

THE DIFFERENTIAL CHARACTERS OF THE SALMONIDÆ AND THYMALLIDÆ.

By THEODORE GILL, M. D., PH. D.

IN 1885 the name *Thymallidæ* was published, but without definition. I have on several occasions been requested to give the distinctive characters of the family, and have done so orally. A detailed exposition has been postponed in the hope that I might be able to study the anatomy of the related forms. As no immediate prospect of doing so is offered, however, I submit diagnoses of the *Salmonidæ* as now restricted and the *Thymallidæ*.

In 1871 Prof. Cope, in his system of teleostomous fishes, named as families of his order of *Isospondyli*, among others, the families *Salmonidæ* and *Coregonidæ*. The *Isospondyli* with a diphycceral tail and "basis cranii double" are divided among those with "(a) parietals united," and "(aa) parietals separated by supraoccipital." The former (a) include the *Hiodontidæ*, *Albulidæ*, *Elopidæ*, *Aulopidæ*, COREGONIDÆ, *Lutodiridæ*, *Sauridæ*, and *Gouorhynchidæ*: the latter (aa) compose the *Alepocephalidæ*, SALMONIDÆ, *Chirocentridæ*, and *Clupeidæ*.

I at first adopted the *Salmonidæ* and *Coregonidæ* in my Arrangement of families, but, on examination of a skull of *Coregonus* shortly before receiving proofs of that article, found that it did not have the "parietals united," but "separated by supraoccipital," and thus agreed with the salmonids. I consequently replaced the name *Coregonidæ* by *Microstomidæ*, but the printers retained the reference to *Coregonidæ* of Cope.

As thus intimated, the true *Coregoni* have the same relations of the supraoccipital, parietals and frontals to each other as the typical salmonids, but there is a genus which manifests the character erroneously attributed to *Coregonidæ* by Cope, and that genus is *Thymallus*.

Thymallus is not only distinguished from the true Salmonine and Coregonine fishes by the junction of the parietals at the middle; it has, in addition, supracostal spines entirely wanting in the others; furthermore, the dorsal is distinguished by its greater development, both in extension and the number of rays, as well as its structure; instead of only one or two simple anterior rays, as in the Salmonines and Corego-

nines, there are in *Thymallus* many (7-11) unbranched rays and the rays in the posterior half are mostly simply bifid. The view generally prevalent (that *Thymallus* is intermediate between the Salmonines and Coregonines, or that it is a member of the latter group), is thus negatived by both the osteological peculiarities and external characteristics. The family *Thymallidæ* is well distinguished.

The diagnostic characters which separate the two families, *Salmonidæ* and *Thymallidæ*, and the two subfamilies of the former are now presented. The genera and their principal synonyms are also added. The desirability of exhibits of exact references to the first introduction and uses of the various synonyms will be evident to those who are conversant with recent works in which the genera have been treated, and will show why the various names here used are employed.

Family SALMONIDÆ.

- < *Dermoptères*, DUMÉRIE, Zool. Analytique, p. 146, 1806.
 < *Salmonidi*, RAFINESQUE, Indice d'Ittiolog. Siciliana, p. 32, 1810.
 < *Dermopteria*, RAFINESQUE, Analyse de la Nature, p. 87, 1815.
 < *Salmonoides*, RISSO, Hist. Nat. de l'Europe Mérid., t. 3.
 < *Salmones*, CUVIER, Règne Animal [1^e éd.], t. 2, p. 159, 1817; 2^e éd., t. 2, p. 301, 1829.
 < *Salmonides*, LATREILLE, Fam. Nat. Règne Animal, p. 119, 1825.
 < *Salmones*, AGASSIZ, Sel. Gen. et Sp. Piscium q. coll. Spix., p. 56, 1829.
 < *Salmonacei*, NILSSON, Prod. Ich. Scand., p. 1, 1832.
 < *Salmonidæ*, BONAPARTE, Giorn. Accad. di Scienze, v. 52 (Saggio Distrib. Metod. Animal. Vertebr. a Sangue Freddo, p. 37,) 1832.
 < *Salmonidæ*, SWAINSON, Nat. Hist. and Class. Nishes, etc., v. 2, pp. 184, 283, 1839.
 < *Salmonidæ*, BONAPARTE, Nuovi Annali delle Sci. Nat., t. 2, p. 132, 1838; t. 4, p. 272, 1840.
 < *Salmones*, MÜLLER, Archiv Naturgesch., 9. Jg., 1. B., p. 323, 1843.
 < *Salmonöides*, VALENCIENNES, Hist. Nat. des Poissons, t. 21, p. 153, 1848.
 < *Salmonidæ*, ADAMS, Man. Nat. Hist., p. 109, 1854.
 < *Salmonidæ*, RICHARDSON, Encycl. Brit., 8th ed., v. 12, p. 245, 1856.
 < *Salmonoidæ*, BLEEKER, Enum. Sp. Piscium Archipel. Indico, p. xxxi, 1859.
 < *Salmonidæ*, GÜNTHER, Cat. Fishes Brit. Mus., v. 6, p. 1, 1866.
 < *Salmonidæ*, COPE, Proc. Am. Assoc. Adv. Science, 1871, p. 333, 1872.
 < *Salmonidæ*, GILL, Arrang. Fam. Fishes, p. 16, 1872.
 < *Salmones*, FITZINGER, Sitzungsber. K. Akad. der Wissensch. (Wien), B. 67, 1. Abth., p. 37, 1873.
 = *Salmonidæ*, GILL, Rep. Smiths. Inst. 1884, p. 619, 1885.

Diagnosis.—Salmonoideans with a short dorsal fin of normal structure, epipleural appendages not developed, and parietal bones separated at middle by the intervention of the supraoccipital which connects with the frontals, and ripe ova first discharged within abdominal cavity.

Subfamily SALMONINÆ.

- < *Trutæ* (*Trutiformes*), LATREILLE, Fam. Nat. du Règne Animal, p. 119 (tribe). 1825.

- < *Salmonini*, BONAPARTE, Giorn. Accad. di Scienze, v. 52 (Saggio Distrib. Metod. Animal. Vertebr. a Sangue Freddo, p. 37,) 1832.
 < *Salmonina*, SWAINSON, Nat. Hist. and Class. Fishes, etc., v. 2, pp. 5, 283, 1839.
 < *Salmonini*, BONAPARTE, Nuovi Annali delle Sci. Nat., t. 2, p. 132, 1838; t. 4, p. 273, 1840.
 < *Salmonim*, BONAPARTE, Conspectus Syst. Piscium, 1850.
 < *Salmoniformes*, BLEEKER, Enum. Sp. Piscium Archipel. Indico, p. xxxi, 1859.
 < *Salmonina*, GÜNTHER, Cat. Fishes Brit. Mus., v. 6, p. 2, 1866.
 < *Salmonina*, GILL, Canadian Naturalist, n. s., v. 3, p. 258, 1865.
 < *Salmonina*, JORDAN and GILBERT, Syn. Fishes N. Am., p. 289, 1882.
 = *Salmonina*, GILL, Mem. Nat. Acad. Sc., v. 6, p. 131, 1893.

Salmonids with a deeply cleft mouth, long lower jaw articulating with the quadrates behind the eyes, and rather narrow supramaxillaries with incurved adoral margins.

The subfamily thus limited includes the genera *Salvelinus*, *Cristivomer*, *Hucho*, *Salmo*, *Oncorhynchus*, and *Brachymystax*.

Genus SALVELINUS.

- = *Salvelini*, NILSSON, Prodr. Ich. Scand., p. 7, 1832. (Group of *Salmo*.)
 = *Salvelinus*, RICHARDSON, Fauna Bor.-Am., v. 3, p. 169, 1836. (Subg. of *Salmo*.)
 = *Baione*, DEKAY, Nat. Hist. N. Y., part 4, p. 244, 1842.
 = *Rödingar* (*Salvelini*), NILSSON, Öfvers. K. Vet. Akad. Förhandl., 1848, p. 64, 1849.
 × *Salmo*, VALENCIENNES, Hist. Nat. Poiss., v. 21, pp. 163, 165, 1848.
 × *Fario*, VALENCIENNES, Hist. Nat. Poiss., v. 21, pp. 163, 277, 1848.
 × *Salar*, VALENCIENNES, Hist. Nat. Poiss., v. 21, pp. 163, 314, 1848.
 = *Salmo*, RAPP, Jahreshefte Ver. vaterl. Naturk. Württemberg, 10. Jahrg., p. 162; Fische des Bodensee, p. 32, 1854.
 = *Salmo*, SIEBOLD, Süßwasserfische von Mitteleuropa, p. 280, 1863.
 = *Salvelinus*, GILL and JORDAN, Jordan's Man. Verteb. N. U. S., 2. ed., p. 356, 1878.
Salmo, sp. auct.

Genus CRISTIVOMER.

- = *Cristivomer*, GILL and JORDAN in *Jordan*, Man. Verteb. N. U. S., 2 ed., pp. 356, 359, 1878.
Salmo, sp., auct. pl.

Genus HUCHO.

- < *Hucho*, GÜNTHER, Cat. Fishes B. M., v. 6, p. 140, 1866. (Provisional name for subdivision of *Salmo*.)
 < *Hucho*, JORDAN, Man. Verteb. N. U. S., 1. ed., p. 260, 1876.
 = *Epitomynis*, SCHULZE, Fauna Pisc. Germ., p. 38, 1890. (Subg. of *Salmo*.)
Salmo sp. auct. pl.

Genus SALMO.

- < *Salmo* [§]* *Trutta*, LINNÉ, Syst. Nat., ed. 10, v. 1, p. 308, 1758.
 < *Salmo*, LACÉPÈDE, Hist. Nat. Poiss., v. 5, p. 152, 1803.
 < *Salmo*, CUVIER, Règne Animal, v. 2, p. 160, 1817.
 < *Salmo* (§ *Trutta*), NILSSON, Prod. Ich. Scand., p. 70, 1832.
 < *Salmo*, RICHARDSON, Fauna Bor.-Am., v. 3, p. 169, 1836. (Subg. of *Salmo*.)
 < *Salmo*, NILSSON, Öfvers. K. Vet. Akad. Förhandl., 1848, p. 64, 1849.
 × *Salmo*, VALENCIENNES, Hist. Nat. Poiss., v. 21, pp. 163, 165, 1848.
 × *Fario*, VALENCIENNES, Hist. Nat. Poiss., v. 21, pp. 163, 277.
 × *Salar*, VALENCIENNES, Hist. Nat. Poiss., v. 21, pp. 163, 314.

- =*Fario*, RAPP, Jahreshefte Ver. vaterl. Naturk. Württemberg, 10. Jahrg., p. 162. (Fische des Bodensee, p. 27,) 1854.
 =*Trutta*, SIEBOLD, Süßwasserfische Mitteleuropa, p. 280, 1863.
 <*Salmo*, GÜNTHER, Cat. Fishes B. M., v. 6, p. 2, 1866.
 =*Salmo*, JORDAN, Man. Vertebr. N. U. S., 2. ed., pp. 356, 359, 1878.

Genus ONCORHYNCHUS.

- <*Oncorhynchus*, SUCKLEY, Annals Lyc. Nat. Hist. N. Y., v. 7, p. 312, 1862.
 =*Oncorhynchus*, GÜNTHER, Cat. Fishes B. M., v. 6, p. 155, 1866.
Salmo sp. *Pallas*, Richardson *et al.*

Genus BRACHYMYSTAX.

- =*Brachymystax*, GÜNTHER, Cat. Fishes B. M., v. 6, p. 172, 1866.
Salmo sp., *auct. pl.*

This genus appears to be represented in Europe by the *Salmo obtusirostris* of Heckel or *Thymallus microlepis* of Steindachner (Sitz. K. Akad. Wissensch., 1. Abth., v. 70, p. 367, 1874),* which must therefore be called *Brachymystax obtusirostris*. That species, at least, does not appear to belong to the genus *Salmo* or *Thymallus* as generally defined, and no generic differences between it and *Brachymystax* are evident from the excellent figure and description.

Subfamily COREGONINÆ.

(*Synonymus as subfamily.*)

- =*Coregonini*, BONAPARTE, Conspectus Syst. Piscium, 1850.
 =*Coregoninae*, GILL, Johnson's New Universal Cyclopedia, v. 4, p. 1651, 1878.
 =*Coregonina*, JORDAN & GILBERT, Syn. Fishes N. Am., p. 289, 1882.

(*Synonym as family.*)

- ?? *Coregonidae*, COPE, Proc. Am. Assoc. Adv. Sci., v. 20, p. 333, 1872. (Name: not diagnosis.)

Salmonids with a small mouth, short lower jaw articulating with the quadrates under the eyes, and broad supramaxillaries with convex adoral margins.

The subfamily, besides the type genus, *Coregonus*, is generally made to include *Stenodus* or *Luciotrutta*, but I have not been able to examine a skeleton of the latter. It probably represents another subfamily.

Genus COREGONUS.

- <*Salmo* [ÿ] *** *Coregoni*, LINNÆUS, Syst. Nat., ed. 10, v. 1, p. 310, 1758.
 >*Tripteronotus*, LACÉPÈDE, Hist. Nat. Poiss., v. 5, p. 47, 1803.
 <*Coregonus*, LACÉPÈDE, Hist. Nat. Poiss., v. 5, p. 239, 1803.
 <*Les Ombres*, *Coregonus*, CUVIER, Règne Animal, v. 2, p. 162, 1817.
 =*Les Lavarets* (*Coregonus*), CUVIER, Règne Animal, 2. ed., v. 2, p. 306, 1829.
 =*Coregonus*, VALENCIENNES, Hist. Nat. des Poissons, t. 20, p. 451, 1848.

* The identity of *Salmo* (or *Salar*) *obtusirostris* of Heckel and *Thymallus microlepis* was recognized by Dr. Steindachner in 1882 (Sitz. K. Akad. Wiss., 1. Abth., v. 84; Ich. Beitr. xii, p. 15). Nevertheless, in 1886, Dr. Seeley in "The Fresh-water Fishes of Europe," retained the two nominal species, *Salmo obtusirostris* (p. 286) and *Thymallus microlepis* (p. 358). If the genus *Brachymystax* is accepted the species in question should apparently be referred to it.

- > *Coregonus*, AGASSIZ, Lake Superior, p. 336, 1850.
 > *Argyrosomus*, AGASSIZ, Lake Superior, p. 336, 1848.
 — *Coregonus*, GÜNTHER, Cat. Fishes in Brit. Mus., v. 6, p. 172, 1866.
 > *Prosopium*, (MILNER) JORDAN, Man. Vertebr. N. U. S. 2. ed., p. 381, 1878,
 > *Allosomus*, JORDAN, Man. Vertebr. N. U. S. 2. ed., p. 361, 1878, (subg. of *Argyrosomus*).
Salmo sp., auct. ret.

Subfamily STENODONTINÆ.

Salmonids, with a deeply-cleft mouth, long lower jaw, articulating with the quadrates behind the eyes, broad supra-maxillaries with convex adoral margins, and bands of teeth on the broad head of vomer and on the palatines.

Genus STENODUS.

- = *Stenodus*, RICHARDSON, Narrative, Artic Land Exp., p. 521, 1836.
 = *Stenodus*, RICHARDSON, Encycl. Brit., 8. ed., v. 12, p. 245, 1856.
 = *Luciotrutta*, GÜNTHER, Cat. Fishes B. M., v. 6, p. 164, 1866.
Salmo sp., RICHARDSON olim.

The genus *Stenodus* was originally proposed by Dr. (afterwards Sir John) Richardson in an appendix to Back's "Narrative of the Arctic Land Expedition to the Mouth of the Great Fish River," etc., published in 1836. In his remarks on the "Fish," allusion is made (p. 521) to "the *Salmo Mackenzii*, which ascends from the Arctic Sea, and does not exist in the more southern waters. This fish [he continued], though agreeing with the trouts in the structure of the jaws, differs from all the subgenera established by Cuvier in the *Règne Animal* in having the teeth disposed in velvet-like bands, and broader on the vomer and palatine bones. From the crowded minute teeth, the name of *Stenodus* may be given to the subgenus, of which the inconnu, or *Salmo Mackenzii*, is the only ascertained species." In 1856 an elaborate description of the genus was published by the same author. The name *Luciotrutta* was proposed for the same type thirty years after *Stenodus* by Dr. Günther, who was apparently unacquainted with Richardson's propositions.

Family THYMALLIDÆ.

- = *Coregonidæ*, COPE, Proc. Am. Assoc. Adv. Science, 1871, p. 333, 1872. (Diagnosis only.)
 = *Thymallidæ*, GILL, Rep. Smithson. Inst., 1884, p. 619, 1885.
 = *Thymallidæ*, COPE, Syl. Lect. Geol. Pal., p. 23, 1891.
Salmonidæ gen., Auct. pl.

Diagnosis.—Salmonoideans with a rather long dorsal fin whose anterior half is composed of graduated simple rays and posterior half of bifurcate or little branched rays, epipleural spines to anterior ribs, the parietal bones meeting at middle and excluding frontals from supra-occipital, and ripe ova first discharged within abdominal cavity.

Genus THYMALLUS.

< *Les Ombres (Coregonus)*, CUVIER, Règne Animal, v. 2, p. 162, 1817.

= *Les Ombres (Thymallus)*, CUVIER, Règne Animal, 2. ed., v. 2, p. 306, 1829.

= *Thymallus*, NILSSON, Prodr. Ich. Scand., p. 12, 1832.

= *Aesche, Choregon*, MINDING, Lehrb. Naturgesch. Fische. p. 119, 1832.

The history of *Thymallus* is somewhat complicated with that of *Coregonus*.

In 1816, Cuvier gave the name "*Les Ombres (Coregonus. Art.)*" to a group composed of the graylings and whitefishes.

In 1829, Cuvier divided the "*Ombres*" into two genera (or subgenera), naming the "*Ombres*" or graylings, *Thymallus*, and the whitefishes *Coregonus*.

In 1832, Minding gave the name "*Aesche, Choregon,*"* to a genus of which the only species mentioned was the "*Thymus-Aesche, C. Thymallus.*" The name was evidently given as a substitute for *Coregonus* of Artedi and Cuvier (1817).

Inasmuch as Cuvier, Fleming, and others simply adopted *Coregonus* from Artedi and Linnaeus, I do not think that the fact that they brought into such prominence the *Thymallus* is sufficient to insure the acceptance of that species as the type of *Coregonus*.

Thymallus was preceded by *Thymalus*, a Coleopterous genus named by Latreille in 1802. Those who think that the two conflict may take the name *Choregon* in place of *Thymallus*.†

* (v. Χορηγέω, ich führe den Chor an.)

† The name *Choregon* is distinct etymologically and in form from *Coregonus*. Artedi, the author of the name, in his *Philosophia Ichthyologica* (p. 72), gave the following etymology:

"COREGONUS a κόρη *pupilla oculi* & γωνία *argulus* quia pupilla anteriore parte in angulum acutum proenrrit."