Hawaiian Lava-Flow Fishes, Part IV
Snyderidia canina Gilbert, with Notes on the Osteology of Ophidioid Families[1]

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ALTHOUGH THE GENUS *Snyderidia* is well marked and well described, it has been assigned at one time or another to four different families. In the attempt to determine the proper family allocation of this genus, it has been necessary to reinvestigate the nature of the families of the suborder Ophidioidea to which it belongs.

The history of *Snyderidia* is as follows. The genus and species (*Snyderidia canina*) were described by Gilbert (1905: 654, 655) from a single specimen 309 mm. in length taken off Kauai of the Hawaiian Islands at a depth of 385–500 fathoms. Another specimen 122 mm. in length was taken by Gosline, Hayes, and Keen from among the fishes killed by the lava flow off Hawaii on June 6, 1950.[3] Gilbert's original description is excellent and applies well to the lava flow specimen. Indeed there is nothing worth adding, so far as external features are concerned. Parr (1933: 49), because of the squamation in *Brotulotaenia,* has suggested that small, embedded scales might be present in *Snyderidia,* but Gilbert is correct in stating that scales in the latter genus are absent.

Snyderidia was placed by Gilbert in the Lycodapidae, a family hitherto represented by the single genus *Lycodapus* from the west coast of North America. However, Regan places *Lycodapus* in the blennioid family Zoarcidae (1912: 276) with the statement:

> *Lycodapus,* Gilbert, includes small deep-sea fishes of the North Pacific, and has been made the type of a distinct family and placed near the Fierasferidae [Carapidae]. But the head and mouth recall those of *Lycodopsis* or *Bothrocara,* the gill-membranes join the isthmus between the rami of the lower jaw (at least in *L. fierasfer*), and the dorsal and anal rays correspond in number to the myotomes.

C. L. Hubbs (*in litt.*) concurs with Regan's placement of *Lycodapus* in the Zoarcidae. On the basis of these allocations I will assume that *Lycodapus* is a blennioid fish and dismiss it from further consideration. Inasmuch as the several dorsal and anal rays per vertebra indicate immediately that *Snyderidia* is not a blennioid, it cannot be placed in the same family with *Lycodapus.*

Smith and Radcliffe (in Radcliffe, 1913: 175) described *Pyramodon,* a genus very similar in appearance to *Snyderidia,* and placed both genera in the Carapidae.

However, Regan (1914: 20) included these genera in the Brotulidae with the following explanation:

> In many respects these two genera seem to connect the Brotulidae with the Fierasferidae, but I have ascertained that *Pyramodon* agrees with the Brotulidae in the structure of the upper surface of the skull, the supraoccipital separating the rather small parietals.

Smith (1955: 546) tentatively assigns *Snyderidia* to his family Pyramodontidae, which is distinguished as follows:

I. Parietals small, separated by supraoccipital. Maxilla well expanded posteriorly. Usually pyloric caeca. Pelvics usually present. Pectorals normally with more than 20 rays.
   A. Dorsal origin well in advance of anal origin and vent, the latter behind pectoral origin. Scales usually present. Dentition feeble. Spines on opercular bones usually present. Preopercle margin usually free.....Brotulidae

[1] Contribution No. 135, Hawaii Marine Laboratory. Previous papers on these same collections of fishes were: I, The Origin and Nature of the Collections; II, Brotulidae; and III, Sternoptychidae. All of these previous sections were published in this journal.

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[3] A third specimen of this species is mentioned by Radcliffe (1913: 176), but he does not state where it was taken. Schultz and Kanazawa (*in litt.*) provide the information that this third specimen is USNM 99230, collected in the Philippines.

B. Dorsal origin opposite anal origin and vent, all far forward, at level of or not far behind pectoral origin. No scales. Dentition powerful, large canines. No opercular armature. Hind preopercle margin entirely below skin.....Pyramodontidae

II. Parietals moderate, meet on midline. Maxilla not or barely expanded posteriorly. Pelvics absent. Scales absent. Vent and anal origin usually anterior to dorsal origin. Pectorals with less than 20 rays.....Carapidae

Arnold's (1956) revision of the Carapidae contains no mention of either *Snyderidia* or *Pyramodon.*

In sum then, *Snyderidia* has been placed in the Lycodapidae, Carapidae, Brotulidae, and tentatively in the Pyramodontidae. As the first of these allocations is almost certainly erroneous, the problem that remains is to determine the relationship of *Snyderidia* to other ophidioid groups.

Aside from Smith's recent erection of the Pyramodontidae and the synonymizing of the Disparichthyidae with the Carapidae (see de Beaufort, 1951: 449; Arnold, 1956: 260, 261), the classification of the ophidioid fishes stems directly from Regan (1912). Three ophidioid families, distinguished by the characters listed in Table 1, were there recognized. So far as can be determined from Regan's paper, the internal features recorded are based on skeletons of a single species from each family: *"Brotula jayakari"* of the Brotulidae, *"Genypterus blacodes"* of the Ophidiidae, and *"Fierasfer acus"* of the Carapidae.

If these were small and uniform families one might allocate *Snyderidia* by simple reference to Table 1. However, the possibility of both internal and external diversity exists in all three and has been abundantly verified in the Brotulidae (cf. Norman, 1939: 83, 84; Gosline, 1953: 220–225). In view of this, it seems advisable to use a much broader base than Regan's for the establishment of family definitions among the ophidioid fishes. Unfortunately such a base is only partly available.

So far as the external features generally used are concerned, some members of the tremendous family Brotulidae nearly overlap the Ophidiidae, whereas others grade almost imperceptibly by way of Smith's Pyramodontidae into the Carapidae. Whether external characters exist in these families that would provide better definitions remains unknown to this author, for only a few forms are available for examination.

The present paper therefore will be concerned primarily with osteological features. Skeletons that have been used here are those of *Microbrotula, Dinematichthys,* and *Brotula* previously prepared (Gosline, 1953), of *Snyderidia,* and of a specimen of (presumably) *Otophidium*[4] (without data) received from the U. S. National Museum. The following literature on internal features has also been referred to: Emery (1880), Regan (1912), and Arnold (1956).

Cranium: Unlike the other crania at hand, that of *Snyderidia* is thin walled and rather fragile. The sutures in many instances—e.g., on the back of the skull, between the lower portion of the sphenotic and pterotic, and in the alisphenoid area—are difficult to make out, and in Fig. 1*a* and *b* some of these have been drawn with considerable misgiving.

Regan (1912) made use of three cranial characters in separating the Brotulidae from the Carapidae (Table 1, nos. 6–8). Two of these concern the development of the supraoccipital. According to Regan (1912) the parietals are

[4] In view of the varied interpretations of ophidiid genera (cf. Harry, 1951; Norman, ms., 1957) it seems advisable to give a brief description of the specimen skeletonized.

Total length 185 mm. Pelvics inserted about below the anterior border of the pupil, the outer filaments a little over twice as long as the inner. Gill membranes attached to the isthmus below rear border of eye. Four developed gill rakers. Pseudobranch consisting of about five short filaments. Head scaleless. No spine on snout tip. Opercle ending in a strong, concealed, little flattened spine. Anterior nostril on snout rim; posterior about midway between snout rim and anterior border of eye. Teeth many-rowed on jaws, vomer, and palatines, the rows tapering in width from front to rear. Outer jaw teeth rather long, curved, and sharply conical; inner similar but smaller, straighter, and blunter. Preorbital not differing greatly from suborbitals.

Scales on body rectangular, not embedded and not overlapping, the long axes of adjacent scales frequently at right angles to one another. Dorsal and anal rays covered with flesh, dark edged posteriorly and around tail. Air bladder short, terminating rather abruptly posteriorly, with a hole in its posteroventral face.

TABLE 1

DIFFERENCES BETWEEN OPHIDIOID FAMILIES NOTED BY REGAN (1912: 277–280)

BROTULIDAE	OPHIDIIDAE	CARAPIDAE
1. Pelvic fins, when present, jugular	Pelvic fins inserted between rami of lower jaw	Pelvics absent
2. Vent remote from head		Vent placed at throat
3. Gill openings wide, with gill membranes separate and free from isthmus (except in *Dermatopsis*)	Gill membranes attached to isthmus behind pelvics	
4. Mouth protractile		Mouth nonprotractile
5. Pterygoid and mesopterygoid separate	Pterygoid and mesopterygoid ankylosed	
6. Parietals separated by supraoccipital		Parietals meet above supraoccipital
7. Supraoccipital forms, with exoccipitals, a strong median crest which does not project above upper surface of skull		Occipital crest is weak, and exoccipitals do not take part in its formation
8. Opisthotic is not enlarged, though basioccipital and prootic form a rather prominent auditory bulla		Enlarged opisthotic reaches basioccipital, sharing with that bone and prootic in formation of auditory bulla
9. Lower fork of posttemporal is directly attached to opisthotic	Lower fork of posttemporal is shortened and attached to opisthotic by ligament	Lower fork of posttemporal is reduced to a little knob
10. Coracoid and scapula are separated by cartilage	Coracoid and scapula are in contact	Coracoid and scapula are in contact
11. Cleithra normal	Cleithra prolonged within isthmus as a pair of slender processes, with pelvic bones attached to their extremities	
12. Vertebrae (in *Brotula multibarbata*) 15 + 40	Vertebrae (in *Genypterus blacodes*) 20 + 52	Vertebrae (in *Carapus acus, fide* Emery) 125–144, of which 17 or 18 are precaudal; 26 precaudal vertebrae in *Carapus dentatus*
13. First 5 vertebrae with sessile ribs, 3rd and 4th pairs being expanded	First 5 vertebrae with sessile ribs, but only 3rd expanded	
14. Strong transverse processes on vertebrae 6–15	Parapophyses on vertebrae 6–11 are strong and broad, much as in *Merluccius;* rest are normal	

separated by the supraoccipital in the brotulids but meet above in the carapids. I have already shown (1953: 232) that *Dinematichthys,* among three brotulids examined, had the parietals meeting above. In *Otophidium* as well as in *"Ophidium Rochei"* (Emery, 1880, pl. 3, fig. 26) the parietals are separated by the supraoccipital. In *Pyramodon* (acc. Regan, 1914) they are separated, but in *Snyderidia* and the two carapids figured by Emery (1880, pl. 3, figs. 18, 23) they meet. Whether the parietals are separated or meet is correlated with the size of the occipital crest (Table 1, no. 7); among the skeletons available it would seem that the supraoccipital is best developed in the narrow, highheaded forms, e.g., *Otophidium* (Fig. 1*c*), and least developed in the broad, flatheaded species, e.g., *Dinematichthys.* That the size and extent of the supraoccipital have any great systematic value in this suborder seems questionable.

The relative size of the opisthotic (Table 1, no. 8) is another feature variable within the

brotulids (Gosline, 1953, table 3). The opisthotic of *Otophidium* (Fig. 1*c*) and *Snyderidia* (Fig. 1*b*) is expanded.

Three other cranial features of *Otophidium* and *Snyderidia* seem worth noting. In *Otophidium* the exoccipital facet for the articulation of the first vertebra forms a single concave wall of nearly uniform depth; in the available brotulids and in *Snyderidia* this articulation is formed by the usual two projecting pads. In *Snyderidia* I can find no trace of a suture between the frontals (Fig. 1*a*). Finally, in the same genus, as frequently in carapids, there is a greatly enlarged canine tooth at the front of the vomer (Fig. 1*b*).

Suspensorium: Regan (1912) has used the fusion vs. nonfusion of the ectopterygoid and mesopterygoid as a distinction between the Ophidiidae and the Brotulidae. In the three brotulid skeletons available the mesopterygoid and ectopterygoid are indeed joined by suture, whereas in the ophidiid they are fused. Emery (1880, pl. 3) shows the mesopterygoid and ectopterygoid of two species of carapids as suturally joined. In *Snyderidia* (Fig. 2) I have been able to find no trace of a suture between the ecto- and the mesopterygoid, but, as already noted, I have had difficulty locating the sutures between several of the other head bones in this specimen.

Another variable character in the ophidioid fishes is the position and size of the metapterygoid. In *Brotula* this bone completely separates the hyomandibula and mesopterygoid. In the other two brotulid skeletons, as in *Otophidium,* the latter two bones barely meet in front of the metapterygoid, and in *Snyderidia* (Fig. 2) there is a broad mesopterygoid-hyomandibula junction in front of the metapterygoid.

In *Snyderidia* (Fig. 2), as in *Otophidium,* the hyomandibular strut that runs back across the inner face of the preopercle to form the articulation with the opercle is long and narrow, not short and strong as in *Brotula.*

Opercular bones: The opercle in *Snyderidia* is formed of two struts extending out like the wings of a V from the opercle-hyomandibular articulation. The upper of these wings ends in a point; the lower is broadly rounded distally. The structure is not very different from that in

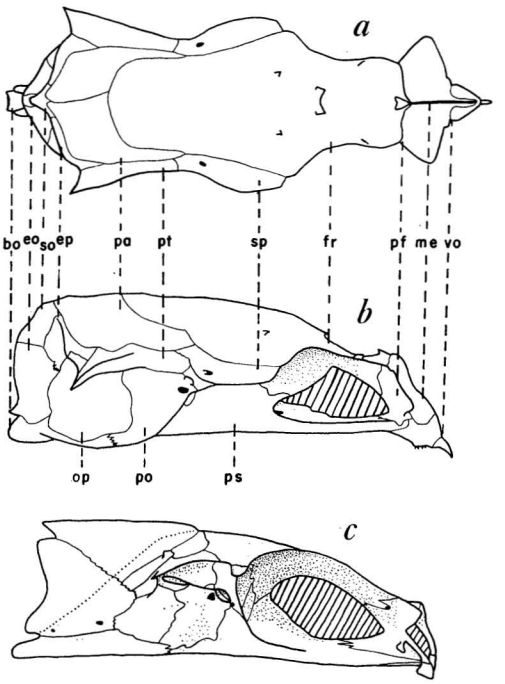

FIG. 1. Skulls of: *Snyderidia, a,* top view, *b,* side view; *c,* of *Otophidium,* side view. The dotted line in *c* represents the approximate limit of the occipital crest. *bo,* Basioccipital; *eo,* exoccipital; *ep,* epiotic; *fr,* frontals; *me,* mesethmoid; *op,* opisthotic; *pa,* parietal; *pf,* prefrontal; *po,* prootic; *ps,* parasphenoid; *pt,* pterotic; *so,* supraoccipital; *sp,* sphenotic; *vo,* vomer.

Otophidium or the illustrations of carapids given by Emery (1880, pl. 3).

Jaws: Except for the large canine tooth at the front of the premaxillary of *Snyderidia,* I am unable to find significant differences between it, *Otophidium,* and the three brotulid genera. The upper jaw of *Snyderidia* is about as drawn by Emery (1880, pl. 3, fig. 25) for "*Fierasfer dentatus.*"

The lower jaw in carapids has been dealt with recently by Arnold (1956) who distinguishes three types within the family. The mandible of *Snyderidia* (Fig. 2) very definitely falls with type B of Arnold (1956, fig. 3; see also Emery, 1880, pl. 3, fig. 25). The lower double rim of this jaw type is also found in *Otophidium* but not in the available brotulid skeletons.

A curious feature of the lower jaw of *Snyderidia* is that in dissection the angular on both sides, together with its ligamentous attachment

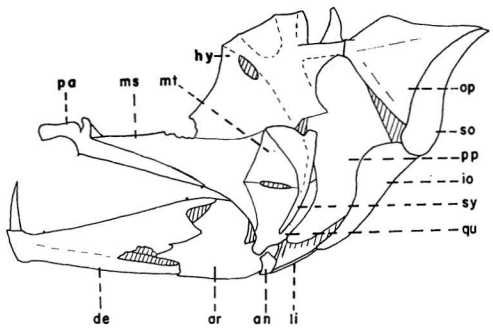

FIG. 2. Right suspensorium, mandible, and opercular bones of *Snyderidia*, from inside. Interosseous areas hatched. *an*, Angular; *ar*, articular; *de*, dentary; *hy*, hyomandibular; *io*, interopercle; *li*, ligament between angular and interopercle; *ms*, mesopterygoid and ectopterygoid; *mt*, metapterygoid; *op*, opercle; *pa*, palatine; *pp*, preopercle; *qu*, quadrate; *so*, subopercle; *sy*, symplectic.

to the interopercle (Fig. 2), came free from the rest of the jaw. Presumably it was loosely connected by ligament with the articular, rather than united with it by suture as in the other ophidioids available.

Visceral arches: The hyoid apparatus of *Snyderidia* seems to show no unusual features. There are seven branchiostegal rays: five on the ceratohyal and two on the epihyal. The urohyal is short and has the configuration of an inverted T.

The first gill arch in *Snyderidia* contains two rows of spinous patches. The outer row below contains about 13 spinous patches in front plus three elongate struts; the uppermost of these is at the angle. Each of these struts, i.e., developed gill rakers, has a whole series of spinelets projecting from its inner surface. On the upper portion of the gill arch (above the angle) there are 3 patches of spinelets in the outer row.

The basibranchial area between the bases of the 2nd gill arch and the pharyngeals consists of an elongate raised ridge with teeth. There are basibranchial teeth in some brotulids (cf. Gosline, 1954: 77, fig. 3), but none are present in those for which skeletons are available. The basibranchials of *Otophidium* are also toothless, but Emery (1880, pl. 5) shows basibranchial teeth in *"Fierasfer acus."*

In *Snyderidia* there are the usual pair of separate toothed lower pharyngeals and three pairs of toothed upper pharyngeals.

Regan has used the gill membranes as a character for separating most of the brotulids from the carapids (Table 1, no. 3). In *Snyderidia* Gilbert (1905: 654) states: "Gill-openings continued forward to below eye; gill membranes separate, free from isthmus." In this feature, and *Pyramodon* is similar, *Snyderidia* belongs with the brotulids.

Pectoral girdle and fin: The bones of the primary pectoral girdle are very light and difficult to make out. Apparently they are similar to those drawn for *"Fierasfer"* by Emery (1880, pl. 4, fig. 35). The coracoid and scapula are in contact, and there is a small scapular foramen.

Regan differentiates the Brotulidae from the other two ophidioid families in having the coracoid and scapula separated by cartilage. This is certainly true of *Brotula*. However, in *Dinematichthys* the scapula and coracoid seem to be nearly in contact (Fig. 3*b*). Be that as it may, the primary pectoral girdle is so poorly developed in all the ophidioid skeletons available that it would seem inadvisable to attach much importance to differences between them.

In the secondary pectoral girdle, Regan has used the structure of the posttemporal as a character for distinguishing families (Table 1, no. 9). However, the distinctiveness of the posttemporal structure as stated by Regan is greater than in the fishes. Whether the lower posttemporal limb articulates directly or by ligament with the opisthotic is difficult to determine in available skeletons; in all, the tip of the lower limb of the posttemporal closely approaches the opisthotic, but even in *Brotula* the main attachment between the two bones appears to be ligamentous.

There is indeed considerable differentiation among the relative sizes of the two posttemporal wings in the skeletons at hand. In *Brotula* both prongs are about equally long; in *Otophidium* the upper prong is nearly five times as long as the lower (Fig. 3*a*); the other brotulids and *Snyderidia* fall between *Brotula* and *Otophidium* in the relative lengths of the posttemporal wings.

Vertebral column: The vertebral column has perhaps been used more than any other internal structure in differentiating groups of ophidioid

fishes. In addition to the features noted by Regan (Table 1, nos. 11–14), various authors have noted the peculiar first vertebra of the Ophidiidae, and Arnold (1956) has recently discussed several aspects of the vertebral column in the carapids.

Posteriorly, the vertebral column of carapids and *Snyderidia* tapers to nothing, and there is no hypural fan (Emery, 1880, pl. 2). In brotulids, the caudal skeleton is quite variable, some species having a moderately well-developed hypural structure (Gosline, 1953, fig. 2b, which unfortunately is upside down); in others (Gosline, 1953, fig. 2a, c) no hypural fan whatever seems present. In *Otophidium* the caudal skeleton is about as in *Dinematichthys* (cf. Gosline, 1953, fig. 2b), i.e., moderately well developed.

At the anterior end the first vertebra shows considerable variation in the different ophidioids. For example, among the skeletons examined *Otophidium* has a rather more specialized method of articulation between the skull and the vertebral column than the others, and the neural arch of the first vertebra is heavy, with the two sides fused above, but low and rounded (Fig. 4*a*). In *Snyderidia* the two sides of the first neural arch extend up and back but are short and barely meet above. In the three brotulids (see Fig. 4*b*) the first neural arch has about the same inclination but is higher and is closely appressed against the second. In the carapids according to Emery (1880, pl. 5) and Arnold (1956) the first neural arch projects upward and forward.

One or more of the first few pairs of ribs in *Brotula, Otophidium* (cf. Müller, 1843; Facciola, 1933), and *Carapus* (cf. Emery, 1880) is closely associated with the air bladder. The nature of these first ribs has been used by Regan (Table 1, no. 13) to differentiate ophidioid families. In *Brotula* (Fig. 4*b*) and *Dinematichthys* the ribs on vertebrae one and two are sessile and unexpanded; in *Snyderidia* the first two ribs are sessile but somewhat expanded; in *Otophidium* the first vertebra and its ribs (Fig. 4*a*) are exceedingly specialized. In *Brotula* and *Dinematichthys* the ribs on the third and fourth vertebrae are separate, sessile and more or less expanded. In *Snyderidia* the rib on the third vertebra is sessile and considerably expanded but that of the fourth is minute and attached to a long parapophysis. In *Otophidium* the second vertebra seems to lack ribs; the third, fourth, and fifth have sessile ribs, of which that from the third runs medially to the air bladder.

As to the number of transverse processes (Table 1, no. 14), there is in *Otophidium,* at least, the probability that "transverse processes" and "sessile ribs" are actually the same structures, the distinction being merely one of definition, i.e., it would appear that in this fish a "transverse process" that has a basal articulation with the centrum becomes a "sessile rib" (cf. Emery, 1880, pl. 5, fig. 50, c_4). Nevertheless the old

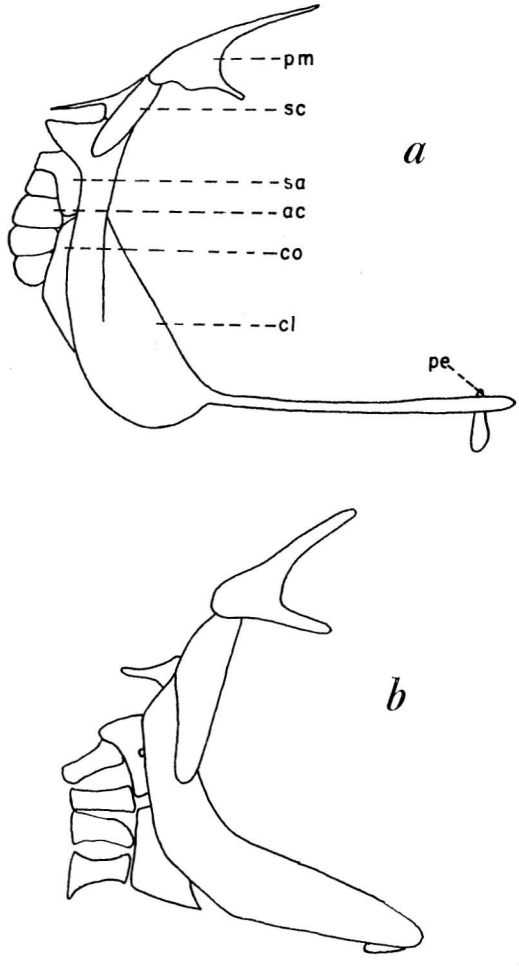

FIG. 3. Right pectoral girdles of, *a. Otophidium* and, *b, Dinematichthys,* from outside. *ac,* Actinost; *cl,* cleithrum; *co,* coracoid; *pe,* pelvic girdle; *pm,* posttemporal; *sa,* scapula; *sc,* supracleithrum.

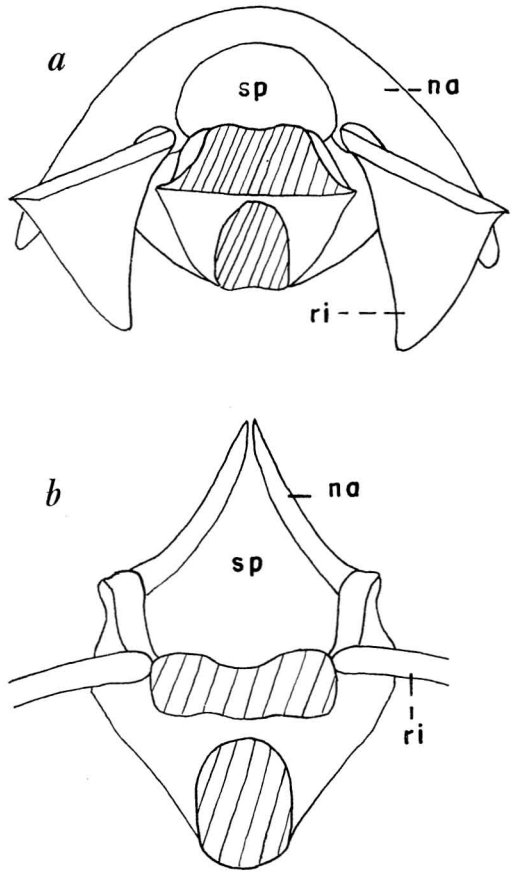

FIG. 4. First vertebra and ribs of, *a, Otophidium* and, *b, Brotula,* from front. Surfaces for articulation with skull hatched. *na,* Neutral arch; *ri,* rib; *sp,* space containing spinal cord.

terminology will be used in order to deal with character no. 13 of Table I. In *Brotula* the first five vertebrae have "sessile ribs"; in *Dinematichthys* the first six; in *Otophidium* the first, third, fourth, and fifth; and in *Snyderidia* the first three only. (In *Microbrotula* ribs are now lacking from several of the front vertebrae, but they may well have been lost in the process of skeletonization.) Judging from Emery's plate (1880, pl. 5) sessile ribs are present on the first four vertebrae of *"Fierasfer acus"* and *"Fierasfer dentatus";* in the latter species each rib is separate, but in the former the ribs of vertebrae three and four have apparently fused into a single plate (see also Arnold, 1956, fig. 2c). According to Arnold (1956: 257, fig. 5) a third group of carapids has the transverse processes ("sessile ribs") of vertebrae three, four, and five fused into a single plate.

Regan has also used the number of "strong transverse processes" as a character for separating the brotulids from the ophidiids (Table 1, no. 14), but this is certainly a variable character in the brotulids. For example, *Microbrotula* has transverse processes only on vertebrae eight through eleven, whereas *Hypopleuron* (see Radcliffe, 1913, pl. 14) has greatly expanded parapophyses on vertebrae four to fourteen (which partly enclose the air bladder).

A final vertebral character is the number of abdominal and caudal vertebrae (Table 1, no. 12). In the three brotulids skeletonized counts are: *Brotula,* 15 abdominal + 46 caudal; *Microbrotula,* 12 + 40; *Dinematichthys,* 12 + 34; in *Otophidium,* 16 + 53; in *Snyderidia,* 15 + 58. Emery (1880: 26) gives 125–144 vertebrae for *"Fierasfer acus,"* of which 17 or 18 are abdominal. Arnold (1956) uses the number of trunk vertebrae as one basis for dividing the carapids into three sections, one group having 17–20, another 27 or 28, and a third 30 or 31.

Internal soft anatomy: The air bladder of *Snyderidia* is apparently simple and extends from below the second to below the twelfth vertebra. According to Gilbert (1905: 654) *Snyderidia* has two pyloric caeca.

External characters: Only a few of the external features of *Snyderidia* need be noted. First, the species resembles the carapids in the presence of a long tail that tapers gradually to nothing. Second, though the pectoral of the lava flow specimen of *Snyderidia* has been rather badly frayed, it is possible to count 27 rays on one side. This high count seems to place *Snyderidia* with the brotulids and ophidiids rather than with the carapids (Smith, 1955: 546). Finally, there are no scales whatever.

Relationships: On the basis of the foregoing comparison *Snyderidia* would appear well differentiated from the Ophidiidae, Brotulidae, and Carapidae, but is probably closest to the last. Especially notable carapid characteristics in *Snyderidia* are the absence of pelvic fins, the long anal fin, the tapering body, the lack of scales, and perhaps especially the dentition. Indeed, in all these respects and notably in lower jaw struc-

ture *Snyderidia* bears a considerable resemblance to the carapid genus *Echiodon* (Arnold, 1956). Nevertheless, in another whole series of characteristics *Snyderidia* differs from *Echiodon* and apparently all other carapids. This series may be divided between presumably primitive and presumably specialized features. Among the "primitive" characters in *Snyderidia* may be mentioned the wide gill openings; the comparatively low number of vertebrae, both abdominal and caudal; the relatively high pectoral count; the small, backwardly sloping first neural arch; and the protractile upper jaw. In all these traits *Snyderidia* is closer to the brotulids and ophidiids than to the carapids. Among specialized features in *Snyderidia* may be mentioned especially the fusion of the frontals and the separate angular bone. On the whole then *Snyderidia* might be considered a side branch of the primitive stock from which the carapids have arisen. In the absence of known transitional forms between *Snyderidia* and the carapids, *Snyderidia* would appear to merit separation at the family level.

Though the internal features of *Pyramodon* remain mostly unknown, it seems most probable that *Snyderidia* should be included in Smith's family Pyramodontidae. The chief external difference between the two appears to be the retention of pelvic filaments in *Pyramodon.* To include *Snyderidia,* some slight rearrangement of Smith's definition (see above) of the family seems required. Using only those characters known for both *Pyramodon* and *Snyderidia,* the family Pyramodontidae may be redefined as follows: Body naked, tapering to a fine point posteriorly. Anal fin commencing below the pectoral. Pectoral with 27 rays. Gill openings extending well forward on throat. Upper jaw protractile. Large canines on the front of the vomer and at the symphyses of both jaws.

Some discussion of the remaining ophidioid families seems in order. The Carapidae is obviously the most specialized; indeed in habits the Carapidae is among the most specialized of all fish families, for it and the unrelated Pygidiidae comprise the only two fish families known that have developed parasitic members.

The Ophidiidae is externally separable from the other families in the group by the mental pelvics, though certain brotulid genera have the pelvics nearly as far forward. A more important character, if it applies to all ophidiids, is the peculiar first neural arch (Fig. 4*a*) and its connection with the air bladder; unfortunately this feature remains uninvestigated in what Norman (ms., 1957: 500) calls the subfamily Lepophidiinae.

The Brotulidae is a tremendous and heterogeneous family (Gosline, 1953), which Norman has recently divided into four subfamilies (ms., 1957: 484). That its osteological features cannot be characterized on the basis of internal examination of one species has been abundantly shown, while even the approximate limits of variation remain unknown. Suffice it to say that even the known variation in osteological features (Gosline, 1953) is greater than between many families of the great superfamily Percoidae.

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