Two Species of Capsalid Monogeneans Infecting Cultured Humpback Grouper *Cromileptes altivelis* in Indonesia

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Gondol Research Station for Coastal Fisheries located in Bali has succeeded in seed production of humpback grouper *Cromileptes altivelis* in cooperation with the Japan International Cooperation Agency (JICA). In recent years, seed production of the fish encountered a problem of ectoparasitic diseases in broodstock, especially by so-called skin flukes belonging to the family Capsalidae. The infected fish exhibited opaque eyes, excessive mucus on the body surface and anorexia. Capsalid monogeneans were collected from fish body surface or eyes. They comprised two species, which were apparently different in size. In this study, identification of the parasites were made, with some notes on their occurrences on the host.

Materials and Methods

Humpback grouper (body weight: 0.2–2.5 kg) collected from the sea in Indonesia and kept for 0–3 years in concrete tanks at the Station were examined for this study. The parasites were sampled by scraping the body mucus or dipping the fish in freshwater for a few minutes. Sampled parasites were fixed in AFA, a mixture of 70% ethanol, formalin and acetic acid, and stained with alum carmine, dehydrated in graded alcohol series, and finally cleared in xylol. Some extra specimens were fixed in a mixture of saturated ammonium picrate and

glycerin for observation of opisthohaptoral sclerites. Ten specimens of each species were measured for the range and the mean $\pm$ standard deviation.

Results and Discussion

The capsalids were composed of two species; one possessing a vagina (Fig. 1) and the other lacking. The vagina-present parasite, apparently representing a species of the genus *Benedenia*, was 1.8–3.3 (2.8 ± 0.5) mm in length. Measurements of other body parts were given in Table 1. The most distinguished morphological feature was the presence of a flap-like structure close to the genital opening (Fig. 1). Such structure has been known only for a few species of *Benedenia*¹⁾. It was identified as *B. epinepheli* from the presence of the flap and general morphology. The size of each organ in the parasite was quite equivalent to that described by Ogawa *et al.*¹⁾ except the accessory sclerites and hamuli; accessory sclerites and hamuli of the present parasite were slightly larger than those in their description, but more similar in size to *Benedenia* sp. reported by Tsutsumi and Ito (1965)²⁾, a synonym of *B. epinepheli*¹⁾. This means that these structures are variable in size.

The vagina-lacking parasite, 3.3–6.1 (4.6 ± 0.7) mm in length, belonged to the genus *Neobenedenia*. It was similar to *N. girellae* reported by Ogawa *et al.*³⁾ in the sizes of almost all organs (Table 1). Ogawa *et al.*³⁾ pointed out a difference in the size of anterior hamulus between *N. girellae* and the type specimens of *N. melleni*. The latter had conspicuously large anterior hamuli compared with *N. girellae*. The ratio of the anterior hamulus length to the accessory sclerite length in our samples was 1.6 and 1.5 in Ogawa *et al.*³⁾, but 1.7–2.2 in *N. melleni* (see Figs. 1a and 3 a–c in Whittington and Horton)⁴⁾. From these results, it was concluded that these capsalids infecting humpback grouper consisted of *B. epinepheli* and *N. girellae*.

The presence or absence of vagina was not easy to

Fig. 1. Anterior part of live *Benedenia epinepheli* collected from *Cromileptes altivelis* in Indonesia. Note the presence of vagina (V) and flap-like structure (F). Bar = 0.5 mm.

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Table 1. Comparative morphometrics of *Benedenia epinepheli* and *Neobenedenia girellae*

	<i>Benedenia epinepheli</i>			<i>Neobenedenia girellae</i>		
	Ogawa <i>et al.</i> ¹⁾	present study		Ogawa <i>et al.</i> ³⁾	present study	
1a ^{*1}	1.5 –3.1 ^{*2}	1.8	–3.3 ^{*2} (2.8 ± 0.5) ^{*3}	3.6 –5.6 ^{*2}	3.3 –6.1 ^{*2}	(4.6 ± 0.7) ^{*3}
1b	0.78 –1.58	0.82	–1.63 (1.4 ± 0.3)	1.8 –3.1	1.8 –3.7	(2.6 ± 0.5)
2a	0.43 –0.70	0.48	–0.70 (0.61 ± 0.08)	0.8 –1.3	0.9 –1.3	(1.1 ± 0.1)
2b	0.40 –0.75	0.42	–0.64 (0.55 ± 0.08)	0.7 –1.4	0.9 –1.2	(1.0 ± 0.1)
3a	0.16 –0.32	0.20	–0.36 (0.28 ± 0.05)	0.28–0.48	0.38–0.54	(0.44 ± 0.05)
3b	0.19 –0.37	0.20	–0.36 (0.29 ± 0.04)	0.32–0.55	0.34–0.52	(0.41 ± 0.05)
4a	0.040–0.086	0.080–0.128	(0.10 ± 0.01)	0.12–0.21	0.15–0.23	(0.19 ± 0.03)
4b	0.062–0.100	0.104–0.152	(0.12 ± 0.02)	0.18–0.37	0.26–0.34	(0.31 ± 0.02)
4c	0.044–0.070	0.048–0.088	(0.07 ± 0.01)	0.08–0.14	0.07–0.13	(0.11 ± 0.01)
4d	–	0.02 –0.04	(0.03 ± 0.006)	0.04–0.07	0.04–0.06	(0.05 ± 0.009)
5a	0.13 –0.34	0.12	–0.20 (0.17 ± 0.03)	0.36–0.55	0.28–0.44	(0.35 ± 0.06)
5b	0.17 –0.38	0.18	–0.28 (0.24 ± 0.04)	0.41–0.72	0.42–0.62	(0.52 ± 0.06)
6a	0.09 –0.20	0.12	–0.28 (0.19 ± 0.05)	0.18–0.38	0.20–0.40	(0.27 ± 0.06)
6b	0.14 –0.37	0.18	–0.30 (0.23 ± 0.05)	0.25–0.50	0.28–0.44	(0.34 ± 0.05)
7	0.10 –0.41	0.14	–0.40 (0.28 ± 0.08)	0.38–0.80	0.26–0.48	(0.37 ± 0.09)
8a	0.10 –0.12	0.10	–0.15 (0.13 ± 0.01)	0.12–0.16	0.15–0.16	(0.16 ± 0.003)
8b	0.09 –0.11	0.08	–0.12 (0.10 ± 0.01)	0.10–0.15	0.13–0.15	(0.14 ± 0.01)

^{*1} Parameters: 1a and 1b, body length and width; 2a and 2b, haptor length and width; 3a and 3b, anterior attachment disc length and width; 4a, accessory sclerite; 4b, anterior hamulus length; 4c, posterior hamulus length; 4d, marginal membrane of haptor width; 4e, marginal hook length; 5a and 5b, pharynx length and width; 6a and 6b, ovary length and width; 7, testes length; 8a and 8b, egg length and width.

^{*2} Range in mm,

^{*3} Mean ± standard deviation in mm.

confirm. The features of accessory sclerites and hamuli were more useful to distinguish the two species, although they were sometimes impractical for identification because of their wide variations of the morphology. However, the two species could be separated from each other not only by the opisthohaptoral sclerites, but also by the size and shape of the body; *B. epinepheli* had a relatively smaller body but a larger opisthohaptor compared to the body proper than *N. girellae*.

The parasite infections were often involved in the mixture of the two species, or purely *N. girellae*. The number of *N. girellae* was approximately between 200 and 600 on fish of 350 to 450 g in body weight. Among the other fish species reared at the Station, coral trout *Plectropomus leopardus* was sensitive to both species, while Napoleon fish *Cheilinus undulatus* was not to any of the species.

Neobenedenia girellae has been reported world-widely from subtropical and tropical areas³⁾. This parasite demonstrates very low host specificity, and several species of groupers are known as hosts. Therefore, the appearance of *N. girellae* on humpback grouper in Indonesia is anticipatory. On the other hand, *B. epinepheli* has been reported from 25 marine fish species in five orders at several localities in Japan¹⁾, but there has been no record from any tropical countries. This is the first report of *B. epinepheli* from the tropical area.

Heavy infection of *B. epinepheli* and *N. girellae* caused not only haemorrhagic and abrasive lesions, but also mortalities in cultured marine fish^{1,3)}. Contrary,

mortalities of humpback grouper associated with these parasitic infections rarely occurred in the Station, and even severely affected fish did not show any haemorrhagic or abrasive lesions on the body surface. However, heavy infections with the two monogeneans on the body surface and fins characteristically caused excessive body mucus and lost appetite. Additionally, *N. girellae* could infect the eyes, causing opaque eyes and blindness. From this point of view, *N. girellae* seemed to be more pathogenic to humpback grouper in comparison with *B. epinepheli*.

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