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**PARASITE TAG IDENTIFICATIONS OF U.S. PACIFIC NORTHWEST ORIGIN
STEELHEAD CAUGHT IN THE NORTH PACIFIC OCEAN IN 1990**

by

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ABSTRACT

Kidney samples from nine steelhead trout (*Oncorhynchus mykiss*) caught by Japanese research vessels operating in the North Pacific Ocean west of 165°E in 1990 were examined for the metacercarial cysts of the parasite *Nanophyetus salmincola*. This parasite is a naturally occurring "tag", and indicates North American (U.S. Pacific Northwest, from Washington to Northern California and Idaho) origin of steelhead caught on the high seas. Three of the specimens tested positive for the parasite, and the catch locations of the three infected fish (162°53'E, 162°50'E, and 162°29'E) were all further west than the previously known western range limit (163°32'E) set by the recovery of a coded-wire tagged steelhead from the Quinault River, Washington, in 1989. The known range of North American steelhead trout in the North Pacific Ocean was extended westward approximately 1° longitude from 163°32'E to 162°29'E. This information substantiates an unconfirmed western range limit of North American steelhead reported in an earlier document from unpublished data on the capture of a steelhead with a missing adipose fin at 162°28'E in 1986.

INTRODUCTION

Naturally occurring parasite "tags" have been used for stock identification and delineation of the ocean distribution of Pacific salmon (*Oncorhynchus* spp.) for more than thirty-four years (INPFC 1956-1961; Margolis 1963, 1965, 1982; Konovalov 1971; MacKenzie 1983; Bailey and Margolis 1987; Moles et al. 1990). Parasite studies conducted under the auspices of the International North Pacific Fisheries Commission (INPFC) have contributed significantly to our knowledge of the ocean distribution of North American steelhead trout *O. mykiss* (Margolis 1984, 1985; Dalton 1989a,b, 1991). In these studies, *Nanophyetus salmincola* metacercariae were used to indicate the North American (U.S. Pacific Northwest, from Washington to Northern California and Idaho) origin of steelhead caught on the high seas. Juvenile steelhead are infected by *N. salmincola* in freshwater, and the infection continues during their ocean residence. *N. salmincola* is sympatric with steelhead trout only in the U.S. Pacific Northwest (Margolis 1984, 1985; Dalton 1989a,b, 1991).

The known westward limit of the range of North American steelhead trout in the North Pacific Ocean is 163°32'E (Dahlberg et al. 1989). This range limit was defined by the capture at this longitude in 1989 of a coded-wire tagged steelhead from the Quinault River, Washington.

Light et al. (1988) reported that, in 1986, a Japanese research vessel captured an adipose-clipped steelhead of unconfirmed North American origin at 162°28'E. Thus, there may be some question in the literature regarding the western-most limit of North American steelhead distribution.

The purpose of this study was to determine if the naturally occurring parasite "tag" *N. salmincola* could be used to extend the known western range of North American steelhead in the North Pacific Ocean and to confirm the western-most limit of North American steelhead distribution reported by Light et al. (1988).

MATERIALS AND METHODS

The metacercarial cysts of *N. salmincola* are known to concentrate in the posterior one-third of the kidney of infected fish (Dalton 1989a,b, 1991). At the 1989 annual meeting of INPFC, the United States requested from Japan frozen samples of the posterior one-third of the kidney from all steelhead caught during Japanese research vessel operations west of 165°E in 1990. Frozen kidney samples collected on the high seas in 1990 were provided by the Fisheries Agency of Japan, and were examined by scientists at the Fisheries Research Institute, University of Washington.

Sample Analysis

Nine frozen steelhead kidney samples were received in individually sealed plastic bags. A list of these tissue samples is presented in Table 1, along with other pertinent collection information. The samples were kept frozen at 30°F (-1°C) until examined.

All samples were processed according to the methods of Dalton (1989a,b, 1991). Sections of thawed kidney samples were homogenized and squashed between two glass plates (20.3 cm X 10.2 cm X 0.3 cm). The resulting thin layer of tissue was examined under a high intensity halogen light source with a 7-60X binocular microscope. The presence or absence of *N. salmincola* was scored using the conventional symbols of positive (+) and negative (-), respectively. For each negative case, the entire tissue sample was examined. Positive samples were examined only until the infection was considered evident (≥ 1 cyst). Upon completion of each examination, the kidney tissue was placed in a polystyrene dish and refrozen in its original bag. Utensils were thoroughly washed in hot soapy water prior to the analysis of each specimen. On a subsequent date, samples with positive identifications were thawed and reexamined to confirm the presence of *N. salmincola* metacercariae.

RESULTS AND DISCUSSION

Of the nine kidney samples received, three specimens tested positive for cyst presence (Table 1). All infected specimens were collected during the last week of June, 1990, by the Japanese vessel, *Iwaki maru*. The catch locations of the infected fish (162°53'E, 162°50'E, and 162°29'E) were all further west than the previously known western range limit (163°32'E, Dahlberg 1989). These data extend the known western range of North American steelhead in the North Pacific Ocean to 162°29'E. In addition, this information substantiates the unconfirmed western range limit of North American steelhead reported by Light et al. (1988) from unpublished data on the capture of a steelhead with a missing adipose fin at 162°28'E in 1986. The naturally occurring parasite "tag" *N. salmincola* provides an efficient and effective tool for delineation of the ocean range of U.S. Pacific Northwest steelhead trout.

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Table 1. Identification of *Nanophyetus salmincola* in kidney samples of steelhead trout caught by Japanese research vessels west of 165°E in 1990. The presence or absence of *N. salmincola* was scored using the conventional symbols of positive (+) and negative (-), respectively.

Fish. No.	Gear	Month	Day	Vessel Code	Location		Length (mm)	Weight (g)	Gonad (g)	Sex	Sample code	<i>Nanophyetus salmincola</i>
					Lat	Long						
1.	C121	6	17	R17	4256N	15757E	686	3730	40	F	135-11	-
2.	A115	6	24	R17	4355N	16244E	745	3800	21	F	244-11	-
3.	A115	6	26	R17	4450N	16253E	722	3650	24	F	280-11	+
4.	A115	6	27	R17	4456N	16229E	762	4330	22	F	302-25	+
5.	A115	6	28	R17	4556N	16245E	687	4000	42	F	319-21	-
6.	A115	6	29	R17	4657N	16250E	825	6280	11	M	342-21	+
7.	C138	7	4	R17	4758N	16055E	772	4850	8	M	430-27	-
8.	A115	7	5	R17	4657N	15954E	790	5400	35	M	464-28	-
9.	B000	6	9	R36	4331N	16630E	824	6700	18	M	4-26	-

Gear code: A = Commercial salmon gillnet
 B = Salmon longline
 C = Research gillnet
 Numbers indicate gillnet mesh size

Vessel code: R17 = *Iwaki maru*
 R36 = *Etsuzan maru*

Sample code: Data sheet No. - Fish No.