

on the neurapophyses; the skull with its frontal portion broad, expanded forward and outward, and entering into the posterior borders of the orbits, which are advanced far forwards: the post-frontals elongated forwards and underlying the frontals; ethmoid short, decurved and expanded sideways.

The abbreviated orbital and ante-orbital regions and ensuing modifications contrast strongly with the corresponding parts in all the forms with which the genus *Lobotes* has been associated. With the exceptions noted, the vertebræ are essentially similar to those of the *Serranidæ*.

*Lobotes* is the only certainly known member of the family.

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NOTE ON THE RELATIONSHIPS OF THE ECHENEIDIDS.

BY THEODORE GILL.

Among those forms that have been most shifted from place to place in the ichthyological systems is the genus *Echeneis* of Artedi and Linnæus.

By Artedi (1738) as well as by Linnæus, at first, it was placed in the order MALACOPTERYGII next to *Coryphæna*, the last a true acanthopterygian fish.

By Linnæus, in the later editions of the *Systema Naturæ* (1758, 1766), it was placed in the order THORACICI, but still kept by the side of *Coryphæna*.

By Cuvier (1817) it was referred to the order of "Malacoptérygiens subbrachiens" and the family "Discoboles" after *Lepadogaster* and *Cyclopterus* (R. A., t. 2, p. 227, 1817).

By Swainson (*Nat. Hist. and Class. Fishes, etc.*, v. 2, 1839) the genus *Echeneis* was raised to family rank and the family (Echeneidæ) referred to the order "Acanthopteryges" and the tribe "Microleptes," in which it was supposed to constitute an "aberrant family" (p. 30), which "represented" the Acanthopterygian "tribe Bleunides" (p. 32) and the "order Apodes" (p. 31).

It was preceded by the "typical" families (1) "Scomberidæ" and (2) "Zeidæ," and followed by the "aberrant" families (4) "Centrisidæ" and (5) "Coryphænidæ."

Subsequently all reference to the family as well to the genus was omitted (apparently through forgetfulness) by Swainson in the later and synoptical portion of the work. His eccentric classification is only noticed here because a similar or still more extreme view as to the affinity of the genus became long afterwards quite prevalent.

By Müller (1844) the genus was put in the order Acanthopteri and in the family Cyclopodii, but as the representative of a peculiar "group" ("3. Gruppe. Echeneiden").

By Agassiz and Holbrook, and later by Günther\* (1860), it was transferred to the family Scombridae, next to Elacate.

By Bleeker (1859) the genus was entitled with family rank (Echeneidei) and also ordinally distinguished (with the name "ordo 38. Discocephali") and interposed between "ordo 37. Fistulariae," and "ordo 39. Cyclopteri."

By Cope (1870) it has been retained next to some Scombroid fishes (the Carangidae), but as a distinct family, and placed in his order "Percomorphi" and suborder "Distegi."

In later years the views of Müller, and subsequently of Swainson and Günther, have been generally adopted by European ichthyologists. In my "Arrangement of the families of fishes" the family Echeneididae has been relegated to the category of Teleocephali "*incertae sedis*." A desire to reach some definite conclusion has induced me to examine its osteological as well as other characteristics, and has resulted in the following conclusions:

The ventral fins being furnished with true spines, the fish is not a Malacopterygian, but an Acanthopterygian of Artedi, Cuvier, etc. The opposite reference to the Malacopterygians was due, in the first place, to the failure of Artedi and the older naturalists to appreciate the difference between slender spines and "soft rays," and subsequently to the assumption, without attempt at verification, by Cuvier, of the correctness of his predecessors' statements.

The "basis cranii" is not double but simple, and there is no "tube." The type, therefore, is not at all related to the Scombridae, Carangidae, and other typical fishes, and consequently does not belong to the suborder "Distegi" of Cope.

The contrary statement implied by Professor Cope is due, doubtless, to the preoccupation of his mind with the idea as to the affinity claimed to exist between Echeneis and the Scombridae, and the consequent assumption that the former had a *basis cranii* like the latter. Inasmuch as the cranial cavity is partly closed, the true state of affairs can only be seen on opening or bisecting the skull, and this has probably been neglected. The group would really be referable to the suborder Scyphobranchii in Professor Cope's system, were it not for the form of the third pair of upper pharyngeal bones.

But what could have been the reason for referring the fish to the family Scombridae (as contradistinguished from the Carangidae) as a simple genus?

The family of "Scomberoides" was constituted by Cuvier for certain forms of known organization, among which were fishes evidently related to *Caranx*, but which had free dorsal spines. In the absence of knowledge of its structure, the genus *Elacate* was approximated to such because it also had free dorsal spines. Dr. Günther conceived the idea

\*On the History of Echeneis. By Dr. Albert Günther. <Ann. and Mag. Nat. Hist. (3), v. 5, pp. 386-402. 1860.

of disintegrating this family, because, *inter alia*, the typical Scombröides (family Scombridæ) had more than twenty-four vertebræ and others (family Carangidæ) had just 24. The assumption of Cuvier as to the relationship of *Elacate* was repeated, but inasmuch as it has "more than 24 vertebræ" (it has  $25 = 12 + 13$ ) it was severed from the free-spined Carangidæ\* and associated with the Scombridæ. *Elacate* has an elongated body, flattish head, and a colored longitudinal lateral band; *Echeneis* has also an elongated body, flattened head, and a longitudinal lateral band; therefore *Echeneis* was considered to be next allied to *Elacate* and to belong to the same family! The very numerous differences in structure between the two were entirely ignored, and the reference of *Echeneis* to the Scombridæ is simply due to assumption piled on assumption. The collocation need not, therefore, longer detain us.

The possession by *Echeneis* of the anterior oval cephalic disk in place of a spinous dorsal fin would alone necessitate the isolation of the genus as a peculiar family. But that difference is associated with almost innumerable other peculiarities of the skeleton and other parts, and in a logical system it must be removed far from the Scombridæ, and probably be endowed with subordinal distinction. In all essential respects it departs greatly from the type of structure manifested in the Scombroidea and rather approximates—but very distantly—the Gobioidæ and Blennioidea. In those types we have *in some* a tendency to flattening of the head, or anterior development of the dorsal fin, a simple basis cranii, etc. Nevertheless there is no close affinity nor even any tendency to the extreme modification of the spinous dorsal exhibited by *Echeneis*. In view of all these facts *Echeneis*, with its subdivisions, may be regarded as constituting not only a family but a suborder, which is definable as follows:

## Suborder DISCOCEPHALI.

### *Synonymy.*

=Discocephali, *Bleeker*, Enum. sp. Piscium archipel. Ind., p. xxvi, (order; not defined), 1859.

=Echeneidoidea, *Gill*, Arrangement Fam. Fishes, p. 12, (super family; not defined), 1872.

Teleocephali with a suctorial transversely laminated oval disk on the

\* "This family [Carangidæ] forms a very natural division, widely [*sic!*] differing from the Scombridæ in the structure of the vertebral column, which is composed of ten abdominal and fourteen caudal vertebræ. The *only exception* is found in the genera *Chorinemus* and *Temnodon*." (*Gthr. Cat. Fishes B. M.*, v. 2, p. 417.) Besides the genera specially excepted, according to Dr. Günther's own figures, the following falsify his generalization, viz: *Caraux goreensis* (p. 457)—"Vert. 10 | 16"; *Psettus argenteus* (p. 488)—"Vert. 9 | 14"; *Platax arthriticus* (p. 491)—"Vert. 11 | 13"; *Zanclus cornutus* (p. 493)—"Vert. 9 | 13"; *Capros aper* (p. 496)—"Vert. 10 | 12-13"; *Equula fasciata* (p. 498)—"Vert. 10 | 13." There are a number of other exceptions, but their consideration is not called for in this place.

upper surface of the head, (homologous with a first dorsal fin\*,) thoracic ventral fins with external spines, a simple basis cranii, intermaxillary bones flattened, with the ascending processes deflected sideways, and with the supramaxillary bones attenuated backwards, flattened, and appressed to the dorsal surface of the intermaxillaries; hypercoracoid (or scapula) perforated nearly in the center; and with four short actinosts ("carpals").

## Family ECHENEIDIDÆ.

### Partial Synonymy.

- < Elentheropodes, *Duméril*, Zool. Anal., p. 123, 1806.  
 = Echeneidi, *Rafinesque*, Indice d'Ittiologie. Siciliana, p. 29, 1810.  
 < Cephoplia, *Rafinesque*, Analyse de la Nature, 13. fam., 1815.  
 < Encheliosomes, *Blainville*, Journal de Physique, t. 83, p. 255? (Includes *Echeneis*, *Cépoles*, and *Gymnètes*). 1816.  
 < Discoboles, *Curier*, Règne Animal, t. 2, p. 227, 1817.  
 < Discobola, *Latreille*, Fam. Nat. du Règne Animal, p. 127, 1825.  
 = Echeneides, *Risso*, Hist. Nat. de l'Europe Merid., t. 3, p. 269, 1826.  
 = Echeneididæ, *Bonaparte*, Giorn. Accad. di Scienze, v. 52. (Saggio Distrib. Metod. Animal. Vertebr. a Sangue freddo, p. 38,) 1831-'32.  
 = Echeneididæ, *Bonaparte*, Nuovi Annali delle Sc. Nat., t. 2, p. 133, 1838.  
 = Echeneidæ, *Swainson*, Nat. Hist. and Class. Fishes, etc., v. 2, pp. 31, 32, 42, 43, 44, 1839.  
 = Echeneisidæ, *Gray*, Syn. Brit. Mus., p. 143, 1842.  
 < Cyclopodi, *Müller*, Archiv für Naturgeschichte, Jahrg. 1843, v. 1, p. 297, 1843.  
 = Echeneididæ, *Gray*, *White*, List Spec. Brit. Animals Brit. Mus., Fish, p. 55, (placed between Callionymidæ and Lophiidæ.) 1851.  
 = Echeneididæ, *Richardson*, Encyclopædia Brit., v. 12, p. 272, (271,) 1856.  
 = Echeneoidæ, *Bleeker*, Enum. Sp. Piscium Archipel. Indico, p. xxvi, 1859.  
 = Echeneidæ, *Cope*, Proc. Am. Assoc. Adv. Science, v. 20, p. 342, 1872.  
 = Echeneididæ, *Gill*, Arrangement Fam. Fishes, p. 12, 1872.  
 = Echeneides, *Fitzinger*, Sitzungsber. k. Akad. der Wissensch. (Wien), B, 67, 1. Abth., p. 43, 1873.  
 Scombridæ gen., *Günther*, (Int. to Study of Fishes, p. 460,) 1880.

## Sub-family ECHENEIDINÆ.

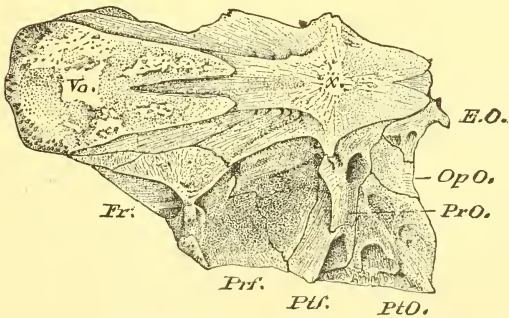
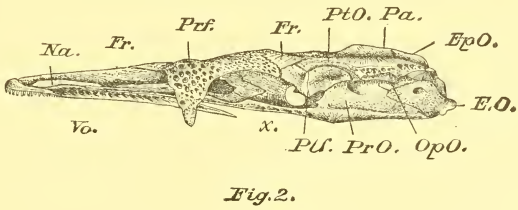
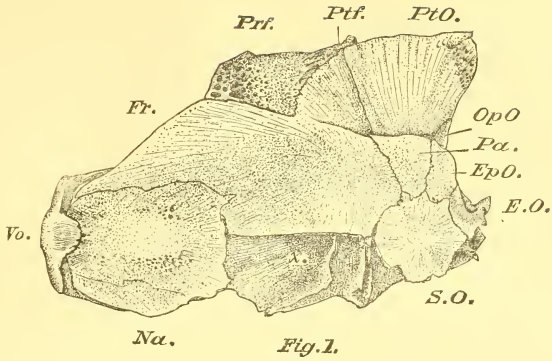
### Synonymy.

- = Echenidia *Rafinesque*, Analyse de la Nature, 1. s. f. of 13. fam., 1815.  
 = Echeneidini, *Bonaparte*, Nouvi Annali delle Sc. Nat., t. 2, p. 133, 1838; t. 4, p. 275, 1840.  
 = Echeniden, *Müller*, Archiv für Naturgeschichte, Jahrg. 1843, p. 297, ("group" of Cyclopodi), 1843.  
 Scombrina gen., *Günther*.

*External characters.* (See plate VII, showing skull).

Body elongated, subcylindrical, diminishing backwards gradually from the head and into the slender caudal peduncle. Anus subcentral.

\* Baudelot (E.) Étude sur le disque céphalique des Rémores (Echeneis) <Annales des Sciences Naturelles, (5e série, Zoologie et Paléontologie,) t. 7, pp. 153-160, pl. 5, 1867; (tr. pt.) Ann. and Mag. Nat. Hist., (4,) v. 19, pp. 375-376, 1867.





Scales, cycloid, very small, and not or scarcely imbricated.

Lateral line nearly straight and very faint.

Head above oblong and with a flattened straight upper surface furnished with an adhesive oblong or elongated laminated disk. The eyes are rather small, submedian, and overhung by the disk.

Suborbital bones forming a slender infraorbital chain; the first or preorbital triangular and thick.

Opercular apparatus normally developed and unarmed.

Nostrils double, close together.

Mouth terminal or, rather, superior, the lower jaw projecting, but with the cleft nearly horizontal and not extending laterally to the eyes.

Teeth present on the jaws and palate.

Branchial apertures ample and fissured forwards. Branchiostegal rays seven (or eight) on each side.

The adhesive disk on the upper surface of the head is a modified first dorsal fin and from the snout generally extends more or less posteriorly on the nape and back; it is oblong or elongated and of an oval or elliptical form, divided into equal halves by a longitudinal septum, and with more or less numerous transverse pectinated or spinigerous transverse laminae in each division, the laminae being slightly erectile and depressible.

Dorsal fin oblong or elongated, on the posterior half of the body (including head), ending some distance from the caudal.

Anal fin opposite and similar to the dorsal.

Caudal fin rather small, variable in outline but never deeply forked.

Pectoral fins moderate, inserted high on the sides.

Ventral fins thoracic; each with a spine and five branched rays.

The vertebral column has vertebrae in slightly increased number, the abdominal vertebrae being about twelve to fourteen and the caudal fifteen or sixteen.

The stomach is caecal and the pyloric caeca are present in moderate numbers. The air bladder is obsolete.

Who can consistently object to the proposition to segregate the Echeineididae as a suborder of teleocephalous fishes?

Not those who consider that the development of three or four inarticulated rays (or even less) in the front of the dorsal fin is sufficient to ordinally differentiate a given form from another with only one or two such. Certainly the difference between the constituents of a disk and any rays or spines is much greater than the mere development or atrophy of articulations.

Not those who consider that the manner of depression of spines, whether directly over the following, or to the right and left alternately, are of ordinal importance; for such differences again are manifestly of less morphological significance than the factors of a suctorial disk.

Nevertheless there are doubtless many who will passively resist the proposition because of a conservative spirit, and who will vaguely recur

to the development of the disk as being a "teleological modification," and as if it were not an actual fact and a development correlated with radical modifications of all parts of the skeleton at least.

But whatever may be the closest relations of *Echeneis*, or the systematic value of its peculiarities, it is certain that it is not allied to *Elacate* any more than to others of the hosts of Scombroïd, Percoid, and kindred fishes, and that it differs *in toto* from it, notwithstanding the claims that have been made otherwise.\* It is true there is a striking resemblance, especially between the young—almost as great, for example, as that between the placental mouse and the marsupial antechinomys—but the likeness is entirely superficial, and the scientific ichthyologist should be no more misled in the case than would the scientific therologist by the likeness of the marsupial and placental mammals.

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NOTE ON THE GENUS SPARUS.

BY THEODORE GILL.

Messrs. Jordan and Gilbert propose to restore the Linnæan name *Sparus* to *Sparus boops*, after the example of Swainson (Nat. Hist. and Class. Fishes, etc., v. 2, pp. 171, 221), instead of to the *Sparus aurata*, as I have done. This course is inadmissible, as those naturalists will doubtless recognize when they become conversant with the facts of the case.

Linnæus, after Artedi and the older authors, employed the name for Sparoid and other fishes of diverse kinds, and including *Sparus aurata*, *Sparus boops*, etc. Both Artedi and Linnæus placed the *S. aurata* at the head or as first of the genus.

Bloch and Lacépède variously restricted the genus, but still retained the forms just noted.

Cuvier, in 1817, subdivided the old genus into "tribes" and "genera," distinguishing for the *Sparus boops*, etc., the "second tribe," and the genus "Boops Cuv.," and for the *Sparus aurata* and related forms the "third tribe" and the restricted genus "Sparus Cuv." The "genus" was subdivided into subgenera, viz: "Les Sargues (Sargus. Cuv.)," "les Daurades" (without a latin equivalent), and "les Pagres (Pagrus. Cuv.)."

The name *Sparus* must, therefore, be retained for a section of the genus as restricted by Cuvier.

Risso, in 1827, supplied a Latin name "Aurata" for "les Daurades" of Cuvier.

Cuvier, in 1829, retained the genus *Sparus* with the same limits as in 1817, but with a slightly different subdivision of subgenera, viz: "Les Sargues (Sargus)," "les Daurades (Chrysophris N.)," "les Pagres" (without a Latin name), and "les Pagels (Pagellus Cuv.)."

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\* This genus [*Echeneis*] is closely allied to the preceding [*Elacate*], from which it differs only by the transformation of the spinous dorsal fin into a sucking organ." (Günther, Int. to Study of Fishes, p. 460, 1860.)