

Raia cooperi has the snout acutely produced, rather more so than in *R. binoculata*, though less than in the variety referred to, the distance from the eye to the tip of the snout being about twice the interorbital width. The length of the disk is $\frac{7}{8}$ its width; the tail is $\frac{2}{3}$ the length of the disk. The female is covered above with small stellate prickles, which are larger over the eye, on posterior edge of pectorals, on ventrals, the middle line of the back, and on the tail. Prickles on tail in several series. Differentiated spines present only over eye and on tail. The male is nearly smooth, its spines essentially as in *R. binoculata*. Color brown, with paler blotches; a large, obscure, blackish blotch at base of pectoral. This species has scarcely a trace of caudal fin, and is therefore likewise an "*Uraptera*." Its teeth are about $\frac{44}{40}$. Whether this *Raia cooperi* is a distinct species or merely very old individuals of *Raia binoculata* we are now unable to decide. There are no important differences, except such as might accompany increased age.

Table of measurements.

	<i>Raia stellulata</i> . ♀	<i>Raia binoculata</i> . ♂	<i>Raia binoculata</i> var. ? ♀
Extreme length, in inches.....	17.45	21.6	28.8
Length of disk, in inches.....	10.10	13.00	18.4
Disk:			
Greatest width (hundredths of length of disk).....	121	106	103
Greatest width at front of eyes.....	58	45.5	41
Width of snout, midway between eyes and tip of snout.....	41	16.7	14
Distance from snout to first gill-opening.....	43	50.5	.....
Distance between first gill-openings.....	31.5	25.5	.....
Distance between last gill-openings.....	18	14.3	.....
Distance from first to last gill-openings.....	14	12.8	12
Width of mouth.....	18	15	15.5
Width of interorbital space.....	8	7	8
Distance from snout to mouth.....	24	21.5	30
Diameter of orbit.....	8	6.2	5.5
Tail:			
Length.....	71.5	67	57
Distance between dorsals.....	5	3.8	3
Height of first dorsal.....	8	8	.....
Length of base of first dorsal.....	7.5	7.6	7

MONTEREY, CAL., April 7, 1880.

DESCRIPTIONS OF NEW SPECIES OF XIPHISTER AND APODICTHYS, FROM MONTEREY, CALIFORNIA.

By DAVID S. JORDAN and CHARLES H. GILBERT.

1. *Xiphister chirus* sp. nov.

Body elongate, somewhat compressed, formed as in *Xiphister mucosus* (*Xiphidion mucosum* Girard). Head short, convex in profile, not depressed above the eyes. Mouth small, oblique, the maxillary extending to opposite middle of pupil. Eye small, as long as snout, about 5 in head. Lower jaw slightly projecting. Teeth strong, the anterior canine-like, bluntish; four canines in lower jaw, *six or more in the upper*, similar

to the posterior teeth, but somewhat enlarged. Lateral teeth of lower jaw short, blunt, the series extending behind the anterior canines. Lips full, the upper protractile. Head naked. Gill membranes united, without isthmus.

Body covered with minute scales, the usual three parallel lateral lines running without union from the head to the tail. Each of these, as in other species, with a series of simple, transverse, alternating, short branches at right angles, and each with one or two open pores. These branches correspond in the outer lines each to a dorsal or anal ray. Middle line farther from each of the outer lines than these are from the dorsal or anal. A short dorsal line, similar to the lateral lines and similarly branched, extending from the occiput to the first dorsal spine. An abdominal line on each side of the belly. These *gradually* converge anteriorly and meet on the breast. They *are not connected with the lower lateral line*. In the other species of the genus the lower lateral line sends a branch to the abdominal line.

The vertical fins are similar in all the species, the dorsal of low sharp spines only; the anal similar, but composed of soft rays, both slightly joined to the caudal.

Dorsal fin beginning close behind the pectoral, at a distance from the opercular angle not greater than the diameter of the eye. Anal beginning about a head's length nearer the snout than the base of the caudal, or about $1\frac{1}{2}$ head's lengths nearer snout than end of caudal.

Pectoral fin quite small, *but several times larger than in any of the other species*, larger than the eye, its length about equal to the distance between the middle and lower lateral lines.

Fin rays: D. LXX; A. 50; P. 14.

Color olive-brown, yellowish below; the sides everywhere with marblings of different shades of brown, mostly in the form of vertical bars. Some round black spots along the back and upper part of the sides; a black spot behind opercles. Head brown above, yellowish below; a narrow black streak from eye directly backward across the temporal region. *Numerous black spots on sides of head, but no radiating bands*. Dorsal and anal fins with black spots; pectorals plain yellowish, a conspicuous dark axillary spot; caudal plain reddish.

This species differs from the others of the genus in the large pectorals, the absence of anterior union of the lower lateral and the abdominal lines, in the position of the first rays of dorsal and anal, in the presence of more than two canines in the upper jaw, and in the coloration, the sides of the head being without stripes and the caudal plain.

It is known to us from about twelve examples taken at the Point of Los Pinos, near Monterey. It inhabits rocks at the extreme low-tide mark, and is abundant chiefly among the masses of mussels which cover the outermost rocks exposed to the wash of the waves. Like the other species of the genus, it is very active and makes its way readily out of water over damp rocks and algæ. It seems to reach a smaller size than the other species.

2. *Xiphister rupestris* sp. nov.

Besides the foregoing species, which is distinguishable at sight from *Xiphister mucosus*, a second species occurs in great abundance among the rocks about Monterey. This species is more nearly allied to *X. mucosus*, agreeing with it in form of body, mouth, teeth, and arrangement of the lateral lines; differing in the coloration of the head, in the number of dorsal and anal rays, in the insertion of the dorsal and anal fins, and in the size of the pectoral fins. A description of these points will suffice, without the enumeration of features common to all the species of the genus.

The life coloration of *Xiphister mucosus* is blackish green, becoming pale green on the belly and sides of the head; toward the tail the blackish is commonly broken with much olive-green in various patterns; a transverse light-greenish bar at base of caudal, which extends to the dorsal and anal fins. Radiating backward from the eye are three olive-brown streaks, these much lighter in the center and edged above and below with blackish, outside of which is sometimes a streak of light green. These streaks all merge backward in the olive-green of the head. The upper streak from the eye toward the occiput is generally obsolete or small and indistinct; the middle streak is wedge-shaped, with the edges straight or nearly so; it is but slightly more than one-third the length of the head; the third streak terminates before reaching the margin of the preopercle. A very old example, over a foot long, has a diffuse yellow blotch on the back anteriorly.

In *Xiphister rupestris* the life coloration is olive-brown or reddish brown, uniform or variously marked and shaded with lighter; a light olivaceous bar at base of caudal, extending on dorsal and anal; behind this a blackish area; the tip of the caudal usually pale. Three long, well-defined streaks radiating backward from the eye, these streaks uniform black, overlaying the olive cheeks, and abruptly margined with very light olive; the upper streak is more distinct than in *X. mucosus*; the central streak proceeds straight backward from the eye, half the breadth of the cheeks, at which point it is broadest; it is then narrowed and bent abruptly downward; both the middle and lower streak reach the margin of the preopercle, the length of the middle streak being three-sevenths that of the head.

In *Xiphister mucosus* the dorsal fin begins anteriorly, nearly as in *Xiphister chirus*, the distance from its origin to the occiput being less than that from the occiput to the tip of the snout. The origin of the anal fin is nearly midway from the snout to the tip of the caudal, it being nearer the snout than the tip of the caudal fin by from one third to two-thirds the length of the head. The fin rays are pretty constantly D. LXXIII, A. 48. The pectoral fin is as long as the eye.

In *Xiphister rupestris* the dorsal fin begins farther back, the distance from its origin to the occiput being one-third greater than the distance from the occiput to the snout. The anal fin begins much in advance of the

middle of the body, the distance from the first ray to the tip of the caudal exceeding the distance to the snout by nearly twice the length of the head. The fin rays are very constantly D. LXVI, A. 50. Pectoral fin very short, its length less than the diameter of the eye (about three-fifths).

These two species are extremely and equally abundant about Monterey, especially on the Point of Pines. They live under rocks in the sand, in crevices of rocks, and in masses of algæ between tide-marks. They are very active, making their way readily on land, and remaining out of water in damp places for hours without inconvenience. We have procured upwards of a hundred specimens of each species, and find the distinctive characters, although few, to be very constant.

Xiphister cruoreus (*Xiphidium cruoreum* Cope, Proc. Am. Philos. Soc., 1873), from Alaska, is apparently either identical with *Xiphister mucosus* or closely allied to it. The description agrees better with *mucosus* than with *rupestris*.

The systematic position of the genus *Xiphister* deserves a moment's notice. Professor Gill has referred it to a family, "*Xiphidiontida*," distinguished from "*Stichæida*" chiefly by the absence of pyloric cæca, and from "*Cebedichthyida*" by the short intestinal canal, the absence of pyloric cæca, and the absence of soft rays in the dorsal.

As a matter of fact, the intestinal canal in *Xiphister* is but little shorter than in *Cebedichthys*. It has five or six well-developed pyloric cæca. Whatever may be the value of the family "*Stichæida*," the writers do not believe that *Cebedichthys*, *Xiphister*, and *Apodichthys* are representatives of distinct families. The lateral line of *Cebedichthys*, by the way, corresponds to the upper lateral line of *Xiphister*, and like it has for its whole length a series of short lateral branches ending in open pores.

Table of measurements.

	<i>X. chirus</i> .	<i>X. mucosus</i> , 1.	<i>X. mucosus</i> , 2.	<i>X. rupestris</i> , 1.	<i>X. rupestris</i> , 2.
Total length, inches.....	4.08	10.90	6.70	7.08	6.25
Length to base of caudal = 100.....	3.90	10.40	6.40	6.75	6.10
Body:					
Greatest depth.....	10	12.9	13	10	.....
Least depth.....	.....	4.3	3.8	.....	.....
Head:					
Greatest length.....	14	13.7	14	15.4	15
Distance from snout to nape.....	.....	8.4	8.5	.....	10
Interorbital area.....	.....	2	.....	1.8	.....
Length of maxillary.....	.....	5.7	5	6.3	.....
Diameter of orbit.....	2.5	1.7	.....	2	.....
Dorsal:					
Distance from snout.....	15.5	16	15	21	21.5
Height.....	.....	3	.....	3	.....
Anal, distance from snout.....	43	51.5	51.5	44.5	43
Caudal, length.....	.....	4.7	.....	.....	.....
Pectoral, length.....	3	1.7	.....	1.5	.....
Pectoral, width.....	2.5	.....	.....	1	.....
Dorsal rays.....	70	73	.....	66	.....
Anal rays.....	50	48	.....	50	.....

3. *Apodichthys fucorum* sp. nov.

Allied to *Apodichthys flavidus* Girard, but differing in the form of the anal spine, in the smaller number of fin-rays, and in the smaller size of the pectoral fins.

Form of head and body and dentition as in *Apodichthys flavidus*. Mouth very oblique, the maxillary reaching the vertical from the center of the pupil. Dorsal fin beginning at a point considerably nearer the nape than the latter is from the end of the snout. *Anal spine small*, its length about one-fifth that of the head, *transversely very convex in front, and slightly concave or grooved behind*. Pectoral fins very small, about one-fifth the length of the head. Anal fin beginning nearer base of caudal than tip of snout by about three times the length of the head. Dorsal, very constantly, LXXXIII; A. 35.

In *Apodichthys flavidus* the dorsal begins as much behind the nape as the latter is behind the tip of the snout. The *anal spine is very large*, two-fifths the length of the head, and *deeply excavated on its anterior surface and very convex behind*, the spine being very thin and with sharp edges, resembling a quill-pen.

Pectoral fins larger, about two-fifths the length of the head. Anal beginning nearer base of caudal than tip of snout by twice the length of the head. Fin rays: D. XCIII; A. 40.

The life coloration of *Apodichthys fucorum* is either bright olive-green or brownish red, becoming in alcohol either bright straw color or vermilion; a row of dark spots extending along axis of body, these sometimes with light-bluish center, and connected by a very narrow dark streak. Generally a dark streak downward from eye, but no other markings about the head.

The ground-color of these fishes, whether red, green, yellow, or brown, has no significance in specific distinction. As with many other species of rock-fish, they take the color of their surroundings. When in masses of *Fucus*, this species is always olive-green; when among *Chondrus*, or other red-brown algæ, it is colored like the plants. We have seen *Oligocottus maculosus* (which species is ordinarily brownish, mottled, the belly blue) dark grayish red in pools lined with *Corallina*, deep crimson when surrounded by brighter algæ, plain gray in pools with granite bottoms and no plants, and of the most intense grass-green when taken from among fronds of *Ulva*. Other fishes imitate exactly the brown branches of the kelp (*Macrocystis*). Thus the names *flavidus*, *virescens*, and *sanguineus* have been successively applied to differently colored examples of *Apodichthys flavidus*.

Our specimens of the latter species are orange-red, everywhere dusted with minute punctulations. A few pale round spots on axis of body posteriorly. A narrow jet-black bar downward and backward from eye, falling behind the maxillary; a shorter black streak from eye toward occiput. Anal fin obliquely barred with brownish.

Apodichthys fucorum is exceedingly abundant about the Point of Los

Pinos, near Monterey. It is found mostly in masses of *Fucus* attached to rocks between tide-marks, and it is often found at low tide at a considerable distance from any water, kept damp by the masses of algæ. Sometimes a dozen of them can be shaken from a bunch of algæ attached to a dry rock. It is, like the species of *Xiphister*, very active, moving over stones or sand, and showing less anxiety about the presence of its native element than any other fish known to us. The very numerous typical examples are all of nearly the same size as the one measured below. It probably does not attain so great a size as *Apodichthys flavidus*.

We have little doubt that Professor Gill is right in uniting *flavidus* Girard, *virescens* Ayres, and *sanguineus* Gill as one species. Whether *inornatus* Gill is different or not we do not know. At any rate, its number of fin-rays (D. XC, A. 38) will separate it from *A. fucorum*.

Table of measurements.

	<i>A. fucorum.</i>	<i>A. flavidus.</i>
Extreme length, in inches	4.35	8.90
Length to base of caudal = 100	4.10	8.50
Body, greatest depth	9.5	11
Head:		
Length	10	11
Distance from snout to nape	8	6
Dorsal, distance from snout	13	11.5
Anal:		
Distance from snout	68	60
Height of spine	2	4
Length of pectoral	2	4
Dorsal rays	83	93
Anal rays	35	40

MONTEREY, CAL., April 7, 1880.

DESCRIPTION OF A VERY LARGE FOSSIL GASTEROPOD FROM THE STATE OF PUEBLA, MEXICO.

By C. A. WHITE.

The United States National Museum has received from Mr. H. B. Acton, through the Hon. J. W. Foster, United States minister to Mexico, the very interesting fossil shell which is described in the following paragraphs. Mr. Acton says, in a letter accompanying the specimen, that it was obtained from the strata upon which are located the Zapotitlan Salt Works, which works are about six miles southwestward from the town of Tehuacan, in the State of Puebla, Mexico, and about 115 miles inland from the Gulf coast. He gives the elevation of that locality as 6,500 feet above the level of the sea.

Only one example of this species has been received, and it is accompanied with examples of no other species. Fragments of the imbedding rock, which is a dense bluish limestone, have been carefully examined, and although they were found to contain numerous fragments of