of the rest.

1837. DUNN, R. The | Ornithologist's Guide | to | the Islands of | Orkney and Shetland. | By Robert Dunn, | Animal-preserved, | Hull. | — | London: | printed by | Richard Taylor, Red Lion Court, Fleet Street; | and published by the author, | 31, George Street, Hull. | 1837. 1 vol. 8vo. pp. i-x, 1 l., pp. 1-128, frontisp. and 2 maps.

There is a later ed., London, Van Voorst, 1840.

It is a good guide: the first half is narrative of the author's experiences; the rest gives a list of the birds met with, with his observations on their breeding and other habits.

1837. FAIRHOLME, G. Observations on Woodcocks and Fieldfares breeding in Scotland. < *Charlesw. Mag. Nat. Hist.*, i, 1837, pp. 336-340.
1837. HOY, J. D. A Notice of the Occurrence of Two Species of the Genus *Tringa*, new to the British Islands; with a List of the rarer Birds killed in Suffolk, and the adjoining Borders of Norfolk and Essex, from the Autumn of 1835 to December, 1836. < *Charlesw. Mag. Nat. Hist.*, i, 1837, pp. 115-118.
1837. KIDD, W., and others. Some account of the Birds of Godalming. < *Entomol. Mag.*, iv, 1837, pp. 263-275.
- Not seen.

- 1837-52. MACGILLIVRAY, W. A | History | of | British Birds, | indigenous and migratory: | including | their organization, habits, and relations; | remarks on classification and nomenclature; | an account of the principal organs of Birds, and | observations relative to practical | ornithology. | Illustrated by | numerous engravings. | By William Maegillivray, A. M., F. R. S. E. | Member of the Wernerian Natural History Society of Edinburgh, of the Natural | History Society of Philadelphia, of the Royal Physical and Cuvierian | Societies, &c.; and Conservator of the Museum of the Royal | College of Surgeons of Edinburgh. | Vol. I [-V]. | [mut. mut.] | London: | printed for Scott, Webster, and Geary, | 35, Charterhouse Square [mut. mut.]. | 1837[-1852]. 5 vols. 8vo. *As follows* :—

. . . Vol. I. | Rasores, Scrapers, or Gallinaceous Birds; | Gemitores, Coopers, or Pigeons; | Deglubitores, Huskers, or Conirostral Birds; | Vagatores, Wanderers, or Crows and allied Genera. | [Imprint as above.] | 1837. 2 p. ll., pp. i-xvi, 1-631, figg. 1-95, pll. i-ix.

. . . Vol. II. | Cantatores, Songsters. | [Imprint as above.] | 1839. 2 p. ll., pp. i-xii, 1-503, figg. 96-185, pll. x-xiii.

1837-52. MACGILLIVRAY, W.—Continued.

. . . Vol. III. | Reptatores, Creepers; Scansores, Climbers; Cuculinae; | Raptatores, Plunderers, or Rapacious Birds; | Excursores, Snatchers; Volitantes, Gliders; | Jaclatores, Darters. | [Imprint as above.] | 1840. 1 p. l., pp. i-xii, 1-768, figg. 186-276, pll. xiv-xxii.

. . . Vol. IV. | Cursores, or Runners. | Tentatores, or Probers. | Aucupatores, or Stalkers. | Latitores, or Skulkers. | London: | William S. Orr, and Co., Amen Corner, | Paternoster Row. | 1852. pp. i-xxviii, 1-700, figg. 1-59, pll. xxiii-xxvi (or i-iv).

. . . Vol. V. | Cribratores, or Sifters. | Urinatores, or Divers. | Mersatores, or Plungers. | [Imprint as last above.] | 1852. pp. i-xx, 1-588, figg. 60-100, pll. xxvii-xxix (or v-vii).

The last 2 vols. having thus a different imprint from that of the first 3, and being separated therefrom by a considerable interval of time (during which Engelmann's *Bibl.* appeared), the work has sometimes been cited as of only 3 vols. But the 5 vols. are continuous and uniform parts of one "History."

This is Macgillivray's *opus magnum*: not to be confounded with his "Manual" in 2 vols., 1840-42.

Opinion differs greatly respecting the merit of Macgillivray's work, and it is not easy to decide in a case where one's estimate must depend so much upon whether one *likes* the author or not; for this writer's personality colors his work throughout, and almost necessarily impresses itself upon the reader. For instance, Macgillivray is to me personally so agreeable a companion, that I doubt not that my warm appreciation of his ability and acquirements is open to a charge of favoritism. His writings attract me strongly; and possess for me the nameless fascination that thousands have felt in perusing the pages of Gilbert White or of Alexander Wilson. Macgillivray appears to have been of an irritable, highly sensitized temperament, fired with enthusiasm and ambition, yet contending, for some time at least, with poverty, ill-health, and a perhaps not well-founded though not therefore the less acutely-felt sense of neglect; thus ceaselessly nerved to accomplish, yet as continually haunted with the dread of failure. The result of such an unstable equilibrium as this will depend mostly upon circumstances; there is the *inpotus* within, but the direction it takes will be along the line of least resistance. This author was undoubtedly unwise in his frankness; but diplomacy is a stranger to such characters. The strength of our universal instinct of self-preservation sometimes converts an attitude intended to be simply defensive into one positively offensive; and Macgillivray's way of handling people whom he disliked or despised often savored of arrogance. It may be doubted that there was really any "holier than thou" feeling at heart, whatever his seeming assumption of superior knowledge or greater love of truth in comparison with his peers. If he never hesitated to differ sharply with any one, or to express his own views pointedly—if he scarcely disguised his contempt for triflers, blockheads, pedants, compilers, and theorizers—if he was also fallible, even as the rest of us—he was nevertheless a lover of nature, an original thinker, a hard student, and, finally, an ornithologist of large practical experience, who wrote down what he knew or believed to be true with great regard for accuracy of statement and in a very agreeable manner.

I suppose this elaborate and extended "History" to be one of the most accurate and reliable of the many which handle the same subject; and it is doubtless, to many besides myself, one of the most entertaining. I am competent to judge of the fidelity of Macgillivray's pictures of bird-life only in the instances of birds common to America and Europe; but in such cases they tally well with my own experiences; and when writing descriptions of the form and colors of birds, I find it of no little assistance to have Macgillivray's page before me as well as the specimens themselves. There is no question of this author's accuracy and clearness in describing specimens in hand.

Besides the specific descriptions which form most of the text of this work, there is a good deal of general ornithology in the matters of classification and anatomy—the latter especially relating to the structure of the digestive system, upon which the author's classification is so largely based. For Macgillivray, it will be remembered, discovered or invented for himself a classification of birds, which has at least the merit of being original with him, and of representing conclusions derived from actual observation. He developed his system consistently, and published it with express unconcern for its fate at the hands of others; he liked it, and if others did not, so much the worse for them—did they expect him to furnish brains also? The outline of this system may be seen from the above title. Though based upon anatomical structure, it is, in fact, one of the purest physiological or so-called "teleological" classifications we have had; worked out upon the *adaptive modifications* of certain organs. It thus proceeds upon what appears to an Evolutionist of to-day to be a radically false premise; and its agreement in any points with a scheme based upon purely morphological con-

1837-52. MACGILLIVRAY, W.—Continued.

siderations of the theory of descent must be regarded as rather fortuitous than essential. At the time he wrote, Evolution had no place in taxonomy; to-day, we utterly discard any scheme of classification, however convenient or however specious, that does not proceed upon the understanding that all birds are descended from a common ancestor, and consequently bear to each other simply the relation of parent and offspring; that classification is entirely a matter of our skill or luck in tracing pedigree to construct a genealogical table; and that there is no such entity in nature as a genus or a species was supposed to be when Macgillivray studied birds.

A marked feature of this work is the numerous chapters on "Practical Ornithology", that is to say, on field work in this branch of science. These are given in the form of personal narrative, with gossipy incident and imaginary dialogue,—the hint of which seems to have been taken from the similar sketches of scenery and character which Audubon introduced in his "Ornithological Biography". They reflect many reminiscences of the author's intimate personal relations with the "American backwoodsman". These two seem to have been very congenial spirits; and what jolly times they must have had o' nights, after their tramps, in some snuggerly with a bottle between them! . . .

William Macgillivray has one very high claim upon the regard of American ornithologists: he was the source of Audubon's inspiration in all that pertains to the technic of the latter's great work. "Not to put too fine a point upon it," he furnished nearly all the "ornithology" of Audubon's work, as distinguished from the portraits that the Frenchman drew either with pen or with pencil. Audubon was primarily, and chiefly, an animal painter, and he finally acquired no little familiarity with bird-life; but he began to paint without the slightest idea of ornithology, and never attained even mediocrity as a strict scientist. He loved warmth, color, action; he liked to exaggerate and "embroider", and make his pages glow like a humming-bird's throat, or like one of his own marvellous pictures; he had no genius for accuracy, no taste for dull, dry detail, no care for a specimen after he had drawn it. Macgillivray supplied what was necessary to make his work a contribution to science as well as to art. In fact he wrote a good deal of Audubon's book. After Audubon had told us how his heart beat when the woods echoed to the report of his gun, and he picked up a lovely warbler which he had long sought for, but until then in vain—conveying an impression of years of solicitude about something that he probably never thought of till he stumbled on it accidentally—after all this, and the execution of a beautiful plate, Macgillivray would furnish his friend a technical name and description. The anatomical matter of Audubon's work is probably all Macgillivray's; and the final classification and nomenclature are from the same source. It will be remembered that the names and whole arrangement of the birds in Audubon's *Orn. Biogr.*, 1831-39, were changed in the *Synopsis*, 1839, and in the 8vo ed., 1840-44. This was entirely due to Macgillivray's hand in the matter. Macgillivray is accredited with several of the biographies in Audubon's volume; but the full extent of his joint-authorship is not generally known. There seems to have been some mutually satisfactory understanding between the two, which has never been made public. I allow these facts to go on record, not in the least to the disparagement of a brilliant and famous author, but in simple justice to a stronger, sounder, and no less agreeable ornithologist.

1837. MOORE, E. On the Birds of Devonshire. < *Charlesw. Mag. Nat. Hist.*, i, 1837, pp. 113-115.

The present article includes only the *Raptores*, an annotated list of which is given. It is succeeded by four articles of similar character, each with modified caption: see next four titles.

1837. MOORE, E. On the Passerine Birds of Devonshire. < *Charlesw. Mag. Nat. Hist.*, i, 1837, pp. 176-180.

1837. MOORE, E. Climbing and Gallinaceous Birds of Devonshire. < *Charlesw. Mag. Nat. Hist.*, i, 1837, pp. 227-229.

1837. MOORE, E. On the Wading Birds of Devonshire. < *Charlesw. Mag. Nat. Hist.*, i, 1837, pp. 319-323.

1837. MOORE, E. On the Web-footed Birds of Devonshire. < *Charlesw. Mag. Nat. Hist.*, i, 1837, pp. 360-366.

This article ends the series.

1837. SALMON, J. D. New *Tringa*, shot near Yarmouth. < *Charlesw. Mag. Nat. Hist.*, i, 1837, p. 54.

T. platyrhyncha, new only as to the locality. The article includes some other rarities of the same region.

1837. SELBY, P. J. An account of two rare British Birds (*Falco apivorus* and *Scolopax sabinii*). < *Trans. Nat. Hist. Soc. Northumb. and Durh.*, ii, 1837, pp. 272-276.
Not seen.
1837. TEMPLETON, R. Irish Vertebrate Animals: selected from the Papers of the late John Templeton Esq., Cranmore. < *Charlesw. Mag. Nat. Hist.*, i, 1837, pp. 403-443.
Annotated list of the Birds, pp. 404-408.
1837. THOMPSON, W. Birds, new to Ireland [*Strix scops*, *Colymbus arcticus*, *Procellaria puffinus*]. < *P. Z. S.*, v, 1837, pp. 54, 55.
1837. THOMPSON, W. Contributions to the Natural History of Ireland. < *Mag. of Zool. and Bot.*, i, 1837, pp. 459-465.
Part of a paper read before the *Linn. Soc.*, Apr. 15 and June 3, 1834. 3 spp., *Sterna stolidus*, *Larus sabinii*, *Cygnus bewickii*.
1837. THOMPSON, [W.] Vögel und Fische, worunter viele neu für Irland. < *Oken's Isis*, Bd. xxx, 1837, pp. 131-135.
Proc. Zool. Soc. Lond., 1835, p. 77.
1837. WHITE, G. (Ed. Bennett.) The | Natural History | and Antiquities | of | Selborne. | By the | Rev. Gilbert White, M. A. | With | The Naturalist's Calendar; | and Miscellaneous Observations, | extracted from his Papers. | [Cut.] | A New Edition; | with notes, by Edward Turner Bennett, Esq. | F. L. S. etc. Secretary of the Zoological Society; | and others. | — | London: | printed for J. and A. Arch [and fifteen others—not all the same as those named in the 1833 ed.]. n. d. (1837.) 1 vol. 8vo. pp. i-xxiv, 1-640, 46 illust.
"This remains as yet the standard edition of the work. E. T. Bennett died as it was passing through the press, and the Preface bears the initials ("I. J. B.") of his brother, and is dated 1836; but the volume is believed (cf. Thompson, *Birds of Irel.*, i, p. 199, note) to have appeared in 1837. Besides a selection from the notes given in Rennie's edition (cf. *supra*, 1833), others are added by Prof. Bell ("T. B."), Daniell ("G. D."), Prof. Owen ("R. O."), and Yarrell ("W. Y."): the woodcuts, many by Harvey, are good." (Comment from Newton, 1877.)
1837. WILLIAMSON, W. C. [Notes on the appearance of rare Birds in the vicinity of Scarborough.] < *Lond. and Edinb. Philos. Mag.*, x, 1837, pp. 287, 288.
From *P. Z. S.*, Aug. 9, 1836, pp. 76, 77.
1837. "W. L." Notice of the Breeding of Woodcocks in Selkirkshire; with Observations upon the Habits and Manners of the Black and Red Grouse, and Carrion Crow, in Scotland. < *Charlesw. Mag. Nat. Hist.*, i, 1837, pp. 118-122.
1837. WOOD, N. Late Singing of [British] Birds. < *Charlesw. Mag. Nat. Hist.*, i, 1837, pp. 53, 54.
- 1837-43. YARRELL, W. A | History | of | British Birds. | By | William Yarrell, F. L. S. V. P. Z. S. | [Arms and motto—mut. mut.] | Illustrated by 520 wood-engravings. | In Three Volumes.—Vol. I [-III]. | London: | John Van Voorst, Paternoster Row. | [1837 to] M. DCCC. XLIII. 3 vols. 8vo. Vol. I, being Parts i-xi, July, 1837-March, 1839, pp. i-xxxii (title, preface, and index), pp. 1-526 (text), 527, 528 (temporary index); also, pp. 268*, 316*, 416*.—Vol. II, being Parts xii-xxv, May, 1839-July, 1841, 2 p. ll., pp. 1-670, and p. 232*.—Vol. III, being Parts xxvi-xxxvi, Sept., 1841-May, 1843, 2 p. ll., pp. 1-528. Numberless cuts in all the vols. Pub. in 36 bimonthly Parts, of 3 sheets (48 pp.) each; furnishings with last part.
The title, preface, and index were issued with the concluding part, in May, 1843.—Part I, pp. 1-48, or 3 sheets, appeared in July, 1837—the rest at bimonthly intervals: thus, Part II, pp. 49-96, in Sept., 1837, etc.—The last part also included the accounts of several species added to the British Fauna during the progress of the work, printed on single leaves to be inserted in the body of the work, as follows: Savi's Warbler, Vol. I, p. 268*; Dalmatian Regulus, Vol. I, p. 316*; Short-toed Lark, Vol. I, p. 416; American Purple Martin, Vol. II, p. 232*.
There are also two SUPPLEMENTS, of dates 1845 and 1856, *which see*. One of these is the Supplement to the 1st ed., and may be found bound therewith (pp. 54). The other is a "second supplement", or "First supplement to the Second Edition" (pp. x. 72), and may similarly be found bound therewith.

1837-43. YARRELL, W.—Continued.

The following are the editions of this celebrated work:—

1837-43. *EDITIO princeps, ut supra.*

1845. (Supplement to the same. 8vo. London. Van Voorst. pp. 54.)

1845. *SECOND edition.*

1856. (Supplement to the same. 8vo. London. Van Voorst. pp. x, 72.)

1856. *THIRD edition.*

1871-188-. *FOURTH edition (now in progress).*

"Many recent wood-engravers have approached Bewick, but none have yet equalled him. Among the most successful of these the Messrs. Thompson of London must be specially mentioned. Their woodcuts in Yarrell's 'British Birds' are beautiful works of art; in delicacy of execution they often exceed the engravings of Bewick; but the occasional stiffness of attitude in the birds, and a conventional *sketchiness* in the accompaniments, indicate the professional artist and not the self-taught child of Nature. The beauty of Yarrell's 'British Birds' is much enhanced by improvements in the preparation of paper and ink, and in the mode of taking off the impressions which have been introduced since Bewick's time. It is probable that if the wood-blocks of Bewick, now in the possession of the great engraver's family, were intrusted to one of our first-rate London printers, an edition of Bewick's 'Birds' could be now produced, far superior in execution to any which was issued in the lifetime of the author."—(*Rep. Brit. Assoc.* for 1844, 1845, p. 202.)

1833. COUCH, J. A | Cornish Fauna: | being a compendium | of the Natural History | of | the county, | Intended to form a Companion to the Collection in the Museum of the Royal | Institution of Cornwall. | — | Part I, | containing the | Vertebrate, Crustacean, | and a portion of the | Radiate Animals. | — | By Jonathan Couch, F. L. S., &c. &c. | — | Truro: | Printed for the Royal Institution of Cornwall, | By L. E. Gillet. | — | 1838. 1 vol. 8vo. pp. i-vi, 5-84.

There are three parts of this "Cornish Fauna": Pt. II. 1841, by the same; Part III. 1844, by Richard Q. Couch. Part I, as above, is occupied with Birds at pp. 10-30; being an annotated list of species. *

1833. EDITORIAL. [Notice of Macgillivray's History of British Birds, Vol. I. < *Mag. of Zool. and Bot.*, ii, 1838, pp. 267-269.

- 1838-39. EYTON, T. C. An Attempt to ascertain the Fauna of Shropshire and North Wales. < *Ann. of Nat. Hist.*, i, 1838, pp. 285-293; ii, 1839, pp. 52-56.

An annotated list of species.

- 1838-43. JARDINE, W. The | Naturalist's Library. | Edited by | Sir William Jardine, Bart., | F. R. S. E., F. L. S., etc., etc. | Vol. I. [-IV.] | — | Ornithology. | Birds of Great Britain and Ireland.—Part I. [-IV.] | By the Editor. | — | Edinburgh: W. H. Lizars, [etc.] n. d. [1838-1843.] 4 vols. sm. 12mo. Vol. I, 1838, portrait of Sibbald, eng. title, other title, contents, 1 leaf, pp. 17-315; unnumbered woodc., pll. col'd 1-34. Vol. II, portrait of Smellie, eng. and col'd title, other title, contents, 1 leaf, pp. 17-409; cuts, pll. col'd 1-30 (with title-vignette and portrait = 32 plates). Vol. III, 1842?, portrait of Rev. Dr. Walker, eng. title, other title, contents, pp. 17-349; cuts, pll. col'd 1-34 (+ portrait and vignette = 36, not "34" as said by the editor). Vol. IV, 1843, portrait of Wilson, eng. title, other title, contents, 1 leaf, pp. 17-313; cuts, pll. 1, 2, 2*, 3-30 (with portrait and vignette = 33 plates).

Vol. I = "IX", Vol. II = "XI", Vol. III = "XII", Vol. IV = "XIV", of the general arrangement of the series; see *Jard. Nat. Libr.*, 1833-1844. The 1st vol. treats of *Raptores*; 2d, *Dentirostres, Conirostres, Scansores, Tenuirostres, Fissirostres*; 3d, *Gallinae and Gallae*; 4th, *Natatores*; with memoirs of the persons whose respective portraits are prefixed.

The pleasure of handling the admirable and most attractive publications of which the Baronet is author or editor, in some moments gives way to a feeling of vexation at the offishness, or amateurishness, which seems to disdain the conventionalities of book-making.

1838. SELBY, P. J. The Fauna of Twizell. < *Mag. of Zool. and Bot.*, ii, 1838, pp. 387-397.

One of a series; chiefly ornithological; general sketch of the avifauna, and nominal list of 112 spp.

1838. SELBY, P. J. Ueber die vierfüssigen Thiere und Vögel in der Grafschaft South-land in Schottland im Sommer 1834. < *Oken's Isis*, Bd. xxxi, 1838, pp. 68-73.

Aus d. *Edinb. New Philos. Journ.*, vol. xx, p. 156-161, 286-295.

1838. SKAIFE, J. Miscellaneous Ornithological Notes [on birds of Lancashire]. < *Charlesw. Mag. Nat. Hist.*, ii, 1838, pp. 331-334.
1838. SKAIFE, J. On the Ornithology of Blackburn and the North of Lancashire. < *Charlesw. Mag. Nat. Hist.*, ii, 1838, pp. 426-433, 524-531.
Annotated list of 119 spp.
1838. THOMPSON, W. Contributions to the Natural History of Ireland. < *Mag. of Zool. and Bot.*, ii, 1838, pp. 42-57, 170-179, 427-440.
These articles treat at length of the Irish *Raptores*, and of some of the *Insectores*.
1838. THOMPSON, W. Contributions to the Natural History of Ireland. < *Annals of Nat. Hist.*, i, 1838, pp. 12-26, 181-195.
These articles are Nos. 5 and 6, being continued from the *Mag. of Zool. and Bot.*, ii, p. 440.
1838. THOMPSON, W. Notes on Irish Birds. < *Annals of Nat. Hist.*, i, 1838, pp. 155-158.
7 spp.
1838. THOMPSON, W. Notes upon the Natural History of a portion of the South West of Scotland. < *Charlesw. Mag. Nat. Hist.*, ii, 1838, pp. 18-21.
Of Birds, treats of *Merops apiaster*, *Larus islandicus*, and *Sula bussana*.
1838. WILLIAMSON, [W.] C. Seltene Vogel bey Scarborough, welches eine Art Halbinsel bildet und mit Wald bedeckt ist. < *Oken's Isis*, Bd. xxxi, 1838, p. 194.
Auszug aus *Proc. Zool. Soc. Lond.*, Aug., 1836, pp. 76, 77.
1839. ARGENT, J. A | Nomenclature | of | British Birds, | being | a systematic Catalogue | of | all the species hitherto discovered | in | Great Britain and Ireland, | intended for | labelling collections | of | British Birds and their Eggs. | — | By James Argent, | 32, Bishopsgate Street, Without. | — | London: | printed for the Proprietor, | by | Lewis and Co., Bunnhill Row. | M DCCC XXXIX. 1 vol. 8vo. cover-title, regular title, and 2^s columns, 2 on a leaf, each page backed blank.
Names only, in large type, to be cut up for labelling.
1839. BLYTH, E. Observations on the Wild Fowl in St. James's Park. < *Charlesw. Mag. Nat. Hist.*, ii, 1839, pp. 469-471.
1839. DOUBLEDAY, H. A Nomenclature of British Birds; being a systematic catalogue of all the species hitherto discovered in Great Britain and Ireland, intended for labelling collections of British Birds and their eggs. Third edition. London: John Van Voorst. 1839. 8vo.
Not seen: nor do I know of other editions.
1839. [EDITORIAL.] Geographical Distribution of British Birds. < *Annals of Nat. Hist.*, iv, 1839, pp. 213, 214.
From Fellows's *Journal in Asia Minor*.
1839. MITCHELL, D. W. Capture of rare Birds [in Britain]. < *Charlesw. Mag. Nat. Hist.*, iii, 1839, p. 467.
1839. PAINE, T., JR. A few particulars respecting some Rare Birds which have lately occurred in the Vicinity of Yarmouth. < *Annals of Nat. Hist.*, iii, 1839, pp. 140-142.
1839. THOMPSON, W. Zoological Notes on a few Species obtained from the South West of Scotland. < *Charlesw. Mag. Nat. Hist.*, iii, 1839, pp. 585-587.
Lestris pomarinus the only bird.
1839. THOMPSON, W. Note on the Effects of the Hurricane of January 7, 1839, in Ireland, on some Birds, Fishes, &c. < *Annals of Nat. Hist.*, iii, 1839, pp. 182-185.
1839. THOMPSON, W. Notes on [4 spp. of] Irish Birds. < *Annals of Nat. Hist.*, iv, 1839, pp. 284, 285.
1840. COWARD, C. Notes on [3 spp. of] British Birds. < *Ann. Mag. Nat. Hist.*, vi, 1840, pp. 74, 75.
1840. DENNY, H. Sketch of the Natural History of Leeds and its Vicinity for Twenty Miles. < *Annals of Nat. Hist.*, v, 1840, pp. 382-396.
Annotated list of about 160 spp. of Birds, pp. 387-392.

1840. GUTCH, J. U. G. Hoopoe.—Little Stint [in England]. < *Ann. Mag. Nat. Hist.*, vi, 1841, pp. 236, 237.
1840. LINGWOOD, R. M. A short Outline of a Fauna for Part of Herefordshire. < *Annals of Nat. Hist.*, v, 1840, pp. 184-188.
Annotated list of 76 spp. of Birds, pp. 185-187.
- 1840-42. MACGILLIVRAY, W. A [Manual] of [British Ornithology: | being a short description of the | Birds of Great Britain and Ireland, | including the essential characters of the species, | genera, families, and orders. | By | William Macgillivray, A. M., M. W. S., &c. | Conservator of the museum of the Royal College of | Surgeons of Edinburgh; lecturer on botany in Queen's College, | and in the Scottish Institution; author of a History of British Birds, | Manuals of Geology, Botany, &c. | Part I. The Land Birds [II. The Water Birds]. | London: | printed for Scott, Webster, and Geary, | Charterhouse Square. | — | 1840 [1842]. 2 vols. sm. 8vo. Vol. I, 1840, pp. 1-248, with 6 ll. of advtvs., and 31 woodc. figs. Vol. II, 1842, pp. 1-272.
Characters of the genera and higher groups, concise descriptions, with synonymy, and biographical items of the species, preceded by tables of the classification adopted and by an essay on structure of birds and general principles of the science. 320 or 323 spp.; 143 res. dent, 44 in summer, 36 in winter, 23 visitors from the north, 55 from the south and east, 19 from the west. British Birds are grouped in 19 "orders".—*Raptrices, Volitatrices, Cœuline Birds, Jaculatrices, Excursives, Vagatrices, Cantatrices, Deglubitricæ, Reptatrices, Scandriees, Gemitricæ, Radrices, Cursitricæ, Tentatricæ, Latitricæ, Aucupatricæ, Cribratricæ, Urinatricæ, Mersatricæ.*—An arrangement virtually in close accord with some approved systems based upon morphological considerations.
This appears to be the original edition of the *Manual*; if so, it is very incorrectly cited by Engelmann. *Bibl.* p. 411. There is a later ed. of the same. The *Manual* must not be confused with the author's greater work, *History of British Birds*, in 5 large 8vo vols., 1837-52, q. v.
1840. THOMPSON, W. Additions to the Fauna of Ireland. < *Annals of Nat. Hist.*, v, 1840, pp. 6-14.
3 spp. of Birds.
1840. THOMPSON, W. Notes on [5 spp. of] Irish Birds. < *Annals of Nat. Hist.*, v, 1840, pp. 354, 355.
1840. TREVELYAN, W. C. Abundance of Wild Swans in the Highland Lochs does not necessarily indicate a severe Winter in Iceland and Faroe. < *Edinb. New Philos. Journ.*, xxix, 1840, p. 423.
1840. WHITE, G. (*Ed. Brown.*) The Natural History of Selborne. . . . "Eighth Edition." London: John Chidley, 123, Aldersgate Street. MDCCCXL.
Not seen. See the orig. Brown ed. of 1833. It would appear, from this title, that there were eight issues of the Brown ed. between 1833 and 1840; but I have not been able to learn of so many as this, and it may be doubted that such number of editions, in a proper sense, actually appeared. No one appears to have taken full account of the many reappearances of the insignificant Brown version of "Selborne."
1841. BROWN, J. Capture of some Rare Birds on the Cotswold Hills. < *Ann. Mag. Nat. Hist.*, vi, 1841, p. 395.
1841. GOATLEY, T. The Hoopoe.—The Arctic Gull. < *Ann. Mag. Nat. Hist.*, viii, 1841, p. 235.
In England.
1841. GUTCH, J. U. G. [On rare species of Birds taken near Swansea.] < *Ann. Mag. Nat. Hist.*, vi, 1841, p. 396.
1841. MACGILLIVRAY, J. Account of the Island of St. Kilda, chiefly with reference to its Natural History; from Notes made during a Visit in July 1840. < *Edinb. New Philos. Journ.*, xxxii, 1841, pp. 47-70.
An excellent account of the birds, particularly of *Fulmarus glacialis*, occupies much of this paper.
1841. MACGILLIVRAY, J. Notes on the Zoology of the Outer Hebrides. < *Ann. Mag. Nat. Hist.*, viii, 1841, pp. 7-16.
Chiefly ornithological.

1841-43. THOMPSON, W.—Continued.

221-230, 373-381; x, 1842, pp. 50-59, 171-179; xi, 1843, pp. 283-290; xii, 1843, pp. 31-38, 254-258.

This is an interesting and valuable series of articles on Irish ornithology, each having, after the running part of the title here given, a modified caption which I omit in order to bring the series together. It is in some sense a prologue of the author's standard treatise which appeared later. Thompson was very active in these matters for some years, as his numerous contributions to various periodicals testify.

1841. WHITE, G. (*Ed. Lady Dover.*) The | Natural History of Selborne. | By | The Rev. Gilbert White, A. M., | Fellow of Oriel College, Oxford. | [Cut.] | New-York: | Harper and Brothers, Cliff-street. | — | 1841. 1 vol. 18mo. Title-p.; pp. vii-x (account of White, and index); 1 l., list of engr.; pp. 13-335; with 52 woodcuts.

This is the original issue of the Harpers' American reprint of the *Lady Dover* edition, being No. 147 of the *Family Library*. By the courtesy of the publishers themselves I am informed of the successive issues, as follows:—1842 (two), 1847, 1853, 1855, 1859, 1868.

It is a reprint of the 'bowdlerized' edition (London, 1833), "arranged for young persons", for which we are indebted to the mother (*Lady Dover*) of H. A[gar], E[llis]. White said little not *virginibus puerisque*, but was castrated nevertheless. It is a curious thing about this ed. that all the woodcuts in the first part (to Pennant) are reversed, while those in the second part (to Barrington) are not. A new woodcut is introduced at p. 223, instead of the original of the Mistletoe Thrush.

1841. WILSON, J. Additional Notice regarding St. Kilda. < *Edinb. New Philos. Journ.*, xxxii, 1841, pp. 178-180.

Only ornithological in reference to *Coracias garrula*.

1842. DALE, J. C. Fauna of Dorsetshire. < *Ann. Mag. Nat. Hist.*, viii, 1842, pp. 472, 473.

Notices briefly some of the rarer Birds.

1842. FLEMING, J. History | of | British Animals, | exhibiting the descriptive characters and systematical | Arrangement | of | the genera and species of Quadrupeds, Birds, | Reptiles, Fishes, Mollusca, and Radiata | of the United Kingdom; | including | the indigenous, extirpated, and extinct | kinds, together with periodical | and occasional visitors. | — | By John Fleming, D. D. F. R. S. E. M. W. S. &c. | Minister of Flisk, Fifeshire; | and author of the "Philosophy of Zoology." | — | Second Edition. | — | London: | Duncan and Malcolm, Paternoster Row. | MDCCCXLII. 1 vol. 8vo. pp. i-xxiv, 1-566, 1 l.

Orig. ed. much earlier (Preface dated 27 Dec., 1827).

Birds, pp. 41-146; a systematic synopsis (by no means a "history") of 237 spp., treated with brief diagnosis, a little synonymy, and fair descriptions, some of which include remarks on habits, &c., interspersed with analyses of higher groups.

The author's classification is—Order I. *Fissipedes* (Land Birds). Tribe I, *Terrrestres*: Sect. I. *Ambulatores*, with 4 groups, *Gallinadæ*, *Columbadæ*, *Accipitres*, *Passeres*; Sect. II. *Scan-sores*. Tribe II, *Grallæ*. Order II. *Palmipedes* (Water Birds).

1842. GURNEY, J. H. Norfolk Birds. < *Ann. Mag. Nat. Hist.*, ix, 1842, p. 79.
4 spp.1842. GURNEY, J. H. Norfolk Birds. < *Ann. Mag. Nat. Hist.*, ix, 1842, p. 333.
4 spp.1842. MUMMERY, S. Birds of Kent. < *Ann. Mag. Nat. Hist.*, x, 1842, pp. 238, 239.
Notices of a few species. See same author, 1841.

1842-50. MEYER, H. L. Coloured | Illustrations | of | British Birds, | and their | Eggs. | By H. L. Meyer. | Vol. I [-VII]. | Containing sixty [60, 60, 60, 60, 60, 72,] plates. | [Vignette.] | London: | G. W. Nickisson, 215, Regent Street, | Successor to the late James Fraser [Simpkin, Marshall, & Co.]. | 1842 [-1850]. 7 vols. 8vo. Vol. I, 1842, pp. i-iv, 1-230, pll. 60; Vol. II, 1844, pp. i-iv, 1-233, pll. 60; Vol. III, 1846 (imprint changes), pp. i-iv, 1-240, pll. 60; Vol. IV, 1847, pp. i-iv, 1-215, pll. 60; Vol. V, 1848, pp. i-iv, 1-192, pll. 60; Vol. VI, 1849, pp. i-iv, 1-185, pll. 60; Vol. VII, 1850, pp. i-iv, 1-206, pll. 72.—In all, 432 plates, mostly coloured. Pub. in parts.

This is a reissue of the original 4to ed., pub. in 78 numbers of (about?) 4 pll. col'd each, 1835

1842-50. MEYER, H. L.—Continued.

to 1843. The present 8vo edition was also published in parts, 1842-50, but the number and dates of them are unknown to me. It is said to resemble the orig. 4to ed. in all respects except in size. I see cited an 8vo ed. as of "1852"; is it anything more than other copies of the present?

Of the plates of Birds, there were published in Vol. I, pll. 1-45; Vol. II, pll. 46-90; Vol. III, pll. 91-135; Vol. IV, pll. 136-180; Vol. V, pll. 181-225; Vol. VI, pll. 226-270; Vol. VII, pll. 271-322. The rest of the plates, 110 in number, making up the 432, are of eggs. I don't know in what order they appeared, but suppose one or more of them with each part of the work.

1842. WHITE, G. *Natural History of Selborne, &c.* New York: Harper Brothers. 1842. 1 vol. 18mo.

There were two issues of the Harper edition of this date. The Harper Brothers originally issued the work in 1841; reissued it in 1842 twice, in 1847, 1853, 1855, 1859, 1868.

1843. ANDREWES, T. *Directions for Keeping British Cage Birds, . . .* London. Limbird. 1843. 12mo. pp. 36.

Not seen.

1843. ANON. Note on [British] Birds in March. < *Zoologist*, i, 1842, p. 81.
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1845. LUBBOCK, R. Observations | on the | Fauna of Norfolk, | and more particularly on | the District of the Broads. | By | the Rev. Richard Lubbock, | Rector of Eccles. | Norwich: | Charles Musket, Old Haymarket. | Longman & Co., London. | — | MDCCCXLV. 1 vol. 8vo. pp. i-viii, 1-156, map, 2 plates.
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1849. HIGGINS, E. T. Rare Birds in Yorkshire. < *Zoologist*, vii, 1849, p. 2569.
Thalassidroma bulweri, *Lestris* sp., *Anthus richardi*.
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Scelopax brehni, *Uria lomvia*, *Thalassidroma pelagica* (sic), *Boschas bimaculata*, *Motacilla boarula*, *Upupa epops*.
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This is the orig. ed.: 2d ed., 18-; 3d ed., 1855.

This is a popular contribution to the Fauna of Sussex, pleasantly written, and possessing attractions for the sportsman as well as the ornithologist. The systematic Catalogue occupies pp. 181-250. The illustrations are by the author, from nature. The volume doubtless awakened a taste for pursuits similar to the author's in some who before passed unobservant along the shores and through the woods of Sussex.

1849. LUCAS, W. Occurrence of the Water Ouzel (*Cinetus* [sic] *aquaticus*) and Bearded Tit (*Calamophilus biarmicus*) near Hitchin. < *Zoologist*, vii, 1849, p. 2346.
- 1849-50. MATTHEWS, A., and MATTHEWS, H. The Birds of Oxfordshire and its Neighbourhood. < *Zoologist*, vii, 1849, pp. 2423-2433, 2531-2541, fig., 2592-2503, fig., 2623-2626; viii, 1850, pp. 2736-2739.
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1849. MORRIS, B. R. Note on the Colour of the Down of Water Birds. < *Zoologist*, vii, 1849, p. 2622.
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1849. NEWTON, A. Dates of Departure of Migratory Birds at Elveden in 1848. < *Zoologist*, vii, 1849, p. 2382.
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1849. RODD, E. H. Occurrence of the Osprey, Pied Flycatcher and Reed Wren at Scilly. < *Zoologist*, vii, 1849, p. 2620.
1849. "RUSTICUS." [NEWMAN, E.] The Letters of Rusticus on the Natural History of Godalming; extracted from the Magazine of Natural History, the Entomological Magazine, and the Entomologist. London: John Van Voorst, Paternoster Row. 1849.
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From "The Natural History of Ireland".
- 1849-51. THOMPSON, W. The | Natural History | of | Ireland. | — | Vol. I [-III]. | Birds, | comprising the orders | [mut. mut.] | — | By | Wm. Thompson, Esq., | [etc., 3 lines.] | London: | Reeve, Benham, and Reeve, King William Street, Strand. | — | 1849 [1850, 1851.] 3 vols. 8vo. Vol. I, 1849, Raptors and Insessores, pp. i-xx, 1-434. Vol. II, 1850, Rasores and Grallatores, pp. i-xii, 1-350. Vol. III, 1851, Natatores, pp. i-viii, 1-492. (A fourth Vol., on Mammals, added in 1856.)

This is a systematic treatise on all the Birds known to occur in Ireland, very interesting and reliable, by a gentleman whose numerous detached papers on the same subject, no less than the present work, show him to have been a close, accurate and faithful observer for a period of years, and whose results are sufficient to place him among the very first writers on this special subject. It may be not inapt to compare him with his Scotch compeer, Macgillivray, at least in originality, fidelity, and diligence. The work is a practical out-of-doors ornithology, carefully digested in the study, with abundant consultation of other writers.

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1850. ADAMS, H. G. Favourite Song Birds, being a popular description of the Feathered Songsters of Britain, Edited by H. G. Adams. With a coloured illustration, designed and lithographed by Edward Gilks. London. Orr. 1850.
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Annotated. Resident natives, 38; migrant natives, 33; winter visitors, 9; occasional visitors, 14.
1850. KNOX, A. E. Game Birds and Wild Fowl: | their friends and their foes. | By | A. E. KNOX, M. A. F. L. S. | Author of "Ornithological Rambles in Sussex." | [*Monogram.*] | London: | John Van Voorst, Paternoster Row. | M.DCCC.L. | I vol. 12mo. pp. i-x, 1-254, 4 tinted plates.
Very agreeably written, like his former "Rambles," and derived nearly all from the author's own experiences with those birds of Great Britain which are usually objects of pursuit by the sportsman, and other animals which, whether justly or not, are supposed to be injurious to game birds.
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1851. ADAMS, H. G. Favorite Song Birds; | containing | a popular description | of the | Feathered Songsters of Britain; | with an account of their | Habits, Haunts, and Characteristic Traits. | Interspersed with | choice passages from

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the poets and quotations from eminent | naturalists. | Edited by H. G. Adams, | author of [etc.] | With Twelve Coloured Illustrations on Stone, | by Edward Gilks. | [Quotation, 4 lines.] | London: | published for the proprietors, by | W. S. Orr and Co., Amen Corner, Paternoster Row; | and North John Street, Liverpool. | J. M'Glaishan, Dublin; and J. Menzies, Edinburgh. | — | 1851. 1 vol. 16mo. pp. i-xii, 1-196, pll. 12.

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1852. PRIDEAUX, C. Occurrence of Rare Birds near Kingsbridge. < *Zoologist*, x, 1852, p. 3474.
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At pp. 109-189, the reader may ramble among the birds, in the author's pleasant company. Appendix by the American editor. Note U, pp. 299-307, treats more formally of a selection of English species "most likely to interest the reader." Note W, on the Robin. Note X, on the Goldfinch. Note Y, on the Skylark. The work first appeared in England about 25 years before, but I have yet to see a copy of the original.
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1853. NORMAN, A. M. Note on the late Nidification of Birds [in Oxfordshire]. < *Zoologist*, xi, 1853, p. 4072.
1853. RODD, E. H. Occurrence of the Long-eared Owl (*Strix Otus*) and Fire-crested Regulus (*Regulus ignicapillus*) near Penzance. < *Zoologist*, xi, 1852, p. 3753.
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1853. POWYS, T. L. Captures of various Birds in Oxfordshire. < *Zoologist*, xi, 1853, p. 3805.
1853. SMITH, A. C. Observations on the General Color and the occasional Variations in the Plumage of Birds. < *Zoologist*, xi, 1853, pp. 3969-3980.
Followed by a list of 57 spp. of British Birds, abnormal variations in the plumage of which have been recorded.
1853. STEPHENSON, J. W. Occurrence of the Blue-throated Warbler (*Sylvia suecica*), the Little Auk (*Uria Alle*), and the Black Redstart (*Sylvia Tithys*) near Worthing, in Sussex. < *Zoologist*, xi, 1853, p. 3907.
1853. THOMPSON, W. Supplementary Report on the Fauna of Ireland. < *Rep. Brit. Assoc. Adv. Sci. for 1852*, 1853, pp. 290-296.
Among birds, enumeration of 32 spp. not known as Irish at date of his *Report*, since ascertained to inhabit that country, with references to the authorities for the occurrences.
1853. WATTERS, J. J. The Natural History of the Birds of Ireland, Indigenous and Migratory, containing Descriptions of the Habits, Migrations, Occurrence and Economy of the two hundred and sixty-one Species comprised in the Fauna. By John J. Watters, Associate Member of the University Zoological Association. Dublin: James McGlaishan. London. W. S. Orr & Co. 1853. 1 vol. 12mo. pp. 300.
Not seen. Is the author's name Walter or Watter, Walters or Watters?
"This volume deserves to be widely circulated, and we heartily recommend it to our readers. It abounds with anecdote, and is written in popular style. They will find it to be an accurate history of our Irish birds—detailing most of their interesting features."—*Nat. Hist. Rev.*, i, 1854, pp. 8-12.

1853. WHITE, G. (*Ed. Jardine.*) The | Natural History and Antiquities | of Selborne, | with | Observations on various parts of Nature, | and | The Naturalist's Calendar. | By the late Rev. Gilbert White, A. M. | A new edition. | Edited, with notes, by | Sir William Jardine, | Bart. F. R. S. E. F. L. S. &c. | Completely illustrated with about seventy engravings, | comprising | subjects from natural history, and views of Selborne, its vicinity | and antiquities, sketched from nature expressly | for this edition. | London: | Nathaniel Cooke, Milford House, Strand. | 1853. 1 vol. 8vo. Engr. title, pp. i-xviii, 1-342, 4 animal plates, and 60 other illustr.

I have handled this ed., of which Prof. Newton remarks: "This forms a volume of the 'National Illustrated Library,' and, though the woodcuts are of inferior quality, is a very good edition. Facing p. 2 is a map of the vicinity of Selborne."

1853. WHITE, G. (*Ed. Lady Dorer.*) Natural History of Selborne, . . . New York: Harper Brothers. 1853. 1 vol. 18mo.

The original issue of the Harper edition was in 1841, which see.

1854. ANON. [Review of Watters' Natural History of the Birds of Ireland.] < *Nat. Hist. Rev.*, i, 1854, pp. 8-12.

1854. BIRKBECK, R. Remarks on a List of the Birds of West Cumberland [Zool. 4166]. < *Zoologist*, xii, 1854, p. 4366.

1854. BRIGGS, J. J. Note on a Hybrid between a Black Grouse and Pheasant. < *Zoologist*, xii, 1854, p. 4253.

1854. FARRAN, Dr. [Note on *Saxicola œnanthe* and *Anser brenta* in Ireland.] < *Nat. Hist. Rev. (Pr. Soc.)*, i, 1854, pp. 236, 237.

[1854.] JENNINGS, C. The | Eggs of British Birds, | Displayed in a series of engravings, copied | and coloured from nature, | with descriptions of British Birds. | By C. Jennings. | The Illustrations by Dickes. | — | Second Edition. | — | Bath: Binns and Goodwin. | London: Low and Son, Agents; Longman; Simpkin; | Hamilton; Whittaker; | Edinburgh: Oliver and Boyd. Dublin: J. M'Glashan. | 1 vol. 12mo. n. d. [1854.] Eng. title, pp. i-xxii, 1-266, unnumbered coloured plates.

This second edit. seems to be enlarged, as I find the orig. ed., 1853 (which I have not seen), cited as of 232 pp. The author says: "I make no pretension to a scientific acquaintance with the department of Natural History to which the following chapters refer. My objects are, to excite or encourage," . . . &c. The book took well, and had a useful career.

1854. MONTGOMERY, [R. J.] [Exhibition of Irish-killed specimens of Great Cinereous Shrike and Black-capped Warbler.] < *Nat. Hist. Rev. (Pr. Soc.)*, i, 1854, p. 26.

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1854. PICKARD-CAMBRIDGE, O. Occurrence of the Hoopoe [*Upupa epops*] and Oriole [*Oriolus galbula*] near Blandford. < *Zoologist*, xii, 1854, p. 4366.

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1854. ROBERTS, A. Occurrence of Rare Birds [8 spp.] at Scarborough. < *Zoologist*, xii, 1854, p. 4331.

1854. ROBSON, J. A List of the Birds of West Cumberland. < *Zoologist*, xii, 1854, pp. 4166-4170.

176 spp. briefly annotated. Cf. *Zool.* 4366, 4406, 4407.

1854. ROBSON, J. Reply to Mr. Birkbeck's "Remarks on a List of Birds of West Cumberland" [Zool. 4166], by Mr. Joseph Robson, addressed to Walter Buchanan, Esq., F. L. S. < *Zoologist*, xii, 1854, pp. 4406, 4407.

1854. RODD, E. H. Provincial Names of Birds in Devonshire and Cornwall. < *Zoologist*, xii, 1854, p. 4255.

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"In sending forth a Third Edition of his 'Ornithological Rambles,' the Author has not thought it necessary to make any essential alterations in the former part of the work, but those who may feel an interest in the occurrence of new or rare species within the limits of the county, will find some additional information on this subject in the Systematic Catalogue at the end of the volume."
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This is a beautiful and luxurious volume. The text is of general character, for the most part a leaf of it to a plate. Some 60 or 70 species are treated. The plates are brilliant; and if the author had numbered them, so that I could cite them, I would do so with pleasure.
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I am very imperfectly acquainted with this work. The edition here cited, which I suppose to be a "3d ed., 2 vols., 1856", is neither dated nor paged, has the species arranged systematically, with the addition, at the end of Vol. II, of 15 species to the 229 before treated, raising the total number of plates to 169, each representing the egg of one or more species, in colours, natural size. The work was originally published (by subscription) in parts. I find it cited "8vo, London, 1831-1844", and also "3 vols, 8vo, London, 1831-1836".
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1860. STEVENSON, H. Ornithological Occurrences in Norfolk. < *Zoologist*, xviii, 1860, pp. 6806, 6807.
1860. STEVENSON, H. Stray [Field] Notes from the Devonshire Coast. < *Zoologist*, xviii, 1860, pp. 6793-6798.
1860. WARREN, R., JR. On the occurrence of Rare Birds [*Limosa melanura*, *Puffinus major*, *Sterna nigra*, *Coccythraustes vulgaris*], and of the Oblong Sunfish, in the County of Mayo [Ireland]. < *Nat. Hist. Rev. (Pr. Soc.)*, vii, 1860, pp. 32, 33.
1860. WHITE, G. (*Ed. Lady Dover.*) The | Natural History of Selborne. | By | the Rev. Gilbert White, A. M., | Fellow of Oriel College, Oxford. | [Engraving.] | New York: | Harper & Brothers, Publishers, | 329 & 331 Pearl street. | Franklin Square. | 1860. 1 vol. 18mo. pp. i-xii, 13-235. many woodc.

Copyright 1841, *q. v.*, the date of the orig. issue of the American reprint of this edition which was several times issued at irregular periods, a few hundred copies at a time. A note to me, recently (1879) obligingly furnished by the publishers, giving memoranda of the dates of successive issues, includes one of "1859," but not one of 1860. As I have handled a copy dated 1860, it may be that 1859 was the actual date of issue of copies post-dated "1860," rather than that there was one of 1859 and one of 1860 too.

This is apparently a very faithful reprint of Lady Dover's edition (cf. 1833), from which most of the woodcuts are reproduced, those in the first part (to Pennant) being reversed, while those in the second (to Barrington) are not. However, two (pp. 31 and 223) are substituted for the English originals, and do not reflect much credit on the draughtsman.

- †1860. WHITE, G. (*Ed. Lady Dover.*) The Natural History of Selborne. . . .
According to Carus and Engelmann, *Bibl.*, p. 1627, an edition of the "Bowdlerized" edition was published this year by the Society for Promoting Christian Knowledge, with figures by Wolf, probably the same as those of the ed. of 1870 or 1871.
1861. ATKINSON, J. C. British | Birds' Eggs and Nests, | popularly described. | By | Rev. J. C. Atkinson, | author of [etc.]. | With coloured illustrations by W. S. Coleman. | London | Routledge, Warne, & Routledge, | Farringdon street. | New York: 56, Walker street. | 1861. 1 vol. 12mo. pp. viii, 182, pll. col'd 12.
Very well-written and acceptable book, doubtless found useful by many: illustrations characteristic and helpful, if not highly artistic. Cf. *Ibis*, 1861, p. 400.
1861. COLLINGWOOD, C. Contributions to British Ornithology—The Notes of Birds. By Cuthbert Collingwood, M. A., F. L. S., &c. From the Proceedings of the Liverpool Literary and Philosophical Society. Read April 15, 1861. 8vo. pp. 26.
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1861. NEWMAN, E. Birds'-nesting: being a complete description of the Nests and Eggs of Birds which breed in Great Britain and Ireland. By Edward Newman. . . . London. 1861. 8vo. pp. 52.
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1861. RAKE, B. [Letter expressing his sense of the desirability of a reliable list of British Birds.] < *Ibis*, iii, 1861, pp. 210, 211.
1861. RAKE, B. [Remarks offered in hope of instigating a reliable List of British Birds.] < *Ibis*, iii, 1861, pp. 307-309.
1861. ROWLEY, G. D. [Letter on various birds observed at Brighton, England.] < *Ibis*, iii, 1861, pp. 113, 114.
1862. ANSTED, D. T., and LATHAM, R. G. The Channel Islands. By David Thomas Ansted and Robert Gordon Latham. London. 1862. 1 vol. 8vo.
Not seen. List of 198 spp., with notes on the general character of the Bird-fauna.
1862. BARTLETT, J. P. Occurrence of the Short-toed Lark (*Alauda brachydactyla*) and other rare Birds in Hampshire. < *Zoologist*, xx, 1862, pp. 7930, 7931.
1862. BRIDGER, W. Occurrence of the Hoopoe and Spoonbill in Surrey. < *Zoologist*, xx, 1862, p. 8283.
1862. BRUNTON, T. Shorteared Owl and Roughlegged Buzzard near Bishop Stortford. < *Zoologist*, xx, 1862, p. 7844.
1862. DUNS, J. On the Nesting Birds of Linlithgowshire and Berwickshire. < *Edinb. New Philos. Journ.*, new ser., xv, 1862, pp. 295-298.
Revised, annotated list of the breeders, regular, past, and occasional.
1862. EDITORIAL. [Notice of J. Gould's forthcoming Birds of Great Britain.] < *Ibis*, 1862, p. 392.
1862. EDMUNDS, A. Occurrence of rare Birds near Worcester. < *Zoologist*, xx, 1862, pp. 8198, 8199.
1862. GATCOMBE, J. Occurrence of the Iceland Gull [*Larus leucopterus*] and Red-necked Grebe [*Podiceps rubricollis*] at Plymouth. < *Zoologist*, xx, 1862, p. 7848.
1862. GILBERT, R. H. T. White Specimens of Redthroated Diver and Lapwing. < *Zoologist*, xx, 1862, pp. 8002, 8003.
- 1862-73. GOULD, J. The | Birds | of | Great Britain. | By | John Gould, F. R. S., &c. | — | In Five Volumes. | — | Volume I [-V]. | London: | printed by Taylor and Francis, Red Lion Court, Fleet Street. | Published by the author, 26, Charlotte Street, Bedford Square. | [1862-] 1873. 5 vols. imp. folio. Vol. I, 6 p. ll. (title, dedication, subscribers, preface), pp. i-exl (introduction: synopsis of 409 spp.), list of plates 1 leaf, pll. 1-37. Vol. II, 2 p. ll., pll. 1-78. Vol. III, 2 p. ll., pll. 1-76. Vol. IV, 2 p. ll., pll. 1-90. Vol. V, 2 p. ll., pll. 1-86. To each

1862-73. GOULD, J.—Continued.

plate a sheet or so of letter-press, not paged. Plates (37 + 78 + 76 + 90 + 86 =) 367. Pub. in 25 semi-annual Parts, 1862-73; furnishings with last Part.

Parts i, ii, 1862: iii, iv, 1863; v, vi, 1864; vii, viii, 1865; ix, x, 1866; xi, xii, 1867; xiii, xiv, 1868; xv, xvi, 1869; xvii, xviii, 1870; xix, xx, 1871; xxi, xxii, 1872; xxiii-xxv, 1873. With the last part were issued the permanent titles, &c., for the 5 vols. in which the work is directed to be made up, including pp. i-ix of introduction. This consists of a synopsis of the 409 spp. of which the work treats. The regular text is not paged; it consists of a sheet or so to each plate. The pl. are not numbered. They were not issued in any systematic order; but are designed to be rearranged systematically in 5 series, one to each vol. as above indicated, and are enumerated conformably to the printed lists; being citable by number according to these lists. The plan of publication is thus like that of all the rest of Gould's famous works. I have only seen the work as made up, and cannot, therefore, give the cover-title by which it was alone known for so many years, and which differs from the permanent title above cited.

"This grand work, which was begun in 1862, is continued at the rate of two parts every year. The plates, as regards beauty and finish, far exceed those in any other of the author's well-known publications. . . . A good deal of care has been bestowed on the letter-press, which is much more comprehensive than in the majority of Mr. Gould's books. Figures of the nestings of many of the species are also introduced to an extent greater than in any other work of the kind with which we are acquainted, excepting perhaps Naumann's 'Vögel Deutschlands.'" (*Zool. Rec.* for 1864, p. 42.)

1862. HILDEBRAND, A. H. The Goosander and Spotted Rail in Leicestershire. < *Zoologist*, xx, 1862, pp. 7847, 7848.

1862. JOHNS, C. A. British Birds | in their Haunts. | By the | Rev. C. A. Johns, B. A. F. L. S. | Author of "Forest Trees of Britain;" "Flowers of the Field," | etc. | With illustrations on wood, | drawn by Wolf, engraved by Whymper. | — | Published under the direction of the | committee of general literature and education, appointed by | the Society for promoting Christian Knowledge. | — | London: | Society for Promoting Christian Knowledge; | [etc., 4 lines.] | — | 1862. 1 vol. 16mo. pp. i-xxxii, 1-626, with 190 woodcuts.

This interesting and beautifully illustrated volume contains an account, more or less detailed, of all the birds figured in the 2d ed. of Yarrell, with additions to date. The author makes out the British list to be: resident all the year, 140; summer visitors, 63; winter visitors, 48; capricious visitors, 110; total, 361. The author has certainly, as he ventured to hope, provided the lover of nature with a pleasant companion in his country walks, and the young ornithologist with a manual which will supply his present needs and prepare him for the study of more important works.

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1862. MORE, A. G. Early Arrival of Migratory Birds [in the Isle of Wight]. < *Zoologist*, xx, 1862, pp. 8026, 8027.

1862. NEWMAN, H. W. Mildness of the Season [winter 1861-2 at Cheltenham]. < *Zoologist*, xx, 1862, pp. 7929, 7930.

1862. NEWMAN, H. W. The Song of [certain British] Birds. < *Zoologist*, xx, 1862, pp. 7829, 7830.

1862. REAKS, H. Notes on Nests [of a few British Birds]. < *Zoologist*, xx, 1862, pp. 8098, 8099.

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1862. SMITH, J. A. Ornithological Notes [on a few Scottish Birds]. < *Edinb. New Philos. Journ.*, new ser., xv, 1862, pp. 305, 306.

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1862. SAXBY, H. L. Ornithological Notes from Edinburgh. < *Zoologist*, xx, 1862, p. 7880.
1862. SHEWELL, J. Nesting of Martins and Sparrows [in Great Britain]. < *Zoologist*, xx, 1862, p. 8194.
1862. THOMPSON, T. Dates of Arrival and Nesting of [a few British] Birds. < *Zoologist*, xx, 1862, p. 8160.
1862. VARLEY, J. Occurrence of the Maux Shearwater, Thickknee and Croosbills in the Neighbourhood of Huddersfield. < *Zoologist*, xx, 1862, p. 8005.
1863. ATKINSON, J. C. Nests of the Common Wren and the Goldcrest. < *Zoologist*, xxi, 1863, pp. 8680, 8681.
1863. BENNETT, E. T. Food of Small [British] Birds. < *Zoologist*, xxi, 1863, pp. 8814, 8815.
1863. BLAKE-KNOX, H. Purple Sandpiper, Iceland Gull and other rare Birds at Dalkley. < *Zoologist*, xxi, 1863, pp. 8447, 8448.
1863. BLAKE-KNOX, H. Ornithological Notes between Bristol and Dublin. < *Zoologist*, xxi, 1863, p. 8523.
1863. BLAKE-KNOX, H. Correction of an Error [Zool., 8523]. < *Zoologist*, xxi, 1863, p. 8378.
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1863. BRUNTON, T. Blackbirds' and Treecreepers' Nests on the Ground. < *Zoologist*, xxi, 1863, pp. 8679, 8680.
1863. FRASER, L. [List of birds captured or observed by Mr. E. Bartlett, in the Society's Gardens.] < *P. Z. S.*, xxxi, 1863, pp. 159, 160.
1863. GATCOMBE, J. The Little Auk and Spotted Crake in Devonshire. < *Zoologist*, xxi, 1863, p. 8832.
1863. GRAY, G. R. Catalogue | of | British Birds | in the | Collection of the British Museum. | By | George Robert Gray, F. L. S., F. Z. S., &c. | London: | Printed by order of the Trustees. | 1863. 1 vol. 8vo. pp. i-xii, 1-247 + 1 + 8.
A complete list of the species of Birds which have been found in Great Britain and Ireland, with a very copious synonymy, and indication by localities of specimens in the Br. Mus., &c.; synonyms of genera and higher groups, as well as of species. The supplementary pages are bibliographical, with special reference to works illustrating the Br. Mus. Coll. Indigenous spp., 115; seasonal visitors, 84; occasional visitors, 112; accidental visitors, 72 (+ 2 in app.); introduced spp., 11; doubtful, 7; total, 401 + 2.
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1863. JEFFREY, W., JR. Scarcity of certain Summer Birds [in Chichester]. < *Zoologist*, xxi, 1863, p. 8816.
1863. NEWMAN, H. W. Food of Small [British] Birds. < *Zoologist*, xxi, 1863, p. 8815.
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1863. READING, J. J. Rare Birds in Devonshire. < *Zoologist*, xxi, 1863, p. 8448.
1863. ROBERTS, G. On the Nidification of Small [British] Birds. < *Zoologist*, xxi, 1863, pp. 8630, 8631.
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ing Rowe, F. L. S., & c. Plymouth, 1863. (London. Van Voorst.)
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Birds by R. B. Smith, pp. 103-116, 127-129; a briefly annotated list of 102 spp.
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1863. TURNBULL, W. P. Birds | of | East Lothian and a portion of | the adjoining counties, | from | memorandums made between 1845-1850, | by | William P. Turnbull, | Gladsmuir, | Member of the Academy of Natural Sciences of Philadelphia. | [Quotation, 5 lines.] | [Seal.] | Philadelphia: | Caxton Press of C. Sherman, Son & Co. | n. d. [1863.] 1 vol. 8vo. pp. 16.
Summer visitants, 42; winter visitants, 44; pass in spring and autumn, 4; permanently resident, 84; stragglers or irregular visitants, 29; = 201. There is a vignette ed., 1867, *q. v.*
1863. WISE, J. R. The New Forest: | its | History and its Scenery. | By | John R. Wise. | [Cut.] | With 63 Illustrations, Drawn by Walter Crane, Engraved by W. J. Linton, | And Two Maps. | London: | Smith, Elder and Co., 65, Cornhill. | — | M.DCCC.LXIII. 1 vol. sm. 4to. pp. i-x, 1-336, with 63 illust.
Chap. XXII. The ornithology, pp. 258-276, some of the illust.; an interesting account.—App. III; pp. 307-318. List of the Birds of the New Forest District: 72 residents, 31 summer, and 35 winter visitors, 90 rarities and stragglers; with 2 birds of double passage, 230 spp.
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1864. BRADBY, A. S. Scarcity of some of the Summer Birds of Passage at Mounds-
mere in 1864. < *Zoologist*, xxii, 1864, pp. 9281, 9282.

1864. BRIDGEMAN, F. C., *and* BRIDGEMAN, G. O. The Flora of Harrow [England]. By J. C. Melvill. With Notices of the Birds of the Neighbourhood, by the Hon. F. C. Bridgeman and the Hon. G. O. Bridgeman. London. Longmans. 1864.
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 "The first attempt of the kind made by the boys of any of our [English] Public Schools."
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1864. CROWLEY, P. Peregrine Falcon and Shorteared Owl near Alton. < *Zoologist*, xxii, 1864, p. 8946.
1864. DOBRÉE, N. F. The Decrease of Birds at Flamborough. < *Zoologist*, xxii, 1864, pp. 9325, 9326.
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 Cf. *tom cit.*, p. 9212.
1864. GOULD, J. [Exhibition of specimens of *Emberiza pusilla*, Pall., and *Anthus campestris*, from Brighton, England.] < *P. Z. S.*, xxxii, 1864, p. 377.
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 Cf. *Zool.*, 9122.
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1864. GURNEY, J. H. Note on the Occurrence in Great Britain of the American Wigeon [*Mareca Americana*] and of the Red-winged Starling [*Agelaius phœniceus*]. < *Zoologist*, xxii, 1864, p. 9024.
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1864. NEWMAN, E. Doubts as to the Occurrence of the Ruddy Shieldrake and Spotted Sandpiper at Epworth. < *Zoologist*, xxii, 1864, p. 9121.
1864. NEWMAN, H. W. Scarcity of Singing Birds [in Cheltenham]. < *Zoologist*, xxii, 1864, p. 8877.

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1864. NICHOLLS, H., JR. Osprey, Kite and Little Bustard in Devonshire. < *Zoologist*, xxii, 1864, p. 9039.
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 Title of a work here criticized and extracted from. Several original paragraphs on British birds.
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1864. STEVENSON, H. A list of the Birds of Norfolk, with remarks on the General Ornithology of the County. Reprinted from White's History and Directory of the County. Sheffield: 1864. (Again reprinted, with alterations, 'Zoologist,' pp. 9025-9036.)
 See also *Zool.*, p. 9103. 293 species.—I have not seen this, nor the original in White's *History and Directory*.
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 Reprinted, with some change, from White's "History and Directory of Norfolk". 293 spp. Annotated List, and general remarks. Cf. *Zool.*, 9103.
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1865. BLAKE-KNOX, H. First Arrival of the Snow Bunting and Purple Sandpiper in the County Dublin in 1864. < *Zoologist*, xxiii, 1865, p. 9433.
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1865. DUTTON, J. Ornithological [Field] Notes from East Sussex. < *Zoologist*, xxiii, 1865, pp. 9577-9579.
1865. "F. R. R." Ornithological Ramble over Bodmin Moors to Dosmary Pool, &c. < *Zoologist*, xxiii, 1865, p. 9726.
1865. GROOM-NAPIER, C. O. The Food, Use, and Beauty of British Birds. An Essay, accompanied by a Catalogue of all the British Birds, with notices of their Food, the result of many hundred examinations of their stomachs, during seven years. Their geographical distribution and æsthetic value. By Charles Ottley Groom-Napier. London. 1865. 1 vol. 8vo. pp. 88.
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1865. MORE, A. G. On the Distribution of Birds in Great Britain during the Nesting-season. [Part I. With a Map.—Pl. i.] < *Ibis*, 2d ser., i, pp. 1-27. Part II, pp. 119-142; Part III, pp. 425-458.
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1865. MORE, A. G. On the Distribution of Birds in Great Britain during the Nesting-Season. < *Ibis*, 1865, pp. 1-27, 119-142, 425-458. With a map (pl. 1).
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 Reissue, identical with the orig. ed. of 1851-57. The author states plainly the aim of the work, in his preface of 1857: 1, To collect, as far as he could, all known facts in the Nat. Hist. of every British Bird; 2, To produce a readable book; 3, To give correct and life-like figures; 4, To do this at the lowest possible cost. The work was originally issued in monthly numbers, each containing four coloured plates, and most of them 24 pp. of text.
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1865. POWER, F. D. A List of Birds [24 spp.] noticed in London during 1863-64. < *Zoologist*, xxiii, 1865, pp. 9727, 9728.
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1865. REEKS, H. Scarcity of Winter Migrants [in Hants]. < *Zoologist*, xxiii, 1865, pp. 9561, 9562.
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1865. ROCKE, J. Ornithological [Field] Notes from Shropshire. < *Zoologist*, xxiii, 1865, pp. 9683-9688, 9775-9782.
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1865. STEVENSON, H. Ornithological Notes from Norfolk. < *Zoologist*, xxiii, 1865, pp. 9405, 9406.
1865. STEVENSON, H. Ornithological [Field] Notes from Norfolk. < *Zoologist*, xxiii, 1865, pp. 9494-9496, 9574-9577, 9805-9808.
1865. STUBBS, C. E. Snipes and Wagtails [at Henley-on-Thames]. < *Zoologist*, xxiii, 1865, p. 9793.

1865. TYRER, R. Backwardness of the Season [spring of 1865, at Keighley]. < *Zoologist*, xxiii, 1865, p. 9562.
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Remarks on introduction of stragglers into local lists.
1866. ALSTON, E. R. The 'Dictionary of British Birds.' < *Zoologist*, 2d ser., i, 1866, pp. 495-497.
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1866. ALSTON, E. R. Ornithological Notes from Lanarkshire. < *Zoologist*, 2d ser., i, 1866, pp. 512-514.
1866. BLAKE-KNOX, H. Ornithological [Field] Notes from the County Dublin. < *Zoologist*, 2d ser., i, 1866, pp. 93, 94, 295-300, figg. 3.
1866. BLAKE-KNOX, H. Ornithological Scraps from Wexford. < *Zoologist*, 2d ser., i, 1866, p. 95.
1866. BLAKE-KNOX, H. Nesting of the Lesser Redpole and Blackbird at Dalkey. < *Zoologist*, 2d ser., i, 1866, p. 188.
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1866. BOULTON, W. W. Ornithological [Field] Notes from the East Coast of Yorkshire during the Summer of 1865. < *Zoologist*, 2d ser., i, 1866, pp. 27-30.
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1866. BROWN, W. A Short Account of a Visit to the Farne Islands during the Nesting Season of 1865. < *Zoologist*, 2d ser., i, 1866, pp. 483-485.
1866. CHIPCHASE, C. Ornithological [Field] Notes from Barnard Castle. < *Zoologist*, 2d ser., i, 1866, pp. 347, 348.
1866. COOPER, W. Birds at Sea [between Liverpool and Quebec]. < *Zoologist*, 2d ser., i, 1866, p. 95.
1866. CORDEAUX, J. Ornithological [Field] Notes from North Wales. < *Zoologist*, 2d ser., i, 1866, pp. 436-441.
1866. CORDEAUX, J. Ornithological [Field] Notes from Flamborough. < *Zoologist*, 2d ser., i, 1866, pp. 21-27.
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1866. CRICHTON, A. W. A Naturalist's Ramble to the Orcaes. By A. W. Crichton, B. A., F. L. S., etc. London: 1866. fcp. 8vo. pp. 132.
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1866. GATCOMBE, J. Gray Phalarope and Black Tern in Devon and Cornwall. < *Zoologist*, 2d ser., i, 1866, p. 500.
1866. GUNN, T. E. Eggs of the Longtailed Titmouse and Golderest in one Nest. < *Zoologist*, 2d ser., i, 1866, p. 269.
1866. GUNN, T. E. Nest [Parns] within Nest [Turdus merula]. < *Zoologist*, 2d ser., i, 1866, p. 311.

- 1866-69. HADFIELD, H. Ornithological [Field] Notes from the Isle of Wight. < *Zoologist*, 2d ser., i, 1866, pp. 169-178, 217-220, 337-345, 443-447; ii, 1867, pp. 732-743, 819-821, 908-910, 985-987; iii, 1868, pp. 1088-1090; iv, 1869, pp. 1545-1547.
1866. HARVIE-BROWN, J. A. A List of Birds [112 spp. shortly annotated] observed in the two adjoining Parishes of Dunipace and Larbert, in Stirlingshire. < *Zoologist*, 2d ser., i, 1866, pp. 67-72.
1866. HARVIE-BROWN, J. A. Varieties of [14] British Birds' Eggs. < *Zoologist*, 2d ser., i, 1866, pp. 146, 147.
1866. HARTING, J. E. The | Birds of Middlesex. | A contribution | to | The Natural History of the County. | By | James Edmund Harting, F. Z. S. | — | London: | John Van Voorst, 1, Paternoster Row. | M. DCCC. LXVI. 1 vol. post 8vo. pp. i-xvi, 1-284, flat-tinted frontisp. and a few cuts.
- Not less than 225 species of Birds have been found in Middlesex, of which 60 are resident, 68 migratory, and 97 rare and accidental visitants. The plan of the work is modeled after Yarrell. The musical notation of the notes of various birds are given. The work is written by a well-known and accomplished field ornithologist, and has a high standing; being, in fact, the chief authority upon the birds of this locality. It is based entirely upon his personal observations in the field, and may be regarded as perfectly reliable, besides being written in an interesting manner. Cf. *Ibis*, 1867, p. 123.
1866. HELE, W. F. Gray Phalarope, Wood Sandpiper, and Black Tern near Adleburgh. < *Zoologist*, 2d ser., i, 1866, p. 499.
1866. HUTCHINSON, M. Arrival of Migrants [at Blackheath]. < *Zoologist*, 2 ser., i, 1866, pp. 308, 309.
- 1866-68. JEFFREY, W. Ornithological [Field] Notes from West Sussex. < *Zoologist*, 2d ser., i, 1866, pp. 87-89, 140-142, 166-168, 264-267, 333-337; ii, 1867, pp. 514-517, 596-599, 730-732, 811-814; iii, 1868, pp. 1031-1035.
1866. LEGGE, W. V. Ornithological [Field] Notes from South-East Essex. < *Zoologist*, 2d ser., i, 1866, pp. 89-92.
1866. LEGGE, W. V. Sea Birds at Malahide. < *Zoologist*, 2d ser., i, 1866, pp. 145, 146.
1866. MONTAGU, G. (*Ed. Newman, E.*) A | Dictionary | of | British Birds. | — | Reprinted from | Montagu's Ornithological Dictionary, | and incorporating | The Additional Species | described by Selby; Yarrell, in all three editions; and | in natural-history journals. | — | Compiled and edited by | Edward Newman, F. L. S., F. Z. S., &c., &c., | Editor of the 'Zoologist.' | — | "We are airy little creatures, | All of different voice and features." | Dean Swift. | — | London: | John Van Voorst, Paternoster Row. | M. DCCC. LXVI. 1 vol. 8vo. pp. i-xxiv, 1-400, 4 ll. advts., no illust.

Montagu's celebrated 'Dictionary' was originally published in 2 vols. in 1802, with a supplement in 1813. The additions which the author made exceeded the original work in bulk. Rennie's edition, being the 2d, appeared in 1831.

In the present greatly enlarged and modified edition the whole of his 'Dictionary,' 'Supplement,' and 'Appendix' are reprinted in a combined and alphabetical order, the words "supplement" and "appendix" being prefixed to whatever is derived from these two sources. "Nothing that Montagu has published is omitted or altered." Newman's additions, chiefly derived from Selby, Yarrell, and the pages of the 'Zoologist,' are marked by inverted commas, with references to those works. Immediately after a name is inserted a reference to the bird and its egg, Yarrell's 'History' (3d ed.) and Hewitson's 'Oology' (3d ed.) being selected for this purpose; these and other editorial interpolations being bracketed.

This is the most convenient form in which Montagu is found, this author's originally separated instalments of his work being here brought together in proper order, and much new editorial matter of value being added.

The editor says:—"I desire explicitly to state that I have taken nothing from the text of the original work; and in the second place, I have added scarcely anything of my own: in no instance have I overlaid the original with my own observations, altered the author's obvious meaning to suit my own views, or attempted to controvert his assertions because at variance with my own more limited experience: nevertheless important additions have been made, as I will endeavor to explain." The gist of the additions are:—a) 24 species added by Selby to those of Montagu; 59 in Yarrell additional to Selby; 21 more in the *Zoologist*, and 2 in the *Ibis*;

1866. MONTAGU, G.—Continued.

total, 106 species added to Montagu's lists. *b*) references to the figures of Yarrell's 3d ed. *c*) to Hewitson's 3d ed. for eggs. *d*) references to other writings, as the *Zoologist* or the *Field* newspaper. All the editorial additions are in brackets. The editor's list of British Birds closes the volume. The page is very closely printed, in double column. Cf. *Ibis*, 1866, pp. 410-412; *Zoologist*, 2d ser., pp. 370-384, 495-497.

1866. NICHOLLS, H., JR. Rare Birds near Kingsbridge. < *Zoologist*, 2d ser., i, 1866, pp. 526, 527.

1866. POWER, W. H. [Field] Notes on Birds observed at Rainham, Kent, during the Summer and Autumn of 1865. < *Zoologist*, 2d ser., i, 1866, pp. 118-129.

1866. PRATT, J. Woodchat Shrike and Golden Oriole at Brighton. < *Zoologist*, 2d ser., i, 1866, pp. 267, 268.

1866. ROBERTS, G. [Cats as] Destroyers of Birds' Eggs. < *Zoologist*, 2d ser., i, 1866, p. 497.

1866. ROCKE, J. Ornithological Notes from Shropshire. < *Zoologist*, 2d ser., i, 1866, pp. 76-84, 161-166.

1866. RODD, E. H. The Migration of [certain British] Birds. < *Zoologist*, 2d ser., i, 1866, p. 40.

1866. RODD, E. H. Ornithological Notes from Penzance. < *Zoologist*, 2d ser., i, 1866, p. 227.

1866. ROWLEY, G. D. Nest [*Parus caeruleus*] within Nest [*Turdus merula*]. < *Zoologist*, 2d ser., i, 1866, p. 102.

1866. SAUNDERS, H. A Visit to Walney, the Lakes, and the Farne Islands. < *Zoologist*, 2d ser., i, 1866, pp. 178-188.

Narrative of a fortnight's bird's-nesting, &c.

1866. SAUNDERS, H. Alpine Swift and Buffbreasted Sandpiper in Ireland. < *Zoologist*, 2d ser., i, 1866, p. 389.

1866-67. SAXBY, H. L. Ornithological [Field] Notes from Shetland. < *Zoologist*, 2d ser., i, 1866, pp. 16-20, 61-67, 211-215, 288-293, 473-479; ii, 1867, pp. 537-539, 688-690.

Cont. from p. 9591.

1866. SMITH, A. C. *Lanius excubitor*, *Strix passerina* and *Bombycilla garrula* in Wiltshire. < *Zoologist*, 2d ser., i, 1866, pp. 227, 228.

1866. SMITH, C. List of Birds observed during a Six Weeks' Summer Visit to the Channel Islands, exclusive of Jersey. < *Zoologist*, 2d ser., i, 1866, pp. 447-453. 68 species are noticed.

1866. STEVENSON, H. Ornithological [Field] Notes from Norfolk, during October, November and December, 1865. < *Zoologist*, 2d ser., i, 1866, pp. 84-87, 260-264, 441, 442, 593-596.

1866-70. STEVENSON, H. The | Birds of Norfolk, | with | Remarks on their Habits, | Migration, | and local Distribution; | by Henry Stevenson, F. L. S., | Member of the British Ornithologists' Union. | In two volumes. | Vol. I [II]. | "Etiam si sint alia graviora et meliora, tamen | nos studia nostra naturæ regula metiamur." | Cic. de Officiis Lib. I., cap. 31. | — | London: | John Van Voorst, 1, Paternoster Row, | Norwich: | Metchett and Stevenson. | 1866[1870]. 2 vols. 8 vo. Vol. I, 1866, pp. i-lxxii, 1-446; Vol. II, 1870, pp. 449, not handled; Vol. III, — ?

"The extreme richness of the Ornithology of the county appears to have early attracted the notice of Norfolk naturalists, and fortunately the records of their observations are to a great extent preserved to us, though scattered amongst 'Transactions' of Learned Societies, and other publications, not always accessible to the general reader. To combine a résumé of the facts thus handed down to us, with the result of personal observations extending over several years, was the idea that first originated the present work; and there is, perhaps, no better motive for incurring the labors and doubtful honors of authorship than a desire to supply to others a want that has been personally experienced." (*Preface.*) Cf. *Ibis*, 1867, p. 238, where

1866-70. STEVENSON, H.—Continued.

the work is highly spoken of. "A most carefully elaborated work on that part of England which has probably the richest ornithology. The introduction describes at some length the general features of the county, and the changes which have been produced in its avifauna of late years, chiefly through improved agricultural practice."

Vol. I carries the subject to the end of *Gallinæ*, treating 142 spp. Vol. II continues to end of *Grallæ* only. So I suppose there is a Vol. III, which, however, I have neither seen nor heard of. Cf. *Ibis*, 1871, pp. 251, 252; *Zool.*, 2d ser., pp. 2413-2433, 2453-2464.

1866. WALTON, C. Two Letters from the late Charles Waterton, Esq., of Walton Hall. < *Zoologist*, 2d ser., i, 1866, pp. 193-196.

Desultory observations on some British Birds. &c.

1867. ANON. The Little Auk and Hen Harrier in the West of England. < *Zoologist*, 2d ser., ii, 1867, p. 637.

From the "Field", Jan. 12.

1867. ANON. Bohemian Waxwing and Bittern near Ipswich. < *Zoologist*, 2d ser., ii, 1867, p. 634.

From the "Field", Jan. 19.

1867. BARRINGTON, R. M. Arrival of Summer Visitants in County Wicklow. < *Zoologist*, 2d ser., ii, 1867, p. 754.

1867. BECKWITH, W. Firecrested Wren, Richard's Pipit and Velvet Scoter in Shropshire. < *Zoologist*, 2d ser., ii, 1867, p. 633.

1867. BLAKE-KNOX, H. Ornithological Notes from the County Dublin. From the Log of the "Gray Gull." < *Zoologist*, 2d ser., ii, 1867, pp. 678-688.

1867. BOULTON, W. W. Ornithological [Field] Notes from Beverley, East Yorkshire. < *Zoologist*, 2d ser., ii, 1867, pp. 540-546.

1867. BREE, C. R. What gives a Bird a claim to be classed as British? < *Zoologist*, 2d ser., ii, 1867, pp. 789, 790.

Answers. Editor also remarks.

1867. "B. T. S." What gives a Bird a claim to be classed as British? < *Zoologist*, 2d ser., ii, 1867, p. 755.

Does not say: and points out that authors disagree.

1867. BULLMORE, W. K. Cornish Fauna, a short account of all the Animals found in the County, with descriptions and remarks on the habits of many of the Rarer Birds, Fishes, &c., procured during the last six years. By W. K. Bullmore, M. D., &c. > Part I. Vertebrata. Truro. 1867. 8vo. pp. 64.

Not seen.—The ornithological portion is at pages 7-45. More than 280 species are stated to have occurred in the county. Cf. *Ibis*, 1868, pp. 99-101.

1867. CLARK-KENNEDY, A. Ornithological Notes from Buckinghamshire. < *Zoologist*, 2d ser., ii, 1867, pp. 637, 638.

1867. CLARK-KENNEDY, A. Curious Position of Nests [of certain British Birds]. < *Zoologist*, 2d ser., ii, 1867, pp. 951, 952.

1867. CLARK-KENNEDY, A. Ornithology of Berks and Bucks. < *Zoologist*, 2d ser., ii, 1867, p. 1014.

Notice of an intended work on.

1867. CLARK-KENNEDY, A. Dates of the Departure of Immigrants [Buckinghamshire] for 1867. < *Zoologist*, 2d ser., ii, 1867, p. 1015.

1867. CLIFTON, Lord. Savi's Warbler (?), Plover and Lesser Spotted Woodpecker in Bucks. < *Zoologist*, 2d ser., ii, 1867, p. 704.

1867. CLIFTON, Lord. Varieties of Birds [albinotic, British]. < *Zoologist*, 2d ser., ii, 1867, p. 987.

1867. CLOGG, S. Remarkable Shot [Kestrel and Blackbird]. < *Zoologist*, 2d ser., ii, 1867, p. 605.

1867. CLOGG, S. Arrival of Immigrants at Looe. < *Zoologist*, 2d ser., ii, 1867, pp. 874, 875.

1867. CORDEAUX, J. Notes on the Ornithology of the English Lakes. < *Zoologist*, 2d ser., ii, 1867, pp. 865-871.
1867. CORDEAUX, J. [Ornithological Field] Notes from Flamborough. < *Zoologist*, 2d ser., ii, 1867, pp. 1008-1011; iii, 1868, pp. 1025-1029.
1867. FEILDEN, H. W. Dates of Oviposition this Year [1867, 5 spp. of British birds]. < *Zoologist*, 2d ser., ii, 1867, p. 754.
1867. GATCOMBE, J. Woodchat Shrike, Sabine's Gull and Gullbilled Tern in the Neighbourhood of Plymouth. < *Zoologist*, 2d ser., ii, 1867, p. 557.
1867. GOATLEY, T. Little Stint [*Tringa pusilla*] and Little Gull [*Larus minutus*] at Leicester. < *Zoologist*, 2d ser., ii, 1867, pp. 991, 992.
1867. GRAY, R. Quadrupeds, Birds, and Fishes of Loch Lomond and its vicinity. Not seen.—An appendix, apparently, to Kiddie's 'Guide Book to the Trosachs, Loch Lomond, &c.' (8vo, 1864). 111 species. Cf. *Ibis*, 1867, p. 373. See same author at 1864.
1867. GREENWOOD, H. Double Bird's Nest [Flycatcher's on top of a Wren's]. < *Zoologist*, 2d ser., ii, 1867, p. 789.
1867. GUNN, T. E. Blue and White Varieties of British Birds' Eggs. < *Zoologist*, 2d ser., ii, 1867, pp. 754, 755.
1867. GUNN, T. E. The Smew, Green Sandpiper, &c., in Suffolk. < *Zoologist*, 2d ser., ii, 1867, p. 759.
1867. GUNN, T. E. White Varieties of [some British] Birds' Eggs. < *Zoologist*, 2d ser., ii, 1867, p. 823.
1867. GUNN, T. E. Summer Migrants, &c., near Norwich. < *Zoologist*, 2d ser., ii, 1867, pp. 873, 874.
1867. GUNN, T. E. Richard's Pipit, Shore Lark and Wood Lark in Norfolk. < *Zoologist*, 2d ser., ii, 1867, p. 634.
1867. HANCOCK, J. Ornithological Notes. < *Nat. Hist. Trans. Northumb. and Durk.*, i, 1867, pp. 281-284.
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1870. HÜGEL, A. DE. Ornithological Notes from South Devon. < *Zoologist*, 2d ser., v, 1870, pp. 1983, 1984.
1870. JEFFERY, W., JR. Rare Birds in West Sussex, 1857-9. < *Zoologist*, 2d ser., v, 1870, pp. 2059, 2060.
1870. KERR, W. J. Notes from Denbighshire. < *Zoologist*, 2d ser., v, 1870, p. 2184.
1870. KERR, W. J. Solitary Snipe and Quail in Denbighshire. < *Zoologist*, 2d ser., v, 1870, p. 2345.
1870. MATHEW, G. F. Garganey, &c., near Sheerness. < *Zoologist*, 2d ser., v, 1870, p. 2182.
1870. MATHEW, M. A. Rare Birds at Barnstaple. < *Zoologist*, 2d ser., v, 1870, p. 2144.
1870. MATHEW, M. A. Slavonian Grebes, Rednecked Grebe and Goosander on the Taw. < *Zoologist*, 2d ser., v, 1870, p. 2069.
1870. MATHEW, M. A. Lesser Gray Shrike, Moore Lark and Temminck's Stint near Great Yarmouth. < *Zoologist*, 2d ser., v, 1870, p. 2060.
1870. MOOR, E. C. Arrival of Spring Migrants [does not state where]. < *Zoologist*, 2d ser., v, 1870, p. 2308.
1870. OVEREND, J. G. Little Gulls, &c., near Great Yarmouth. < *Zoologist*, 2d ser., v, 1870, p. 2143.
1870. PRESTON, T. A. Little Gull, &c., near Marlborough. < *Zoologist*, 2d ser., v, 1870, p. 2143.
1870. RAVENSWORTH, Lord. Notice of some Rare Birds seen recently [in Northumberland]. < *Nat. Hist. Trans. Northumb. & Durh.*, iii, 1870, pp. 173, 174.
Coracias garrula, *Ficus major*, *Anas acuta*, *A. clypeata*, *Sula bassana*, *Falco nisus*.
1870. RICKARDS, M. S. C. Gray Phalarope, Little Stint and Snow Bunting at Northam Burrows. < *Zoologist*, 2d ser., v, 1870, p. 2025.
1870. RICKARDS, M. S. C. Notes from Northam Burrows. < *Zoologist*, 2d ser., v, 1870, p. 2387.
1870. ROBERTS, G. Notes on [certain British] Migratory Birds. < *Zoologist*, 2d ser., v, 1870, pp. 2220, 2221.

1870. RODD, E. H. Winter Visitants in West Cornwall. < *Zoologist*, 2d ser., v, 1870, pp. 2068, 2069.
1870. RODD, E. H. A List of the Birds of Cornwall. < *Zoologist*, 2d ser., v, 1870, pp. 2193-2204, 2229-2244, 2269-2280, 2321-2326.
"Although a general list of British Birds, is intended to show a statistical summary of the species at present included in the Cornish Fauna." Extensively annotated.
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1870. ROWLEY, G. D. [Exhibition of Specimens of the Siberian Lark, and of some other rare British Birds.] < *P. Z. S.*, xxxviii, 1870, pp. 52, 53.
1870. ROWLEY, G. D. Shore Larks and Gray Phalaropes near Brighton. < *Zoologist*, 2d ser., v, 1870, p. 2407.
From 'Field,' Nov. 12.
1870. SMEE, A. H. Note on Migration at Carshalton. < *Zoologist*, 2d ser., v, 1870, p. 220.
1870. SMEE, A. H. Shore Lark at Southwold and Redthroated Diver in London. < *Zoologist*, 2d ser., v, 1870, p. 2140.
1870. SMEE, A. H. Blackthroated Diver and Redbreasted Merganser on the Thames. < *Zoologist*, 2d ser., v, 1870, p. 2107.
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- 1870-71. SOUTHWELL, T. On the Ornithological Archaeology of Norfolk. < *Tr. Norw. Soc.*, 1870-71, pp. 14-21.
Extracts showing the former ornithological condition of the country.
1870. STEVENSON, H. On the Meres of Wretham Heath. < *Trans. Norf. and Norw. Nat. Soc.*, 1870, pp. 36-41.
Account of the birds observed during a visit to these meres.
1870. STEVENSON, H. Miscellaneous Notes and Observations. < *Trans. Norf. and Norw. Nat. Soc.*, 1870, pp. 59-62.
Occurrence in Norfolk of *Aquila chrysaetos* and *Grus cinerea*: note on mortality among *Hirundinidae*.
1870. STEVENSON, H. Ornithological Notes from Norfolk—September to December, 1869. < *Zoologist*, 2d ser., v, 1870, pp. 2055-2058.
1870. STEVENSON, H. Ornithological Notes from Norfolk—January to September, 1870. < *Zoologist*, 2d ser., v, 1870, pp. 2361-2367.
1870. SWEETAPPLE, E. Where do our [British] Summer Visitants go? < *Zoologist*, 2d ser., v, 1870, p. 2347.
Not even Echo answers.
1870. THOMPSON, T. Dates of the Breeding of Birds on Tyneside for 1869. < *Zoologist*, 2d ser., v, 1870, p. 2027.
1870. THURN, E. F. IM. Birds of Marlborough, | being | a contribution | to the | Ornithology of the District, | by Everard F. Im Thurn. | With an Appendix. | Marlborough: | Perkins, "Times" Office; and Lucey, Bookseller. | London: | Simpkin, Marshall, & Co., Stationers Hall Court | MDCCCLXX. | 1 vol. 16mo? pp. viii, 117, + 1 l.
A largely annotated List, divided into Residents, Summer Visitors, Winter Visitors, Spring and Autumn Visitors, Rare and Occasional Visitors. Especially full and important in giving dates (for several years) of observed nidification and oviposition.
1870. TUCK, J. G. Notes on the Sea and Shore Birds of Aldeburgh. < *Zoologist*, 2d ser., v, 1870, pp. 2368, 2369.
- 1870-71. WALKER, T. E. Bird-haunts of the Outer Hebrides. < *Zoologist*, 2d ser., v, 1870, pp. 2073-2077, 2113-2119, 2163-2171; vi, 1871, pp. 2423-2429.

1870-72. WHEELER, R. F., and HOOPPELL, R. E. Meteorological Report for 1867 [-1871]. < *Nat. Hist. Trans. Northumb. and Durh.*, iii, 1870, pp. 1-32, 205-285; iv, 1872, pp. 308-348, 445-511.

Calendarly notes on birds, among other phenomena; tables of dates of migration, and also a list of dates on which certain species were known to breed in that county.

1870 or 1871. WHITE, G. (*Ed. Lady Dorer.*) The | Natural History | of | Selborne. | By the | Rev. Gilbert White, A. M. | Fellow of Oriel College, Oxford. | Arranged for young persons. | A new edition with notes. | London: | Society for Promoting Christian Knowledge; | Sold at the Depositories: | 77, Great Queen Street, Lincoln's Inn Fields; | 4, Royal Exchange; 48, Piccadilly; | and by all Booksellers. [n. d. 1870? 1871?] 1 vol. 8vo. pp. i-x, 1-346.

Not seen: title and comment from Newton.

There is no date in the title-page, but I believe this edition appeared in 1870 or 1871. The woodcuts, mostly by Mr. Wolf, are very superior, and the foot-notes are by "T. B." (Prof. Bell). A sketch map of the district is introduced to face p. 1. Altogether it is an excellent edition and admirably meets the purpose for which it was intended.

1871. BOYNTON, T. Rare Gulls, &c., at Bridlington. < *Zoologist*, 2d ser., vi, 1871, p. 2488.

1871. BOYNTON, T. Goosander, Glaucous Gull and Iceland Gull in Yorkshire. < *Zoologist*, 2d ser., vi, 1871, pp. 2526, 2527.

1871. BRUNTON, J. Birds observed in the Vicinity of Glenarm. < *Zoologist*, 2d ser., vi, 1871, pp. 2698-2702.

1871. CAREY, C. B. Ornithological Notes from Guernsey. < *Zoologist*, 2d ser., vi, 1871, p. 2836.

1871. CHALK, W. J. Cirl Bunting and Longtailed Duck in Bedfordshire. < *Zoologist*, 2d ser., vi, 1871, p. 2562.

1871. CHALK, W. J. Arrival of Migrants, &c. [at Bedford.] < *Zoologist*, 2d ser., vi, 1871, p. 2638.

1871. CLIFTON, *Lord*. Buzzards, &c., at Cobham during 1870. < *Zoologist*, 2d ser., vi, 1871, pp. 2481, 2482.

1871. CLIFTON, *Lord*. Ornithological Notes from Cobham, Kent. < *Zoologist*, 2d ser., vi, 1871, pp. 2844, 2845.

1871. CORDEAUX, J. Ornithological Notes from North Lincolnshire. < *Zoologist*, 2d ser., vi, 1871, pp. 2469-2472, 2495, 2496, 2594-2596, 2653-2656, 2782-2784, 2859-2861.

1871. COUCH, J. Woodcock, Wood Pigeon and Ring Ouzel in Guernsey. < *Zoologist*, 2d ser., vi, 1871, p. 2870.

1871. EDITOR. American Birds [*Coccyzus americanus* and *Numenius borealis* in Great Britain]. < *Am. Nat.*, v, 1871, p. 437.

1871. EEDLE, T. Birds Observed at Rannoch in 1870. < *Zoologist*, 2d ser., vi, 1871, pp. 2656-2658.

Shortly annotated list of 52 spp.

1871. GATCOMBE, J. Wild Birds to be found in the London Markets. < *Zoologist*, 2d ser., vi, 1871, pp. 2625-2628.

1871. GATCOMBE, J. Montagu's Harrier and Hoopoe in Devonshire. < *Zoologist*, 2d ser., vi, 1871, p. 2638.

1871. GORDON, C. Little Auk, &c., near Dover. < *Zoologist*, 2d ser., vi, 1871, p. 2443.

1871. GRAY, R. The Birds of the West of Scotland, including the Outer Hebrides, with occasional records of the occurrence of the rarer species throughout Scotland generally. By Robert Gray. Glasgow: Thomas Murray & Sons. 1871. 1 vol. 8vo. pp. 520.

Not seen.—The author had been upward of 30 years in gathering his material. A notable feature of the work consists in the copious details given respecting particular localities.

Cf. *Ibis*, 1872, p. 184.

1871. GUNN, T. E. Raptorial Birds in Norfolk. < *Zoologist*, 2d ser., vi, 1871, p. 2521.
1871. GUNN, T. E. Golden Oriole and Hoopoe near Norwich. < *Zoologist*, 2d ser., vi, 1871, p. 2849.
1871. GURNEY, J. H. Ornithological Notes from the Vicinity of Torquay during the Winter of 1870-71. < *Zoologist*, 2d ser., vi, 1871, pp. 2629-2631.
1871. GURNEY, J. H. Ornithological Notes from South Devon. < *Zoologist*, 2d ser., vi, 1871, p. 2379.
1871. GURNEY, J. H. Waterhens and Woodpigeons successively occupying the same Nest. < *Zoologist*, 2d ser., vi, 1871, pp. 2770, 2771.
1871. GURNEY, J. H. Departure of Summer Migrants from the Coast of Suffolk. < *Zoologist*, 2d ser., vi, 1871, p. 2863.
1871. GURNEY, J. H., JR. Birds at Rannoch. < *Zoologist*, 2d ser., vi, 1871, p. 2725.
1871. GURNEY, J. H., JR. Birds of the Malvern District. < *Zoologist*, 2d ser., vi, 1871, pp. 2725, 2726.
1871. GURNEY, J. H., JR. Pheasant and French Partridge. < *Zoologist*, 2d ser., vi, 1871, p. 2728.
1871. GURNEY, J. H., JR. Notes from Instow, North Devon. < *Zoologist*, 2d ser., vi, 1871, p. 2845.
1871. HADFIELD, H. Arrival of Migrants [in the Isle of Wight]. < *Zoologist*, 2d ser., vi, 1871, p. 2780.
1871. KERR, W. J. Quails and Siskins in Wales. < *Zoologist*, 2d ser., vi, 1871, pp. 2521, 2522.
1871. KNIGHT, V. Nocturnal Flight of Birds at Folkestone. < *Zoologist*, 2d ser., vi, 1871, pp. 2845, 2846.
1871. LEES, E. Birds of the Malvern District, Resident, Migratory or Occasional Visitors. < *Zoologist*, 2d ser., vi, 1871, pp. 2517-2520, 2631-2637, 2659-2666.
1871. LISTER, T. Arrival of Migrants [Barnsley]. < *Zoologist*, 2d ser., vi, 1871, pp. 2763, 2764.
1871. MATHEW, M. A. British Ornithology of the Year 1870. < *Zoologist*, 2d ser., vi, 1871, pp. 2437, 2438.
Retrospective summary of rarities, etc.
1871. MATHEW, G. F. Nocturnal Flight of Birds at Plymouth. < *Zoologist*, 2d ser., vi, 1871, p. 2803.
1871. MOOR, E. C. Arrival of Migrants, &c. [in Suffolk.] < *Zoologist*, 2d ser., vi, 1871, p. 2338.
1871. MOOR, E. C. Arrival of Migrants at Great Bealings. < *Zoologist*, 2d ser., vi, 1871, p. 2855.
1871. POWER, G. E. Osprey and Rednecked Phalarope in Kent. < *Zoologist*, 2d ser., vi, 1871, p. 2847.
1871. RICHARDS, M. S. C. Purple Sandpiper, Gray Phalarope and Snow Bunting at Northam Burrows. < *Zoologist*, 2d ser., vi, 1871, pp. 2485, 2486.
1871. ROBERTS, G. A List of [17 spp. of] uncommon Birds seen or captured in Yorkshire during the Year 1870. < *Zoologist*, 2d ser., vi, 1871, p. 2304.
1871. ROBERTS, G. Miscellaneous Rural [Yorkshire] Notes for 1870. < *Zoologist*, 2d ser., vi, 1871, pp. 2373-2377, 2702-2712.
1871. ROBERTS, G. Arrival of Migrants [near Wakefield]. < *Zoologist*, 2d ser., vi, 1871, p. 2380.
1871. ROBERTS, G. Summer Migrants in Yorkshire. < *Zoologist*, 2d ser., vi, 1871, p. 2726.
1871. RODD, E. H. Notes from Scilly. < *Zoologist*, 2d ser., vi, 1871, p. 2679.

1871. [SALVIN, O.] [Notice of Stevenson's 'Birds of Norfolk.'] < *Ibis*, 3d ser., i, 1871, pp. 251, 252.
1871. SAXBY, H. L. Ornithological Notes from Shetland. < *Zoologist*, 2d ser., vi, 1871, pp. 2533-2540.
1871. SMEE, A. H. [Rarities seen in] Leadenhall Market. < *Zoologist*, 2d ser., vi, 1871, p. 2528.
1871. SMEE, A. H. Birds observed in the Thames, &c., in the Winter of 1870-71. < *Zoologist*, 2d ser., vi, 1871, pp. 2604-2605.
1871. SMEE, A. H. Arrival of Migrants [at Wallington Bridge]. < *Zoologist*, 2d ser., vi, 1871, pp. 2679, 2680.
1871. SMITH, C. Rednecked Grebe and Bittern in Somerset. < *Zoologist*, 2d ser., vi, 1871, p. 2563.
1871. SPENCER, T. Extraordinary Flight of Birds by Night [in England]. < *Zoologist*, 2d ser., vi, 1871, pp. 2846, 2847.
1871. STEVENSON, H. Ornithological Notes from Norfolk—September to December, 1870. < *Zoologist*, 2d ser., vi, 1871, pp. 2496-2499.
1871. STEVENSON, H. Ornithological Notes from Norfolk—January and February, 1871. < *Zoologist*, 2d ser., vi, 1871, pp. 2597-2604.
1871. STEVENSON, H. Ornithological Notes from Norfolk—March to September, 1871. < *Zoologist*, 2d ser., vi, 1871, pp. 2828-2833.
1871. TUCK, T. G. Ornithological Notes from Aldeburgh, Suffolk. < *Zoologist*, 2d ser., vi, 1871, pp. 2804, 2805.
1871. WALKER, F. A. Notes on the Scilly Isles. < *Zoologist*, 2d ser., vi, 1871, pp. 2830, 2834.
1871. WHITAKER, J., JR. Rare Birds in Nottinghamshire. < *Zoologist*, 2d ser., vi, 1871, pp. 2803, 2804.

1871-8-. YARRELL, W. (*Ed. Newton, A.*) A History of British Birds. By the late William Yarrell, V. P. L. S., F. Z. S. Fourth Edition, revised by Alfred Newton, M. A., F. R. S., etc. London: John Van Voorst. (Now publishing, in Parts of about 80 pages, to form 3 vols., 8vo, with about 600 illustrations.)

The following are the dates of appearance of Parts thus far: Part I, June 1871, pp. 1-80; II, Aug. 1871, pp. 81-160; III, ———? pp. 161-240; IV, July 1872, pp. 241-320; V, Mar. 1873, pp. 321-400; VI, July 1873, pp. 401-480; VII, Feb. 1874, pp. 481-560; VIII, Nov. 1874, pp. 561-646, ending Vol. I, with temporary title-page, note, errata, and contents, pp. i-viii.—Part IX, Feb. 1876, pp. 1-80; X, Nov. 1876, pp. 81-160; XI, Sept. 1877 (pp. 101, 102 to replace those pages in Part X), pp. 161-238; Part XII, Oct. 1878, pp. 239-318; no more seen.

The publication of Yarrell's work began July, 1837, and ended May, 1843. A second edition appeared in 1845, and a third in 1856, but a few months before the author's death. The 2d and 3d were substantially reprints of the first, though with some additions and alterations. During the thirty years the literature of the subject nearly doubled, and there was a great increase in the knowledge of the subject after the third edition appeared. A new edition was demanded, not only by the public at large but by those who held the earlier issues; and it was the heaviest task of the editor of the fourth to sift the enormous mass of new material at his service. The editor did not scruple to make such systematic changes as he considered necessary, nor to scrutinize closely the claim of any bird to be considered British. The scientific names were retained, as given by Yarrell; but the editor also prefixed names according, as far as possible, to the Rules adopted by the British Association, hoping thus to ultimately reach a more uniform nomenclature. The third edition was embellished with 550 woodcuts; the present is to contain nearly 600.

The editor has thus far executed his self-imposed task with the utmost care, fidelity, and success; but of a work thus in process of publication a full notice must be deferred.

1872. BIRCHALL, E. Are the Channel Islands British? < *Zoologist*, 2d ser., vii, 1872, pp. 3304-3306.

Regrets even qualified approval of the proposal for including their productions in the British Fauna.

1872. BRUNTON, T. [Note on 3] Birds at Glenarm. < *Zoologist*, 2d ser., vii, 1872, p. 3235.
1872. BUTTON, D. T. Hawks, &c., at Gravesend. < *Zoologist*, 2d ser., vii, 1872, p. 3019.
1872. CAREY, C. B. Ornithological [Field] Notes from Guernsey [cont. from Zool., 2836]. < *Zoologist*, 2d ser., vii, 1872, pp. 2910, 2911.
1872. CAREY, C. B. Ornithological Notes from Guernsey [cont. from Zool., s. s., 2911]. < *Zoologist*, 2d ser., vii, 1872, pp. 2990, 2991.
1872. CAREY, C. B. Spring Arrivals in Guernsey. < *Zoologist*, 2d ser., vii, 1872, p. 3062.
1872. CAREY, C. B. Are Guernsey Birds British? < *Zoologist*, 2d ser., vii, 1872, p. 3066.
1872. CAREY, C. B. Are Guernsey Birds British? < *Zoologist*, 2d ser., vii, 1872, p. 3145.
With his idea of the imaginary 'British' boundary.
1872. CAREY, C. B. Ornithological Notes from Guernsey. < *Zoologist*, 2d ser., vii, 1872, p. 3233.
1872. CAREY, C. B. Are the Channel Islands Birds British? < *Zoologist*, 2d ser., vii, 1872, p. 3324.
1872. CHALK, W. J. The Fourth Edition of "Yarrell". < *Zoologist*, 2d ser., vii, 1872, pp. 3018, 3019.
A slight criticism, advanced "with all humility".
1872. CLERMONT, Lord. Are the Channel Islands British? < *Zoologist*, 2d ser., vii, 1872, p. 3184.
Answered in the negative.
1872. CLOGG, S. Razorbills, &c., picked up on the Coast of Cornwall. < *Zoologist*, 2d ser., vii, 1872, p. 2935.
1872. CORDEAUX, J. Notes [chiefly Ornithological] from the Lincolnshire Coast and North Sea. < *Zoologist*, 2d ser., vii, 1872, pp. 3203-3209.
1872. CORDEAUX, J. Ornithological Notes from North Lincolnshire [cont. from Zool., s. s., 2831]. < *Zoologist*, 2d ser., vii, 1872, pp. 2928-2932, 3014-3016, 3095-3098, 3165, 3166, 3320-3323.
1872. CORDEAUX, J. Birds [of] the Humber District. | By | John Cordeaux. | — | *δείρ' ἕτε πενήθμενοι τὰ νεώτερα. | πάντα γὰρ ἐνθεθε φῆλ' ἀπρὸς ἴσμεν οἱ- | ὠνῶν τῶν τ:ναοδέϊρων.* | Aristoph. Aves, 252 sqq. | — | London: | John Van Voorst, Paternoster Row. | MDCCLXXII. | 1 vol. 16mo. pp. i-xii, 1 leaf, pp. 1-231, frontisp. and tailp.
Annotated list of 276 spp.
1872. DURNFORD, H. Richardson's Skua, &c., in Norfolk. < *Zoologist*, 2d ser., vii, 1872, pp. 2903, 2907.
1872. DURNFORD, H. Birds observed in Liverpool Market. < *Zoologist*, 2d ser., vii, 1872, p. 3018.
1872. DURNFORD, H. Birds observed in Liverpool Market during March. < *Zoologist*, 2d ser., vii, 1872, p. 3036.
1872. DURNFORD, H. Ornithological Notes from the Neighbourhood of Southwold, Suffolk. < *Zoologist*, 2d ser., vii, 1872, pp. 3307-3309.
1872. FIELDEN, H. W. The Birds of the Faroe Islands. < *Zoologist*, 2d ser., vii, 1872, pp. 3210-3225, 3245-3257, 3277-3294.
1872. GATCOMBE, J. Rare Birds at Plymouth. < *Zoologist*, 2d ser., vii, 1872, p. 2940.
1872. GATCOMBE, J. Ornithological Notes, chiefly from Devonshire, during the Autumn and Winter of 1871-72. < *Zoologist*, 2d ser., vii, 1872, pp. 2984-2988.
1872. GATCOMBE, J. Ornithological [Field] Notes made in the neighbourhood of Plymouth during February, 1872. < *Zoologist*, 2d ser., vii, 1872, pp. 3011-3014.
1872. GATCOMBE, J. Ornithological Notes made in the neighbourhood of Plymouth during March, 1872. < *Zoologist*, 2d ser., vii, 1872, pp. 3049-3052.

1872. GATCOMBE, J. Ornithological Notes made in the Neighbourhood of Plymouth during April, 1872. < *Zoologist*, 2d ser., vii, 1872, pp. 3093-3101.
1872. GATCOMBE, J. Ornithological Notes made in Devon and Cornwall during the Month of May, 1872. < *Zoologist*, 2d ser., vii, 1872, pp. 3133-3138.
1872. GATCOMBE, J. A few Ornithological Notes made in Devon and Cornwall during June, 1872. < *Zoologist*, 2d ser., vii, 1872, pp. 3156-3169.
1872. GATCOMBE, J. Ornithological Notes made in Devon and Cornwall during July and August, 1872. < *Zoologist*, 2d ser., vii, 1872, pp. 3258-3260.
1872. GIBB, T. H. Ornithological [Field] Notes from Northumberland for 1871. < *Zoologist*, 2d ser., vii, 1872, pp. 3008-3011.
1872. GURNEY, J. H. Ornithological Occurrences in the Neighbourhood of Torquay during the Spring of 1872. < *Zoologist*, 2d ser., vii, 1872, pp. 3134-3136.
1872. GURNEY, J. H. [Misc. notes on] Kestrel, Sparrowhawk and Cuckoo. < *Zoologist*, 2d ser., vii, 1872, p. 3146.
1872. HADFIELD, H. Arrival of Spring Migrants [at the Isle of Wight]. < *Zoologist*, 2d ser., vii, 1872, pp. 3032, 3033.
1872. HARTING, J. E. A Handbook [of] British Birds, [showing the] distribution of the resident and migratory species [in the British Islands,] with [an index to the records of the rarer visitants.] By [J. E. Harting, F. L. S., F. Z. S.,] member of the British Ornithologists' Union, etc., etc. — [London: John Van Voorst, Paternoster Row. MDCCCLXXII. 1 vol. 8vo. pp. xxiv, 198. 395 spp.—130 residents, 100 periodical migrants, 30 annual visitants, the remainder rare and accidental visitants (more than 40 of them from America). The feature of the work is the elaborate record of occurrences, which, in the cases of the stragglers alone, occupies half the volume. The work seems to have been prepared with care, and was favorably received. Cf. *Zool.*, 1872, pp. 3326-3329; *Am. Nat.*, vii, 1873, pp. 163-165.
1872. HUGEL, A. V. Ornithological Notes from Lancashire. < *Zoologist*, 2d ser., vii, 1872, pp. 3228-3230.
1872. KERR, W. J. Ornithological Notes from North Wales. < *Zoologist*, 2d ser., vii, 1872, p. 3144.
1872. KNOX, A. E. Autumns on the Spey. By A. E. Knox, M. A., F. L. S., &c. London. Van Voorst. 1872. post 8vo. pp. 172, pl. lithog. 4.
Not seen.—Cf. *Zoologist*, s. s., viii, 1873, pp. 3479-3486.
1872. MATHEW, G. F. Ornithological [Field] Notes from Devonshire. < *Zoologist*, 2d ser., vii, 1872, pp. 2917-2921.
1872. MATHEW, M. A. English Ornithology of 1871. < *Zoologist*, 2d ser., vii, 1872, pp. 2908-2910.
Notes increase in numbers, on the whole, of several species formerly rare.
1872. MATHEW, M. A. [Note on the] Ornithology of Dartmoor. < *Zoologist*, 2d ser., vii, 1872, pp. 3017, 3018.
1872. NEWMAN, E. Are Guernsey Birds British? < *Zoologist*, 2d ser., vii, 1872, pp. 3324-3326.
1872. NEWMAN, E. Notices of New Books. < *Zoologist*, 2d ser., vii, 1872, pp. 3326-3329.
Reviews Harting's 'Handbook of British Birds.'
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Answered in the negative; with sharp criticism of certain parties.
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 Spp. circ. 265, an addition of over 50 spp. to the principal previous list (Selby's, 1831, *q. v.*). 90 residents (breeding or not); 40 spring-and-autumn migrants (breeders); 54 autumn-and-winter visitants; 79 casual visitants; *Accip.* 26, *Pass.* 102, *Columb.* 4, *Gall.* 7, *Grall.* 50, *Palmpip.* 76. Replete with local items and biographical matter. The introduction notices previous publications on the subject, and treats very fully of the character of the region and its Ornis in general; special exposition of and protest against wanton destruction of birds. The classification of Degland-Gerbe is followed. The author's ripe experience and great care result in a work meeting all the requirements of a local treatise, which at once becomes the standard authority on the subject.
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 This is a considerable list, with short miscellaneous notices of each species. It is entirely remodeled from the old Pulteney list, to which reference is made. The author had the co-operation of several accomplished ornithologists in revising the nomenclature, and appears to have brought the subject fully up to date in all the requirements of a local list.
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1875. GURNEY, J. H. Redwing killed by a Crow. < *Zoologist*, 2d ser., x, March, 1875, p. 4381.
1875. GURNEY, J. H., JR. Pomatorhine Skuas and Black Guillemots at Flamborough. < *Zoologist*, 2d ser., x, Oct., 1875, p. 4667.
1875. GUNN, T. E. Wild Fowl in Norfolk. < *Zoologist*, 2d ser., x, Feb., 1875, p. 4337.
1875. GUNN, T. E. Starvation of Kingfishers, &c. < *Zoologist*, 2d ser., x, Feb., 1875, p. 4338.
1875. HADFIELD, H. Spring Migrants [in the Isle of Wight]. < *Zoologist*, 2d ser., x, June, 1875, p. 4495.
1875. HADFIELD, H. Spring Migrants [in the Isle of Wight]. < *Zoologist*, 2d ser., x, July, 1875, p. 4537. See p. 4623.
1875. HADFIELD, H. On the Migration of [certain British] Birds. < *Zoologist*, 2d ser., x, Dec., 1875, pp. 4711-4713.
1875. HAMEL, E. D. Cuckoos Congregating: Pigeons laying in a Magpie's Nest. < *Zoologist*, 2d ser., x, Aug., 1875, p. 4573.
1875. HARTING, J. E. Our Summer Migrants. | An account of | the Migratory Birds | which pass the summer in | the British Islands. | By J[ames]. E[dmund]. Harting, F. L. S., F. Z. S. | author of [etc., 3 lines.] | Illustrated from designs by Thomas Bewick. | [Design.] | London: | Bickers and Son, | 1, Leicester Square. | 1875. 1 vol. 8vo. pp. i-x, 1-336.

"In the following chapters an attempt has been made to answer these questions [respecting migration] and to give such information generally about our summer migratory birds as will

1875. HARTING, J. E.—Continued.

prove acceptable to many who may be glad to possess it without knowing exactly where to look for it. Some of these sketches were originally published in the Natural History columns of "The Field" during the summer of 1871, and as a reprint has frequently been asked for, I have now carefully revised them and made some important additions and emendations, besides adding to the series a dozen or more chapters which have never before appeared." (Extr. from Preface.)

About fifty species are treated in the author's usual agreeable style. The cuts, though not without a certain brilliancy, cannot be highly commended as finely finished reproductions of Bewick.

1875. MATHEW, G. F. Ornithological Notes from Dartmouth. < *Zoologist*, 2d ser., x, Feb., 1875, pp. 4325-4329.

Oct.-Dec., 1874.

1875. MATHEW, M. A. The Somerset-shire Moors in the Spring. < *Zoologist*, 2d ser., x, July, 1875, pp. 4532, 4533.

With reference to the birds seen there and then.

1875. MATHEW, M. A. Rare Birds in North Devon. < *Zoologist*, 2d ser., x, Dec., 1875, p. 4720.

1875. NEWMAN, E. The Birds of Shetland, with Observations on their Habits, Migration and Occasional Appearance, . . . < *Zoologist*, 2d ser., x, Jan., 1875, pp. 4269-4289.

Third and concluding notice of H. L. Saxby's work of that name.

1875. PALMER, J. E. Birds observed near Huddersfield. < *Zoologist*, 2d ser., x, Mar., 1875, p. 4379.

Notes on 6 spp.

1875. PIKE, W. Migration of [certain British] Birds. < *Zoologist*, 2d ser., x, June, 1875, p. 4494.

1875. PIKE, W. Climate and Ornithology of Achill. < *Zoologist*, 2d ser., x, July, 1875, pp. 4534-4536.

1875. PILLY, J. B. Hobby and Egyptian Goose near Hereford. < *Zoologist*, 2d ser., x, Mar., 1875, p. 4381.

1875. RICKARDS, M. S. C. Hobby at Portishead and Goldeneye near Axbridge. < *Zoologist*, 2d ser., x, Jan., 1875, p. 4297.

1875. RODD, E. H. Spring Migration at the Land's End District. < *Zoologist*, 2d ser., x, June, 1875, pp. 4494, 4495.

1875-76. [ROWLEY, G. D.] British Birds. < *Rowley's Orn. Misc.*, Pt. ii, Aug. 1875, pp. 49-134, pls. x-xv; Part iii, Jan. 1876, pp. 135-140.

This is a series of pleasantly written articles on various Birds of Great Britain, accompanied by some excellent plates. The species are too many (upwards of 40) and the matter too miscellaneous to be here characterized. The plates are: pl. x, *Accipiter nisus*; xi, *Aluco flammeus*; xiii^a, xiii^b, xiii^c, *Anas boschas*, *Carduelis elegans*, etc., and other birds, to show variation in throat plumage; xii, a lenk glass; xiv, xv, Scenery.

1875. SCLATER, J. [Ornithological] Notes from Castle Eden. < *Zoologist*, 2d ser., x, Feb., 1875, pp. 4329-4332; Apr., 1875, pp. 4401-4406.

1875. SMEE, A. H. Notes of a Cruise at the Mouths of the Thames and Blackwater Rivers. < *Zoologist*, 2d ser., x, May, 1875, pp. 4451, 4452.

Notes on various birds observed.

1875. SMEE, A. H. Migration of Waders [in England]. < *Zoologist*, 2d ser., x, Oct., 1875, p. 4663.

1875. SMITH, CECIL. Ornithological Notes from Somersetshire. < *Zoologist*, 2d ser., x, Feb., 1875, pp. 4332-4335.

1875. SMITH, CECIL. Albino and other Variations of Plumage in [certain British] Birds. < *Zoologist*, 2d ser., x, Apr., 1875, pp. 4422-4424.

1875. SOUTHALL, W. Birds in my Garden [at Birmingham]. < *Zoologist*, 2d ser., x, July, 1875, pp. 4533, 4534.

1875. STEVENSON, H. Ornithological Notes from Norfolk. < *Zoologist*, 2d ser., x, Jan., 1875, pp. 4289-4294; Mar., 1875, pp. 4366-4370; Sept., 1875, pp. 4629-4635.
Notes continued from p. 4191.
1875. TUCK, J. G. [Ornithological] Notes from Aldeburgh, Suffolk. < *Zoologist*, 2d ser., x, July, 1875, pp. 4536, 4537.
1875. TUCK, J. G. Rare Birds at Flamborough. < *Zoologist*, 2d ser., x, Nov., 1875, p. 4689.
1875. WHITAKER, J. Arrival of Spring Birds in Nottinghamshire. < *Zoologist*, 2d ser., x, July, 1875, p. 4537.
1875. WHITE, G. (*Ed. Harting, from Bennett.*) The Natural History | and | Antiquities | of | Selborne, | in the county of Southampton. | By the Rev. Gilbert White, M. A. | The standard edition by E. T. Bennett. | Thoroughly revised, with additional Notes. | By James Edmund Harting, F. L. S., F. Z. S. | Author of "A Handbook of British Birds," "The | Ornithology of Shakespeare," etc. | Illustrated with Engravings by Thomas Bewick, | Harvey, and others. | London: Bickers and Son, 1, Leicester Square, 1875. 1 vol. 8vo. pp. i-xxii, 1-532.
Not seen: title from Newton, 1877. The engravings ascribed to Bewick in the title-page may easily be seen, on comparison, to be copies of his masterpieces, and not printed from the blocks which illustrate his well-known *British Birds*. The edition is otherwise very well "got up." The editor has freely altered such of his predecessor's notes as seemed to require amendment, and of course many did. To face p. 385 is inserted a *fac-simile* copy of the same page of the author's diary as had been given forty years before by Jesse, in his *Gleanings in Natural History*. (Cf. 1834.)
1875. WHITE, G. (*Ed. Buckland.*) Natural History | and | Antiquities of Selborne | by | Gilbert White | with notes, by | Frank Buckland. | A chapter on Antiquities, by | Lord Selborne. | And new letters. | Illustrated by P. H. Delamotte. | London: | Macmillan and Co. | 1875. 1 vol. 8vo. pp. i-xxx, 1-591.
Not seen—title and comment from Newton.
In this edition the author's "Natural History" ends with p. 292, to which follow the comparative "Calendar" kept by White and Markwick, and then Mr. Buckland's notes, extending over pp. 309-458. The author's "Antiquities" occupy pp. 459-555, and on p. 559 begins Lord Selborne's "Appendix," which ends at p. 574. The volume is profusely illustrated by woodcuts; but, except the views of the place and its neighborhood, few of them have anything especially to do with White or Selborne. The same may be said of the editor's "Notes"; and the "Memoir" gives little information about the author that was not known before. As a whole, the edition has served to amuse the general reader, but can never be deemed by a naturalist to be worthy of the author's memory. Lord Selborne's contribution excepted. The new letters (five in number, lent by Mr. J. W. Edgehill, of Culter, Aberdeen) bear date from November, 1774, to January, 1791, and are addressed to the writer's nephew Samuel Barker, his sister Mrs. Barker, his niece Anne Barker (2), and his brother-in-law Thomas Barker. To the first is prefixed a poetical "Invitation to Selborne," which consists of a great part of the poem "Selborne," afterwards printed with amplifications, combined with some lines subsequently incorporated with the well-known "Naturalist's Summer Evening Walk." One of the letters to Anne Barker, dated February 5, 1785, is nearly identical with the already published sixty-third letter to Barrington. To face p. xxii is a photograph of a portion of the letter there printed, and on p. 473 is a woodcut representing in *fac-simile* the last entry in the burial register of Selborne, signed by White as "Curate," June 10, 1793, followed by the certificate of his own burial, July 1, 1793, signed "Ch. Taylor—Vicar."
1875. WHITE, G. (*Ed. Buckland.*) The Natural History and Antiquities of Selborne. By Gilbert White, with notes by Frank Buckland: A Chapter on Antiquities by Lord Selborne; and New Letters. Illustrated by P. H. Delamotte. New York: Macmillan. 1875. 8vo.
American reissue of London ed. of same date. Cf. *The Nation*, No. 565, April 27, 1875, p. 283.
1875. WHIGLEY, J. W. Richardson's Skua and Storm Petrel at Formby, Lancashire. < *Zoologist*, 2d ser., x, Jan., 1875, p. 4300.
1876. BENSON, C. W. Sparrowhawk and Missel Thrush. < *Zoologist*, 2d ser., xi, July, 1876, pp. 5000, 5001.
1876. BOYES, F. A few Rough Notes from Beverley for the Close of the Year 1875. < *Zoologist*, 2d ser., xi, Apr., 1876, pp. 4861-4863.

1876. BOYES, F. Sea Birds at Bridlington. < *Zoologist*, 2d ser., xi, Oct., 1876, p. 5116.
1876. BOYES, F. The Time of Day at which Birds lay their Eggs. < *Zoologist*, 2d ser., xi, Oct., 1876, pp. 5115, 5116.
1876. CLIFTON, Lord. Wood Wren and Greenshank in Sutherland. < *Zoologist*, 2d ser., xi, Oct., 1876, p. 5122.
1876. CLOGG, S. Migration of Birds [in England]. < *Zoologist*, 2d ser., xi, Jan., 1876, pp. 4757, 4758.
1876. CORBIN, G. B. Small Birds and Reed Beds. < *Zoologist*, 2d ser., xi, Mar., 1876, pp. 4827, 4828.
1876. CORBIN, G. B. Rare Birds near Ringwood during the Winter of 1875-76. < *Zoologist*, 2d ser., xi, July, 1876, pp. 4989-4991.
1876. CORDEAUX, J. Ornithological Notes from North Lincolnshire. < *Zoologist*, 2d ser., xi, Feb., 1876, pp. 4778-4780.
Continued from p. 4710.
1876. CORDEAUX, J. Ornithological Notes from North Lincolnshire. < *Zoologist*, 2d ser., xi, May, 1876, pp. 4897-4899.
1876. CORDEAUX, J. Ornithological Notes from North Lincolnshire. < *Zoologist*, 2d ser., xi, July, 1876, pp. 4982-4985.
1876. CORDEAUX, J. Ornithological Notes from North Lincolnshire. < *Zoologist*, 2d ser., xi, Sept., 1876, pp. 5031, 5032.
1876. DOUGLAS-OGILBY, J. Notes from Portrush, County Antrim. < *Zoologist*, 2d ser., xi, May, 1876, pp. 4903-4906.
1876. DOUGLAS-OGILBY, J. Arrival of Spring Migrants in County Dublin. < *Zoologist*, 2d ser., xi, July, 1876, p. 4993.
1876. DURNFORD, W. A. Ornithological Notes from the North-West Coast. < *Zoologist*, 2d ser., xi, May, 1876, pp. 4903-4910.
1876. EDSON, G. Rare Birds near Malton. < *Zoologist*, 2d ser., xi, May, 1876, p. 4919.
1876. EEDLE, T. Peregrine Falcon, Great Northern Diver and Wild Geese near Merton Hall, Norfolk. < *Zoologist*, 2d ser., xi, Jan., 1876, p. 4760.
1876. ELLIOTT, A. C. Rare Birds in Lincolnshire. < *Zoologist*, 2d ser., xi, Feb., 1876, p. 4794.
1876. GATCOMBE, J. Ornithological Notes from Devonshire and Cornwall. < *Zoologist*, 2d ser., xi, Feb., 1876, pp. 4783-4785.
Continued from p. 4636.
1876. GATCOMBE, J. Ornithological Notes from Devonshire and Cornwall. < *Zoologist*, 2d ser., xi, Mar., 1876, pp. 4823, 4824.
1876. GATCOMBE, J. Ornithological Notes from Devonshire and Cornwall. < *Zoologist*, 2d ser., xi, May, 1876, pp. 4901-4903.
1876. GATCOMBE, J. Ornithological Notes from Devon and Cornwall. < *Zoologist*, 2d ser., xi, July, 1876, pp. 4991-4993.
1876. GATCOMBE, J. Ornithological Notes from Devon and Cornwall. < *Zoologist*, 2d ser., xi, Aug., 1876, pp. 5028-5030.
1876. GATCOMBE, J. Ornithological Notes from Devon and Cornwall. < *Zoologist*, 2d ser., xi, Oct., pp. 5109, 5110.
1876. GATCOMBE, J. Ornithological Notes from Cornwall, Devon, and Somersetsshire. < *Zoologist*, 2d ser., xi, Nov., 1876, pp. 5145-5147.
1876. GATCOMBE, J. Chongh, Curlew Sandpiper and Little Stint at Portrush. < *Zoologist*, 2d ser., xi, Nov., 1876, p. 5165.
1876. GRIPPER, J. E. Rare Birds and Otter near York. < *Zoologist*, 2d ser., xi, 1876, p. 4919.

1876. GUNN, T. E. Notes on the Occurrence of Rare Birds in Norfolk and Suffolk. < *Zoologist*, 2d ser., xi, Feb., 1876, pp. 4785-4791.
1876. GURNEY, J. H., JR. Avocet and Pectoral Sandpiper in Durham. < *Zoologist*, 2d ser., xi, Jan., 1876, p. 4765.
1876. GURNEY, J. H., JR. Dneks and Partridges laying in the same Nest. < *Zoologist*, 2d ser., xi, Jan., 1876, pp. 4765, 4766.
1876. GURNEY, J. H., JR. 'A Catalogue of the Birds of Northumberland and Durham', by John Hancock. < *Zoologist*, 2d ser., xi, Feb., 1876, p. 4793.
Remarks on Doubleday's (p. 4429) notice of the work.
1876. GURNEY, J. H., JR. Addendum to a Note on Rare Sea Birds (*Zool. S. S.* 1295). < *Zoologist*, 2d ser., xi, Feb., 1876, p. 4794.
1876. GURNEY, J. H., JR. Sparrowhawk and Woodcock. < *Zoologist*, 2d ser., xi, Apr., 1876, p. 4870.
1876. GURNEY, J. H., JR. Leadenhall Market in May. < *Zoologist*, 2d ser., xi, June, 1876, p. 4953.
1876. GURNEY, J. H., JR. The Farne Islands. < *Zoologist*, 2d ser., xi, July, 1876, p. 4999.
1876. GURNEY, J. H., JR. The Museum at York. < *Zoologist*, 2d ser., xi, July, 1876, pp. 4999, 5000.
The Strickland Collection.
1876. GURNEY, J. H., JR. Nidification of the Pied Wagtail and Swallow. < *Zoologist*, 2d ser., xi, July, 1876, p. 5003.
1876. GURNEY, J. H., JR. Errata in Mr. Harting's 'Handbook of British Birds'. < *Zoologist*, 2d ser., xi, Aug., 1876, p. 5041.
1876. GURNEY, J. H., JR. Ornithological Notes from Blakeney. < *Zoologist*, 2d ser., xi, Sept., 1876, pp. 5078, 5079.
1876. HADFIELD, H. Arrival of Spring Migrants, Nesting of the House Sparrow, &c. < *Zoologist*, 2d ser., xi, July, 1876, p. 4997.
1876. HADFIELD, H. Bird Notes from the Isle of Wight. < *Zoologist*, 2d ser., xi, July, 1876, pp. 4997, 4998.
1876. HADFIELD, H. Ornithological Notes from the Isle of Wight. < *Zoologist*, 2d ser., xi, Nov., 1876, p. 5160.
1876. HENSON, C. W. Ornithological Notes from Dublin. < *Zoologist*, 2d ser., xi, May, 1876, p. 4919.
1876. JEFFERY, W. Notes from West Sussex. < *Zoologist*, 2d ser., xi, Apr., 1876, pp. 4863-4865.
1876. J. T. C. Transactions of the Norfolk and Norwich Naturalists' Society. 1875-6. Vol. II., Part 2. Norwich: Fletcher & Son. < *Zoologist*, 2d ser., xi, July, 1876, pp. 4974-4982.
A digest of the Part of the Transactions named, the ornithological matter here commented upon relating chiefly to British Birds. The most interesting part of the article has reference to ten before unpublished letters of Gilbert White, addressed to Robert Marsham.
1876. KERRY, F. Rare Birds in Essex. < *Zoologist*, 2d ser., xi, Mar., 1876, p. 4827.
1876. MARSHAM, H. P., and BELL, Prof. The Correspondence | of | Robert Marsham of Stratton Strawless in the County | of Norfolk, Esquire, and Fellow of the Royal Society; | and | the Reverend Gilbert White, of Selborne, in the County | of Southampton, Master of Arts, and Fellow of Oriol College | in the University of Oxford. | 1790-1793. | Communicated by the Rev. H. P. Marsham, and Prof. Bell, | September 28th, 1875, and March 1st, 1876 (*Transactions of the Norfolk and Norwich Naturalists' Society*, vol. ii, pp. 133-195).

Not seen—title and comment from Newton.

[Cf. "Notes and Queries," 5th ser., vi, 280.] Ten hitherto unpublished letters are here printed from the originals in Mr. H. P. Marsham's possession. Two more of the series (dated, as appears from his correspondent's replies, Oct. 12, 1790, and June 8, 1791) are missing. The "Introductory Note" is signed "T. S." (Southwell), and foot-notes are added by "J. E. H." (Harting) and "A. N." (Alfred Newton).

1876. MATHEW, M. A. Notes from North Devon and West Somerset. < *Zoologist*, 2d ser., xi, Mar., 1876, pp. 4813-4815.
1876. MATHEW, M. A. Notes from West Somerset. < *Zoologist*, 2d ser., xi, May, 1876, pp. 4899-4901.
1876. MATHEW, M. A. Notes from West Somerset. < *Zoologist*, 2d ser., xi, July, 1876, pp. 4995, 4996.
1876. MATHEW, M. A. Notes on the Cuckoo and Redbacked Shrike. < *Zoologist*, 2d ser., xi, Aug., 1876, p. 5045.
1876. MATHEW, M. A. The Exeter Albert Memorial Museum. < *Zoologist*, 2d ser., xi, Oct., 1876, p. 5115.
1876. MATHEW, G. F. Scarce Birds at Torquay. < *Zoologist*, 2d ser., xi, Nov., 1876, p. 5161.
1876. [NEWMAN, E.] A History of British Birds, by the late William Yarrell. . . . < *Zoologist*, 2d ser., xi, June, 1876, p. 4969.
Notice of Part ix of Newton's ed. of the work.
1876. [NEWMAN, E.] Our Summer Migrants: an Account of the Migratory Birds which pass the Summer in the British Islands. By J. E. Harting. . . . < *Zoologist*, 2d ser., xi, June, 1876, p. 4970.
Notice of the work.
1876. NICHOLLS, H. Bewick's Swan and other Birds at Kingsbridge, Devon. < *Zoologist*, 2d ser., xi, Dec., 1876, p. 5180.
1876. PRIOR, C. M. Tree Sparrow and Wood Pigeon building in a Magpie's Nest. < *Zoologist*, 2d ser., xi, Apr., 1876, p. 4875.
1876. RODD, E. H. Dartford Warbler, Green Woodpecker and Starling at the Land's End. < *Zoologist*, 2d ser., xi, Feb., 1876, p. 4793.
1876. RODD, E. H. Our Summer Migrants in Cornwall. < *Zoologist*, 2d ser., xi, Aug., 1876, pp. 5039, 5040.
1876. RODD, E. H. Solitary Snipe, Hoopoe, and Leach's Petrel in Cornwall. < *Zoologist*, 2d ser., xi, Nov., 1876, p. 5167.
1876. SAXBY, S. H. The Time of Day at which Birds lay their Eggs. < *Zoologist*, 2d ser., xi, Nov., 1876, p. 5161.
1876. SCLATER, J. Notes from Castle Eden. < *Zoologist*, 2d ser., xi, Jan. 1876, pp. 4743-4750.
Continued from p. 4406. Entirely ornithological.
1876. SCLATER, J. Notes from Castle Eden. < *Zoologist*, 2d ser., xi, Mar., 1876, pp. 4815-4819.
1876. SCLATER, J. Notes from Castle Eden. < *Zoologist*, 2d ser., xi, April, 1876, pp. 4858-4860.
1876. SCLATER, J. Notes from Castle Eden. < *Zoologist*, 2d ser., xi, July, 1876, pp. 4985-4989.
1876. SCLATER, J. Notes from Castle Eden. < *Zoologist*, 2d ser., xi, Oct., 1876, pp. 5103-5105.
1876. SMITH, CECIL. A few Ornithological Notes from Guernsey. < *Zoologist*, 2d ser., xi, Feb., 1876, pp. 4780-4783.
1876. SMITH, CECIL. A few Ornithological Notes from Guernsey and some of the other Channel Islands, from the 3rd to the 19th of June, 1876. < *Zoologist*, 2d ser., xi, Aug., 1876, pp. 5024-5028.
1876. SMITH, H. ECROYD. A First Peep at the Bird-breeders on old Farne. < *Zoologist*, 2d ser., xi, May, 1876, pp. 4933-4936.
1876. STEVENSON, H. Ornithological Notes from Norfolk. < *Zoologist*, 2d ser., xi, Feb., 1876, pp. 4773-4778. May, 1876, pp. 4893-4897.
Continued from p. 4635.

1876. STEVENSON, H. Ornithological Notes from Norfolk. < *Zoologist*, 2d ser., xi, May, 1876, pp. 4893-4897.
1876. STEVENSON, H. Ornithological Notes from Norfolk. < *Zoologist*, 2d ser., xi, Oct., 1876, pp. 5105-5108.
1876. STEVENSON, H. Redstarts and Blue Tits nesting in Human Skulls. < *Zoologist*, 2d ser., xi, Oct., 1876, pp. 5116, 5117.
1876. TUCK, J. G. Sea Birds at Flamborough. < *Zoologist*, 2d ser., xi, Jan., 1876, pp. 4758, 4759.
1876. TUCK, J. G. Notes from Flamborough, &c. < *Zoologist*, 2d ser., xi, Aug., 1876, p. 5040.
1876. WALLIS, H. M. Ornithological Notes. < *Zoologist*, 2d ser., xi, Aug., 1876, pp. 5030-5032.
On *Alca torda*, *Fratereula arctica*, *Uria grylle*, *Tringoides hypoleucus*.
1876. WHITAKER, J. Birds near Rainworth. < *Zoologist*, 2d ser., xi, Apr., 1876, p. 4869.
1876. WHITAKER, J. Ornithological Notes from Perthshire. < *Zoologist*, 2d ser., xi, Oct., 1876, pp. 5100-5103.
1876. WHITE, G. [Correspondence with R. Marsham.]
See MARSHAM, H. P., 1876.
1876. WHITE, G. (Ed. Harting, from Beaucl.) The Natural History and Antiquities of Selborne. . . . London, 1876.
This is the Harting ed. of 1875, reissued as a new edition, with the addition of the letters of White to Marsham (cf. Marsham, 1876).
1877. ANON. Scarcity of Spring Birds [in England]. < *The Country*, i, Nov. 17, 1877, p. 43.
1877. GURNEY, J. H., JR. On Flamborough Head. < *Rowl. Orn. Misc.*, iii, pt. xi, Nov., 1877, pp. 29-38.
Notes on the habits of the birds of that place.
1877. NEWTON, A. The published Writings of Gilbert White. (Nat. July 18, 1720; ob. June 26, 1793.) < *Notes and Queries*, 5th ser., vii, Mar. 31, 1877, pp. 241-243; Apr. 7, 1877, pp. 254, 265.
This is an admirable piece of bibliography, by one from his boyhood a diligent disciple of White, and for many years a careful collector of the different editions of his principal work; it gives a far more complete list of his writings than had before appeared. It was originally prepared, the writer states, for Dr. Elliott Cones; and has been mainly relied upon in the present bibliography.
Chiefly according to this authority the editions of White's "Selborne" are as follows:
1789. PRINCEPS edition. 1 vol. 4to. London. T. Bensley for B. White and Sons. pp. vi, 468, 7 ll., 7 pll., besides one on p. 307.
1792. MEYER edition (German translation, modified). 1 vol. 16mo. Berlin. H. A. Rottmann. pp. viii, 168.
- ?1793. (Cf. Ag. and Strickl. Bibl. iv, p. 560, "probably in error.") [See antea, p. 368.]
1795. AIKEN edition of the "Calendar" only. 1 vol. 8vo. London. B. & J. White. pp. 176.
1802. MARKWICK edition. 2 vols. 8vo. London. For J. White by T. Bensley. i, pp. viii, 392, pll. 2; ii, pp. 330, pll. 2.
1813. *The same*. 2 vols. 8vo (some in 4to?). London. For White, Cochrane & Co., etc. i, pp. viii, 352, pll. 3; ii, pp. 364.
- ?1822. (Cf. Engelm. Bibl. i, p. 202; "most likely a mistake"; [qu. err. typog. for 1802?].)
- ?1825. (Cf. Jardine, Introd. to ed. of 1829, p. vii.—Erroneous?)
1829. JARDINE edition. 1 vol. 12mo. Edinburgh, Constable & Co., and London, Hurst, Chance & Co.
1829. *The same*, forming vol. xlv of "Constable's Miscellany."
- ?1830. *The same*. (Cited by Ag. and Strickl. Bibl., ii, p. 561; perhaps in error.)
1832. *The same*; new title-page ending For Whittaker, Treacher & Co., London, and Wagh & Innes, Edinburgh, pp. xvi, 343.
1833. *The same*, reissued this year.
- ?1836. *The same*, reissued this year?
1853. *The same*. 1 vol. 8vo. London. Nathaniel Cooke. pp. xviii, 342, forming a vol. of the "National Illustrated Library".
1833. RENNIE edition. 1 vol. 8vo. London. For J. & J. Arch, etc. pp. xii, 562.

1877. NEWTON, A.—Continued.

1833. BROWN edition. 1 vol. 16mo. Edinburgh, J. Chambers, and London, W. Orr, and Dublin, W. Curry, Jr. & Co. pp. xii, 356. (Being vol. i of 'British Library.')
1834. *The same*, reissued.
- ? 1835. *The same* (cf. Englm. Bibl., p. 202).
1840. *The same*. London. John Chidley.
1843. *The same*. Edinburgh. Andrew Shortrede.
1845. *The same*. J. Billing, Woking, Surrey.
1833. LADY DOVER edition. 1 vol. 12mo. London. For N. Hailes. p. x, 316. (The first "Bowdlerized" edition.)
- 1841 *et seq.* *The same*. 1 vol. 16mo. New York, Harper & Brothers. pp. 335. (Many reissues of this—1842, 1842 again, 1847, 1853, 1855, 1859 (or 1860), 1863.)
- ? 1860. *The same*. London. Society for Promoting Christian Knowledge.
- ? 1870. *The same*. 1 vol. 8vo. London. By the same Society. pp. x, 346. [No date; 1870 or 1871?]
1834. JESSE'S Gleanings in Natural History. London. John Murray.
1836. BLYTH edition. 1 vol. 8vo. London. Orr & Smith. pp. xx, 418.
1858. *The same*. 1 vol. 8vo. London, Edinburgh and New York, Thos. Nelson and Sons.
1837. BENNETT edition. 1 vol. 8vo. London. For J. & J. Arch, etc. pp. xxiv, 640.
1843. JENYNS edition. 1 vol. 16mo. London. J. Van Voorst. pp. xvi, 398.
1851. JESSE edition. London. Forming a vol. of Bohn's "Illustrated Library".
1854. *The same*, reissued. (pp. xiv, 416.)
1854. WOOD edition. 1 vol. 8vo. London. G. Routledge & Co. pp. viii, 428.
1875. BUCKLAND edition. 1 vol. 8vo. London. MacMillan & Co. pp. xxx, 591.
1875. *The same*. New York. Macmillan & Co.
1875. HARTING edition (after Bennett). 1 vol. 8vo. London. Beckers & Son. pp. xxii, 532.
1876. MARSHAM'S Correspondence, 1790-1793. < *Trans. Norfolk and Norwich Nat. Hist. Soc.*, ii, pp. 133-195.
1877. BELL edition. 2 vols. 8vo. London. Van Voorst. i, pp. lxx, 507; ii, pp. 410.
1879. DAVIES edition. 1 vol. 8vo. London. Warne & Co.

} Doubtless other issues than here noted of this ed.

1877. RODD, E. H. To be published by subscription, Demy 8vo, The Birds of Cornwall: A Contribution to the Natural History of the County. By Edward Hearle Rodd. 8vo. pp. 4. Prospectus.

1877. ROWLEY, G. D. On Flamborough Head. < *Rowl. Orn. Misc.*, iii, pt. xi, Nov., 1877, pp. 11-18, pll. lxxxii-lxxxv.

Interesting notice of the sea-birds of that place, with beautiful illustrations of the scenery.

1877. [SCLATER, P. L., and SALVIN, O.] Wharton's 'List of British Birds.' < *Ibis*, 4th ser., i, Oct., 1877, pp. 483, 484.

1877. "TANTRAMAR" []. More [English] Birds' Nests in Extraordinary Places. < *Forest and Stream*, ix, Dec. 13, 1877, p. 367.

1877. WHARTON, T. H. A List [of] British Birds. [The genera] arranged according to Sundevall's method. [The Nomenclature revised by] Henry Thornton Wharton, [M. A., M. R. C. S., F. Z. S.] — [London: John Van Voorst, 1, Paternoster Row. —] MDCCCLXXVII. 1 vol. 12mo. pp. i-iv, 1-20.

The introduction includes a brief essay on nomenclature and classification. p. 14, for *Ereunetes pusillus* read *Tringa minutilla*. Cf. *Ibis*, 1877, p. 483.

1877. WHITE, G. The [Natural History and Antiquities] of [Selborne,] in the County of Southampton. [By the late] Rev. Gilbert White, [formerly Fellow of Oriol College, Oxford.] Edited by [Thomas Bell, F. R. S., F. L. S., F. G. S., &c.,] Professor of Zoology in King's College, London. [Volume I [II].] [h. nat. mut.] [London: John Van Voorst, 1 Paternoster Row. MDCCCLXXVII.] 2 vols. 8vo. Vol. I, Natural History, Antiquities, Naturalist's Calendar, Observations on various parts of Nature, and Poems, pp. i-lxx, 1-507, 8 illust. Vol. II, Correspondence, Sermon, Account book, Garden Kalendar, Animals and Plants, Geology, Roman-British Antiquities, &c., 3 p. ll., pp. 1-410, 6 illust.

1878. MILLER, S. H., and SKERTCHLEY, S. B. J. The Fenland [past and present] by Samuel H. Miller, F. R. A. S., F. M. S., [etc.] and [Sydney B. J. Skertchley, F. G. S., [etc.]] Illustrated with Engravings, Maps and Diagrams. [Design.]

1878. MILLER, S. H., and SKERTCHLEY, S. B. J.—Continued.

| Guthlac's Cross. | Wisbech: Leach and Son. | London: | Longmans, Green, and Co. | 1878. | [All rights reserved.] 1 vol. large 8vo, pp. xxxii, 649.

Chapter XII, p. 355.—III. Birds in the past: Ancient Records, Plover Nesting, Drayton's Polyoibion, Swan Marks. IV. Decoys. V. List of Birds—permanent residents, that is, nesting, 101; regular visitants, 74; rare and occasional, 69. The list is extensively annotated.

1878. ROWLEY, G. D. A few words on Fen-land. < *Rowl. Orn. Misc.*, iii, pt. xiv, May, 1878, pp. 203-222, pll. cv-cix.

An attractive article, with handsome plates of scenery, geese, &c.

1878. [SCLATER, P. L., and SALVIN, O.] Proposed B. O. U. List of British Birds. < *Ibis*, 4th ser., ii, July, 1878, pp. 386, 387.

1878. [SCLATER, P. L., and SALVIN, O.] The Dyke-Road Museum, Brighton. < *Ibis*, 4th ser., ii, July, 1878, pp. 387, 388.

Favourable notice of E. T. Booth's collection of mounted British Birds.

1878. [SCLATER, P. L., and SALVIN, O.] J. H. Gurney, Jun., on the Birds of the Fern Islands. < *Ibis*, 4th ser., ii, Oct., 1878, pp. 471, 472.

Notice of the paper in *Proc. Nat. Hist. Soc. Glasgow*, 1877, pp. 268-278.

1879. ANON. Lubbock's Fauna of Norfolk. < *The Field* (London), lv, No. 1, 416, Feb. 14, 1880, p. 198.

Extended review of the ed. of 1879.

1879. ANON. The Natural History of Selborne, and the Naturalists' Calendar. . . . < *The Zoologist*, 3d ser., iii, No. 36, Dec., 1879, pp. 494-496.

Review of the Davies edition, 1879, of the work named.

1879. BECKWITH, W. E. A Guide to the Botany, Ornithology and Geology of Shrewsbury and its Vicinity. . . . The Ornithology by W. E. Beckwith. . . . Shrewsbury. Bunny and Davis. 1879. 1 vol. 12mo. pp. 65.

Not seen.—The list of Birds "occupies about eight pages, and includes only those which have been observed within five or six miles of Shrewsbury—in all 165 out of 218 found in the county of Salop." (*Zoologist*, Apr., 1880, p. 158.)

1879. LUBBOCK, R. Observations on the Fauna of Norfolk, and more particularly on the District of the Broads. By the late Rev. Richard Lubbock, M. A., Rector of Eccles. New Edition by Thomas Southwell, F. Z. S. With a Memoir by Henry Stevenson, F. L. S. And Notes on Hawking in Norfolk by Alfred Newton, M. A., F. R. S. Norwich and London. Jarrold and Sons. 1879. 1 vol. 8vo. pp. 239.

Not seen. See the orig. ed., 1845.

"Lubbock may be said to have done for the Norfolk broads what White did for the parish of Selborne; and each has left behind him in the shape of a charming and instructive volume, a lasting memorial of a well-spent life. Lubbock's volume, written five-and-thirty years ago, has long been out of print and scarce; and the reliable nature of the information which it affords has for some time rendered a new edition a *desideratum* with naturalists." (*The Field*, Feb. 14, 1880, p. 198.)

1879. WHITE, G. (*Ed. Davies.*) The Natural History of Selborne, and the Naturalists' Calendar. By the Rev. Gilbert White, A. M. A New Edition. Edited, with Notes, by G. Christopher Davies, Author of 'The Swan and her Crew,' &c. London: Warne & Co. 1879. Post 8vo. Illustrated.

Not seen—title from *The Zoologist*, Dec., 1879, pp. 494-496, when reviewed.

"Although we are unable to understand how any necessity can possibly have arisen for another edition of White's 'Selborne,' three different editions having appeared within the last three years, . . . In the present instance the editor's chief merit seems to lie in the brevity of his notes; we should like to have added also in the accuracy of them. . . . We cannot say much for the engravings. The best are copies (electros, we presume), of Wolf's illustrations to John's 'British Birds and their Haunts,' engraved by Whymper. These were charming when they first appeared, but as they have been published some seventeen years, and have been used over and over again in different books, many of them are much worn, and the impressions consequently are not satisfactory." (*Zoologist*, l. c.)

1880. DIXON, C. Rural Bird Life | being | Essays on Ornithology | with instructions for preserving objects | relating to that science | by | Charles Dixon | with a

1880. DIXON, C.—Continued.

frontispiece in colours, and numerous illustrations | engraved on wood by G. Pearson | London | Longmans, Green, and Co. | 1880 | All rights reserved | 1 vol. 16mo. pp. i-xiv, 1-374, col'd frontisp., 4 pll. and 41 illustr. in text.

"My object in giving publicity to this little work has been solely to excite a love for the study of the feathered tribes—to place in a popular form the true economy of birds, showing their relations and positions in Nature's great system: . . ." The pages are attractive, as would be expected from the author's modest yet firm preface; though many persons may, as he feared they might, wish he had spent more time among books, if not less among birds. The volume is quite original, presenting some fresh facts, and discussing many interesting questions. It brings the flavor of the woods and fields.

The volume is reissued at Boston, Mass., by Estes and Lauriat, who purchased the stereotype plates, and caused a new preface to be written by Dr. Coues, the American editor. The text, however, is identical. (It is just now—May, 1880—coming out.)

1880. [TUNSTALL, M.] Ornithologia Britannica. . . .

Not seen.—Orig. ed. 1771, *q. v.* This is a photolithographic reprint of the scarce tract, reduced in size from the folio original to demy 8vo; it is issued by "The Willoughby Society," formed in 1879 for the purpose of reprinting certain ornithological works of rarity or utility, and is the first of the series undertaken.

"In a Preface by the Editor, Professor Newton, a few particulars are given concerning the author, Marmaduke Tunstall, the reader being reminded that a memoir of him is given by Fox in his 'Synopsis of the Newcastle Museum,' published in 1827. His museum, including his collection of birds, which, it is said, cost him several thousand pounds, formed the basis of the Museum at Newcastle-on-Tyne, and from specimens contained in it were drawn *twelve* of the figures of birds in Brown's 'Illustrations of Zoology,' and *fifty* of Bewick's well-known engravings. This catalogue is interesting for its 'rarity' rather than its 'utility,' since it contains no descriptions—merely a list in English, Latin, and French, of the species known to the author as British." (*Zoologist*, Apr., 1880, p. 159.)

ADDITIONS AND CORRECTIONS.

For most of the following additions and corrections I am indebted to Professor NEWTON, who kindly examined many of the press-proofs, but whose valued emendations, though communicated with the utmost expedition, reached me too late for incorporation with the body of the article.

1667. MERRETT, C. Pinax Rerum Naturalium Britannicarum, . . .

"I have two copies of this ed., from one of which the original title-page (as printed by you) has been torn out, remains of it being visible, and a new title inserted. This resembles the original in all but the insertion of "Editio Secunda." as the 9th line, and alteration of the last two thus:—| Typis T. Roycroft, Impensis Cave Pulleyn, Prostat apud | Sam. Tomson in vico vulgo dicto Ducklane. 1667. |"

1753. MARTIN, M. A | Voyage | to St. Kilda. | The remotest of all the Hebrides, | or Western Isles of Scotland: | giving | An Account of the very remarkable in- | habitants of that Place, their Beauty and sin- | gular Chastity (Fornication and Adultery being | unknown among them); their Genius for | Poetry, Music, Dancing: their surprising Dex- | tery in climbing the Rocks, and Walls of | Houses; Diversions, Habits, Food, Language, | Diseases and methods of Cure; their extensive | Charity; their Contempt of Gold and Silver, | as below the Dignity of Human Nature; their | Religious Ceremonies, Notion of Spirits and | Visions, &c. &c. | To which is added, | An Account of Roderick, the late Impostor there, | pretending to be sent by St. John Baptist, with new Reve- | lations and Discoveries; his Diabolical Inventions, At- | tempts upon the Women, &c. | By M. Martin, Gent. | The Fourth Edition, corrected. | [Quotation of 3 lines from p. 67 of the book.] | London: | Printed for Dan. Browne, without Temple-Bar, | and Lockyer Davis, in Fleet Street. | MDCCCLIII. 1 vol. 8vo. pp. 71, the last wrongly numbered "63," frontisp., a map, and figg. of two birds.

Orig. ed. 1698. Earlier eds. are rare. The present is that from which the ed. in Pinkerton's *Voyages* is derived.—Birds are described at pp. 26-36: "The Sea-Fowl are, first, Gair-fowl [*Alca impennis*], being the stateliest, as well as the largest Sort," etc. Birds figured are the "Fulmar" [*Fulmarus glacialis*] and the Assilag [*Procellaria peltica*]. The picture of the Fulmar was drawn by James Monroe: *cf.* Edwards's *Nat. Hist.*, p. 289; and Gurney, *Zoologist*, 2d ser., xi, 1876, p. 493f

1766. [PENNANT, T.] The | British Zoology. | Class I. Quadrupeds. | II. Birds. | Published under the Inspection of the | Cymmurodorian Society, | instituted for the | Promoting Useful Charities, and the Knowledge of | Nature, among the Descendants of the | Ancient Britons. | Illustrated with | One Hundred and Seven Copper Plates. | London: | Printed by J. and J. March, on Tower Hill, for the Society: | And sold for the Benefit of the British Charity-School on | Clerkenwell Green. M, DCC, LXVI. 1 vol. folio. Tit., 1 fol.; Dedic., 1 fol.; Preface, Contents and Errata, 5 foll.; pp. 1-162 + 4 pp. Index, &c. (Birds, p. 57 to end.)

My entry of this work was left very defective. Prof. Newton supplies the above full title of the orig. ed., and corrections as follows:—

1766. *Editio princeps*, ut supra.

1768. *Second edition*. 8vo.

1770. *Third edition*. 8vo. "A thin volume, supplementary to the preceding, must rank as the 3d edition."

1766-77. "*Fourth*" edition. 4 vols., in two issues, 8vo and 4to. "Plates identical, but letter-press wholly distinct."

1812. *Fifth edition*. 4 vols. 8vo. (First ed. with author's name on the title.) "This posthumous ed. is said by E. T. Bennett in his ed. of White's 'Selborne' (p. 113, note) to have been edited by Hammer, a statement corroborated in a letter to me from J. E. Gray, who added that he gave Bennett the information—but Hammer is spoken of (p. xxvii) as being merely one of the editor's friends who assisted him—the others being Latham, Hawkins (who seems to have furnished notes on birds of Greece), Henry Jenner (nephew of the great man) and Hugh Davies—the additions of the latest being mainly or wholly on Invertebrates. On the other hand, the anonymous author (probably Neville Wood) of a memoir of Latham (*Nat.* iv. p. 31), speaking of Latham's revision of this work, which he seems to regard as the 'second edition' of Pennant, says it 'was published by his son, Mr. D. Pennant.'"

Above enumeration of eds. is exclusive of Murr's Latin-German version, 1771-76.

1768. [PENNANT, T.] British Zoology. | Class I. Quadrupeds. | II. Birds. | Si qui verò sint in urbe sua Hospites, in Patria sua Peregrini, et | cognitione semper pueri esse velint, sibi per me placeant, sibi | dormiant; non ego illis hæc conscripsi, non illis vigilavi. | Camden. Britan. Prefat. | Vol. I. | London: | Printed for Benjamin White, | at Horace's Head, Fleet-Street. | MDCCLXVIII.
[Title of 2d vol. changed thus:—]

British Zoology. | Class II. Genus XVIII, &c. Birds. | With an | Appendix, | an | Essay on Birds of Passage, | and | an Index. | Vol. II. | [rest as above.]

3 vols. 8vo. Vol. I. Tit., 1 fol.; Preface, &c., pp. i-xxiv; Text, pp. 1-232, ending abruptly with a catch-word. Ornithology, pp. 117 to end. Vol. II, after tit., 1 fol., begins abruptly at p. 233 (pagination thus being continuous with that of Vol. I), and text ends at p. 522; Index, pp. i-ix + i having separate pagination. (Vol. III treats of Reptiles and Fishes.)

This is the *second ed.*

1770. [PENNANT, T.] British Zoology. | Illustrated by | Plates | and brief | Explanations. | Chester: | printed by Eliz. Adams, | MDCCLXX. 1 vol. 8vo. Tit., dedic., advt., 3 foll.; pp. —.

This must rank as the *third ed.* It is supplementary to the former. The copy examined is imperfect, but is believed to contain all the ornithology, which begins at p. 7 and ends at p. 27.

1771. [TUNSTALL, M.] Ornithologia Britannica: | seu | Avium omnium Britannicorum tam Terrestrium, | quam Aquaticarum | Catalogus, | Sermoni Latino, Anglico et Gallico redditus: | cui subjeitur Appendix, | Aves alienigenas, | in Angliam raro advenientes, complectens. | In tenui labor: at tenuis non gloria—Virg. | London: | Printed for the Author by J. Dixwell, in St. Martin's Lane. | M. DCC. LXXI. folio. Tit., 1 fol., and pp. 4.

Of this anonymous tract, more remarkable for its rarity than for its utility, a facsimile in photolithography, reduced to 8vo size, was issued by the Willoughby Society, 1880, *q. v.*

1776-77. [PENNANT, T.] *British Zoology*. . . .

The orig. ed., 1 vol. folio, dates 1766, *q. v.* The 2d ed., 3 vols., 8vo, dates 1768. The ed. of 1770, 1 vol., 8vo, must count as the third. There are two issues of date 1776-77, each in 4 vols. one 8vo, the other 4to. These two issues, though each bearing the words "Fourth Edition" on the printed title-pages, are absolutely distinct—the plates in each being printed on paper of different sizes. Ornithology begins in the 8vo at p. 153, and in the 4to at p. 133.—Whence it appears that in the body of this Bibliography I have got the editions of Pennant badly mixed up, and otherwise very defective.

1789. WALCOTT, T. *Synopsis of British Birds*. . . .

The story has always gone that Walcott, being dissatisfied with the book, had nearly the whole impression destroyed; but copies do not seem to be rare.

1794-1819. DONOVAN, E. *The Natural History of British Birds*; . . .

I have made a bad break in citing this work as of "2 vols. in one", with "48" plates, and of dates "1794-95."

According to Prof. Newton's memoranda, the work is in 10 vols., with 244 plates, of dates 1794-1819.—Vol. I, 1794.—Vol. II, 1795.—Vol. III, —?; "new ed." 1815; after "By E. Donovan"; in the title comes | A New Edition. | and then as before.—Vol. IV, 1797.—Vol. V, —?; 1820; after "specimens" in the title comes | By E. Donovan, F. L. S. W. S. | Author of the Natural Histories of British Fishes, Insects, Shells, Quadrupeds, &c. | In ten volumes. | Vol. V. | London: | printed for the author: | and for F. C. and J. Rivington, 62, St. Paul's Church-Yard, | and 3, Waterloo-Place, Pall-Mall: | By R. Gilbert, St. John's-Square, Clerkenwell. | 1820.—Vol. VI, 1809.—Vol. VII, 1816.—Vol. VIII, 1817.—Vol. IX, 1818.—Vol. X, 1819.—The title-pages of all, excepting III and V, are alike, *mutatis mutandis*; the last has the imprint—London: | printed for the Author: and for F. C. and J. Rivington, No. 63, | St. Paul's Church-Yard, and No. 3, Waterloo-Place, | Pall-Mall. 1819. |

1797-1804. BEWICK, T. *History of British Birds*. . . .

Respecting the two issues of Vol. I, Land Birds, 1797, Prof. Newton remarks: "The typography of these two issues is wholly distinct; the difficulty at first is to say which of them was the earlier. I believe this may be decided by looking at p. 71, lines 5 and 6, where the words "bill, nostrils, and even round the eyes" of what seems to be the oldest issue are replaced in the later by "bill and nostrils, as far as the eyes"—the last expression being retained in subsequent editions. On the other hand, on p. 145 we have, in what I take to be the earlier issue, "*Schœniclus*" which in the later is still further corrupted into "*Sahœniclus*"; but on the reverse of p. 335 in one issue the *third* ed. of Bewick's "Quadrupeds" is announced as lately published, while in the other the announcement is that the *fourth* ed. of that work "speedily will be published"; which seems to be final and decisive."

The 3d ed., 1809, is said to be the worst, owing to bad paper.

In the 8th ed., 1847, some of the woodcuts have utterly failed, but the majority show details better than in any other ed.

An elaborate Catalogue of works illustrated by Bewick and his brother John was published by John Gray Bell, London, 1851.

1799? ANON. *Our [British] Song Birds*. . . .

Doubtless of quite recent date. Qu., a reprint of Albin's book?

1799. PULTENEY, R. *Catalogues | of the | Birds, Shells, and some of the | more rare Plants, of | Dorsetshire. | From the | new and enlarged edition of | Mr. Hutchins's History of that County. | By Richard Pulteney, M. D. F. R. S. Lond. & Edinb. | and Fellow of the Linnaean Society. | London, printed by J. Nichols, | for the use of the compiler and his friends. | MDCCXCIX. 1 vol. folio. Title and pp. 92.*

Ornithology occupies pp. 1-22.—An enlarged ed. appeared in 1813. See also MANSEL-PLEYDELL, 1874. Cf. *Ibis*, 1874, p. 447.

1804. BEWICK, T. *History | of | British Birds. | The Figures engraved on wood by T. Bewick. | Vol. II. Water Birds. | [Cut.] Newcastle: | printed by Edward Walker, for T. Bewick: sold by him, and | Longman and Rees, London. | [Price 18s. in Boards.] | 1804.*

This is the full title of Vol. II. See the date 1797-1804, in the body of this Bibliography.

1815-22. HUNT, J. *British | Ornithology; | containing portraits of all the | British Birds, | including those of foreign origin, | which have become domesticated; | drawn, engraved and coloured | by J[ohn]. Hunt | with descriptions compiled from the | works of the most | Esteemed Naturalists, | & arranged according to the | Linnaean Classification. | Vol. I [-III]. | Inscribed by Per-*

1815-22. HUNT, J.—Continued.

mission | To Sir J. E. Smith, | M. D. F. R. S. | and President of the Linnæan Society. | Norwich; 1815 [-1822]. | Printed by Bacon & Co. for the Proprietor & may be had of the Booksellers. 3 vols. 8vo. Pub. in parts of about 12 pll., dates unknown to me. Vol. I, engr. title (only?), pp. 183, with 34 pll. Vol. II, pp. 365, with 58 pll. Vol. III, pp. 138, ending abruptly, with 18 pll. belonging to text, and 76 pll. to which text was never published.

Perfect copies are extremely rare. The work appeared in parts, announced to be quarterly; corresponding plates and text seem not to have been issued together in all cases. The work was never completed. The author died in 1842.

1825. SELBY, P. J. Illustrations | of | British Ornithology. | By Prideaux John Selby, Esq. | Member of the Wernerian Natural History Society. | Part First. | Land Birds. | Edinburgh: | printed for Archibald Constable & Co. Edinburgh; | and Hurst, Robinson, & Co. London. | 1825. 1 vol. 8vo. pp. i-xxxvi, 1-335.

See what is said in the body of this Bibliography at date of 1833, same author.—The above is the title and collation of the *original* edition of the *text* of Vol. I of the work. This original is rare.

1826-28. DONOVAN, E. The Natural History of the Nests and Eggs of British Birds; . . .

The incompleted date is to be filled in as above. Five parts appeared, neither 4 nor 5 being dated. "No. V has lately appeared": *Ed. Mag. N. H.*, ii, Sept., 1829, p. 394.

1828. FLEMING, J. A | History | of | British Animals, | exhibiting the | descriptive characters and systematical arrangement | of | the Genera and Species of Quadrupeds, Birds, | Reptiles, Fishes, Mollusca, and Radiata | of the United Kingdom; | including | the indigenous, extirpated, and extinct | kinds, together with periodical | and occasional visitants. | By | John Fleming, D. D. F. R. S. E. M. W. S. &c. | Minister of Flisk, Fifeshire; | and author of the "Philosophy of Zoology." | Edinburgh: | printed for Bell & Bradfeete, Edinburgh; and James Duncan, London. | MDCCCXXVIII. 1 vol. 8vo. pp. i-xxiv, 1-565. Birds, pp. 41-146.

1828. [HOPE, J.] Memorandum from the Right Honourable . . .

1829. "CORRESPONDENT."

Numerous articles bearing this pseudonym are all believed to be by T. C. Heysham. Cf. *Mag. N. H.*, i, p. 290; ii, p. 89; iii, p. 172, *et aliis locis*.

1829. "J. D. M."

This is J. D. Marshall, *vide* Thomps., *B. Irel.*, ii, p. 82. These initials have the same significance in other places.

1829. WHITE, G. (*Ed. Jardine.*)

Of the two 1829 Jardine editions which I have given, the one that comes second on my page is that forming a vol. of Constable's *Miscellany*, as I have stated; it has an engraved title, with a design drawn by D. O. Hill and engraved by Tho. Dick; the collation is: title and introd., x pp.; text, 330 pp.—The one that comes first on my page has as frontisp. the engr. title of the latter; it is as the last, with some omissions. Other issues of this, with slightly altered title, were published bearing date 1832 and 1833.

1829. "W. J."

This is Sir William Jardine.

1831-38. HEWITSON, W. C. British Oology; . . .

The 1st ed. of this work was published in 37 parts, at irregular intervals, from April, 1831, to June, 1838. A supplement appeared in 1842. There was a 2d ed. in 1842-46, and a 3d ed. in 1853-58. See all these dates, as given beyond in this Bibliography. The orig. ed. forms either 2 or 3 vols. The quotation on the title differs in each vol.

The following are the dates of issue of the 37 parts of the orig. ed.

VOL. I.—Pt. i, Apr. 1, 1831, pll. 1-4, and text. Pt. ii, May 15, 1831, pll. 5-8, text to 6 and 7 only. Pt. iii, Oct. 1, 1831, pll. 9-12, text to 5, 8-12. Pt. iv, Dec. 1, 1831, pll. 13-16, and text. Pt. v, Feb. 1, 1832, pll. 17-20, and text. Pt. vi, Apr. 1, 1832, pll. 21-24, and text. Pt. vii, June 1, 1832, pll. 25, 27, 28, 30, and text. Pt. viii, Aug. 1, 1832, pll. 29, 31-33, and text. Pt. ix, Oct. 1, 1832, pll. 26, 35-37, and text. Pt. x, Dec. 1, 1832, pll. 38, 39, 41, 43, and text. Pt. xi, Feb. 1, 1833, pll. 40, 42, and text. Pt. xii, Apr. 1, 1833, pll. 44-49, and text, with title-page for Vol. I, dedication, and list of subscribers.

1831-38. HEWITSON, W. C.—Continued.

VOL. II.—Pt. xiii, Oct. 1, 1833, pll. 50, 51, and text. Pts. xiv, xv, Dec. 1, 1833, pll. 52-61, and text. Pt. xvi, Mar. 1, 1834, pll. 62-65, and text. Pt. xvii, May 1, 1834, pll. 66-69, and text. Pt. xviii, Aug. 1, 1834, pll. 70-73, and text. Pt. xix, Nov. 1, 1834, pll. 74-77, and text. Pt. xx, Mar. 1, 1835, pll. 78-81, and text. Pt. xxi, May 1, 1835, pll. 82-85, and text. Pt. xxii, July 1, 1835, pll. 86-89, and text. Pts. xxiii and xxiv, Nov. 1, 1835, pll. 90-94, 96, 98, 99, and text, with title-page to Vol. II, and dedication.

VOL. III.—Pt. xxv, Jan. 1, 1836, pll. 95, 97, 103, 34, and text. Pt. xxvi, Mar. 1, 1836, pll. 100-102, 104, and text. Pt. xxvii, May 1, 1836, pll. 105-108, and text. Pt. xxviii, July 1, 1836, pll. 109-112, and text. Pt. xxix, Sept. 1, 1836, pll. 113-116, and text. Pts. xxx and xxxi, Jan. 1, 1837, pll. 117, 118, 120-124, and text, and part of text for pl. 119. Pts. xxxii and xxxiii, May 1, 1837, pll. 125-132, and text. Pts. xxxiv and xxxv, Sept. 1, 1837, pll. 133-142, and text. Pt. xxxvi, Jan. 1, 1838, pp. 143-146, and pl. 119, with text. Pt. xxxvii, June 1, 1838, pll. 147-155, and a new copy of pl. 87 instead of that before issued, which is to be cancelled; with title-page to Vol. III, directions to binder, list of subscribers, viii pp.; introduction, 15 pp.; systematic index to suit binding in 2 vols. (as recommended by author), and index to each of the 3 vols. if that number be preferred.

1831. SELBY, P. J. A Catalogue . . .

The title is correctly given. The paper was read Feb. 21, 1831. It gives 214 spp. The list was the first for this locality, of any authority or approaching completeness, for over 40 years, as I have said; but dele in my comment the words "and remained single."

1831. SELBY, P. J. Notice of *Cypselus alpinus* and *Mergus cucullatus*. < *Trans. Nat. Hist. Soc. Northumb. and Durh.*, i, 1831, pp. 291-293.

"As acquisitions to the British Fauna."

1831. "T. G."

This is T. Goatley; and the initials stand for the same name in other places; but there is a second "T. G.," who wrote in *Mag. Nat. Hist.*, hailing from Lancashire; see 1833; this being a different person.

1831. "X. Y. Z."

This is G. Duncan: cf. *Mag. N. H.*, v, p. 571.

1832 or 1833? FOX, G. T. Notice of some Rare Birds, recently killed in the Counties of Northumberland and Durham. < *Trans. Nat. Hist. Soc. Northumb. and Durh.*, ii, pp. 181-186.

Read Nov. 21, 1831. Records *Pernis apivorus* and *Tringa subarquata*.

1832 or 1833? SELBY, P. J. An account of Two rare British Birds. < *Trans. Nat. Hist. Soc. Northumb. and Durh.*, ii, pp. 273-275.

Read May 21, 1832. Records *Pernis apivorus* and *Scotopax sabinii*.

1832. SLANEY, R. A. An Outline of the smaller British Birds. . . .

This is the date of the orig. ed. The title-page is just as I have given it, excepting the author's name, given as Robert A. Slaney. The collation of this ed. is pp. viii, 143.

1832. "T. K."

This is T. Knox: cf. *Mag. N. H.*, v, p. 731, and Thomps., *B. Irel.*, ii, p. 320.

1833. MONTAGU, G. (*Ed. Rennie, J.*)

Rennie's ed. of Montagu's *Dictionary* was reissued in 1833, with a new title-page bearing that date.

1834. "J. G."

This is J. Grubb: cf. *Mag. N. H.*, viii, p. 511.

1842. HEWITSON, W. C. Supplement | to | British Oology; | by | William C. Hewitson. | London: | John Van Voorst, Paternoster Row. | M. DCCC.XLII. 1 vol. 8vo. 4 pll. and text.

Has no title-page; the wrapper is as above, with addition of "1st October." Contains pll. 156-169, with accompanying text; also an Introduction, and an index to the English names of the eggs figured, arranged for binding them in 2 vols.

The title which stands in the body of the Bibliography, p. 425, at date of "1856?," I took, I find, from a copy of the original edition, including the present supplement, there being 169 plates in all. Without this supplement, the work dates 1831-38; with it, 1831-42. It is found in 2 or in 3 vols. The 2d ed. dates 1842-46. The 3d ed. dates 1853-56. See the orig. ed.

- 1842-46. HEWITSON, W. C. Colored Illustrations | of the | Eggs of British Birds, | accompanied with descriptions | of the | Eggs, Nests, etc. | By William C. Hewitson. | In Two Volumes. | Vol. I [II]. | London: | John Van Voorst, Paternoster Row. | [M. D. CCCXLII-] M. D. CCCXLVI. 2 vols. 8vo. pp. i-xvi, 1-470, continuous through both vols. Pl. 1-137 plus 7 which are numbered 12*, 25*, 37*, 67*, 78*, 101*, 120* = 144.

Orig. ed., 1831-38, *q. v.*; Supplement, 1842, *q. v.* This is the 2d ed., which appeared in monthly parts during 1842-46, but I cannot give the details. The plates of the 'Supplement' are utilized, but otherwise all is new. There is a 3d ed., 1853-56, *q. v.*

1846. GURNEY, J. H., and FISHER, W. R. An Account | of the | Birds found in Norfolk, | including | notices of some of the rarer species, | which have occurred in the adjoining counties; | with | remarks on Migration, | and a table showing the number of the resident and | migratory species of each family. | By | John Henry Gurney | and | William Richard Fisher. | [From the *Zoologist*.] | London: | printed by E. Newman, 9 Devonshire Street, Bishopsgate Street. | 1846.

This is the full title of the reprint from the *Zoologist*, pp. 1300-1324, 1373-1393.

1846. ST. JOHN, C. Short Sketches of the Wild Sports and Natural History . . .

This either appeared originally in, or was subsequently incorporated with the series known as "Murray's Home and Colonial Library". There are several issues. I have given one of 1847 in full. There is another dated 1849.

1846. "W. H. S."

This is W. H. Slaney.

1847. BATTERSBY, R. Occurrence of the . . . Harlequin Duck near Torquay. . . .

For correction of this statement, cf. *Ibis*, 1859, p. 165.

1848. BURY, C. A.

Dele, as not British.

1848. HOLM, P. A.

Dele, as not British.

1848. MALAN, S. C. A Systematic | Catalogue | of the | Eggs | of British Birds; | arranged with the view to supersede the use of | Labels for Eggs. | By the Rev. S. C. Malan, M. A., | Vicar of Broadwindsor, Dorset. | London: | John Van Voorst, 1, Paternoster Row. | MDCCCXLVIII.

1849. [NEWMAN, E.] The | Letters of Rusticus | on the | Natural History | of | Godalming. | Extracted from the | Magazine of Natural History, | the | Entomological Magazine, | and the | Entomologist. | [Ornament.] | —"Stat nominis umbra." | [Cut.] | London: printed for John Van Voorst, Bookseller and | Publisher, No. 1 Paternoster Row. | M. DCCC. XLIX.

1850. WOLLEY, J.

Dele, as not British.

1851. CROTCH, W. D. List of Birds' Eggs found in Somersetshire, with Observations. < *Somersets. Archæol. and Nat. Hist. Soc., Proc. at the Gen. Quart. and Ann. Meetings for 1849 and 1850, 1851, Papers*, pp. 149-174.

Notices 109 spp.

1851. CROTCH, W. D. The | Birds | of | Somersetshire. | With | colored illustrations, | of their heads, sterna, feet and eggs. | By | W. D. Crotch. | [Poetical extract of 8 lines from] | C. W. Thompson. | Taunton: | Printed by Frederick May, High Street. | No. 1 only published. 8vo. pp. 24, pl. vi.

1851. WHITE, G. (*Ed. Jesse*.) The | Natural History | of | Selborne; | with | Observations on various parts of Nature; | and | the Naturalist's Calendar. | By the late | Rev. Gilbert White, A. M. | Fellow of Oriel College, Oxford. | With additions and supplementary notes by | Sir William Jardine, Bart. F. R. S. E., F. L. S., M. W. S. | Edited, with further illustrations, a biographical sketch of the author, | and a complete index, by | Edward Jesse, Esq. | Author of

1851. WHITE, G.—Continued.

“Gleanings of Natural History,” &c. &c. | With forty engravings. | London: | Henry G. Bohn, York Street, Covent Garden. | MDCCCLL.
Forming a vol. of Bohn’s “Illustrated Library.”

1852. WHEELWRIGHT, H. W.

According to Wallengren (*Naumannia*, 1854, p. 63), the title is “Comparative List of the Birds of Scandinavia and Great-Britain.” It cannot be in German, though there was probably an alternative Swedish title.

1853-56. HEWITSON, W. C. Colored Illustrations | of the | Eggs of British Birds, | with descriptions of | their nests and nidification. | By William C. Hewitson. | Third edition. | In Two Volumes. | Vol. I [II]. | London: | John Van Voorst, Paternoster Row. | [M. DCCC. LIII-] M. DCCC. LVI. 2 vols. 8vo.

Orig. ed., 1831-38; Supplement, 1842; Second ed., 1842-46. See these dates. The present, *third* ed., also appeared in parts; there were 38 of them, pub. May, 1853, to June, 1856, as follows:

Part I, May, 1853, pll. 1-4, pp. 1-16 (preface). Pt. ii, June, 1853, pll. 5-8, pp. 17-32. Pt. iii, July, 1853, pll. 9-12, pp. 33-48. Pt. iv, Aug., 1853, pll. 13-16, pp. 49-64. Pt. v, Sept., 1853, pll. 17-20, pp. 65-80. Pt. vi, Oct., 1853, pll. 21-24, pp. 81-96. Pt. vii, Nov., 1853, pll. 25-28, pp. 97-112. Pt. viii, Dec., 1853, pll. 29-32, pp. 113-128. Pt. ix, Jan., 1854, pll. 33-36, pp. 129-144. Pt. x, Feb., 1854, pll. 37-40, pp. 145-160. Pt. xi, Mar., 1854, pll. 41-44, pp. 161-176. Pt. xii, Apr., 1854, pll. 45-48, pp. 177-192. Pt. xiii, May, 1854, pll. 49-52, pp. 193-208. Pt. xiv, June, 1854, pll. 53-56, pp. 209-224. Pt. xv, July, 1854, pll. 57-60, pp. 225-240. Pt. xvi, Aug., 1854, pll. 61-64, pp. 241-256. Pt. xvii, Sept., 1854, pll. 65-68, pp. 257-272. Pt. xviii, Oct., 1854, pll. 69-72, pp. 273-288. Pt. xix, Nov., 1854, pll. 73-76, pp. 289-304. Pt. xx, Dec., 1854, pll. 77-80, pp. 305-320. Pt. xxi, Jan., 1855, pll. 81-84, pp. (none). Pt. xxii, Feb., 1855, pll. 85-88, pp. 321-336. Pt. xxiii, Mar., 1855, pll. 89-91, 90*, pp. 334*, 337-350. Pt. xxiv, Apr., 1855, pll. 92-95, pp. (none). Pt. xxv, May, 1855, pll. 96-99, pp. 351-366. Pt. xxvi, June, 1855, pll. 100-103, pp. (none). Pt. xxvii, July, 1855, pll. 104-107, pp. 367-382. Pt. xxviii, Aug., 1855, pll. 108-111, pp. 383-398. Pt. xxix, Sept., 1855, pll. 112-115, pp. 399-414. Pt. xxx, Oct., 1855, pll. 116-119, pp. 415-430. Pt. xxxi, Nov., 1855, pll. 120-123, pp. 431-446. Pt. xxxii, Dec., 1855, pll. 124-127, pp. 447-462. Pt. xxxiii, Jan., 1856, pll. 128-131, pp. 463-478. Pt. xxxiv, Feb., 1856, pll. 132-135, pp. 479-494. Pt. xxxv, Mar., 1856, pll. 136-139, pp. 495-510. Pt. xxxvi, Apr., 1856, pll. 140-143, pp. (none). Pt. xxxvii, May, 1856, pll. 144, 145, 45*, 53*, pp. 511-522, 178*, 210*. Pt. xxxviii, June, 1856, pll. 46*, 51*, pp. 202*, 289*; with Title-pages, Introduction, and Index. (pp. 1-522 of text, plus 178*, 202*, 210*, 289*, 334*. pll. 1-145, plus 45*, 46*, 51*, 53*, 90*.)

1853. WATTERS, J. J. The | Natural History | of | the Birds of Ireland, | Indigenous and Migratory, | containing | Descriptions of the Habits, Migrations, Occurrence, and | Economy of the 261 Species comprised in the Fauna. | By John J. Watters, | Associate Member of the University Zoological Association. | Dublin: | James McGlashan, 50 Upper Sackville-St. | William S. Orr & Co. London. | 1853. 1 vol. 12mo.

1854. WHITE, G. (*Ed. Jesse.*)

The edition of this date and editor is apparently a reissue of that of 1851.

1859. NEWMAN, E. The ‘Zoologist’ List of Birds . . .

“There are many issues of this list, mostly, I think, without dates; and not all are by Newman, though those styled “The ‘Zoologist’ List” are certainly his. The first I remember to have seen was at least ten years prior to 1859. I had two such lists printed for my own convenience long before 1859.” (*A. N.*)

1859. [WHEELWRIGHT, W. H.] Comparatif förteckning på Skan- | dinaviens och Stor-Brittanniens | foglar | [and in parallel columns] Comparative List of the Birds | of Scandinavia and Great Bri- | tain | 1859. | Carlstad. | Tryckt hos C. Forssell. | 1859. | 4to. pp. 18.

Gives scientific, Swedish and English names of 416 species.

1850. MORE, A. G. Outlines | of the | Natural History | of | the Isle of Wight. | Edited by | A. G. More, F. L. S. | Extracted from | A New Guide to the Isle of Wight. | By Rev. E. Venables, M. A. | London: | printed by | Spottiswoode & Co. New-Street Square. | 1850.

1870. MORRIS, F. O. A History of British Birds. . . .

Orig. ed. 1851-57. Another ed. 1865-66. Another ed. 1870.

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