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Author(s)	NAGASAWA, Kazuya; WATANABE, Julio Robert; KIMURA, Shizuo; HARA, Akihiko
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**Infection of *Salmincola stellatus* (Copepoda: Lernaepodidae)
on Sakhalin Taimen *Hucho perryi* Reared in Hokkaido***

Kazuya NAGASAWA**, Julio Roberto WATANABE***,
Shizuo KIMURA*** and Akihiko HARA***

Abstract

The parasitic copepod *Salmincola stellatus* Markevich, 1936 is reported from the wall of the buccal cavity of the Sakhalin taimen *Hucho perryi* reared at the Nanae Fish Culture Experimental Station of Hokkaido University in southern Hokkaido. *Salmincola stellatus* must have been introduced with wild Sakhalin taimen which were collected in northern Hokkaido and transported live to the Station. The appetite of infected fish was reduced. *Salmincola stellatus* was not found on species of the salmonid genera *Oncorhynchus*, *Salmo*, and *Salvelinus*, suggesting that this parasite is host specific to Sakhalin taimen.

Introduction

The Sakhalin taimen *Hucho perryi* Pallas is distributed in Hokkaido, northern Japan, and in the southern Kuril Islands, Sakhalin and Primore of Far Eastern Russia (Holcik et al., 1988; Kawamura, 1989). This fish is an endangered species in Japan, and the Nanae Fish Culture Experimental Station, Faculty of Fisheries, Hokkaido University at Nanae in southern Hokkaido (41°45'N, 140°46'E) is a research center in which various aspects of the biology of this species is being studied for its stock enhancement (Kimura and Hara, 1989, 1993).

In July 1994, we examined Sakhalin taimen from raceways of the Nanae Fish Culture Experimental Station for parasites because some taimen exhibited poor appetite. We found the lernaepodid copepod *Salmincola stellatus* Markevich, 1936 in the buccal cavity of the fish. The present note reports on the occurrence and effect of *S. stellatus* on Sakhalin taimen and the introduction of the parasite to the Nanae Fish Culture Experimental Station. This is the third report of *S. stellatus* from Japan (Kabata, 1986; Nagasawa and Urawa, 1991).

Materials and Methods

A total of 192 Sakhalin taimen *Hucho perryi* were examined for copepods in

* Contribution No. 88 from the Nanae Fish Culture Experimental Station, Faculty of Fisheries, Hokkaido University

(北海道大学水産学部附属七飯養魚実習施設業績第 88 号)

** National Research Institute of Far Seas Fisheries, Fisheries Agency of Japan, Orido, Shimizu, Shizuoka 424, Japan

(水産庁遠洋水産研究所)

*** Nanae Fish Culture Experimental Station, Faculty of Fisheries, Hokkaido University

(北海道大学水産学部附属七飯養魚実習施設)

July, 1994. Fishes of the salmonid genera *Oncorhynchus*, *Salmo*, and *Salvelinus* were also examined in order to determine the parasite's host preference. For controlling copepods, infected fish were treated with 3–4% NaCl solution for 30–40 min. Copepods found were manually removed using forceps, fixed in 5% formalin, and subsequently stored in 70% ethanol. Voucher specimens are deposited in the National Science Museum, Tokyo (NSMT-Cr 11414) and the remaining specimens retained in the collection of the senior author (K.N.).

Results and Discussion

All Sakhalin taimen examined (53–96 cm fork length) were infected with *S. stellatus*. The intensity of infection ranged from 10–50 specimens per fish with a mean intensity of 30. The copepods were found on the floor and roof of the host's buccal cavity, as reported by Nagasawa and Urawa (1991). The morphology of the specimens (Fig. 1) corresponds to the description given by Kabata (1986).

Salmincola stellatus was probably introduced with wild Sakhalin taimen. Before the present report, *S. stellatus* had not been found on salmonids reared at the Nanae Fish Culture Experimental Station. For a comparative study of taimen from various locations in Hokkaido, 11 fish were collected at Lake Shumarinai (43°59'N, 142°00'E), an artificial lake in the upper reaches of the Unryu River (a tributary of the Ishikari River system, northern Hokkaido) in the autumn of 1993 and transported live to the Nanae Fish Culture Experimental Station. These fish were overwintered with artificially reared taimen that were hatched there. In July 1994 we noticed that the latter taimen had poor appetite and we found them infected with *S. stellatus*. Thus we think that the parasite was introduced with the wild Sakhalin taimen from Lake Shumarinai and that the new infections occurred in the

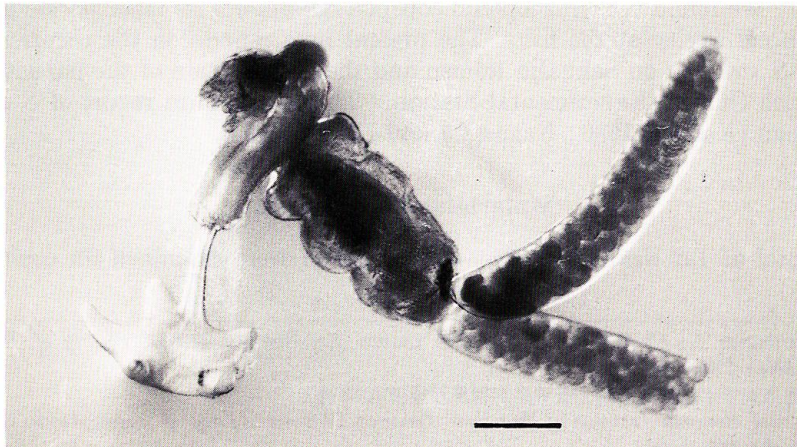


Fig. 1. *Salmincola stellatus* female (one egg sac damaged) taken from the wall of the buccal cavity of Sakhalin taimen *Hucho perryi* from the Nanae Fish Culture Experimental Station on July 11, 1994. Scale bar = 1 mm.

raceways of the Nanae Fish Culture Experimental Station. It is desirable that Sakhalin taimen should be examined for *S. stellatus* before transportation.

Salmincola stellatus appears to be host specific to Sakhalin taimen. Several species of salmonids were reared in the effluent water from the raceways holding Sakhalin taimen, but *S. stellatus* was not found on those fishes. They include sockeye salmon *Oncorhynchus nerka*, coho salmon *O. kisutch*, masu salmon *O. masou*, rainbow trout and steelhead trout *O. mykiss*, cutthroat trout *O. clarki*, brown trout *Salmo trutta*, Dolly Varden *Salvelinus malma*, Miyabe charr *S. malma miyabei* (subspecies of Dolly Varden), and white-spotted charr *S. leucomaenis*.

Our observations indicated that the appetite of infected fish was reduced. Prior to our finding of *S. stellatus*, appetite reduction among Sakhalin taimen at the Nanae Fish Culture Experimental Station had not been noted. Laboratory examination of Sakhalin taimen did not reveal any parasites other than *S. stellatus* nor any pathological signs. Accordingly it is reasonable to believe that infection of *S. stellatus* was the major cause of the reduction in feeding activity of infected fish.

Copepods were found to be still alive after infected fish were placed in a 3-4% NaCl solution for 30-40 min, indicating that this is not an effective procedure for controlling *S. stellatus*. Thus we manually removed copepods from the buccal cavity of each fish using forceps, changed the water in the raceways, and washed the walls of the raceways using bleach. The efficiency of manual removal of copepods from the host fish is known for *Salmincola salmoneus* (McGladdery and Johnston, 1988) and for *S. californiensis* (Higgins et al., 1993).

Sakhalin taimen have recently been considered as a promising species for aquaculture in Japan (Kimura and Hara, 1989, 1993) and it is possible that *S. stellatus* may be an important pathogen of cultured taimen. In addition, *S. stellatus* has been reported from Sakhalin taimen reared in aquaria (see Nagasawa and Urawa, 1991). However, little is known about *S. stellatus*. There are only four original articles dealing with this species (Markevich, 1936; Kabata, 1986; Nagasawa and Urawa, 1991; present report) and no information is available on its life history. Further studies are needed to understand the biology of this species for control measures and for comparison with the biology of other species of the genus *Salmincola*.

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