

ON THE ANACANTHINE FISHES.

BY THEODORE GILL.

Under the name Anacanthini have been grouped those Teleost fishes which have "vertical and ventral fins without spinous rays; the ventral fins, if present, are jugular or thoracic; air-bladder, if present, without pneumatic duct" (Günther, Int. to Study of Fishes, p. 537, 1880). These characters are not reinforced by any others, but nevertheless the fishes so characterized have been segregated by most ichthyologists into an "order." The propriety of such valuation was disputed by the present writer in 1861 (Cat. Fishes E. Coast N. Am., p. 7), and the group degraded to the rank of a suborder, and subsequently (Proc. Acad. Nat. Sc. Phila., 1863, p. 255), the genus *Zoarces* was transferred to it and associated with the Lycodinæ and Gymnelinæ in the same family. The American ichthyologists have generally acceded to the propriety of this degradation of the Anacanthini to subordinal rank. Most have also conceded the propriety of the association of *Zoarces* with the forms indicated, as has also Prof. Collett of Norway (Den Norske Nordhavs Expedition 1876-1878; Ficke, p. 78-79, 1880), although Prof. Cope has still retained *Zoarces* among the Blenniidæ. The subordinate rank of the Anacanthini appears indeed to be too evident to need further emphasis in this place, and its value as a suborder, or even as a natural and homogeneous group, may be justly questioned and denied. Nevertheless, for the sake of convenience at least, the collection may be provisionally (and only provisionally) preserved. The group under various names has been adopted by European authors, and the following are synonyms, exclusive of those pertaining to the Heterosomatous types.

JUGULARES OR ANACANTHINI.

Synonymy.

- × [*Holobranches*] *Jugulaires*, Duméril, Zoologie Analytique, p. 111, 1806.
- × [*Holobranches*] *Apodes*, Duméril, Zoologie Analytique, p. 117, 1806.
- × *Chorizopia*, Rafinesque, Analyse de la Nature, p. —, 1815. (Suborder.)
- × [*Tétrapodes*] *Jugulaires*, De Blainville, Journal de Physique, t. 83, p. 255, 1816. (Suborder.)
- × [*Apodes*] ——— De Blainville, Journal de Physique, t. 83, p. 255, 1816.

- × [*Malacopterygiens*] *Subbranchiens*, Cuvier, Règne Animal, 1re ed., t. 2, p. 211, 1817. (Tribe.)
- × *Jugulaires Malacopterygiens*, Risso, Hist. Nat. de l'Europe, t. 3, p. 214, 1827. (Tribe.)
- × *Apodes*, Risso, Hist. Nat. de l'Europe, t. 3, p. 189, 1827. (Order.)
- × *Lotes*, Oken, Lehrbuch der Naturgeschichte, 1816.
- × *Malacopterygii*, Bonaparte, Giorn. Accad. di Sci., v. 52 (Saggio Distrib. Metod. Animali Vertebr. a Sangue Freddo, p. 36), 1832; Isis, 1833, col. 1202.
- × *Subbranchiani* (*Sternopygii*). Bonaparte, Giorn. Accad. di Scienze, v. 52, (Saggio Distrib. Method. Animali Vertebr. a Sangue Freddo, p. 37), 1832; Isis, 1833, col. 1202.
- < *Malacopteryges*, Swainson, Nat. Hist. and Class. Fishes, etc., v. 2, pp. 167, 197, 1839. (As order.)
- < *Anacanthini*, Müller, Abhand. K. Akad. Wissensch. Berlin, 1844, p. 199, 1846. (As order.)
- < *Gadi*, Bonaparte, Catalogo Metodico dei Pesci Europei, pp. 5, 22, 1846. (As order.)
- < *Physoclysti*, Gill, Cat. Fishes E. Coast N. Am., p. 7, 1861. (As suborder of *Teleocephali*).
- < *Anacanthini*, Günther, Cat. Fishes Brit. Mus., v. 4, p. 317, 1862. (As order.)
- < *Anacanthini*, Häckel, Generelle Morphologie der Organismen, B. 2, p. cxxvii, 1866. (As suborder.)
- = *Anacanthini*, Gill, Arrangement Families Fishes, p. 31, 1872. (As suborder of *Teleocephali*.)
- > *Anacanthini*, Cope, Proc. Am. Assoc. Adv. Science, v. 20, p. 341, 1872.
- > *Scyphobranchii*, Cope, Proc. Am. Assoc. Adv. Science, v. 20, p. 341, 1872.
- = *Anacanthini* or *Jugulares*, Jordan & Gilbert, Syn. Fishes N. Am., p. 783, 1882. (As group or suborder.)

Two open questions affect the constituency of the group.

Prof. Cope, in his memorable "Observations on the systematic relations of the Fishes", defined the group, which he referred to his "order" Percamorphi, in the following terms:—

1. "Anacanthini. Basis cranii simple, no tube; post-temporal bifurcate; scapular foramen between scapula and coracoid; superior pharyngeals three, horizontal, third little larger; dorsal fin rays flexible, jointed. Includes the families *Gadidæ* and *Macruridæ*, both with isocercal caudal vertebræ."

This definition is quite applicable to the typical *Gadidæ* and *Macruridæ*, but there are several forms which have generally been associated with them (and which have even been usually considered to be more nearly allied to the *Gadidæ* than are the

Macruridæ) which do not exhibit the combination of characters signalized. Such fishes have been designated as the families *Brotulidæ*, *Ophidiidæ*, *Fierasferidæ*, and *Congrogadidæ*. These have the characters assigned by Prof. Cope to his Scyphobranchii, at least as much as the genus *Zoarces* (referred to that group as a genus of Blenniidæ), but none of the genera are mentioned under either title. Probably Prof. Cope had no skeletons of any of the families in question. We are therefore left in doubt (1) whether he would associate them with the *Gadidæ* and *Macruridæ* and modify the characters of the including group Anacanthini, or (2) whether he would refer them to the Scyphobranchii, next to *Zoarces* and the *Blenniidæ* generally.

Messrs. Jordan & Gilbert, in their excellent "Synopsis of the Fishes of North America," incidentally (p. 783, in a foot-note) refer to the "Anacanthini or Jugulares" as a "group or suborder" of Acanthopteri, and conclude the "order Acanthopteri" with the series of families generally combined under the former name. After having first admitted the family *Brotulidæ* (p. 79), they finally referred its constituents to the family *Gadidæ* (p. 794), admitting, however, the families *Congrogadidæ* (p. 790), *Fierasferidæ* (p. 791), *Ophidiidæ* (p. 792), and *Macruridæ* (p. 810). The question now arises whether the last thought of the eminent ichthyologists is an advance on their first thought.

A preliminary investigation into the structure of the Jugular or Anacanthine fishes, leads us to different conclusions from those enunciated by the several great authorities, whose views we have mentioned. That lamentable inattention to anatomy, and poverty of the museums in anatomical preparations and skeletons, which is the opprobrium of the institutions of this country, has prevented anything like an exhaustive examination, and will forbid the rapid progress here of scientific ichthyology till the want is supplied. My own small private collection, supplemented by the data published by others, has alone rendered even the present outline of the system of the Anacanthini possible. The details will therefore have to be filled in when science shall have established itself more thoroughly here, or when a citizen of a more fortunate land shall take up the subject. Enough is now known, however, to almost assure us that the present outline cannot be far out of the way.

Thanks to the kindness of my venerable friend, Prof. Poey, of Havana, I obtained, many years ago, the cranium of the West Indian *Brotula* (*B. barbata*) and briefly indicated the most salient characteristics of the type in a foot-note to an article "On the Affinities of several doubtful British Fishes" (Proc. Acad. Nat. Sci. Phila., 1864, p. 200). The note, published in this rather irregular manner, has doubtless escaped the attention of Messrs. Cope, Jordan and Gilbert, for otherwise they would certainly have recognized the validity of the family Brotuliidæ. The type in question, indeed, has but little affinity with the Gadidæ, and it gives me a pleasure, the greater because it is so rare, to find myself in accord with Dr. Günther in combining it rather with the Ophidiina, Fierasferina and Congrogadina, in contradistinction to the Gadidæ. I must, however, entirely dissent from that gentleman in considering the combination as of simply family value, in associating with them the Ammodytina, and also as to the sufficiency of the diagnosis.

The several groups are distinguishable as follows:—

SUPERFAMILY GADOIDEA.

Synonymy.

- > *Gadoidea*, Gill, Cat. Fishes E. Coast N. Am., p. 7, 1873. (Named only.)
- > *Macruroidea*, Gill, Cat. Fishes E. Coast N. Am., p. 7, 1873. (Named only.)

Jugulares with the orbito-rostral portion of the cranium longer than the posterior portion, the cranial cavity widely open in front; the supraoccipital well developed, horizontal and cariniform behind, with the exoccipitals contracted forwards and overhung by the supraoccipital, the exoccipital condyles distant and feebly developed, with the hypercoracoid entire, the hypocoracoid with its inferior process convergent towards the proscapula, and the fenestra between the hypercoracoid and hypocoracoid.

GADIDÆ.

Family Synonyms.

- < *Jugulaires* ou *Auchénoptères*, Duméril, Zoologie Analytique, p. 118, 1806.
- < *Gadinia*, Rafinesque, Analyse de la Nature, p. —, 3e fam., 1815.
- < *Metrosomes*, De Blainville, Journal de Physique, t. 83, p. 255, 1816.
- × *Gadini*, Rafinesque, Indice d'Ittiolog. Siciliana, p. 11, 1810.
- < *Gadoïdes*, Risso, Hist. Nat. de l'Europe Mérid., t. 3, pp. 104, 214, 1826.
- < *Gadoïdes*, Cuvier, Règne Animal, 1re éd., 2, p. 211, 1817; 2e éd., t. 2, p. 330, 1829.

- < *Gadites*, Latreille, Fam. Nat. du Règne Animal, p. 125, 1825.
 < *Gadites*, Stark, Elements of Nat. Hist., v. 1, p. 423, 1828.
 < *Gadites*, McMurtrie, Cuv. Animal Kingdom, v. 2, p. 243, 1831.
 < *Gadidæ*, Bonaparte, Giorn. Accad. di Scienze, v. 52 (Saggio Distrib. Metod. Animali Vertebr. a Sangue Freddo, p. 37), 1832.
 < *Gadoideæ*, Rich, Fauna B., Americana, v. 3, p. 241, 1836.
 < *Gadidæ*, Swainson, Nat. Hist. and Class. Fishes, etc., v. 2, pp. 188, 299, 1839.
 < *Gadidæ*, Bonaparte, Nuovi Annali delle Sci. Nat., t. 2, p. 132, 1838; t. 4, p. 194, 1840.
 > *Brosmiidæ*, Adams, Manual Nat. Hist., p. 104, 1854.
 > *Phycidæ*, Adams, Manual Nat. Hist., p. 104, 1854.
 X *Merluciidæ*, Adams, Manual Nat. Hist., p. 104, 1854.
 > *Gadidæ*, Adams, Manual Nat. Hist., p. 104, 1854.
 < *Gadidæ*, Kaup, Archiv. für Naturgeschichte, Jahr. 1858, B. 1, p. 86, 1858.
 < *Gadidæ*, Girard, Expl. and Surv. for R. R. Route to Pac. Oc., v. 10, Fishes, p. 140, 1858.
 X *Gadoidei*, Bleeker, Enum. Sp. Piscium Archipel. Indico, p. xxvi, 1859.
 < *Gadidæ*, Günther, Cat. Fishes Brit. Mus., v. 4, p. 326, 1862.
 < *Gadidæ*, Gill, Proc. Acad. Nat. Sci. Phila., v. 15, p. 247, 1863.
 < *Gadidæ*, Cope, Proc. Am. Assoc. Adv. Sci., v. 20, p. 341, 1872.
 = *Gadidæ*, Gill, Arrangement Families of Fishes, p. 3, 1872.
 < *Gadi*, Fitzinger, Sitzungsber. K. Akad. der Wissensch. (Wien), B. 67, 1. Abth., p. 43, 1873.
 < *Gadidæ*, Jordan & Gilbert, Syn. Fishes N. Am., p. 400, 794, 1882.

Subfamily Synonyms.

- X *Merluccia*, Rafinesque, Analyse de la Nature. p. —, 1re S. fam., 1815.
 < *Gadini*, Bonaparte, Giorn. Accad. di Scienze, v. 52 (Saggio Distrib. Metod. Animali Vertebr. a Sangue Freddo, p. 37), 1832.
 > *Gadinæ*, Swainson, Nat. Hist. and Class. Fishes, etc., v. 2, pp. 188, 299, 1839.
 X *Merluccinæ*, Swainson, Nat. Hist. and Class. Fishes, etc., v. 2, pp. 188, 300, 1839.
 > *Phycinæ*, Swainson, Nat. Hist. and Class. Fishes, etc., v. 2, pp. 188, 301, 1839.
 X *Brosminæ*, Swainson, Nat. Hist. and Class. Fishes, etc., v. 2, pp. 188, 301, 1839.
 X *Gadini*, Bonaparte, Nuovi Annali delle Sci. Nat., t. 2, p. 1832, 138; t. 4, p. 194, 1840.
 > *Lotini*, Bonaparte, Nuovi Annali delle Sci. Nat., t. 2, p. 132, 1838; t. 4, p. 194, 1840.
 < *Gadinæ*, Kaup, Archiv für Naturgeschichte, Jahrg. 1858, B. 1, p. 86, 1858.
 X *Gadiformes*, Bleeker, Enum. Sp. Piscium Archipel. Indico, p. xxvi, 1859.
 > *Gadinæ*, Gill, Proc. Acad. Nat. Sci. Phila., v. 15, pp. 229, 243, 248, 1863.
 > *Lotinæ*, Gill, Proc. Acad. Nat. Sci. Phila., v. 15, p. 230, 1863.

- > *Phycinæ*, Gill, Proc. Acad. Nat. Sci. Phila., v. 15, p. 230, 1863.
- > *Ciliatinæ*, Gill, Proc. Acad. Nat. Sci. Phila., v. 15, p. 230, 1863.
- > *Brosminæ*, Gill, Proc. Acad. Nat. Sci. Phila., v. 15, p. 230, 1863.
- = *Gadinæ*, Jordan & Gilbert, Syn. Fishes N. Am., p. 794, 1882.

Gadoidea with a moderate caudal region coniform behind, and with the caudal rays procurrent above and below; submedian anus, moderate suborbital bones, terminal mouth, jugular ventrals, dorsal furniture commencing nearly above the pectoral region, variously developed, and anal confined mostly to the posterior half of the length.

This group is, perhaps, still a composite one, and all the forms retained in it, otherwise called *Gadinæ* by Messrs. Jordan & Gilbert, do not have the "frontal bone single, normal." The *Gadinæ*, *Phycinæ* and *Brosminæ* (Gill, op. cit.) are thus characterized, and are typical constituents, but the *Lotinæ*, and apparently *Ciliatinæ* or *Oninæ*, have doubled or paired frontals. Unfortunately the only skeletons of these types accessible to me are articulated, and cannot be critically examined. It seems probable, however, that they may be segregated in a peculiar family.

MERLUCIIDÆ.

Family Synonyms.

- < *Merluciidæ*, Adams, Manual Nat. Hist., p. 104, 1864.
- = *Merluciidæ*, Gill, Arrangement Families of Fishes, p. 3, 1872.
- Jugulaires*, gen., Duméril.
- Gadinia*, gen., Rafinesque.
- Metrosomes*, gen., Blainville.
- Gadoides*, gen., Risso.
- Gadidæ*, gen., Bon., Swains., Adams, Günther, Girard.
- Gadoidei*, gen., Bleeker.
- Gadi*, gen., Fitzinger.

Subfamily Synonyms.

- < *Merluccia*, Rafinesque, Analyse de la Nature, 1re S. fam., 1815.
- < *Merluccinæ*, Swainson, Natural History of Fishes, Amphibians and Reptiles, v. 2, pp. 118, 300, 1839.
- = *Merlucciinæ*, Gill, Proc. Acad. Nat. Sci. Phila., v. 14, pp. 243, 244, 1863.
- = *Merlucciinæ*, Jordan & Gilbert, Syn. Fishes N. Am., p. 795, 1882.
- Gadini*, pt., Bon.
- Gadinæ*, pt.

Gadoidea with a moderate caudal region coniform behind and with the caudal rays procurrent forwards, the anus submedian, moderate suborbital bones, terminal mouth, subjugular ventrals;

dorsal double, a short anterior and long posterior one, a long anal corresponding to the second dorsal; *ribs wide, approximated, and channeled below or with inflected sides, and paired excavated frontal bones with divergent crests continuous from the forked occipital crest.*

BREGMACEROTIDÆ.

Synonymy.

= *Bregmacerotidæ*, Gill, Arrangement Families of Fishes, p. 3, 1872.

Blenniidæ, gen., Richardson.

Gadidæ, gen., Günther, Day.

Gadoidea? with a robust caudal portion truncate or convex behind, almost without procurrent caudal rays above or below, with an antemedian anus, moderate suborbitals, terminal mouth, jugular ventrals abnormally developed; an occipital ray, and behind a continuous dorsal fin, confined to the caudal portion, and an anal nearly similar to the long dorsal.

RANICEPITIDÆ.

Family Synonyms.

= *New Family*, Parnell, Mag. of Zool. and Bot., v. 1, p. —, 1837. (Not named, but indicated.)

= *Ranicepitidæ*, Gill, Arrangement of Fam. of Fishes, p. 3, 1872.

Jugulaires, gen., Duméril.

Gadinea, gen., Rafinesque.

Gadoides, gen., Cuvier.

Gadidæ, gen., Bonaparte, *et al.*

Gadoidea, gen., Bleeker.

Gadi, gen., Fitzinger.

Subfamily Synonym.

= *Ranicepini*, Bonaparte.

Gadoidea? with a moderate caudal portion, coniform behind, and with caudal rays procurrent, submedian anus, moderate suborbital bones, terminal mouth, jugular ventrals, dorsal (typically) double, an anterior small and posterior long one, anal corresponding to second dorsal, and *rudimentary pyloric cæca in reduced number (2).*

MACRURIDÆ.

Family Synonyms.

< *Lophionotes*, Duméril, Zoologie Analytique, p. 129, 1806.

< *Trachinidi*, Rafinesque, Indice d'Ittiolog. Siciliana, p. 12, 1810.

< *Cephalosomes*, Blainville, Journal de Physique, t. 83, p. —, 1818.

- = *Lépidoléprides*, Risso, Hist. Nat. des Poissons de l'Europe Mérid., t. 3, p. 242, 1826.
 < *Gadoïdes*, Cuvier, Règne Animal, 1re éd., t. 2, p. 211, 1817; 2e éd., t. 2, p. 330, 1829.
 = *Lepidolepride*, Swainson, Nat. Hist. and Class. Fishes, etc., v. 2, pp. 179, 261, 1839.
 = *Macruridæ*, Bonaparte, Nuovi Annali delle Sci. Nat., t. 2, p. 132, 1838; t. 4, p. 194, 1840.
 = *Lepidosomatidæ*, Adams, Manual Nat. Hist., p. 101, 1854.
 < *Gadoidei*, Bleeker, Enum. Sp. Piscium Archipel, Indico, p. xxvi, 1859.
 = *Macruridæ*, Günther, Cat. Fishes Brit. Mus., v., 4, p. 390, 1862.
 = *Macruridæ*, Cope, Proc. Am. Assoc. Adv. Sci., v. 20, p. 341, 1872.
 = *Macruridæ*, Gill, Arrangement Families of Fishes, p. 3, 1872.
 = *Macrouri*, Fitzinger, Sitzungsber. K. Akad. der Wissensch. (Wien), B. 67, 1. Abth., p. 43, 1873.
 = *Macruridæ*, Jordan & Gilbert, Syn. Fishes N. Am., p. 400, 810, 1882.
Gadinia, gen., Rafinesque, 1815.
Gadidæ, s. fam., Bonaparte, 1832.
Gadoidei, s. fam., Bleeker.

Subfamily Synonyms.

- < *Trachinia*, Rafinesque, Analyse de la Nature, p. —, 2e s. fam., 1815.
 = *Macrourini*, Bonaparte, Giorn. Accad. di Scienze, v. 52 (Saggio Distrib. Metod. Animali Vertebr. a Sangue Freddo, p. 37), 1832.
 = *Macrurini*, Bonaparte, Nuovi Annali delle Sci. Nat., t. 2, p. 132, 1838; t. 4, p. 194, 1840.
 = *Macrurini*, Kaup, Archiv für Naturgeschichte, Jahrg. 1858, B. 1, p. 86, 1858.
 = *Macrouriformes*, Bleeker, Enum. Sp. Piscium Archipel. Indico, p. xxvi, 1859.

Gadoidea with an elongated tail tapering backwards and destitute of a caudal fin, postpectoral anus, enlarged suborbital bones, inferior mouth, subbrachial ventrals, a distinct anterior dorsal, and a long second dorsal and anal converging on end of tail.

The several families thus defined are certainly, or in the case of the Ranicepitids and Bregmacerotids, presumably typical Anacanthines, and exhibit the cranial and scapular characteristics signalized for the superfamily Gadoidea. The group thus defined is quite a natural one and perhaps may be deemed worthy of continued isolation under the name Anacanthini or Jugulares, although the propriety of assigning to it subordinal rank is very doubtful.

How very different the other forms approximated to the group are, may be appreciated from the following diagnoses.

SUPERFAMILY OPHIDIOIDEA.

Synonymy.

- > *Brotuloidea*, Gill, Cat. Fishes E. Coast N. Am., p. 7, 1873. (Named only.)
 > *Ophidioidea*, Gill, Cat. Fishes E. Coast N. Am., p. 7, 1873. (Named only.)

Jugulares with the orbito-rostral portion of the cranium contracted and shorter than the posterior, the cranial cavity closed in part by the expansion and junction of the parasphenoid and frontals, the supraoccipital horizontal and cariniform posteriorly, the exoccipitals expanded backwards and upwards behind the supraoccipital, the exoccipital condyles contiguous, and with the hypercoracoid (scapula, Parker) fenestrate (or foraminate) about its centre, and the hypocoracoid with its inferior process divergent from the proscapula.

These characters are exhibited in the *Brotula barbata* (specimen in coll. T. G.), *Brosomphycis marginatus* (MSS. note), *Pteridium ater* (cranium behind, Emery,¹ f. 27), *Ophidium barbatum* (cranium above, E., f. 26; scapular arch, E., f. 44), *Fierasfer acus* (cranium, E., f. 18-22; scapular arch, E., f. 35-36), *Echiodon dentatus* (cranium, E., f. 23-25; scapular arch, E., f. 37-38), and *Encheliophis vermicularis* (scapular arch, E.,¹ f. 39). The osteology of the Congrogadidæ and Brotulophididæ is entirely unknown and it is only assumed that they belong to this group on account of general agreement in superficial characters.

BROTULIDÆ.

Synonyms as Family Names.

- = *Brotulidæ*, Adams, Manual Nat. Hist., p. 104, 1854.
 < *Brotuloidei*, Bleeker, Enum. Sp. Piscium Archipel. Indico, p. xxv, 1859.
 = *Brotuloideæ*, Gill, Proc. Acad. Nat. Sci. Phila. [v. 15], p. 252, 1863.

¹ The references indicated by "E.," are to Prof. Emery's excellent memoir on "Fierasfer" in the *Atti della R. Accademia dei Lincei* 1879-80 (pp. 167-254, pl. 1a-9a.. How useful and indeed indispensable this memoir has been may be judged from the references.

- = *Brotuloids*, Gill, Proc. Acad. Nat. Sci. Phila. [v. 16], p. 200, 1864 (cranial characters indicated).
 = *Brotulidæ*, Gill, Arrangement Families of Fishes, p. 3, 1872.

Gadoides, gen., Cuvier.
Gadidæ, gen., Bonaparte.
Ophidiidæ, s. fam., Günther.
Gadi, gen., Fitzinger.
Gadidæ, s. fam., Jordan & Gilbert.

Synonyms as Subfamily Names.

- = *Brotulinæ*, Swainson, Nat. Hist. and Class. Fishes, etc., v. 2, pp. 188, 301, 1839.
 < *Brotulina*, Günther, Cat. Fishes Brit. Mus., v. 4, p. 371, 1862. (Defined.)
 > *Brotulinæ*, Gill, Proc. Acad. Nat. Sci. Phila. [v. 14], p. 280, 1863; [v. 15], p. 252. (Defined.)
 > *Brosmophycinæ*, Gill, Proc. Acad. Nat. Sci. Phila. [v. 14,] p. 280, 1863; [v. 15], pp. 252, 253, 1863.
 > *Bythitinæ*, Gill, Proc. Acad. Nat. Sci. Phila. [v. 14], p. 280, 1863; [v. 15], p. 253, 1863.
 > *Sirembinæ*, Gill, Proc. Acad. Nat. Sci. Phila. [v. 14], p. 280, 1863; [v. 15], p. 253, 1863.
 < *Brotulini*, Emery, Atti R. Accad. dei Lincei (3), v. 7, p. 168, 1880.
 < *Brotulinæ*, Jordan & Gilbert, Syn. Fishes N. Am., p. 794, 1882.

Ophidoidea with jugular ventrals reduced to one or two rays, and the anus in the anterior half of the length.

This family is quite rich in deep-sea types, and may be divided into various subfamilies, four of which (*Brotulinæ*, *Brosmophycinæ*, *Bythitinæ*, and *Sirembinæ*) have already been indicated and defined (see synonymy). The deep-sea forms chiefly belong to the subfamily *Brosmophycinæ*, and perhaps one or two still undifferentiated ones whose definition is not at present possible.

BROTULOPHIDIDÆ.

Synonymy.

- = *Brotulophididæ*, Gill, Arrangement Families of Fishes, p. 3, 1872.
Ophidiidæ (*Brotulina*), gen., Günther.

Ophidoidea with subbrachial (or thoracic) ventrals reduced to simple filaments, and anus in the anterior half of the length.

The single genus *Brotulophis*, for which this family has been distinguished, is still very imperfectly known, and its affinities are doubtful.

OPHIDIIDÆ.

Family Synonyms.

- < *Pantoptères*, Duméril, Zoologie Analytique, p. 115, 1806.
 < *Ofidini*, Rafinesque, Indice d'Ittiolog. Siciliana, p. 38, 1810.
 < *Ophidiidæ*, Bonaparte, Giorn. Accad. di Scienze, v. 52 (Saggio Distrib. Metod. Animali Vertebr. a Sangue Freddo, p. 38), 1832.
 < *Ophidiidæ*, Bonaparte, Nuovi Annali delle Sci. Nat., t. 2, p. 133, 1838 ; t. 4, p. 276, 1840.
 < *Ophidonidæ*, Swainson, Nat. Hist. and Class. Fishes, etc., v. 2, pp. 49, 259,¹ 1839.
 < *Ophidiidæ*, Adams, Manual Nat. Hist., p. 105, 1854.
 < *Ophidinæ*, Kaup, Cat. Apodal Fish. B. M., p. 153, 1856.
 < *Ophidiidæ*, Rich, Encycl. Brit., 8th ed., v. 12, p. 268, 1856.
 < *Ophidiidæ*, Girard, Expl. and Surv. for R. R. Route to Pacific Oc., v. 10, Fishes, p. 137, 1858.
 < *Ophidioides*, Bleeker, Enum. Sp. Piscium Archipel. Indico, p. xxv, 1859.
 < *Ophidiidæ*, Günther, Cat. Fishes Brit. Mus., v. 4, p. 370, 1862.
 = *Ophidiidæ*, Gill, Arrangement Fam. of Fishes, p. 3, 1872.
 = *Ophidiidæ*, Putnam, Proc. Boston Soc. Nat. Hist., v. 16, p. 339, 1874.
 < *Ofidiiidei*, Emery, Atti R. Accad. dei Lincei (3), Fis. Mem., v. 3, p. 168, 1880.
 = *Ophidiidæ*, Jordan & Gilbert, Syn. Fishes N. Am., pp. 400, 792, 1882.

Anguilliformes, gen., Cuvier.

Xiphoides, gen., Risso, 1826.

Subfamily Synonyms.

- < *Ophidiini*, Bonaparte, Nuovi Annali delle Sci. Nat., t. 2, p. 133, 1838 ; t. 4, p. 276, 1840.
 < *Ophidinæ*, Swainson, Nat. Hist. and Class. Fishes, etc., v. 2, p. 260, 1839.
 < *Ophidiiformes*, Bleeker, Enum. Sp. Piscium Archipel. Indico, p. xxv, 1859.
 = *Ophidiina*, Günther, Cat. Fishes Brit. Mus., v. 4, p. 376, 1862.
 = *Ofidina*, Emery, Atti R. Accad. dei Lincei (3), v. 7, p. 168, 1873.

Ophidioidea with chin ventrals, represented by bifid barbel-like filaments, and the anus in the anterior half of the length.

This family is well-marked by the encroachment of the ventrals forwards under the chin and between the rami of the mandible, on which account the species were supposed to have barbels

¹ At p. 49, regarded as one of the "Families of the Gymnetres ; at p. 159 as the 4. subfamily "Ophidoninæ" of the "tribe Gymnetres" (family not differentiated), and at p. 259, mentioned as "3. subfam. Ophidonidæ."

analogous to those of the Mullids and to be destitute of ventrals. Their homology was not even recognized by those who studied their anatomy, Prof. Agassiz, for instance, in his *Recherches sur les Poissons fossiles*, representing them as apodal.

There are three or four genera, *Ophidium*, *Genypterus*, and *Leptophidium*.

Leptophidium, although recognized as a mere subgenus by Messrs. Jordan & Gilbert, is very distinct.

FIERASFERIDÆ.

Family Synonyms.

- < *Ginnotini*, Rafinesque, *Indice, d'Ittiolog. Siciliani*, p. 37, 1810.
 = *Fierasferidæ*, Gill, *Proc. Acad. Nat. Sc. Phila.*, 1864, p. 203, 1864.
 = *Fierasferidæ*, Gill, *Arrangement Fam. of Fishes*, p. 3, 1872.
 > *Fierasferi*, Fitzinger, *Sitzungsber. K. Akad. der Wissensch.*, v. 67, 1. Abth., p. 43, 1873.
 > *Enchelyophes*, Fitzinger, *Sitzungsber. K. Akad. der Wissensch.*, v. 67, 1. Abth., p. 43, 1873.
 = *Fierasferidæ*, Putnam, *Proc. Boston Soc. Nat. Hist.*, v. 16, p. 339, 1874.
 = *Fierasferidæ*, Jordan & Gilbert, *Syn. Fishes N. Am.*, pp. 400, 791, 1882.

Ophidiidæ, gen., Bon.

Ophidioidei ophidiiformes, gen., Blkr.

Ophidiidæ, s.-fam., Günther.

Subfamily Synonyms.

- = *Fierasferina*, Günther, *Cat. Fishes in Brit. Mus.*, v. 4, pp. 370, 381, 1862.
 = *Fierasferini*, Emery, *Atti R. Accad. dei Lincei* (3), v. 7, p. 168, 1873.

Ophidioidea without ventrals, and with the anus thoracic or jugular.

CONGROGADIDÆ.

Family Synonyms.

- = *Congrogadidæ*, Gill, *Arrangement Families of Fishes*, p. 3, 1872.
 < *Congrogadidæ*, Jordan & Gilbert, *Syn. Fishes of N. Am.*, p. 790, 1882

Subfamily Synonyms.

- < *Congrogadinæ*, Günther, *Cat. Fishes in Brit. Mus.*, v. 4, pp. 370, 388, 1862.
 < *Congrogadini*, Emery, *Atti R. Accad. dei Lincei* (3), v. 7, p. 168, 1873.

Ophidioidea without ventrals, the anus in the anterior half of the length, and branchial membranes united beneath but free from the throat.

The family is perhaps composite and has been constituted or retained for three genera (*Congrogadus* = *Machærium*, *Haliophis*, and *Scytalina*) which may prove to have little or no affinity to each other. It is entirely provisional and must remain of very uncertain value till the forms can be anatomically investigated. It is only by an assumption, perhaps, if not probably illegitimate, that *Haliophis* has been referred to the group. "Rüppell says 'Apertura branchialis parva,'" but Dr. Günther, "by a comparison of the figure" was "induced to suppose that, as in *Congrogadus*, the gill-opening is of moderate width, the gill-membranes being united below the throat, and not attached to the isthmus."¹ I should not have been induced, by the figure to make any such assumption, for the likeness to *Congrogadus* is very slight. The single specimen of *Scytalina* in the National Museum cannot be dissected.

SUPERFAMILY LYCODOIDEA.

Synonymy.

= *Lycodoidea*, Gill, Cat. Fishes E. Coast N. Am., p. 7, 1873. (Named only.)

Jugulares with the orbito-rostral portion of the cranium contracted and shorter than the posterior, the cranial cavity open in front, but bounded laterally by expansions of the annectant parasphenoid and frontals, with the supraoccipital declivous and tectiform behind, the occipitals above inclined forward along the sides of the supraoccipital, and the exoccipital condyles distant, with the hypercoracoid foraminate about its centre and the hypocoracoid with an inferior process convergent to the proscapula.²

These characters are formulated from a skeleton of *Zoarces anguillaris* in the possession of the writer.

LYCODIDÆ.

Family Synonyms.

× *Zoarchidæ*, Swainson, Nat. Hist. and Class. Fishes, etc., v. 2, pp. 184, 283, 1839.

> *Lycodidæ*, Günther, Cat. Fishes Brit. Mus., v. 4, p. 319, 1862.

= *Lycodoidea*, Gill, Proc. Acad. Nat. Sci. Phila., v. 15, p. 255, 1863 (Defined); v. 16, p. 203, 1864. (Cranial characters indicated.)

¹ Günther, Cat. Fishes in Brit. Mus., v. 4, p. 389.

² The nostrils are single on each side as in many Blennioidea.

= *Lycodidae*, Gill, Arrangement Fam. of Fishes, p. 3, 1872.

> *Zoarcæ*, Fitzinger, Sitzungsber. k. Akad. der Wissensch. (Wien), B. 67, 1. Abth., p. 43, 1873.

Gadidae and *Ophidini*, pt., Reinhardt.

Blennioidei and *Ophidoidei*, pt., Bleeker.

Blennioideæ, pt., Gill, Kroyer.

Lycodidae and *Blenniidae*, gen., Günther.

Subfamily Synonyms.

> *Gymnelinae*, Gill, Proc. Acad. Nat. Sci. Phila., v. 15, pp. 256, 261, 1863.

> *Zoarcinae*, Jordan & Gilbert, Syn. Fishes N. Am., p. 783, 1882.

> *Lycodinae*, Jordan & Gilbert, Syn. Fishes N. Am., p. 783, 1882.

= *Lycodidae*, Collett, Norske Nordhavs-Exped. 1876-78; Fiske, p. 77, 1880.

= *Zoarcidae*, Jordan & Gilbert, Syn. Fishes N. Am., p. 400, 1882.

= *Lycodidae*, Jordan & Gilbert, Syn. Fishes N. Am., p. 783, 1882.

Lycodoidea of a more or less anguilliform shape, tapering backwards; dorsal and anal elongated and confluent with caudal, invested in a thick skin; ventrals jugular and rudimentary or suppressed, and branchial apertures lateral and not confluent.

The chief group of this family, or the subfamily Lycodinae, is a characteristic deep-sea type, and represented by many species varying greatly in elongation, and with the extreme terms tolerably well connected by graduated representatives. Nevertheless, the two sections of *Lycodes*, defined by Prof. Collett (*op. cit.*, p. 84), seem to be entitled to generic rank, and corroborated by other species obtained by the U. S. Commission of Fish and Fisheries. The name *Lycodes* must be retained for the robust species, while *Lycenchelys* may be used as a designation for Collett's second group which have "the body elongate;" height of the body contained from twelve to twenty-four times in the total length. The genera would then be *Lycodes*, *Lycenchelys*, *Lycodopsis*, *Lycodonus*, and *Lycocara* (= *Uronectes*, Gthr.).

In the preceding diagnoses of the superfamilies Gadoidea, Ophidioidea and Lycodoidea, little more is given than what may serve to neatly differentiate the several groups, but the characters given are reinforced by many others, such as the cranial foramina, details in the relations of the bones, and characters of the vertebræ. The relations of the Brotuloidea appear to be almost as intimate, if not indeed more so, with the Lycodoidea than with the Gadoidea. But a comparison of the cranium of a Lycodid with that of a Blenniid, must convince the ichthyotomist

that there is a close affinity between the two. Indeed, it is quite possible, at least, that Prof. Cope might retain his diagnosis of the Anacanthini, and refer the Brotuloid families to his Scyphobranchii by the side of *Zoarces* and his other Blenniidæ. Prof. Emery has also perceived the great differences exhibited in cranial characters by the Ophidioidea from the Gadoidea and has even contended that they should be approximated to the Gobioidea.¹ In view of these facts, it is evident that the group of Anacanthini not only has a very uncertain tenure, but it may have either to be entirely abolished as being an unnatural combination of different types, or to be limited to the Gadoidea.

But it is possible that the group as retained by the most recent ichthyologists may be even more heterogeneous than has been supposed. Several other types have been generally associated with the forms already indicated, but the pertinence of the Ammodytidæ,² Ateleopodidæ and Xenocephalidæ to it is doubtful, and it is almost certain that the Gadopsidæ are not at all related to any of the families already discussed; nevertheless, to complete the summary of the families generally referred to the Anacanthini, their synonymy and characteristics are here given:—

AMMODYTIDÆ.

Family Synonyms.

- *Ammodytidæ*, Bonaparte, Catal. Metod. Pesci Europei, pp. 7, 40, 1846.
- *Ammodytidæ*, Gill, Arrangement of Families of Fishes, p. 3, 1872.
- *Ammodyte*, Fitzinger, Sitzungsber. K. Akad. der Wissensch. (Wien), B. 67, 1. Abth., p. 43, 1873.
- *Ammodytidæ*, Jordan & Gilbert, Syn. Fishes N. Am., p. 414, 1883.

Gadidæ, s. fam., Bonaparte.

Coryphænidæ, gen., Swainson.

Ophidioidæi, s. fam., Bleeker.

Ophidiidæ, s. fam., Günther.

¹ “Attenendomi ai risultati delle mie ricerche anatomiche, io debbo, tra le due opinioni, adottare quella del Canestrini e considerare gli Ofidiidei come affini di Gobioidi, coi quali hanno caratteri comuni assai importanti, in specie nella struttura del cranio.” Emery, *op. cit.*, p. 169; see also p. 187.

² The only skeleton at present accessible to me, has been so badly prepared that I do not venture to base any opinion upon it. I hope soon to have a clean disarticulated one.

Subfamily Synonyms.

- = *Ammodytini*, Bonaparte, Nuovi Annali delle Sci. Nat., p. 133, 1838; t. 4, p. 276, 1840.
- = *Ammodyteiformes*, Bleeker, Enum. Sp. Piscium Archipel, Indico, p. xxv, 1859.
- = *Ammodytina*, Günther, Cat. Fishes Brit. Mus., v. 4, p. 384, 1862:
- = *Ammodytina*, Gill, Cat. Fishes E, Coast N. A., p. 40, 1861.
- > *Argyrotanina*, Gill, Cat. Fishes E. Coast N. A., p. 40, 1861.

Anacanthini? with an elongated, almost parallelogrammic body, with a dorsal lateral line, postmedian anus, narrow suborbitals, terminal mouth with protractile jaws, enlarged suboperculum, widely cleft branchial apertures, lamelliform pseudobranchiæ, a long dorsal and long but postmedian anal with articulated rays, low pectorals and no ventrals.

A TELEOPODIDÆ.*Synonyms as Family Names.*

- = *Ateleopodoidei*, Bleeker, Enum. Sp. Piscium Archipel. Indico, p. xxvi, 1859. (Not defined; made the type of a distinct order—"Ateleopodi—au forte cum Siluris adjungendi.")
- = *Ateleopodida*, Günther, Cat. Fishes Brit. Mus., v. 4, pp. 318, 398, 1862.
- = *Ateleopodida*, Gill, Arrangement Families of Fishes, p. 3, 1872.

Synonym as Subfamily Name.

- = *Ateleopodini*, Bonaparte, 1850.

Anacanthini? with an elongated tail tapering backwards, but provided with a narrow caudal, antemedian anus, moderate suborbitals, inferior mouth, thoracic ventrals reduced to double or simple filaments, a short anterior dorsal only, and a long oval continuous with the caudal.

XENOCEPHALIDÆ.*Synonyms.*

- = *Xenocephaliformes*, Bleeker, Enum. Sp. Piscium Archipel. Indico, p. xxvi, 1859.
- = Appendix to the Anacanthini Gadoidei, Günther, Cat. Fishes in Brit. Mus., v. 4, pp. 318, 399, 1862.
- Gadoidei*, s. fam., Bleeker.

Anacanthini? with a "small body," a distinct caudal, postmedian anus; head very large, truncated, cuirassed with plates

and armed with spines; jugular? ventrals of five rays and one short dorsal, and a short anal, both near the caudal.

Two other types referred by Dr. Günther to the Anacanthini certainly do not belong to the group and are true Acanthopterygian fishes. They are the Gadopsidæ and Chiasmodontidæ.

GADOPSIDÆ.

Synonymy.

- = *Gadopsidæ*, Günther, Cat. Fishes Brit. Mus., v. 4, pp. 317, 318, 1862.
 < *Gadopsidæ*, Cope, Proc. Am. Philos. Soc. Phila., v. 13, p. 31, 1873.
Blenniidæ, gen., Steindachner.

CHIASMODONTIDÆ.

Family Synonyms.

- = *Chiasmodontidæ*, Gill, Jordan & Gilbert, Syn. Fishes N. Am., p. 964
 1882. (Defined.)
Gadidæ, gen., Günther.

Subfamily Synonym.

- = *Chiasmodontinæ*, Jordan & Gilbert, Syn. Fishes N. Am., p. 795, 1882.