

TRANSACTIONS
OF THE
ROYAL SOCIETY OF NEW ZEALAND

ZOOLOGY

VOL. 7

No. 5

16 SEPTEMBER 1965

Ecological Variation of *Chlamys dieffenbachi* (Reeve)
(Mollusca, Lamellibranchiata)

By A. G. BEU,

Geology Department, Victoria University of Wellington

[Received by the Editor, 13 April 1965.]

Abstract

Chlamys dieffenbachi shows its typical spiny sculpture only when enclosed in sponge. The form known as *suprasilis* Finlay is shown to be the phenotype assumed by *dieffenbachi* when it lives in the much less common unenclosed condition. A large specimen of *Chlamys zeelandona* (Hertlein) is also recorded from a sponge. The relationship between the sponge and the lamellibranch appears to be one of mutualism.

INTRODUCTION

DELL (1963: 172) has recently shown that the form of *Chlamys* known since 1928 as *C. celator* Finlay should bear the name *C. dieffenbachi* (Reeve, 1853). For several years the writer has been accumulating specimens of *Chlamys* from Wellington Harbour, where *dieffenbachi* is by far the most common species. About 60 Wellington specimens were examined for this study. Among these are a few specimens which exhibit the characters of *C. suprasilis* Finlay over the early part of the disc, but later change to the sculpture of *dieffenbachi*. Investigation of these specimens lead to this note.

Genus CHLAMYS Roeding, 1798

Type species (by subsequent designation, Hermannsen, 1846): *Pecten islandicus* Mueller, Pleistocene to Recent, circum-Boreal.

Chlamys dieffenbachi (Reeve, 1853). Pl. 1, Figs. 1-10.

1853. *Pecten dieffenbachi* Reeve, Conch. Icon. spec. 88.

1913. *Pecten zelandiae gemmulatus* Suter, Man. N.Z. Moll.: 878 (not *gemmulatus* Reeve, 1853).

1928. *Chlamys celator* Finlay, Trans. N.Z. Inst. 59(2): 268; Pl. 42, figs. 49, 50.

1928. *Chlamys suprasilis* Finlay, Trans. N.Z. Inst. 59(2): 269; Pl. 43, figs. 52-55.

1948. *Chlamys suprasilis crepusculi* Fleming, Trans. Roy. Soc. N.Z. 77: 77, Pl. 7, figs. 1-3.

1963. *Chlamys dieffenbachi* (Reeve). Dell, Trans. Roy. Soc. N.Z., Zoology 3(17): 172; Pl. 1, fig. 3.

Published by the Royal Society of New Zealand, c/o Victoria University of Wellington, P.O. Box 196, Wellington.

Sponges washed up on beaches along the eastern side of Wellington Harbour often contain a single double-valved specimen of *Chlamys*, with the valves joined by the resilium. The specimens are large for the species (up to 48 millimetres high) with well-preserved long spines on the main ribs and many prickly subsidiary ribs, and often contain the dead animal. Specimens washed up free of enclosing sponges are single valves with the spines worn off. The sponge is therefore considered to be the normal habitat of this form. The shells agree well with Dell's (1963: Pl. 1, fig. 3) figure of the type of *dieffenbachi* (Reeve), with Finlay's (1928: 268, Pl. 42, figs. 49, 50) figures and description of *celator*, and with specimens of this form from southern New Zealand. The Wellington specimens have been identified as *celator* for many years, although Powell has never listed this species from the Cookian Province in his checklist (e.g., 1961: 118).

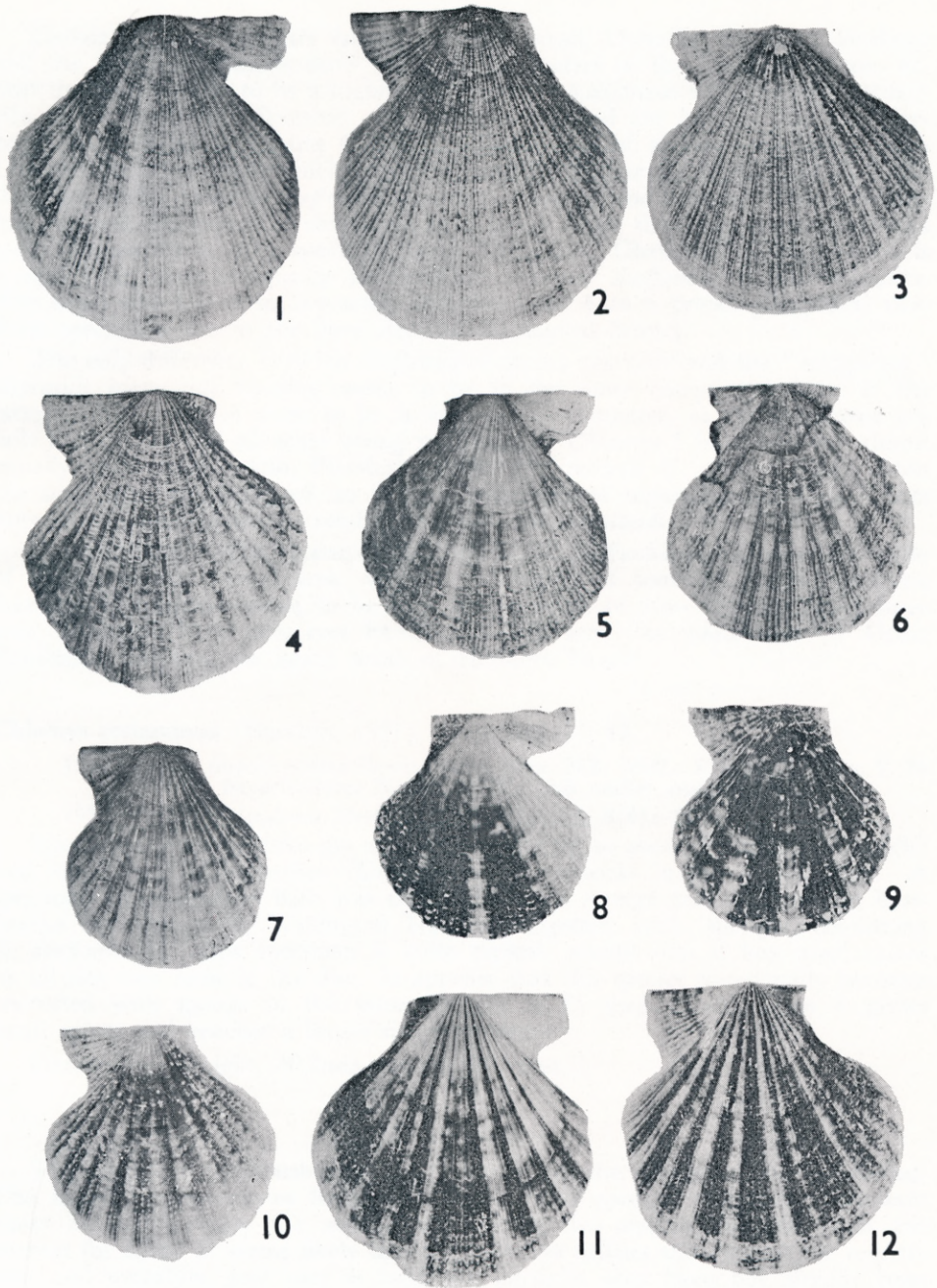
The width of the ribs is very variable on these specimens. A few have narrow, high ribs with a triangular cross-section, about 20% have broad rounded main ribs with broad scales rather than spines, and most specimens are intermediate between these extremes. The intermediate forms are typical *dieffenbachi* and agree with Finlay's figures of *celator*. The broad-ribbed specimens agree with Finlay's (1928: Pl. 43, fig. 55) figure of the variety of *suprasilis* having many interstitial ribs. Most Wellington specimens of *dieffenbachi* have a small area near the umbo which is devoid of spines, and this extends over half to two-thirds of the disc on about 5 per cent of specimens seen. There are generally only one or two interstitial ribs on this area, and the main ribs bear a few broad high convex scales. This area of the shell is therefore indistinguishable from *suprasilis* Finlay. The sculptural change is nearly always very sudden, and occurs on the ears as well. A small percentage of specimens exhibiting this feature have been seen in all collections examined, including fossils from Te Piki, Cape Runaway, and from Castlecliff, Wanganui (both Castlecliffian, Lower Pleistocene).

In Wellington Harbour the form *suprasilis* is rare. Specimens are found washed up on the eastern beaches where *dieffenbachi* is cast up in sponges. Six live specimens have been found inside dead shells of *Atrina* caught in dragnets, 3 at Lowry Bay and 3 at Rona Bay. Two of these specimens are about 34 millimetres high and are the largest specimens of this form seen by the writer. Specimens of *suprasilis* examined from other localities (e.g., Castlecliff, dredged in Cook Strait, etc.) are usually about 20 millimetres high, ranging up to about 30 millimetres.

These facts can best be interpreted in the following manner. Juveniles of *Chlamys dieffenbachi* have the *suprasilis* type of sculpture, and probably live attached by the byssus. They may retain this form, free of sponge, until they attain a height of about 20 millimetres, after which they rarely grow larger unless they are able to inhabit a very sheltered micro-environment such as the interior of a shell of *Atrina*. Some of the 20 millimetre specimens become enclosed in sponge, and are able to grow larger, the ribs dividing many times and developing prominent spines. Normally, however, the *Chlamys* becomes completely enclosed in sponge by the time it is about 5 millimetres high, and remains so throughout life, developing strong prickly sculpture and growing up to about 45 millimetres high.

It appears, therefore, that the forms *dieffenbachi* (Reeve) and *suprasilis* Finlay are ecological phenotypes of one species, which must bear the name *dieffenbachi*. The name *suprasilis* should not be used in a specific or sub-specific sense, but could be used as a varietal name.

It should be noted that a single specimen of typical *dieffenbachi* 35 millimetres high and with unusually fine ribs was found with the specimens of the *suprasilis* form in the *Atrina* shell from Lowry Bay. This seems to indicate that the phenotypic response to enclosure in sponge may occasionally develop in other environments.



L. Homer, photo.

FIGS. 1-10.—*Chlamys dieffenbachi* (Reeve). All figures natural size. All specimens are from Wellington Harbour except Figs. 4 and 10. Figs. 1, 2—Typical form, from sponge. Fig. 3—Broad-ribbed form, from sponge. Fig. 4—Forma *suprasilis* Finlay, Charteris Bay, Lyttelton. Figs. 5, 6—Specimen showing change from sculpture of *suprasilis* to that of *dieffenbachi*. Fig. 7—Forma *suprasilis*, most extreme specimen. Figs. 8, 9—Forma *suprasilis*, from *Atrina* shell. Fig. 10—Morphological intermediate from Kaingaroa, Chatham Islands. Figs. 11, 12—*Chlamys zealandona* (Hertlein) from sponge, Wellington Harbour.

Collections from Stewart Island, Foveaux Strait, Dunedin, Lyttelton Harbour and the Chatham Islands show the same characters as the Wellington one, except that there seems to be a higher proportion of specimens with broader primary ribs in the southern collections. All specimens figured are from Wellington Harbour except those in Figures 4 and 10. Figure 4 is of a large specimen from Charteris Bay, Lyttelton, which shows the *suprasilis* characters over almost all of the disc, but grades towards *dieffenbachi* over the outer 5 millimetres. This specimen has retained the *suprasilis* characters to a larger stage than any other specimens seen. Figure 10 is of a specimen from Kaingaroa, Chatham Islands, which is a rare form morphologically intermediate between *dieffenbachi* and *suprasilis*. The main ribs are as in *suprasilis*, and there are 4 to 6 prickly interstitial ribs. Both specimens are in the New Zealand Geological Survey.

The only difference between *dieffenbachi* forma *suprasilis* and the "subspecies" *suprasilis crepusculi* Fleming seems to be in the more compressed form of the latter. This does not seem to be a very useful character, as the specimens are only half grown and all other young specimens of *Chlamys* I have seen are almost equally compressed. Also, Fleming (1950: 23) records *C. celator* Finlay from the same area as *crepusculi*, so that no geographical separation remains. There appears to be no reason to retain the subspecies *crepusculi*.

DISTRIBUTION. The recent distribution of *C. dieffenbachi* includes the whole of the Neozelanic faunal area, with the exception of some of the Subantarctic Islands. The species seems to be rare in the north of New Zealand, as I have seen specimens from only two localities in this area, the south end of Great Exhibition Bay and the beach south of Houhora Heads.

Chlamys zeelandona (Hertlein, 1931). Pl. 1, figs. 11, 12.

1913. *Pecten imparicostatus* Bavay. Suter, Man. N.Z. Moll.: 876, Pl. 58, figs. 9, 9a (not *P. imparicostatus* Bittner, 1895) (full earlier synonymy given).

1931. *Pecten zeelandonus* Hertlein, J. of Paleontol. 5(4): 369.

Specimens of *zeelandona* are normally small (up to about 20 millimetres high) and found with *C. zelandiae* (Gray) attached to rocks in the littoral zone. A specimen 40 millimetres high was collected from a sponge cast up near the Eastbourne bus garage in Wellington Harbour, together with sponges containing *C. dieffenbachi*. This specimen is quite typical, except that it has small spines on all ribs over most of the disc. It appears that this species occasionally becomes encrusted with sponge in the same manner as *C. dieffenbachi*, when it grows small spines and reaches a larger size than usual.

Dimensions: Height, 40.2mm; length, 37.7mm.

DISCUSSION

The ecological relationship of the *Chlamys* and the sponge is very interesting. The flagellate choanocytes lining the chambers of sponges maintain a constant water current through the animal and extract the smallest particles from the current for food. It seems likely that the *Chlamys* utilizes this current for respiration and excretion, and uses as food the particles that have not already been extracted from the current by the sponge. This constant supply of food may be the reason for the sponge-encrusted *Chlamys* growing larger than any others. The *Chlamys* must also receive almost perfect protection when in the sponge, and altogether seems to have a great ecological advantage over unencrusted specimens. It is likely that the sponge obtains initial benefit from the association in using the *Chlamys* as a substratum to grow on. It is also possible that the sponge is able to utilize part of the lamelibranch's excretory products as food. This association may therefore be considered to be an example of mutualism.

Chlamys dieffenbachi forma *suprasis* has the appearance of a finely ribbed *Scaeoclamys*. The type of sculpture is very similar to that of *Scaeoclamys livida* (Lamarck). There are several other Indo-Pacific species, such as *C. squamata* (Gmelin) from Japan, which seem to fit into *Scaeoclamys*. This paper points to the desirability of examining the relationship of *Scaeoclamys* to some of the more normal species of *Chlamys* with which it is associated.

ACKNOWLEDGMENTS

I am indebted to Dr R. K. Dell, of the Dominion Museum, for the original suggestion which led to this paper, and for criticism of the manuscript. I also wish to thank Dr C. A. Fleming, New Zealand Geological Survey, for critical reading of the manuscript, and Mr Lloyd Homer, New Zealand Geological Survey, for the photographs produced in Plate 1.

LITERATURE CITED

- DELL, R. K., 1963. Notes on Some New Zealand Mollusca in the British Museum. *Trans. Roy. Soc. N.Z., Zoology* 3(17): 171-177, Pls. 1, 2.
- FINLAY, H. J., 1928. The Recent Mollusca of the Chatham Islands. *Trans. N.Z. Inst.* 59(2): 232-286, Pls. 38-43.
- FLEMING, C. A., 1950. The Molluscan Fauna of the Fiords of Western Southland. *N.Z. Journ. Sci. Tech. (B)* 31(5): 20-40.
- POWELL, A. W. B., 1961. *Shells of New Zealand*, 4th edition. Whitcombe and Tombs, Wellington: 203 pp., 36 pls.

A. G. BEU,
Geology Department,
Victoria University of Wellington,
P.O. Box 196,
Wellington.