ON THE FAMILY AND SUBFAMILIES OF CARANGIDÆ.

BY THEODORE GILL.

The family of Carangidæ, as limited by me in the "Arrangement of the families of Fishes" (also as in the Proc. Acad. Nat. Sc. Phila., for 1862, p. 430, after the exclusion of *Pomatomus*) is an exceedingly natural one, notwithstanding the differences in external form. I have examined skulls of representatives of all the groups hereinafter named, and their common characters are so numerous, while their severally peculiar ones are so insignificant that the so-called subfamilies are scarcely entitled to that rank. The most characteristic skull is manifested in *Trachynotus;* in that form, the orbito-rostral portion is shorter in comparison, the post-frontal bones larger and more projecting, the inner lateral crests more produced forwards than in any others, and the ethmoid is abbreviated and markedly and abruptly declined. Analagous characters in many families, however, are of inferior systematic value. It is to be also remarked that the Caranginæ and Seriolinæ are especially nearly allied, so far as their crania are concerned, and there is even less superficial difference between the skull of *Seriola* and most Caranginæ—*e. g. Carangus*—than between it and the related genus *Elagatis*.

Greatly as the elongated *Trachurus* and the high *Selene* differ, even they essentially agree as to the structure of the skull, that of *Selene* differing from the Carangine chiefly in being compressed, with its crest elevated and extended backwards and its rostral portion attenuated and produced forward. Its ethmoid especially is characteristic in being much compressed and carinated above instead of flattened and double-headed. If, therefore, the subfamilies already indicated are retained in the present communication, it is rather in order to epitomize the history expressed in their nomenclature than because I insist on or persist in their retention. The hærnal canal is perhaps more characteristic.

CARANGIDÆ.

Synonyms as families.

× Centronotides, *Risso*, Hist. Nat. de l'Europe Mérid., t. 3, pp. 110, 426, 1826.
> Carangoidei, *Bleeker*, Enum. Sp. Piscium Archipel. Indico, p. xxiii, 1859.
× Lichioidei, *Bleeker*, Enum. Sp. Piscium Archipel. Indico, p. xxii, 1859.
× Serioloidei, *Bleeker*, Enum. Sp. Piscium Archipel. Indico, p. xxiii, 1859.
× Carangidæ, *Günther*, Cat. Fishes Brit. Mus., v. 2, p. 417, 1860.
× Carangidæ, *Günther*, Archiv für Naturg., 28. Jahrg., B. 1, p. 59, 1862.
< Carangoidæ, *Gill*, Proc. Acad. Nat. Sci. Phila., [v. 14,] p. 430, 1862.
< Carangidæ, *Cope*, Proc. Am. Assoc. Adv. Sci., v. 20, p. 342, 1872.
= Carangidæ, *Gill*, Arrangement Families Fishes, p. 8, 1872.
= Carangidæ, *Poey*, Anal. Soc. Esp. Hist. Nat., t. 4 (Enum. Pisc. Cub., p. 7), 1875.
> Caranges, *Fitzinger*, Sitzungsber. K. Akad. der Wissensch. (Wien), B. 67, 1 Abth., p. 33, 1873.

> Chorinemi, *Fitzinger*, Sitzungsber. K. Akad. der Wissensch. (Wien), B. 67, 1. Abth., p. 33, 1873.

× Naucratæ, *Fitzinger*, Sitzungsber. K. Akad. der Wissensch. (Wien), B. 67, 1. Abth., p. 33, 1873.

Zeidæ gen., *Swainson*.

Dr. Günther (*op. cit.*, p. 417) has claimed special merit for his family of Carangidæ, remarking "that several authors have also distinguished a family *Carangidæ*, but if they defined it at all they have applied characters very different from those given above [his remarks], and have not paid attention to the structure of the skeleton." I am not aware that any author except Bleeker had previously distinguished a family Carangidæ; the name "Carangidæ," suggested by Agassiz, being merely an orthographical substitute for subfamily names of the Caranginæ. As is too often the case with that author, Dr. Günther has withheld all definite information and means of verification of his statement. It may be added, too, in this connection, that Dr. Günther had evidently also "not paid attention to the structure of the skeleton" further than as to the number of the vertebræ, for had he done so he would have avoided the remarkable combination of genera he has assembled as constituents of his "Carangidæ."

The family may be briefly diagnosed as follows:

Scombroidea* with the vertebræ in typical (10 +14), or nearly typical, number, the skull not expanded backwards and outwards, but with the internal as well as external lateral crests continued backwards to the exoccipital condyles, and the frontal bones coalesced; the body moderately elongated and more or less compressed; a short spinous dorsal more or less developed, and a long soft dorsal and anal fins, the latter preceded by a more or less detached and distinct finlet of two spines (sometimes atrophied).

The more detailed characteristics are as follows:

Body oblong, compressed, generally subfusiform (sometimes fusiform, sometimes elevated), highest below the first dorsal fin, and with a slender caudal peduncle. Anus antero-median.

Scales small, generally cycloid, and regularly imbricated.

Lateral line continuous to and ending at the base of the caudal fin.

Head compressed, oblong or short, and with the crown generally decurved or arched. Eyes moderate and submedian or anterior.

Suborbital bones small and not articulated with the preoperculum.

Opercular bones normally developed; subopercuhum forming most of the posterior border and the angle.

Nostrils double, in front of each eye.

Mouth moderate, with the cleft lateral and little oblique, generally partly extending under the eyes.

Upper jaw not protractile, formed above by the premaxillary bones,

*The Scombridæ and Coryphænidæ exhibit the peculiarities of the vertebræ (as compared with spariform and percifform fishes, *e. g.*) manifest in the Carangidæ.

whose posterior or ascending processes are short, and on the sides by the supraniaxillary bones, which are expanded towards the ends.

Teeth acute, variable in position, and sometimes entirely obsolete or lost in old age.

Branchial apertures very large and ample. Branchiostegal membrane deeply emarginated, sustained generally by 7 rays on each side (rarely by 5, 6, 8, 9, or 10.)

Spinous dorsal fin short, generally fully developed, but sometimes represented by free spines, which may be very small or even obsolete.

Soft dorsal fin commencing near the middle of the length, and little less than half as long as the trunk.

Anal fin opposite to, and generally nearly equal to, the soft dorsal, with two (rarely obsolete) spines in front, detached from the fin.

Caudal fin forked, and with its lobes slender and pointed.

Pectoral fins inserted at the normal moderate height above the breast on the scapular arch; they are generally pointed.

Ventral fins thoracic and usually normally developed, each having a spine and five branched rays, which are regularly graduated. (In the *Paropsinæ* they are obsolete.)

The vertebræ are in normal (10 + 14) number, with few deviations (*e. g.*, *Naucrates*, with 10 + 16); they are much contracted at the middle (like an hour-glass), and most (the costiferous and last caudal excepted) have anterior as well as posterior zygapophyses above and below, and the anterior pair of one vertebra are frequently interposed (or so tend) between the posterior pair of the preceding; the neurapophyses and hæmapophyses spring from near the middle or contracted portion of the vertebræ, and are moderately curved backward; the costiferous vertebræ have pits behind or above the parapophyses for the reception of the ribs; the parapophyses are obsolete on the anterior vertebræ, and only moderately developed backwards.

The skull is oblong, inclining to triangular, seen from above; the brain-case is not expanded backwards or outwards, but provided with extensions from the lateral external and internal crests towards the exoccipital condyles; the internal crests are continued forwards in a nearly or quite parallel direction; the frontal bones are co-ossified; the vomer projects forwards and downwards; the post-frontals are more or less excavated or impressed on their inferior surface.

SERIOLINÆ.

Synonymy.

> Centronotini, *Bonaparte*, Giorn. Arcad. di Scienze, t. 52 (Saggio Distrib. Metod. Animali Vertebr. a Sangue Freddo, p. 34), 1832.

< Centronotinæ, *Swainson*, Nat. Hist. and Class. Fishes, etc., v. 2, pp. 176, 243, 1839.

> Centronotini, *Bonaparte*, Nuovi Annali delle Sci. Nat., t. 2, p. 133, 1838; t. 4, p. 275, 1840.

< Seriolinæ, *Gill*, Cat. Fishes E. coast N. A., p. 36, 1861 (n. d).

> Centronotinæ, *Gill*, Cat. Fishes E. coast N. A., p. 36, 1861 (n. d).
= Centronotinæ, *Gill*, Proc. Acad. Nat. Sci. Phila., [v. 14,] p. 431, 1862.
< Seriolinæ, *Poey*, Anal. Soc. Esp. Hist. Nat., t. 4 (Enum. Pisc. Cub., p. 7), 1875.

The chief genera are the following:

SERIOLA.

Synonymy.

< Seriola, *Cuvier*, Règne Animal, 2e éd., t. 2 p. —, 1829. (Not *Seriola* Cass.)
< Seriola, *Cuv. & Val.*, Hist. Nat. des Poissons, v. 9, p. 200, 1833.
< Seriola, *Günther*, Cat. Fishes in Brit. Mus., v. 2, p. 462, 1860.
= Halatractus, *Gill*, Proc. Acad. Nat. Sci. Phila. [v. 14], p. 442, 1862.
Scomber sp., *Mitchill*, *etc.*

In returning to the name *Seriola* and abandoning *Halatractus*, I defer to the majority of naturalists, who consider that the same name may be used without interference in zoology and botany.

NAUCRATES.

Synonymy.

= Centronotus, *Lacépède*, Hist. Nat. des Poissons, t. 3, p. 311, 1802. (Not *Centronotus* Bl., Schn., 1801.)
= Naucrates, *Cuvier*, Règne Animal, 2e éd., t. 2, p. —, 1829.
= Naucrates, *Cuv. & Val.*, Hist. Nat. des Poissons, t. 8, p. 312, 1831 (adult).
> Nauclerus, *Cuv. & Val.*, Hist. Nat. des Poissons, t. 9, p. 247, 1833 (very young).
= Naucrates, *Günther*, Cat. Fishes in Brit. Mus., v. 2, p. 374, 1860 (adult).
> Nauclerus, *Günther*, Cat. Fishes in Brit. Mus., v. 2, p. 469, 1860 (very young).
= Naucrates, *Gill*, Proc. Acad. Nat. Sci. Phila. [v. 14,] pp. 262, 440, 1862.
Gasterosteus sp., *Linn.*, *Daldorf*, *etc.*
Scomber sp., *Bloch*, *Mitchill*, *etc.*
Thynnus sp., *Gronow.*
Seriola sp., *Cuv. & Val.*, *Günther* (moderately young).

Even the partial synonymy of the pilot-fish is remarkable, viz:

NAUCRATES DUCTOR.

"Pilot-fish."

1st c.—Pompilus, *Oridius*, Halientica, l. 5.
1st c.—Pompilus, *Plinius*, Historiæ Mundil. ix, c. 61; xxxii, c. 11.
2d c.—Πώμπιλος, *Oppianus* ἁλιευτικῶν βιβλία, i.
3d c.—Πώμπιλος, *Athenæus* Deipnosophisticarum, vii.
3d c.—Πώμπιλος, *Aelianus*, Περὶ ζώων ἰδιότητος, ii, c. 15; xv, c. 2.
1558—Pompilus, *Gesner*, Historiæ Animalium l. iv.
1613—Pompilus, *Aldrorandus* De Piscibus l. iii, c. 19.
1667—Pilote, *Dutertre*, Hist. Gen. des Antilles, 2e éd., t. 2, p. 233.
1686—Pompilus, *Willoughby*, De Hist. Piscium. lib. p. 215, app. pl. 8, f. 2.
1713—Pompilus, *Ray*, Synopsis Methodica Piscium, p. 101.
1714—Pompilus, *Feuillée*, Journal d'Observations de Physique, etc.
1738—Coryphæna No. 3, *Artedi*, Genera Piscium, p. 16.
1754—Gasterosteus spinis dorsalibus quatuor, *Linnæus*, Museum Adolph. Friederici, p. 88.

1755—Scomber ductor, *Osbeck*, Acta Stockholmense, p. 71?, (fide Linnæi).
1757—Scomber ductor, *Hasselquist*, Iter Palistinense, p. 336.
1758—Gasterosteus ductor, *Linnæus*, Systema Naturæ, ed. x, t. I, p. 295, 1758; (ed. xii, t. 1, p. 489, 1766).
1763—Scomber sp., *Gronow*, Zoophylacium No. 309.
1768—Scomber, *Laxling*.
1768—Gasterosteus ductor, *Brunnich*, Ichthyologia Massiliensis, p. 67.
1770—Scomber sp., *Koelreuter*, Novi. Commentar. Petrop., t. 9, p. 464, tab. 10, f. 4, ?5.
1771—Scomber ductor, *Osbeck*, Voyage to China.
1782—*Duhamel du Moncean*, Traité Gén. des Pesches, t. 2, sect. 4, pl. 4, f. 4, pl. 9, f. 3.
1792—Gasterosteus ductor, *Walbaum*, Artedi Genera Piscium, p. —.
1793—Scomber ductor, *Bloch*, Ausländische Fische, p. —, taf. 338.
1800?—Gasterosteus antecessor, *Daldorf*, Skrivt. Nat. Selskab. Kjobenhavn, t. 2, p. 166.
18 —Gasterosteus antecessor, *Geoffroy St. Hilaire*, Annales Mus. d'Hist. Nat., t. 9, p. 469.
18 —Pilote, *Bosc*, Dict. d'Hist. Nat. de Deterville.
1801—Scomber ductor, *Bloch*, Systema Ichthyologiæ, Schneider ed., p. 32.
1801—Scomber Koelreuteri, *Bloch*, Systema Ichthyologiæ, Schneider ed., p. 570.
1802—Centronotus conductor, *Lacépède*, Hist. Nat. des Poissons, v. 3, p. 311.
1803—Scomber ductor, *Shaw*, Gen. Zoology, v. 4, p. 586.
1810—Naucrates fanfarus, *Rafinesque*, Caratteri de Alcuni Nuovi Generi e Nuove Specie di Animali e Piante della Sicilia, p. 45.
1810—Naucrates conductor, *Rafinesque*, Caratteri de Alcuni Nuovi Generi e Nuove Specie di Animali e Piante della Sicilia, p. 44.
1810—Centronotus conductor, *Risso*, Ichthyologie de Nice, p. 428.
1814—Scomber ductor, *Mitchill*, Trans. Lit. and Phil. Soc. New York, v. 1, p. 424.
1825—Centronotus conductor, *Couch*, Trans. Linn. Soc., v. 14, p. 82.
1827—Centronotus conductor, *Risso*, Hist. Nat. Europe Mérid., t. 3, p. 193.
1829—Naucrates indicus, *Lesson*, Voyage sur la Coquille, Zoologie, p. 157, pl. 14.
1831—Naucrates ductor, *Cuv. & Val.*, Hist. Nat. des Poissons, v. 8, p. 312.
1831—Naucrates noveboracensis, *Cuv. & Val.*, Hist. Nat. des Poissons, v. 8, p. 325.
1831—Naucrates indicus, *Cuv & Val.*, Hist. Nat. des Poissons, v. 8, p. 326.
1831—Naucrates Keolreuteri, *Cuv. & Val.*, Hist. Nat. des Poissons, v. 8, p. 327.
1833—Seriola Dussumieri, *Cuv. & Val.*, Hist. Nat. des Poissons, v. 9, p. 217.
1833—Seriola succincta, *Cuv. & Val.*, Hist. Nat. des Poissons, v. 9, p. 218.
1833—Nauclerus compressus, *Cuv. & Val.*, Hist. Nat. des Poissons, v. 9, p. 249
1833—Nauclerus abbreviatus, *Cuv. & Val.*, Hist. Nat. des Poissons, v. 9, p. 251.
1833—Nauclerus brachycentrus, *Cuv. & Val.*, Hist. Nat. des Poissons, v. 9, p. 253.
1833—Nauclerus triacanthus, *Cuv. & Val.*, Hist. Nat. des Poissons, v. 9, p. 253.
1833—Nauclerus annularis, *Cuv. & Val.*, Hist. Nat. des Poissons, v. 9, p. 254.
1833—Nauclerus leucurus, *Cuv. & Val.*, Hist. Nat. des Poissons, v. 9, p. 255.
1834—Naucrates ductor, *Cuvier*, Animal Kingdom, Griffith ed., v. 10, p. 189, pl. 47, f. 1.
1835—Centronotus ductor, *Jenyns*, Syst. Cat. Brit. Vertebr. Animals, p. 365.
1839—Naucrates ductor, *Swainson*, Nat. Hist. and Class. Fishes, v. 2, p. 412.
1839—Naucrates cyanophrys, *Swainson*, Nat. Hist. and Class. Fishes, v. 2, p. 412.
1839—Naucrates serratus, *Swainson*, Nat. Hist. and Class. Fishes, v. 2, p. 413.
1840—Gasterosteus ductor, *Bennett*, Narrative of a Whaling Voyage, v. 2, p. 274.
1840—Nauclerus abbreviatus, *Lowe*, Proc. Zool. Soc. London, v. 8, p. 36; *reprinted in* Trans. Zool. Soc. London, v. 3, p. 3.
1841—Naucrates ductor, *Yarrell*, Brit. Fishes, 2d ed., v. 1, p. 170; (3d ed., v. —, p.—)
1842—Naucrates noveboracensis, *DeKay*, Nat. Hist. of New York, Fishes, p. 112.
1842—Naucrates ductor, *DeKay*, Nat. Hist. of New York, Fishes, p. 113.
1846—Naucrates indicus, *Richardson*, Rep. 15th Meeting Brit. Assoc. Adv. Sci., p. 269.
1846—Naucrates fanfarus, *Bonaparte*, Cat. Metod. Pesci Europei, p. 72.

1846—Naucrates ductor, *Bonaparte*, Cat. Metod. Pesci Europei, p. 72.
1846—Naucrates ductor, *Storer*, Mem. Am. Acad. Arts and Sci. (2), v. 2, p. 349; Syn. Fishes N. Am., p. 97.
1846—Naucrates noveboracensis, *Storer*, Mem. Am. Acad. Arts and Sci. (2), v. 2, p. 349; Syn. Fishes N. Am., p. 97.
1846—Naucrates indicus, *Cuvier*, Règne Animal, éd. de luxe, t. 2, p. —, pl. 54, f. 1.
1850—Naucrates ductor, *Guichenot*, Exploration Scient. de l'Algérie, Poissons, p. 60.
1854—Thynnus pompilus, *Gronow*, Systema Ichthyologicum, publ. Gray, p. 123.
1860—Naucrates ductor, *Günther*, Cat. Fishes in Brit. Mus., v. 2, p. 374.
1860—Seriola Dussumieri, *Günther*, Cat. Fishes in Brit. Mus., v. 2, p. 468.
1860—Seriola succincta, *Günther*, Cat. Fishes in Brit. Mus., v. 2, p. 462.
1860—Nauclerus compressus, *Günther*, Cat. Fishes in Brit. Mus., v. 2, p. 469.
1860—Nauclerus abbreviatus, *Günther*, Cat. Fishes in Brit. Mus., v. 2, p. 469.
1860—Nauclerus brachycentrus, *Günther*, Cat. Fishes in Brit. Mus., v. 2, p. 470.
1860—Nauclerus triacanthus, *Günther*, Cat. Fishes in Brit. Mus., v. 2, p. 470.
1860—Nauclerus annularis, *Günther*, Cat. Fishes in Brit. Mus., v. 2, p. 470.
1860—Nauclerus leucurus, *Günther*, Cat. Fishes in Brit. Mus., v. 2, p. 470.
1862—Naucrates ductor, *Gill*, Proc. Acad. Nat. Sci. Phila. [v. 14], pp. 262, 440. (*Naucrates* recognized as old and *Nauclerus* as young of same fish.)
1868—Naucrates ductor, *Poey*, Repertorio Fisico-Natural de la Isla de Cuba, t. 2, p. 374.

Habitat.—High seas.

It will be thus seen that twelve nominal species were based on specimens of this one by Cuvier and Valenciennes, and nine by Dr. Günther, who referred some to the family Carangidæ because they were supposed to have 24 (10 + 14) vertebræ, and one to the family Scombridæ, because the skeleton in the B. M. had 26 (10 + 14) vertebræ, I demonstrated in 1862 that all such forms belonged to one species, and the truth of this has been generally recognized since.

SELENINÆ.

Synonymy.

>Selenidi, *Rafinesque*, Indice d' Ittiolog. Siciliana, p. 15, 1810.
<Vomerini, *Bonaparte*, Nuovi Annali delle Sci. Nat., t. 2, p. 133, 1838; t. 4, p. 276, 1840.
<Vomerini, *Bonaparte*, Giorn. Arcad. di Scienze, v. 52 (Saggio Distrib. Method. Animali Vertebr. a Sangue Freddo, p. 34), 1832.
=Vomeriinæ, *Gill*, Proc. Acad. Nat. Sci. Phila., [v. 14,] pp. 431, 436, 1862.
=Vomerini, *Poey*, Anal. Soc. Esp. Hist. Nat., t. 4 (Enum. Pisc. Cub., p. 7), 1875.

CARANGINÆ.

Synonymy.

× Caranxia, *Rafinesque*, Analyse de la Nature, p. —, 1815.*
<Carancini, *Bonaparte*, Giorni. Arcad. di Scienze, t. 52 (Saggio Distrib. Method. Animali, Vertebr. a Sangue Freddo, p. 34), 1832.*

*Corrected to "Carangidæ" (not Carangoidæ) by Agassiz (Nom. Zool. Index Un., p. 188, 1848), but without intending to adopt the group as a family.

<Carangini, *Bonaparte*, Nuovi Annali delle Sci. Nat., t. 2, p. 133, 1838; t. 4, p. 275, 1840.*
<Carangina, *Günther*, Cat. Fishes in Brit. Mus., v. 2, pp. 417, 419, 1860.
=Caranginæ, *Gill*, Proc. Acad. Nat. Sci. Phila. [v. 14], p. 431, 1862.
<Carangini, *Poey*, Anal. Soc. Est. Hist. Nat., t. 4 (Enum. Pisc. Cub., p. 7), 1875.
<Centronotinæ gen., *Swainson*.

The synonomy of the genus Trachurus is as follows:

TRACHURUS.

Synonymy.

=Trachurus, *Rafinesque*, Caratteri di Alcuni Nouv. Genere e Nuov. Specie di Animali e Piante della Sicilia, etc., p. 41, 1815.
=Caranx (Trachurus), *Cuv. & Val.*, Hist. Nat. des Poissons, t. 9, p. 6, 1833. (Section.)
<Selar, *Bleeker*, Natuurkundig Tijdschrift voor Nederlandsch Indie, v. 1, pp. 343, 352, 1850.
<Trachurus, *Girard*, Expl. and Surv. for R. R. Route to Pac. Oc., v. 10, Fishes, p. 107, 1858.
=Trachurus, *Günther*, Cat. Fishes in Brit. Mus., v. 2, p. 419, 1860.
Scomber sp., *Linn.*
Caranx sp., *Lac. et al.*
Caranxomorus sp., *Lac.*
Seriola sp., *Bowditch.*

CHLOROSCOMBRINÆ.

Synonymy.

=Chloroscombrinæ, *Gill*, Proc. Acad. Nat. Sc. Phila., [v. 14,] p. 431, 1865.
=Chloroscombrini, *Poey*, Anal. Soc. Esp. Hist. Nat., t. 4 (Enum. Pisc. Cub., p. 7), 1875.

TRACHYNOTINÆ.

Synonomy.

=Trachynotinæ, *Gill*, Proc. Acad. Nat. Sc. Phila., [v. 14,] p. 431, 1862.
<Trachynotini, *Poey*, Anal. Soc. Esp. Hist. Nat., t. 4 (Enum. Pisc., Cub., p. 7), 1875.

CATALOGUE OF A COLLECTION OF BIRDS MADE IN THE INTERIOR OF COSTA RICA BY MR. C. C. NUTTING.

BY ROBERT RIDGWAY.

On page 383 of the present volume, reference is made to a collection of birds from the interior of Costa Rica, but which at the time of writing had not been received. This collection has lately come to hand, and a list of the species is presented herewith. The better to aid our knowledge of the geographical distribution of Central American birds, the specimens collected at the two principal points of San José and the Volcan de Irazú, are given in separate lists. The prominent character-