

NOTES ON THE SEXUAL DIMORPHISM IN THE GENITAL PAPILLA OF SEA URCHINS¹⁾

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The sexual difference of the genital papilla was observed in the four species of sea urchins collected at Asamushi. The genital papillae of *Glyptocidaris crenularis* are remarkably long in male and a stumpy or flat swell in female. In *Temnopleurus hardwicki* the genital papilla of the male is a short conical protuberance and that of the female is a flat swell laying in a dish-like depression. In *Strongylocentrotus intermedius* and *Strongylocentrotus nudus* the genital papilla of the male is a nipple-like cone, whereas that of the female is a small bulge appearing sometimes on the body surface.

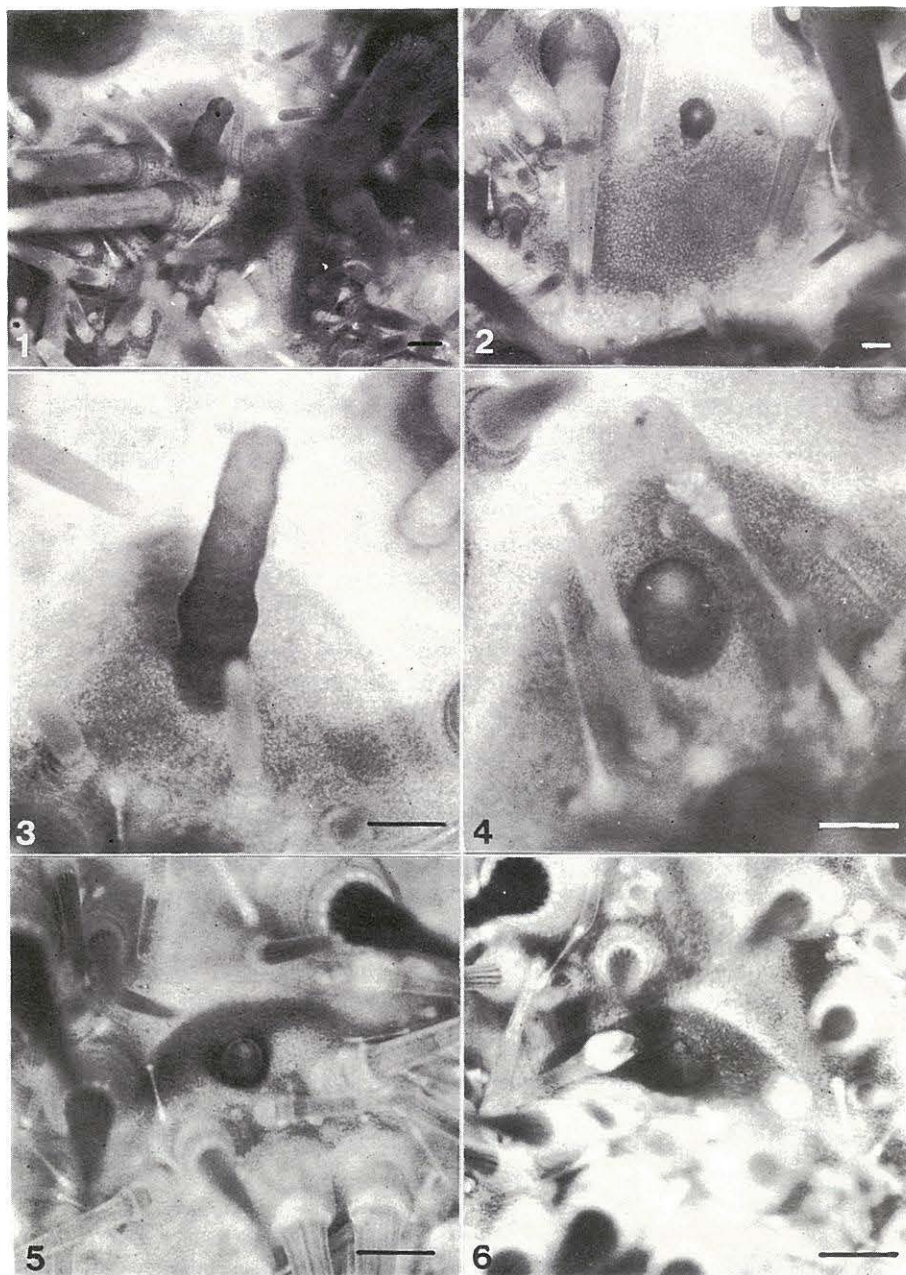
The sexual differences in the shape of the genital papilla were first found in European sea urchins (HAMANN 1887, cited from TAHARA *et al.* 1958). TAHARA, OKADA and KOBAYASHI (1958, 1960) observed the sexual dimorphism in the eleven species of the sea urchins collected from southern Japan. They classified these species into the two types according to the characteristics of the secondary sexual character in the shape of the genital papilla. *Anthocidaris crassispina*, *Hemicentrotus pulcherrimus*, *Mesipilia globulus*, *Pseudocentrotus depressus*, *Temnopleurus toreumaticus* and *Texopneustes pileolus* belong to the Mesipilia type, in which the genital papilla of the male is a short conical protuberance and that of the female is flat and sinks below the body surface. In the second type, the Tripneustes type, the genital papilla of the male forms a long tube, whereas that of the female is a short and stumpy protuberance. *Diadema setosum*, *Echinocardium cordatum*, *Echinometra mathaei*, *Echinostrephus aciculatus* and *Tripneustes gratilla* belong to the second type. The present report deals with the sexual difference of the genital papilla in the four species of the sea urchins which were not described by TAHARA *et al.* (1958, 1960). These species are common in northern Japan and used frequently for embryological studies at the Asamushi Marine Biological Station, Tohoku University.

MATERIALS AND METHODS

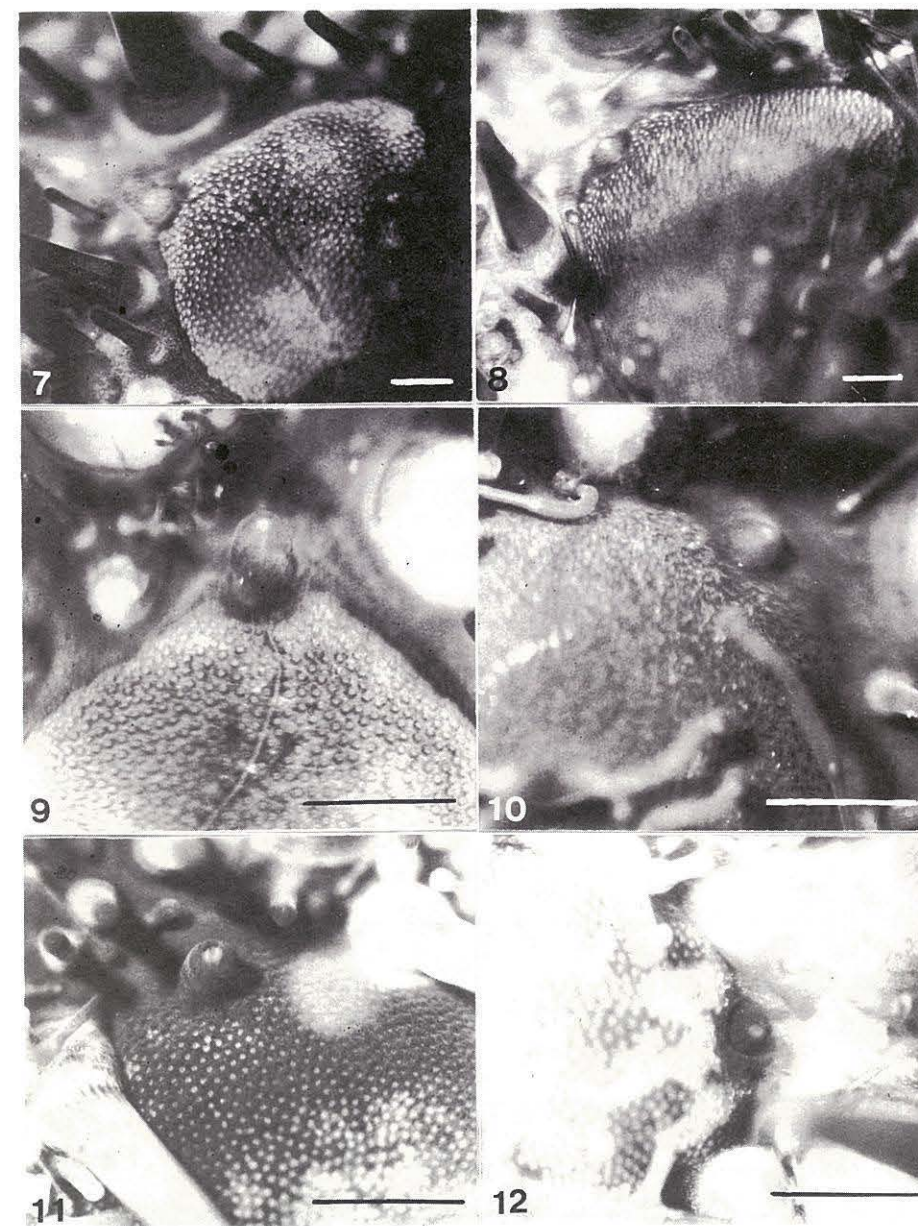
The sea urchins, *Glyptocidaris crenularis* A. AGASSIZ, *Strongylocentrotus intermedius* (A. AGASSIZ), *Strongylocentrotus nudus* (A. AGASSIZ) and *Temnopleurus*

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Figs. 1-4. Genital papillae of the male (1 and 3) and the female (2 and 4) of *Glyptocidaris crenularis*. Figs. 5 and 6. Genital papillae of the male (5) and the female (6) in *Temnopleurus hardwickii*. The bars indicate 1 mm in length.



Figs. 7-10. Genital papillae of *Strongylocentrotus nudus*; Fig. 7: living male specimen, Fig. 8: living female specimen, Fig. 9: fixed male, Fig. 10: fixed female. Figs. 11 and 12. Genital papillae in the fixed specimens (the male in Fig. 11 and the female in Fig. 12) of *Strongylocentrotus intermedius*. The bars indicate 1 mm.

hardwicki (GRAY) were collected at Asamushi, Aomori Prefecture. The sex of the examined specimens was determined by observing discharged gametes. The spawning was artificially induced by injecting 0.5M potassium chloride solution into the body cavity. The living specimens were examined under the stereo-microscope. Some specimens were fixed with 10% formalin-seawater solution to take photographs.

OBSERVATION AND CONSIDERATION

In the male of *Glyptocidaris crenularis*, the genital papilla is a long penis-like projection, 3–4 mm in length and 0.8–1 mm in width. The genital papilla of the female is a stumpy or flat swell. A circular groove surrounds the swell because the base of the genital papilla sinks below the body surface.

In *Strongylocentrotus intermedius* the genital papilla protrudes on the body surface, forming a somewhat elongated cone. The height of the cone is longer than the width of its base (0.3–0.5 mm). In the female a deeper groove surrounds the base of the genital papilla, which is a small bulge and appears sometimes on the body surface.

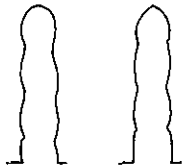
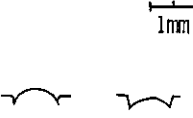






SPECIES	MALE	FEMALE
GLYPTOCIDARIS CRENULARIS		
STRONGYLOCENTROTUS INTERMEDIUS		
STRONGYLOCENTROTUS NUDUS		
TEMNOPLEURUS HARDWICKI		

Fig. 13. Schema representing the sexual difference of the shape of the genital papilla in the four sea urchin species examined.

The genital papillae of *Strongylocentrotus nudus* are similar to those of *S. intermedius*. The genital papilla of the male is a nipple-like cone. The height of the cone (about 0.6 mm) is somewhat longer than the width (about 0.5 mm). In the female the genital papilla is a flat swell which is surrounded by a circular

groove. The height of the swell is smaller than its radius.

In *Temnopleurus hardwicki*, the genital papilla is a conical or hemispheric protrusion. The height of the protrusion is longer than its radius. The genital papilla of the female is a flat swell laying in a dish-like depression. The height of the swell is smaller than its radius.

The shape of the genital papilla in the four species examined is schematized in Fig. 13. The genital papilla of the *Glyptocidaris* male is longer than that of the other species. On the other hand, the genital papilla of *Temnopleurus hardwicki* is shortest among the four species. The genital papilla of the female in the *Strongylocentrotus* species is shorter than that in *Glyptocidaris*, but longer than that in *Temnopleurus*. The genital papilla of the *Strongylocentrotus* female protrudes often on the body surface. Thus, the *Strongylocentrotus* species seems to be an intermediate type in the sexual difference of the genital papilla.

REFERENCES

- TAHARA, Y., M. OKADA and N. KOBAYASHI 1958 Secondary sexual characters in Japanese sea-urchins. Pub. Seto Mar. Biol. Lab., 7: 165–172.
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