

Subgenus *Salvelthymus*. One species, *S. svetovidovi* (Longfin Char), described by I. A. Chereshnev and M. B. Skopets in 1990, known only from Lake El'gygytyn, a cold, clear, ultraoligotrophic lake formed in a meteorite crater about 3.5 million years ago and having been a refugium during the Pleistocene glaciation. This planktivore is unique among salmonines in several features; for example, it has an unusually high number of gill rakers and very reduced orbitosphenoid (sometimes absent) and basisphenoid. Reasons for not recognizing *Salvelthymus* at the generic level, as proposed by Chereshnev and Skopets (they also recognized *Baione* and *Cristivomer* as genera), are given in Nelson (1994), based on Behnke (1989).

Subgenus *Baione*. Two species, *Salvelinus fontinalis*, Brook Trout (freshwater and anadromous, eastern North America), and *S. namaycush*, Lake Trout (freshwater, northern North America, recognized by some in the subgenus or genus *Cristivomer*).

Subgenus *Salvelinus*. Freshwater and anadromous; Northern Hemisphere. About eight species (e.g., Arctic Char, Dolly Varden, and Bull Trout). Perhaps the northernmost record for any freshwater fish is that for anadromous and freshwater Arctic Char in Lake Hazen, Ellesmere Island, Canada. The work of Stearley and Smith (1993) suggested that several species recognized here belong in the *Baione* lineage; for example, in their cladogram, Bull Trout and Lake Trout are sister species. E. B. Taylor and colleagues have done many studies on hybridization and its significance in char species (e.g., Taylor, 2004). Up to 52 species.

*Parahucho*. Erected as a monotypic subgenus by Vladykov in 1963, this is a separate lineage according to the 1995 molecular study by R. B. Phillips and colleagues and by some of the results of Crespi and Fulton (2004). Wilson and Williams (2010) in a supertree analysis suggested that it was sister to *Salmo* and *Oncorhynchus*.

*Salmo*. Freshwater and anadromous; North Atlantic basin (northeastern North America and Europe) and European Arctic. Fall spawning. Commercially important species include the Atlantic Salmon (*S. salar*) and Brown Trout (*S. trutta*), both with numerous anadromous and freshwater populations that have been named as separate species (e.g., Kottelat and Freyhof, 2007; Susnik et al., 2007; Turan et al., 2011, 2012). Nominal subgenera that are probably derived, landlocked populations of the genus *Salmo* include *Acantholingua* (*A. ohridanus*), *Salmothymus* (*S. obtusirostris*), and *Platysalmo* (*P. platycephalus*) (see also Wilson and Williams, 2010). Up to 41 species.

*Oncorhynchus* (*Pacific trouts and Pacific salmon*). About 17 species.

Stearley and Smith (1993) provided evidence that the subgenus *Rhabdofario*, previously used for several Pacific trout species, is paraphyletic, with the four extant species forming separate branches on a comb-like cladogram.

Pacific salmon comprise an important fishery, and a great deal is known of their biology. They are a rich source of material for studies in diversity. They have a strong homing ability, usually returning to their natal streams for spawning. *Oncorhynchus masou* (Masu Salmon or Cherry Salmon) and *O. rhodurus* (Amago) are the most "trout-like"; the latter nominal species is probably conspecific with *O. masou*—both occur only in far eastern Asia. *Oncorhynchus kisutch* (Coho Salmon) and *O. tshawytscha* (Chinook Salmon) are somewhat intermediate between the Japanese endemics and the next three species. *Oncorhynchus keta* (Chum Salmon) and *O. gorbuscha* (Pink Salmon) usually spawn in the lower reaches of rivers and are the most "marine-like." Individuals of *O. gorbuscha* have a rigid two-year life span, with one or the other or both of the even- and odd-year stocks existing allochronously in the same stream. Individuals of other species have variable lifespans; those of *O. nerka* (Sockeye Salmon) live as long as eight years in their northern range (Alaska). In this species the anadromous form (sockeye) has, throughout most of its range, given rise to freshwater populations (kokanee), which occur in sympatry or allopatry (usually in so-called "landlocked" lakes, though connected to the sea by rivers) with the parental anadromous form. All individuals of the last five species and all anadromous individuals die after spawning; some non-anadromous *O. masou* may repeat spawn. Wilson et al. (2009) reconstructed the history of inland populations of *O. clarki* using mtDNA, recognizing six subspecies in western USA and Mexico.

Fossils include i) the Eocene †*Eosalma*, the oldest salmonid and the primitive sister group to all other salmonines, combining characters of Thymallinae and Salmoninae (Wilson and Williams, 1992, 2010; Stearley and Smith, 1993), with two species, †*E. driftwoodensis* from North America (Wilson 1977, Wilson and Li, 1999, Wilson and Williams, 2010) and †*E. kamchikensis* from eastern Siberia (Sytchevskaya, 1986); ii) †*Brachymystax bikinensis* of Oligocene age (Sytchevskaya, 1986); iii) the giant Miocene †*Oncorhynchus rastrosus* from Oregon and California, a very large-bodied filter feeder that had over 100 gill rakers; iv) †*Oncorhynchus ketopsis*, also Miocene, from Oregon (Eiting and Smith, 2007); and v) the southernmost known salmonid, †*Oncorhynchus australis*, from the Pliocene of Mexico (Stearley and Smith, 1993). These and related fossils demonstrate that Salmoninae are at least as old as early Eocene, and that *Oncorhynchus* arose at least six million years ago.

**Order ESOCIFORMES (Haplomi, Esocae) (38)—pikes and mudminnows.** Maxilla toothless but in gape of mouth; no adipose fin; dorsal and anal fins located posteriorly; no breeding tubercles; no pyloric caeca; no mesocoracoid; cheek and operculum scaled; one postcleithrum; basibranchial tooth plate in two parts; ossification of middle radials on only central pterygiophores of dorsal and anal fins (*Esox* and *Umbra*), or not ossified at all (*Dallia* and *Novumbra*); paired elongate proethmoids (Rosen, 1974; Johnson and Patterson, 2010).

Two families, four genera, and at least 12 species. There is one fossil-only family recognized.