

Distribution of *Trochopus australis* and *Neobrachiella robusta* in Gills of Darkblotched Rockfishes, *Sebastes crameri*

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볼락류 *Sebastes crameri* 아가미에서 검출된 단생흡충류인 *Trochopus australis*와 요각류인 *Neobrachiella robusta*의 분포도

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ABSTRACT

Seventeen metazoan parasites were recovered from *Sebastes crameri* collected from Newport fish market. Nine *Trochopus australis* and 8 *Neobrachiella robusta* were found on gill arches of canary rockfishes. The commonest sites of metazoan parasites were the posterodorsal region and second gill arches of *Sebastes crameri*. *T. australis* were most commonly found on the second gill arches, but in *N. robusta*, the first gill arches were the most frequented position. No *N. robusta* were discovered on the fourth gill arch. Metazoan parasites infected gill arches I, II, and posterodorsal regions of *S. crameri*, occurring less frequently on the gill arches III, IV, anteriorventral and middle regions.

Keywords: Distribution, Gill arch, *Trochopus trituba*, *Neobrachiella robusta*, *Sebastes crameri*

요 약

뉴포트 어시장에서 채집한 볼락류인 *Sebastes crameri*로부터 17개체의 아가미 기생물을 발견하였다. 그중 9개체는 단생흡충류인 *Trochopus australis*이고 나머지 8개체는 요각류인 *Neobrachiella robusta*였다. 이 기생물의 가장 많이 발견되는 부위는 볼락류의 제 2 아가미새궁과 배측 후부였다. 단생류인 *T. australis*는 주로 제 2 아가미새궁에서, 요각류인 *N. robusta*는 제 1 아가미새궁에서 발견되었으나 요각류는 제 4 아가미새궁에서는 발견되지 않았다. 이번 연구에서 기생물의 아가미 부착은 주로 제 1, 2 새궁의 배후측에, 그러나, 제 3, 4 아가미새궁의 전복측과 중앙에는 적게 분포되어 있었다.

I. Introduction

A knowledge of the detailed distribution from the adhesive organs of parasites is necessary in order to understand the mechanism of attachment. Workers have reported differential spatial distributions of monogenean trematodes and parasitic copepods on certain parts of the gill apparatus of their hosts.^{1,2)} Copepods are capable of parasitizing the fishes directly and some monogenean trematodes

constitute a serious problem in fish populations. Both monogenean trematodes and parasitic copepods can quickly increase on fish under favorable temperature conditions.³⁻⁵⁾

Damage can be inflicted to the gills by attachment of parasites such as monogenean trematodes and copepods. It depends on the mode of attachment and on the site of predilection of the metazoan parasites. This paper provides information regarding distribution of gill parasites from *S. crameri*.

II. Materials and Methods

Darkblotched rockfishes were transported to the

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laboratory for examination. Alive specimens, whole mounts, and sections were studied by standard parasitological techniques. Hosts measurements were in millimeters. Fish hosts were fixed and stored in 8% formalin. The gills of host fish were excised and each arch was removed to an individual container of tap water. Monogenean trematodes and parasitic copepods were removed from the fresh gills and fixed in 70% ethanol. Worms were observed under a stereomicroscope at magnification of 50x.

The number of parasites in each region of gill arches was recorded. The sites of attachment of each metazoan parasites were recorded in respect of three parameters : (1) anterior-ventral, (2) middle, (3) postero-dorsal region. Gill arches were numbered from 1-4 anteroposteriorly. The nomenclature used for the metazoan parasites in this paper was based on Beverley-Burton *et al.*⁶⁾ and Berland.⁷⁾ Scientific and common names of rockfishes conformed to the guide to Northeast Pacific rockfishes.⁸⁾

III. Results

In this study, 10 *Sebastes crameri* were examined and 4 found parasitized. Metazoan parasites were ranged from 1 to 7 worms in infected *S. crameri*. The hosts measured from 31.5 to 35.8 cm in length. *Trochopus australis* Sekerak and Arai, 1977 and *Neobrachiella robusta* Wilson, 1912 were attached to the gill arches of *Sebastes crameri* Jordan. As many as 17 of metazoan parasites were occurred on the gill arches of *Sebastes crameri*. The numbers of metazoan parasites were 6 first, 7 second, 3 third, and 1 fourth gill arches. A total of 9 *T. australis* were recovered, and 6 of these were found on the posterodorsal region, two were on the anteriorventral region. Only one of *T. australis* was found on the middle region of gill arches. Eight *N. robusta* were found on the gill arches of *S. crameri*. Four were attached on the posterodorsal region of gill arches I, III. Two were attached on the anteriorventral region of gill arches I, II, and the rest two were found on the middle region of the second gill arches.

The second gill arches were more heavily infected, 41.2% carried 7 metazoan parasites. Fourth gill arch of *S. crameri* was carried only one monogenean

trematode. The sites of predilection in metazoan parasites were the posterodorsal region of second gill arches. *T. australis* and *N. robusta* occurred most often on gill arches I, II, and III. The third and fourth gill arches of *S. crameri* were less frequently infected, usually with one or two worms. In the distribution of *N. robusta*, first gill arches were the dominant sites, followed by second and third gill arches. No copepoda was found on fourth gill arches of hosts. Middle region in second gill arches carried two worms of *N. robusta*.

IV. Discussion

Four *Sebastes crameri* from Newport fish market were infected with at least one parasitic species. Two species of metazoan parasites were recovered and occurred in gill arches. *T. australis* and *N. robusta* were a conspicuous metazoan parasites attached on the gill arches. The metazoan parasites occurred on the second gill arches. The first gill arches received the next greatest volume and the fourth the least. 76.5% of the attached worms occurred on the first and second gill arches. In *T. australis*, the second gill arch was the most heavily infested, and half of *N. robusta* were attached to the first gill arch. The first gill arch of *N. robusta* was the most heavily infested site. Llewellyn⁹⁾ indicated that the parasites of seven of eleven species of fishes exhibited a site specificity for particular gill arches.

In this study, site specificity was indicated for the posterodorsal regions of the first and second gill arches. Frankland¹⁰⁾ found that monogenea from *G. virens* was more prevalent on the inner surfaces of first gill arches. Wiles¹¹⁾ reported that *Diplozoon paradoxum* occurred most often on the first and second gill arches in the bream. The direction of the ventilating current and the position of the hemibranchs during respiration may influence the position on metazoan parasites on the gills. The numbers of *T. australis* on gill arches ranged from 1 to 4. The *N. robusta* ranged from 0 to 4 on gill arches. The largest number of gill arches in metazoan parasites was 10 of posterodorsal region. Posterodorsal region of gill arches were more frequently infected with *T. australis* and *N. robusta*.

Posterodorsal region of gill arches was a dominant site, but none had on fourth gill arches. *N. robusta* on first gill arches were present in larger numbers

Table 1. Occurrence of *Trochopus australis* and *Neobrachiella robusta* in *Sebastes crameri*.

Parasites		Body location	No. of parasites(%)
Monogenea	<i>T. australis</i> Sekerak and Arai, 1977	Gills	9(52.8)
Copepoda	<i>N. robusta</i> Wilson, 1912	Gills	8(47.6)

Table 2. Distribution of metazoan parasites on the gill arches in *S. crameri*.

Gill arch	Position			Total
	A	M	P	
1	3	-	3	6
2	1	2	4	7
3	-	-	3	3
4	-	1	0	1
Total	4	3	10	17

A: anterior-ventral region, M: middle region, P: postero-dorsal region.

Table 3. Distribution of *T. australis* on the gill arches of *S. crameri*.

Gill arch	Position			Total
	A	M	P	
1	2	-	-	2
2	-	-	4	4
3	-	-	2	2
4	-	1	-	1
Total	2	1	6	9

A: anterior-ventral region, M: middle region, P: postero-dorsal region.

Table 4. Distribution of *N. robusta* on the gill arches of *S. crameri*

Gill arch	Position			Total
	A	M	P	
1	1	-	3	4
2	1	2	-	3
3	-	-	1	1
4	-	-	-	0
Total	2	2	4	8

A: anterior-ventral region, M: middle region, P: postero-dorsal region.

than second gill arches. *N. robusta* was found as a light infection on the third gill arch of *S. crameri*. Llewellyn⁹⁾ has shown that the flow of water across the gills of some teleost fishes is strong enough to have a profound influence on the adhesive attitudes of gill parasites. The purpose of this study was to further investigation the distribution of monogenean trematodes and parasitic copepods on the gills of *S. crameri*.

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