

The American Lake Char (*Cristivomer namaycush*)

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TAXONOMIC

THE genus *Cristivomer* was created by Gill and Jordan (1878) for a char which they described as differing from *Salvelinus* in having a toothed crest extending posteriorly from the head of the vomer and free from the body of this bone. Regan (1914) stated that this crest or posterior process was merely an extension of a structure found in typical *Salvelinus* and regarded the two genera as intergrading through the species *fontinalis*, which he described and represented diagrammatically as an intermediate form. He proposed the union of the chars in a single genus containing three groups defined as follows: the *alpinus* group having the posterior process on the head of the vomer but little developed and hyoidal teeth uniserial, the *fontinalis* group having the posterior process on the head of the vomer well developed and lacking hyoidal teeth and the *namaycush* group having a long posterior process and hyoidal teeth multiserial. It is also to be noted that Day (1887, p. 10 and p. 70) showed a considerable posterior process in both *S. fontinalis* and *S. alpinus*. The present writer has not had the opportunity of examining specimens of the *alpinus* form, but has been unable to find anything that could be regarded as a well-developed posterior process on the vomer of *Salvelinus fontinalis*. So far as New Zealand-grown specimens are concerned, the rearward projection occurs in the teeth and not in the bone to which they are attached. The lateral aspect of the vomer of this species is shown in Fig. 2, and a comparative figure of the same bone in *Cristivomer namaycush* is shown in Fig. 3. The contention of intergradation is not borne out by the present material, the long posterior process in *Cristivomer* being quite distinct from the arrangement in *S. fontinalis*.

The second character by which Regan proposed to separate his groups, namely, the hyoidal dentition, also fails in respect of *Salvelinus fontinalis*. It has been shown elsewhere (Stokell, 1940) that this species may or may not have teeth on the hyoid, and that when present these teeth are variable in number and degree of development. It is therefore impossible to separate *fontinalis* from other chars of the genus *Salvelinus*, and the proposed intermediate group must be abandoned. *Cristivomer*, however, has a multiserial arrangement of the hyoidal teeth and differs in this feature from all species of *Salvelinus* recorded.

The two groups are further differentiated by the number of pyloric caeca. In the seven specimens of *Cristivomer* available the number ranges from 128 to 164, while in ten specimens of *Salvelinus fontinalis* the range was found to be 26-36. Gunther (1866) records 32-52 in British char and Day (*loc. cit.*) widens the specification to 28-62.

In a single specimen of *Salvelinus malma* from North America examined by the writer the number is 26. The American representatives of the genus *Salvelinus* would therefore appear to conform to the specifications of the European species, and the number of caeca must be regarded as providing a useful distinction between this genus and *Cristivomer*. There appears no justification for uniting the two genera, although their distinctness is somewhat affected by the existence of a common feature indicative of close affinity. All chars of the genera *Salvelinus* and *Cristivomer* that have come under the writer's observation have considerably more cross-rows of scales on the body than scales in the lateral line. The lateral line scales are not composed of hard, transparent material as are those on other parts of the body, but are almost cutaneous in character. They carry no circuli and are flexibly connected. The arrangement differs greatly from that in *Salmo* and *Oncorhynchus*, in which the lateral line scales number approximately the same as the cross-rows and are similar to those on the remainder of the body except that each carries a mucus tube. Another feature common to *Salvelinus* and *Cristivomer* is the presence of well-developed mucus pits below the lower jaw, usually ten on each side in *Cristivomer*. Obsolete pits with occasionally some small functional ones occur in *Salmo trutta* and *Salmo salar*, but they are lacking in *Salmo gairdnerii* and in all observed species of *Oncorhynchus*. The group known as *Salmo clarki* has a more definite development of mucus pits than occurs in typical *Salmo*, and, in this feature, comes close to the chars, which it further resembles in usually having teeth on the hyoid, but it is to be noted that the scales in the lateral line, although irregularly placed in relation to the cross-rows, agree with those of typical *Salmo*.

A redescription of *Cristivomer namaycush* is given below and a photograph of a typical specimen is shown in Fig 1.

***Cristivomer namaycush* Walbaum**

B. 11-12. D iii-iv 8-9. A iii 9. Gill-rakers 20-21. Pyloric caeca 128-164. Vertebrae 62.

Body of vomer elevated above level of head, in section an inverted V, toothless. Head of vomer with a blade-shaped structure extending posteriorly and, in its latter part, free from the body of the vomer, the extent of the free portion variable. Teeth on head of vomer arranged in an irregular chevron, uniserial on blade. Hyoid with a long patch of small strong teeth.

Head 4.41-4.51 in standard length, maxillary extending well behind posterior of eye. Dorsal fin inserted at 0.5-0.505 of the standard length, its height 1.07-1.38 times its basal length. Pectoral extending 0.42-0.45 of the distance from its root to the ventral, ventral inserted at 0.56 of the standard length, height of ancillary 0.28-0.31 of the height of ventral. Height of anal 1.3-1.34 times its basal length, caudal peduncle 2.1-2.21 times as long as its least depth, caudal fin deeply forked. Scales small and irregularly placed, about 190 cross-rows immediately above lateral line, 128-130 scales in lateral line.

Colour greenish-grey with pale spots and short markings, belly and lower fins tending to golden. Maximum total length observed 25 inches.

NEW ZEALAND EXISTENCE

In 1906 fifty thousand eggs of this fish were imported by the New Zealand Government and hatched by the North Canterbury Acclimatisation Society at its hatchery in Christchurch. The Society's Annual Report for 1907 states that 4,000 young fish were liberated in Lake Pearson in Canterbury and a similar quantity was forwarded to Westland for disposal by Government officials. The late T. E. Donne (1927), Government Tourist Officer, at whose instigation the eggs were obtained, gives the Westland locality as Lake Ianthe and states that the Canterbury lot was divided between Lake Pearson and Lake Grasmere. A few of the young fish were retained in the acclimatisation ponds and apparently reared to maturity. The Society's Annual Report for 1910 states that 56 four-year-old fish were held at that time, and it is obvious that a second generation was bred from them, as the 1911 Report records the presence of two-year-olds. There is no account of what became of these fish, but they appear to have been disposed of by 1913, as the only salmonoids recorded as being held in ponds at that time were brown trout and rainbow trout.

The only New Zealand water from which this char has been recorded is Lake Pearson, which is situated about four miles south of Cass, on the West Coast road. This lake has an altitude of 1990 feet and appears to have been ponded partly by moraine and partly by shingle fans. It is about two miles in length and about half a mile in width except at the middle, where it narrows to a neck about 30 yards wide. The principal tributary is the Craigieburn Creek, which is so unstable in the lower part of its course that it may divide its waters between the lake and the outlet stream or flow wholly into one or the other. The Ribbonwood Creek is usually dry in the lower part of its course, but assists in feeding the lake by soakage and there are several small trickles which usually maintain a connected flow. The outlet known as Winding Creek is at the south end and flows into Broken River, a tributary of the Waimakariri, but is frequently dry for a considerable distance just below the lake.

No records of the number of char taken at Lake Pearson have been kept, but it would appear from information received from several anglers who regularly fish the water that twelve fish per year would be a reasonable estimate. The largest fish observed by the writer was 7 lb. in weight and the average for the eight specimens examined is 5 lb. These weights are much lower than those recorded in North America, where fish of 15 lb. and 20 lb. are not rare, and individuals of double these weights are taken occasionally. The small size of the New Zealand fish appears to be explainable on the grounds of unsuitability of habitat, and it is even matter for surprise that the species has established itself in a lake so different from its native waters. The great depths and extremely cold waters of the Canadian lakes, in which this fish abounds, are in sharp contrast to the conditions at Lake Pearson, which is comparatively shallow and warm. A series of soundings showed that a considerable area of the northern section is between 35 feet and 40 feet deep, with a maximum depth of 45 feet recorded about the middle transversely and somewhat south of the middle longitudinally. The neck is shallow and the greater part of the

southern section ranges from 22 feet to 32 feet in depth. At the time these soundings were taken (March 25, 1950) the surface temperature taken in shade at mid-day was 58°F., while the readings at 35 feet and 45 feet were 56·5° and 55·5° respectively. Seasonal temperatures have not been taken apart from a surface reading of 63°F. obtained on November 29, 1949. These records agree fairly closely with those of better known alpine lakes and suggest that surface readings approaching 70°F. would be obtained in mid-summer.

The growth rate of these char is much more difficult to determine than that of trout on account of the scales being smaller and the ridges more closely placed. This close placing is customary in stunted fish, the scales of which manifest little differentiation between summer zones and winter bands. In the majority of the specimens available the scales are too indefinite to justify even an approximate reading, but after examining a large number of scales of the most favourable specimen the opinion was formed that the fish was in its fifth year. This fish was 23 inches in length and the lengths attained at what appeared to be the completions of the several years were computed as 2·75 inches, 7·5 inches, 15·5 inches and 21 inches. These figures appear reasonable, but in the absence of more definite knowledge of the life history of the species they cannot be accepted unreservedly.

The condition factor of the specimens available, as obtained from Corbet's calculator, averaged 44·6, which would be quite good for trout in similar waters.

The time of spawning cannot be estimated with any precision, as the specimens available were taken early in the season. In a male measuring 24·25 inches in length, taken on November 1, the milt lobes were about 9 inches in length and 0·6 of an inch in width, and in a female of 23·25 inches, taken at the same time, the egg lobes measured 5 inches and contained eggs of up to 2 mm. in diameter.

Particulars of the stomach contents of the eight specimens examined are given in the following table. One stomach was empty.

*Stomach Contents of Eight Specimens of Cristivomer namaycush
from Lake Pearson*

<i>Philypnodon breviceps</i>	<i>Galaxias lynx</i>	Larvae of <i>Procordulia</i>	Sundry
44	1	3	Small quantity of vegetable matter
23	4	2	1 water-snail
38		14	1 beetle, 4 small stones
1		6	
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26		2	
63		7	1 larva of <i>Zantagrion</i> , 1 caddis larva, water-weed and rushes

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Compared with the food of trout from Lake Pearson and similar waters the food listed above reveals a marked scarcity of surface insects and a preponderance of *Philypnodon*. Green manuka beetles (*Pyronota festiva*) and adult dragonflies of several species form an important part of the food of both rainbow trout and brown trout in alpine lakes, the remainder consisting largely of *Procordulia* larvae, caddis larvae, water-snails and sundry beetles, with fishes occupying only a minor position.

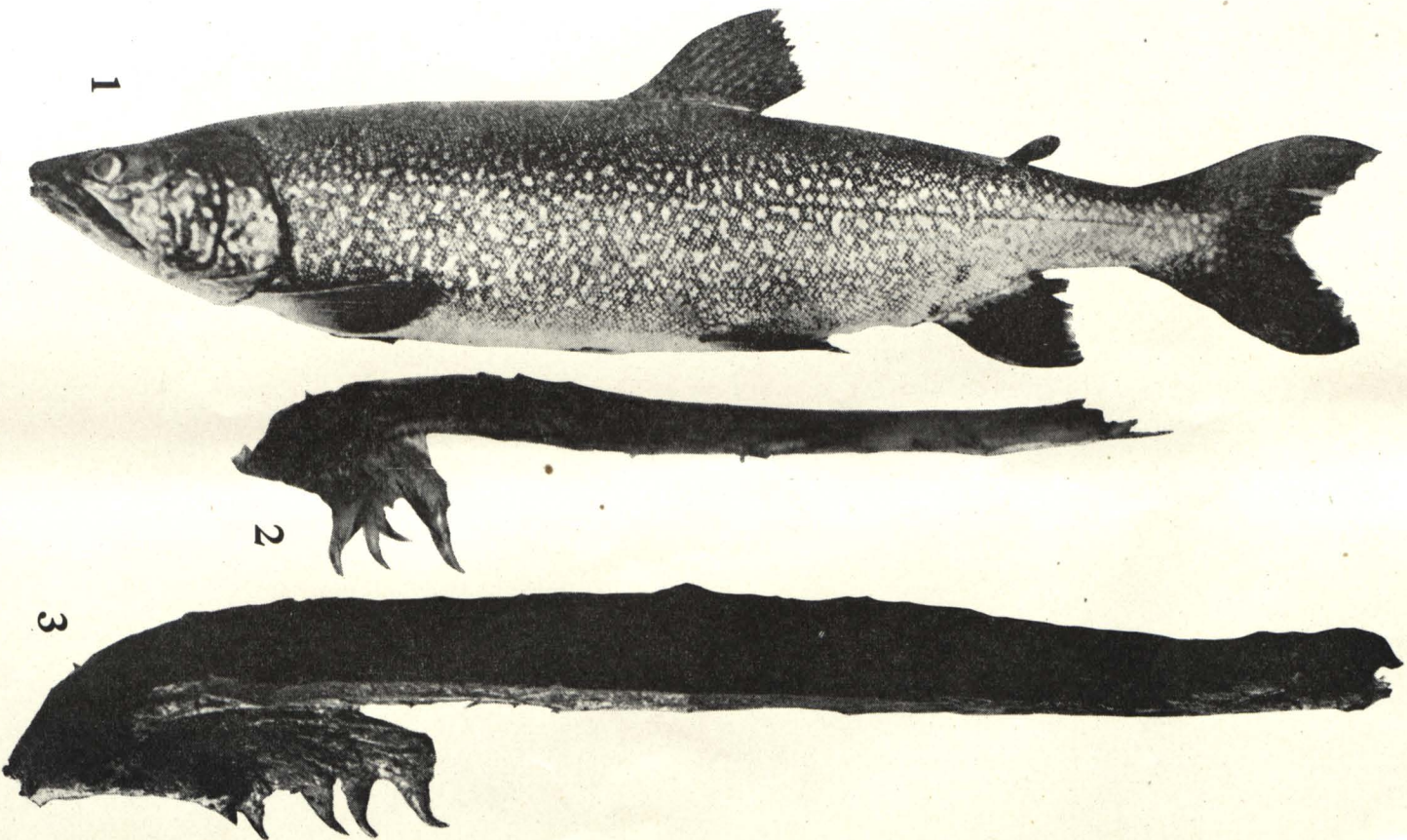


FIG. 1.—*Cristromer namagoush*. Lake Pearson, Canterbury.

FIG. 2.—Vomer of *Sebastes fontinalis*.

FIG. 3.—Vomer of *Cristromer namagoush*.



Several specimens contained the cysted parasite *Eustrongylides*, one natural host of which (*Phalacrocorax carbo*) is moderately plentiful in the locality.

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REFERENCES

- DAY, F., 1887. *British and Irish Salmonidae*. Williams and Norgate, London and Edinburgh.
- DONNE, T. E., 1927. *Rod Fishing in New Zealand*. Seely Service & Co. Ltd., London.
- GILL, T. E., and JORDAN, D. S., 1878. In Jordan, *Manual Vertebrates*. E.U.S. Ed. 2, 356.
- GUNTHER, A., 1866. *Cat. Fish. Brit. Mus.*, vol. 6.
- REGAN, C. T., 1914. The Systematic Arrangement of the Fishes of the Family Salmonidae. *Ann. Mag. Nat. Hist.*, series 8, vol. 13, pp. 405-408.
- STOKELL, G., 1940. The Occurrence of Hyoidal Teeth in *Salvelinus fontinalis*. *Trans. Roy. Soc. N.Z.*, vol. 70, pp. 161-163.