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Attachment of the *Microcotyle sebastis* (Monogenea: Microcotylidae) to the Gills of Black Rockfish, *Sebastes melanops*

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볼락류 *Sebastes melanops* 아가미에 단생 흡충류 *Microcotyle sebastis*의 부착에 관하여

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ABSTRACT

The gills of seven black rockfish, *Sebastes melanops* collected from Hatfield Marine Science Center Aquarium during September 19-October 3, 2001 were examined for parasites attached to the gills. The species of *Sebastes melanops* were *Microcotyle sebastis* based on the number of clamps and testes. The prevalence of 42.9% was recorded for host and fourteen worms of three black rockfish were recovered. Mean intensity of infection of *Microcotyle sebastis* individuals per infected host for black rockfish was 2.0(range 1-11). Monogenea helminth sites were mainly consist of second and third gill arch's filaments of black rockfish. The results revealed that surface area of the 2nd and 3rd pair of gills might affect the distribution of *Microcotyle sebastis*.

Keywords : Black rockfish, *Sebastes melanops*, *Microcotyle sebastis*, Gill arch's filaments

요 약

2001년 9월 19일부터 동년 10월 3일까지 Hartfield Marine Science Center Aquaium에서 구입한 볼락류 *Sebastes melanops* 7마리의 아가미에 부착한 단생 흡충류를 조사하였다. 파악기와 정소 수를 근거로 한 볼락류(*S. melanops*)의 단생 흡충류는 *Microcotyle sebastis*였다. *M. sebastis*의 감염률은 42.9%이었고 감염강도는 1-11(평균 2.0)을 나타내었다. 단생 흡충류의 감염부위는 주로 감염어 아가미의 제 2차와 제 3차 새변이었다. 따라서, 아가미의 제 2차와 제 3차 새변 표면은 *M. sebastis*의 분포에 영향을 끼치고 있음을 알 수 있었다.

I. Introduction

The gill tissue of the fish is an ideal site for parasitic infestation. Any parasites in the water would be carried to the gills during ventilation and thus brought into close contact with them and attachment faciliated (Hughes and Morgan, 1973). Yamaguti (1958) has found members of the genus *Microcotyle* on the Japanese *Sebastodes schlegeli*, and has allocated them to *Microcotyle sebastis* Goto (1894), saying that the framework of the posterior sucker differs from Goto's representation, and that his specimens show indications of lateral branches from the oesophagus, not mentioned by Goto. The survey of rockfish parasites was reported from the Bering Sea by Mamaev (1965).

The monogeneans can be important limiting factors in marine aquaculture because of their direct transmission. They are mostly ectoparasitic animals with no intermediate hosts involved in the life cycle and they all possess a posterior organ of attachment known as the haptor, armed with hooks

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and/or clamps or suckers. They usually have some form of attachment organ at the anterior end.

The general gill lesions include degeneration, tissue damage, haemorrhages, necrosis, atrophy and cell proliferation. The local lesions comprise erosions, endothelial impairment and minor areas of cell degeneration (Hart, 1973; Rhode, 1977). Epithelial thicking is usually followed by fusion of adjacent secondary lamellae, lifting of the epithelium from the basement membrane of the gill filaments and their secondary lamellae, and finally, dissociation of the epithelim (Hanek and Fernando, 1978; Skidmore, 1970).

The present study was to exhibit the spatial distribution of Monogenean helminthes attached on the gills of black rockfish, *Sebastes melanops.*

II. Materials and Methods

Seven specimens of black rockfish (*Sebastes melanops*) were collected on September 19, 2001 in the Hatfield Marine Science Center Aquarium. Alive specimens of black rockfish were transported to the Oregon State University laboratory and the size of the fishes was measured. They were sliced gill and fixed with 10% formalin. The gill arch were separately dissected. These sections were then placed in individual petri dishes in normal saline awaiting examination under the stereomicroscope. With regard to gill arches, sides of hemibranches were designated as anterior and posterior, and each was divided into 3 subequal sections (dorsal, medial, ventral), thus giving 6 subequal sections per gill arch for a total of 48 per fish.

Microcotyle sebastes were mainly isolated from 2nd and 3rd gill arch's filaments of rockfish. *Microcotyle sebastis* were sorted with a micropin under streromicroscope and fixed worms with Ergens method (1969) were cleared with glycerin. The number of testis and clamps were measured with ocular micrometer. The infection status was recorded according to prevalence and intensity.

III. Results

Seven specimens of rockfish were obtained on the September 19, 2001 from the Aquarium in Newport, Oregon and forteen of them were found to have their gills infested with *Microcotyle sebastis.* From seven fishes of black rockfish, 3 (42.9%) of which had diseased gills. The worms are quite small measuring 3.0 to 3.9 mm in length by 0.5 to 0.7 in width (Table 2). Note was made of the exact site of attachment of each parasite to its host. The second pair of gills was the most heavily infested, having 8 paired individuals ; the third

Table 1. Numbers of *Microcotyle sebastis* recovered from each compartment of the gills in rockfish

Compartment	Gill Arches								sum
	Left				Right				
	I	II	III	IV	I	II	III	IV	
Anterior dorsal	0	2	1	0	0	2	1	0	6
Anterior medial	0	1	0	0	0	0	0	0	1
Anterior ventral	0	0	1	0	1	0	0	0	2
posterior dorsal	0	0	0	1	0	2	0	0	3
posterior medial	0	0	0	0	0	1	0	0	1
posterior ventral	1	0	0	0	0	0	0	0	1
sum	1	3	2	1	1	5	1	0	14

Table 2. Comparison of measurements of *Microcotyle* sp.

species	Present	*M. Sebastisci*	*M. sebastis*	*M. tango*
Body length(mm)	3.0~3.9*0.5~0.7	1.7~4.4*0.6~0.7	3.9~4.1*0.6~0.7	1.5~4.1*0.3~0.8
clamps	51~65	29~62	52~56	50~90
Testes	34~46	8~20	36~43	11~24

pair of gills bore 3, the first pair 2, and the fourth pair 1 (Table 1). The parasites were found to be attached with their anterior adhesive organs nearer to the gill arch of the host, and posterior end nearer to the distal end of the primary lamellae. Monogenea were attached in an asymmetrical manner to the gills of the host.

The intensity of infestation varied between 1 and 11 pairs per fish, with an average of 2.0 pairs per fish when including in the total only those fishes which were parasitized. *Microcotyle sebastis* has typical forms with a long tail-like haptor.

IV. Discussion

Worms were collected from the gills of infected black rockfish cultured in Aquatic tank in Oregon. The size of the fishes was measured from the mouth to the tip of the tail fin. *Microcotyle sebastis* was found on the gills filaments. The prevalence showed 42.9% and mean intensity was 2.0. Aaron and Hisao (1973) showed that incidences and intensities of infection of *Microcotyle* sp. harboured 33.3%, 2.3 respectively are commonly encounted parasites of *Sebastes alutus* in the Pacific. The prevalence in this study was considered high.

Gills were excised and gill arches were numbered 1-4 from anterior to posterior. A significant preference for the second and third pair of gills marked affinity for anterior hemibranches of each gill branch. Wooten (1974) showed that a larger volume of water flows marked preference over the second and third gills compared with the first or fourth gills of *Gymnocephalus cernua.* Paling (1968) found in brown trout that most respiratory water flows over the second and third pairs of gills and least respiratory water flows over the last. Benz (1984) reported that in the branchial region, access to blood is easiest via the secondary lamellae because there the respiratory blood sinuses are only one epithelial cell deep.

It can be conjectured, therefore, that the larger volume of water flows and surface area of the second and third pair of gills might affect the distribution of worms resulting higher number of *Microcotyle sebastis* on those two gill pairs.

Suydam (1971) suggested that the direction of the ventilating current may influence the position of Monogenea on the gills. Hughs and Morgan (1973) stated that the degree of gill infestation by ectoparasites is probably related to respiratory volume and the specific pattern of water flow over the hemibranches. Although specimens are united inpairs, the adhesive attitude assumed by each member of a pair appears to be related only to its own site of attachment and the incident current of water. A large parasite would gradually impede the functioning of the gills. Adeney & Hughes (1973) reported a reduction in filament length and fusion between neighbouring filaments in the oceanic sunfish occurs in regions of parasitic attachment.

The location of *Microcotyle sebastis* on the gills of black rockfish revealed that 7 pairs parasitized the right and the left gill chamber respectively. Nine of the pairs of parasites were divided equally between the inner hemibranch of the first gill arch and the outer hemibranch of the second gill arch. Each monogenea and each individual of a pair of *Microcotyle sebastis* was attached to the secondary gill lamellae of either the dorsal or ventral of a primary lamella. There is strong evidence to show that *Microcotyle sebastis* is facultatively asmmetrical either to the left or to the right. Bovet (1959) found the parasite to decrease in number from the first to the fourth pair of gills on *Abramis brama,* the bream, whereas in the present work *Microcotyle sebastis* was most prevalent on the second pair of gills in *Sebastes melanops,* the black rockfish. In studies using glochidia larvae of *Anodon,* Paling (1968) suggested that there is a correlation between total gill area and the degree of infection in experimentally infected trout. According to Hanek and Fernando (1978), monogenea infection is correlated with the distribution of area in the different parts of the gill system and particularly with filament length. Because the gills are among the most delicate structures of the teleost body, one might expect these organs to be frequently involved in these problems. The particular site of infection was noted, i.e. left or right of the fish, serial number of the gill arch, position on the gill arch, inner or outer hemibranch, and dorsal, ventral, or lateral surface of primary lamellae.

The asymmetrical disposition of the clamps in the monogena has been utilized in the diagnoses of

certain species. The family Microcotylidae (Monogenoidea) has typical forms with a long tail-like haptor. Recognition of the genera are characterized by the number of clamps and testes. The species of *Sebastes melanops* were *Microcotyle sebastis* in view of the structure of the framework of the posterior suckers (clamps) on the haptor.

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