

OCCASIONAL PAPERS OF THE MUSEUM OF  
ZOOLOGY

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UNIVERSITY OF MICHIGAN

ANN ARBOR, MICHIGAN

UNIVERSITY OF MICHIGAN PRESS

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RELATIONSHIPS OF *ALEPIDOMUS*, A NEW GENUS  
OF ATHERININE FISHES FROM THE FRESH  
WATERS OF CUBA

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IN his fascinating little book *The Migration of Animals from Sea to Land*, Pearse (1936) has pointed out that animals have seldom surmounted the great physiological difficulties involved in a change of habitat from sea water to fresh water. It is not surprising, therefore, to note that isolated fresh-water representatives of marine groups are often so strongly differentiated from their supposedly remote marine ancestors as to justify generic or greater separation. That this is true as a rule of the Atherinidae can be seen by a perusal of the systematic monograph on this family (Jordan and Hubbs, 1919). Another example of the trenchant distinctness of a fluviatile atherine becomes apparent when one considers in detail the characters of the Cuban fresh-water species which was described by Eigenmann (1903: 222, Fig. 9) as *Atherina evermanni*. In this paper I treat the relationships of that species, discuss the genera into which *Atherina* and the related *Hepsetia* have been divided in recent years, and then erect a new genus, *Alepidomus*, for the sole reception of *Atherina* or *Hepsetia evermanni*.

## RELATIONSHIPS OF "ATHERINA" EVERMANNI

Despite its close superficial resemblance to certain species of the New World group Atherinopsinae this tiny little silverside of Cuban fresh waters obviously belongs to the essentially Old World and largely marine subfamily Atherininae. I have already indicated (Hubbs, 1936: 249) that it agrees with the Atherininae in the structural features by which that group has been separated (by Jordan and Hubbs, 1919: 14-15, 29, 48) from the Atherinopsinae: the premaxillaries are not dilated posteriorly; the gape is nearly straight and scarcely restricted at the corner of the mouth by the membranes between the jaws; the anus opens far in advance of the normal position just in front of the anal fin (nearer pelvic insertion than anal origin); the belly is rather long (though less elongate than usual in the Atherininae); the pelvic fins are inserted much nearer the pectoral insertion than the anal origin; and the anal fin is short (though longer than in most Atherininae).

A newly observed character clinches the evidence that "*Atherina*" *evermanni* should be referred to the Atherininae rather than the Atherinopsinae. This character involves the dentition of the premaxillary. In *evermanni* the dentigerous surface is reflected outward so as to cover the whole outer face of the premaxillary with shagreen. In all available species of *Atherina* and *Hepsetia* (in the sense of Jordan and Hubbs), whether from the New World, Europe, or the Indo-Pacific region, I find that a shagreen of minute teeth more or less completely covers the exposed part of the premaxillary. A survey of nearly the entire gamut of the Atherinopsinae, on the other hand, discloses no dentition of this type. In certain atherinopsines with weakly developed mandibles, notably in the marine *Membras* and the Mexican fluviatile *Archomenidia* (Jordan and Hubbs, 1919: 54-56) the teeth which occur in a uniserial file along the extreme edge of the premaxillary are exposed, but they are directed downward and do not simulate the villous band on the outer surface of the bone, as developed in *Atherina* and its relatives.

This distinction in premaxillary dentition appears to provide a usual but not invariable subfamily criterion. In a few small aberrant genera of the Atherininae the character breaks down. Thus, in the Australian fluviatile genus *Craterocephalus* (Jordan and Hubbs, 1919: 14, 44-47; Weber and De Beaufort, 1922: 277; Whitley, 1943: 132, 135) the teeth are described as being "microscopic" or "very small" in the jaws and apparently do not extend over the outer surface of the premaxillary. Although also referred to the Atherininae by Jordan and Hubbs (1919: 15, 47, Pl. 3, Fig. 10) the excessively compressed Indo-Pacific genus *Iso* Jordan and Starks (1901: 204-6, Fig. 4) has the outer face of the premaxillary smooth and edentulous.

In this connection it is interesting to note that the *Iso*-like but even more bizarrely specialized Chilean atherine recently described by Clark (1937: 88-90, 1 fig.) as *Notocheirus hubbsi*—presumably a parallel offshoot, from the Atherinopsinae—has the small teeth in the jaws "more or less concealed by the numerous spines of the snout" and the head "from snout to nape velvety or bristly with spines like those on the scales." These head spines are more plausibly interpreted as hypertrophied scale ctenii than as jaw teeth which have become extended over the surface of the head and body. These alternative explanations seem distinct even if one favors the idea that ctenii and teeth are homologous, in that they have both been derived from denticles.

The suggestion that spines on the outer surface of the head may represent teeth extroverted from their normal position in the jaws is not purely theoretical, for this is certainly true of the armature of the free surface of the premaxillary in *Atherina* and other fishes. The process seems to have been carried to an excessive extreme in the western Pacific atherinine genus *Atherion* (Jordan and Starks, 1901: 199, 203-4, Fig. 3; Jordan and Hubbs, 1919: 14, 30). Counteracting the principle of irreversible evolution as it applies to the extent of development over the body surface, what are obviously true teeth (rather than "tooth-like spines" or "fine spinules")

thickly cover in *Atherion* not only the premaxillary but also the lower lip, the entire exposed bony surfaces of the mandible, interopercle, preopercle and anterior part of subopercle, various ridges on the muzzle and around the eye, the postorbital ridge, and even the margin of the scapular process.

The teeth extend over the outer surface of the lips in some but not all species of the Melanotaeniinae, a subfamily of Atherinidae occurring in the fresh waters of Australia and New Guinea (Regan, 1914: 276-84, Pl. 31; Weber and De Beaufort, 1922: 286-311, Figs. 77-83). The same character is exhibited by certain genera in other families of teleost fishes.

Returning to the Cuban fresh-water silverside I conclude that it has properly been classified in the Atherininae. Its source is, therefore, not to be sought in the fresh waters of any New World land, for all other fresh-water atherines of the Western Hemisphere are classed in the Atherinopsinae. It shows no particular approach toward either of the two known New World Atlantic species of Atherininae, nor toward any of the numerous other marine members of that subfamily. Its ancestry must be traced to some remote, presumably marine progenitor.

#### RECENT GENERIC DIVISIONS OF ATHERINA

To provide a basis for a consideration of the generic status of "*Atherina*" *evermanni* it is desirable to consider the genera that have recently been proposed for species which had previously been referred to a large genus *Atherina*.

Fowler (1903: 730) first based a new subgenus, *Atherinomorus*, on the western Atlantic marine species *Atherina laticeps*, with the prime character, "rami of mandibles not elevated inside of mouth." Noting that this character is also a feature of *Atherina boyeri* Risso, the European type species of *Hepsetia* Bonaparte, Jordan (1919: 310-11) and Jordan and Hubbs (1919: 31) synonymized *Atherinomorus* with *Hepsetia*. We recognized *Hepsetia* as a genus, because the species with the low mandibular rami "usually differ from those of typical *Atherina* in their shorter and blunter premaxillary

spine, the shorter and more rounded snout, the larger eye, wider interorbital, longer head, deeper body, and larger scales." The general facies strongly suggest two distinct phyletic lines.

Believing that we held an inaccurate conception of *Hepsetia*, Whitley (1930: 9-10) proposed a new genus, *Pranesus*, "practically identical with *Hepsetia* as defined by Jordan & Hubbs." Not having at hand a copy of Bonaparte's book, Whitley based his belief on the fact that "Sherborn, in his Index Animalium, considers *Hepsetia* Bonaparte as a possible error for *Hepsetus* Swainson." The two names, however, have little but spelling in common, and are nomenclatorially distinct (Hubbs, 1939). Bonaparte (1832-41) specifically states that he is erecting two subgenera. Under *Hepsetia* he mentions only the "esempio l'unica europea *Atherina Boyeri* (*Hepsetus*, Rond.)"; under the other subgenus ("*Atherina*, Rond.") he cites only *A. hepsetus*. Bonaparte's indications of the type species were made clear by Jordan (1916). The type species of *Pranesus* is *Pranesus ogilbyi*, which was based on the description of Australian examples of "*Atherina pinguis*" by Ogilby (1912: 38-40, Pl. 12, Fig. 1, and Fig. a). Whitley proposed the new name because Ogilby thought that the wide-ranging nominal *pinguis* might be a complex. Incidentally, one might be inclined to raise a voice of protest against the naming of new genera and species on the basis of a suspicion that they may be unnamed. In a later paper Whitley (1934) named two other new genera for Australian fishes of the *Atherina* type, namely *Pranesella* and *Atherinason*, without offering trenchant generic diagnoses. More recently (1943) he has proposed still further generic separations.

Not mentioning the new "genera" proposed by Whitley, Fowler (1941: 249-51, Fig. 1) has lately erected the new genus *Thoracatherina* for the Hawaiian species, *Atherina* or *Hepsetia insularum*, and in the same paper recognized *Atherinomorus* as a valid genus for the Atlantic American species (*laticeps* = *stipes*). He separated the two genera from *Hepsetia* (*boyeri*) of Europe primarily on the basis of the greatly enlarged

"infra-pectoral" scales, on the shoulder girdle below the base of the pectoral fin. He stated that the scales of that region are small in *Hepsetia boyeri*, and they are so indicated on the excellent plates in the monographs by Bonaparte (1832-41) and Borsieri (1904). The type species of *Atherina* (*A. hepsetus*), also European, is shown by an examination of specimens as well as figures to have these scales similarly small. All other species of the *Atherina* and *Hepsetia* type at hand, with the exception of *evermanni*, have these scales more or less notably enlarged. Species found to be so characterized are *Atherinomorus stipes* and *Atherina harringtonensis* of the New World, and a number of species each of the *Atherina* and *Hepsetia* types of eastern Asia (Japan, Philippines, Java). The type species of *Pranesus* is figured by Ogilby as having these scales not enlarged, but I suspect an error. If *Pranesus ogilbyi* has enlarged scales on the shoulder girdle I see no valid grounds for separating *Thoracatherina* from *Pranesus*. Other characters assigned to *Thoracatherina* do not appear, after an examination of East Indian species, to be of generic significance.

There are better grounds for the generic separation of the Atlantic American species *stipes*. As Fowler (1941: 249, Fig. 2) indicated in establishing *Atherinomorus* as a genus, this species differs from *Hepsetia boyeri* in having scales on the dorsal, anal, and pectoral fins (these scales are thin and deciduous, and apt to be overlooked unless well-preserved specimens are carefully examined). *Atherina*, as represented by *A. hepsetus*, agrees with *Hepsetia* and *Thoracatherina* in totally lacking scales on these fins. Nor are such scales developed in *Atherina harringtonensis*, "*Atherina*" *evermanni*, or in any of the eastern Pacific species examined. I therefore recognize *Atherinomorus* as a distinct genus, but hold in abeyance the question of any further generic division of *Hepsetia* or of *Atherina*. These open problems are not vitally concerned in the treatment of the Cuban fresh-water species, for which I now propose the name

*Alepidomus*, new genus

TYPE SPECIES.—*Atherina evermanni* Eigenmann.

The characters in which this genus agrees with *Atherina*, *Hepsetia*, and *Atherinomorus* (and with the similar Pacific genera *Pranesus*, *Thoracatherina*, etc., if these are valid) have already been stated. Its most trenchant feature is, perhaps, the lack of scales on the shoulder girdle below the pectoral. As correctly shown in the type figure this region, instead of being covered with either small or large scales, is totally and abruptly naked (hence the name *Alepidomus*, from  $\acute{\alpha}$ , privative,  $\lambda\epsilon\pi\iota\varsigma$  scale, and  $\acute{\omega}\mu\omicron\varsigma$ , shoulder). The abdomen is shorter and the urosome consequently longer than in typical atherinines: the origin of the anal fin is much nearer the head than the caudal base. The scales are relatively larger than in any near relative, numbering about thirty-two along the axial line, and the exposed field of the individual scales is normally shaped; that is, the scales are less elevated and less extensively imbricated than is usual in the group. The adult size is much smaller than that of the species in related genera. In an aquarium it is seen to be a very delicate, semitranslucent fish.

*Alepidomus* differs from *Atherina* and agrees with *Hepsetia* and *Atherinomorus* in having the mandibular rami scarcely elevated within the mouth and in other less trenchant features. It deviates from *Atherinomorus* but agrees with other related genera in lacking scales on the dorsal, anal, and pectoral fins.

Only one species of the genus is known.

*Alepidomus evermanni* (Eigenmann)

*Atherina evermanni*.—Eigenmann, 1903: 222, Fig. 9; Hubbs, 1936: 249.

*Hepsetia evermanni*.—Jordan and Hubbs, 1919: 35, Pl. 2, Fig. 2.

In the preparation of this account I have had at hand a paratype from San Cristóbal, Cuba, and a specimen collected by Merino in August, 1935, in Laguna la Canoa, Artemisa, Cuba. Through the courtesy of Arthur Greenberg of the Everglades Aquatic Nursery I have had live specimens in an aquarium. They were mid-water swimmers, moving about

rather jerkily with much fluttering of the high-set pectoral fins.

The Atherininae of the New World may now be listed as follows. For synonyms see Jordan and Hubbs (1919).

Genus *Atherinomorus* Fowler

*Atherinomorus stipes* (Müller and Troschel): shores of western Atlantic from Florida to Brazil; also reported (Hubbs, 1920: 1), perhaps erroneously, from the Pacific coast of Colombia.

Genus *Thoracatherina* Fowler

*Thoracatherina insularum* (Jordan and Evermann): Hawaiian Islands; also New Caledonia and Galápagos Islands, according to the questionable records by Borodin (1932: 76).

Genus *Atherina* Linnaeus

*Atherina harringtonensis araea* (Jordan and Gilbert): western Atlantic from Florida Keys to Puerto Rico and Panamá; also reported (Hubbs, 1920: 2), perhaps erroneously, from the Pacific coast of Colombia.

*Atherina harringtonensis harringtonensis* Goode: Bermuda Islands.

Genus *Alepidomus* Hubbs

*Alepidomus evermanni* (Eigenmann): fresh waters of Cuba.

All other New World Atherinidae are referred to the Atherinopsinae.

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