

## 5. Notes on the Epifauna on the Shells of Living *Nautilus* from Fiji

by

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### Introduction

It has been well known that the drifted *Nautilus* shells frequently have some sedentary organisms attached to their external surfaces, such as barnacles, corals, bivalves, and annelids (HAMADA, 1964, 1983; HAYASAKA and SUZUKI, 1988). It has been recorded that the sedentary animals also adhered to the shells of *Nautilus* in living state. HAMADA (1964) reported in detail the epifauna on the drifted shells and estimated their origin. It was also recorded that the sedentary animals adhering to live shells are foraminifers, bryozoans, serpulid annelids, and acorn or stalked barnacles (HAMADA, 1983). The epifauna on the drifted shells of *Nautilus* is noticeable as an indicator of origin of the shells, drifting route and its distance, and the length of time before washed ashore. On the other hand, it is considered that the epifauna on the live shell indicate the migratory behavior within the habitat of *Nautilus*.

During the field study on the habitat of *Nautilus pompilius* in Fiji in 1986, some specimens were observed to have adhering organisms on the external surfaces of shells. In this article, the results of observation on the epifauna on the shell surfaces of living *Nautilus* from Fiji are described.

### Epifauna

Many chambered *Nautilus* were captured by trapping during the field work in 1986 (see "The Trapping Experiment" in this volume). Among the 222 specimens captured, randomly selected 55 specimens were brought to Japan. Among them, 33 shells (60% of the brought specimens) have a few kinds of epifauna attached to their external surfaces. These shells are quite variable in size (maximum diameter).

Living specimens from Tañon Strait, the Philippines, have a rich epifauna including dense colonies of bryozoans, while those from New Caledonia are reported to have poor epifauna with small stalked barnacles and slender serpulid worms

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(HAMADA, 1983; HAMADA and JECOLN, 1981). Paucity of attached animals were also observed on the specimens captured in this survey. The epifauna examined was represented by four genera belonging to three phyla and three families (Table 1).

### 1) Bryozoans

Bryozoans were observed adhering to most of the examined specimens. Small colonies of *Berenicea* sp. were found on 25 shells of the examined specimens (Pl. 17, figs. a and b). 60% of the specimens having epifauna show attachment only of bryozoans. The other seven specimens have some other sedentary animals besides bryozoans.

### 2) Serpulid annelids

Two serpulid annelids, *Spirorbis* sp. and *Spirobranchus* sp., were found on 9 *Nautilus* shells among the examined specimens. One of them has only *Spirobranchus* sp. *Spirorbis* sp. is a small serpulid with a coiled tube and *Spirobranchus* sp. is a large serpulid with a nearly straight tube (Pl. 17, figs. c and d). To attach on the surface of shells in living state must be more difficult for serpulid worms than for bryozoans.

Table 1. Matrix of number of specimens having epifauna and list of adhering animals. Numerals in parentheses indicate the percentage.

	Bryozoans	Serpulids		Stalked Barnacle
	<u>B.</u> sp.	<u>S.</u> sp.	<u>S.</u> sp.	<u>P.</u> sp.
Bryozoans <u>Berenicea</u> sp.	18 (60)	2 (7)	1 (3)	1 (3)
Serpulids <u>Spirorbis</u> sp.				
<u>Spirobranchus</u> sp.			1 (3)	2 (7)
Stalked Barnacle <u>Poecilasma</u> sp.				5 (17)

Three specimens were attached by all animals.

Table 2. Matrix of number of specimens in each position of the shell surface attached by each animal. Numerals in parentheses indicate the percentage.

	Bryozoans					Serpulids					Stalked Barnacle				
	Um	Ve	U1	L1	Cm	Um	Ve	U1	L1	Cm	Um	Ve	U1	L1	Cm
Um	13 (52)					5 (56)					1 (9)	1 (9)			
Ve		2 (8)			1 (4)							9 (82)			
U1			2 (8)					4 (44)							
L1				1 (4)											
Cm					6 (24)										

Um; inside of umbilicus,  
 Ve; ventral edge of shell,  
 U1; upper part of lateral surface of shell,  
 L1; lower part of lateral surface of shell,  
 Cm; black chitinous membrane

### 3) Stalked barnacles

About one thirds of the specimens have small stalked barnacle, *Poecilasma* sp., attaching to the shell surfaces (Pl. 17, figs. e and f). Five specimens have attachment only of stalked barnacle. It has been known that this stalked barnacle is distributed in the water ranging from 19 m to 1958 m in depth and adheres to the outer skeleton of a giant spider crab, *Macrocheira kaempferi*. The larvae of this stalked barnacle are capable of settling within a wide depth range and may attach easily upon the surface of shells in living state.

### Attachment Positions of Epifauna

Each sedentary animal seems to have preference for attachment position on the *Nautilus* shells (Table 2). Bryozoan colonies were found everywhere on the shells, but both serpulid worms and stalked barnacles have tendencies to adhere to a certain limited site.

About a half (52 %) of the specimens have *Berenicea* sp. attaching to inside of umbilicus of the shells. *Berenicea* colonies were also observed adhering to the shell surface with the black chitinous membrane behind a soft body (Pl. 17, fig. b) in one fourths of the specimens having *Berenicea* colonies. It is noticeable that this bryozoan could enter into the space between soft body and shell in living state. Both serpulid worms, *Spirorbis* sp. and *Spirobranchus* sp., have a tendency to cling to the inside of umbilicus similarly to bryozoan and to the upper part of lateral surface of shells as reported by HAMADA (1983). On the

other hand, the stalked barnacles have a tendency to attach to the ventral margin of the *Nautilus* shells as shown in Table 2.

The positions inside or near umbilicus of the *Nautilus* shell may be suitable for attachment of epifauna larvae, because of rather rough surface of the umbilical area in comparison with the surfaces of the other parts.

As mentioned above, it may be useful to study the epifauna and its larval ecology for clarifying indirectly the ecology and taphonomy of *Nautilus*. For the future, it may be necessary to study the depth, area and processes of larval settlement of epifauna on the *Nautilus* shells.

### References

- HAMADA, T., 1964: Notes on the drifted *Nautilus* in Thailand. *Sci. Pap. Coll. Gen. Educ., Univ. Tokyo*, 14(2), 255-278, pls. I-V.
- , 1983: Preliminary report on some *Nautilus* drifts and the epifauna on *Nautilus* shells in a living state from the Tañon strait, the Philippines. *Kagoshima Univ. Res. Center S. Pac., Occasional Papers*, (1), 36-39, pls. 3-5.
- and JECOLN, 1981: *Nautilus* studies in Japan. *Recent Progr. Nat. Sci. Japan*, 6, 95-99.
- HAYASAKA, S. and SUZUKI, H., 1988: Notes on the drifted *Nautilus* shells in Yap, the Caroline Island. *Prof. T. KOTAKA Mem. Vol.* (in Press).

Plate 17

### Explanation of Plate 17

- Fig. a. Close-up of the inside of umbilicus to show the scattered bryozoan colonies.
- Fig. b. Dorsal view of the shell showing the distribution of the bryozoans on the black chitinous membrane.
- Fig. c. Serpulid worms with small coiled tube inside of the left umbilicus.
- Fig. d. *Spirobranchus* tube and the scattered bryozoans inside of the right umbilicus.
- Fig. e. Lateral view of the shell with the stalked barnacles on the ventral edge.
- Fig. f. Ventral view of the shell showing the attachment of *Poecilasma* barnacles on the edge.

