RECORDS
of the
AUCKLAND INSTITUTE AND MUSEUM

Volume 12

December 17th, 1975

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AUCKLAND INSTITUTE AND MUSEUM

Volume 12

December 17th, 1975

Published by Order of the Council

E. G. Turbott, Director

Address: Auckland Institute and Museum

Private Bag, Auckland, New Zealand

RECORDS OF THE AUCKLAND INSTITUTE AND MUSEUM

VOLUME 12

CONTENTS

THE EXCAVATION OF SKIPPER'S RIDGE (N40/7), OPITO, COROMANDEL PENINSULA, IN 1959 AND 1960

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Abstract. The evidence from excavations at Skipper's Ridge during 1959 and 1960 is reviewed. Structural remains are discussed in detail, and midden and artifacts described.

The Auckland University Archaeological Society carried out excavations at Skipper's Ridge (N40/7), Opito, on the east coast of the Coromandel Peninsula, on several occasions between January 1959 and January 1960. The excavations, directed by R. H. Parker, formed part of the overall programme in the area organised by J. Golson (1959), who also supervised the initial work at Skipper's Ridge.

The site was first tested in response to the insistence of the owner, Mr R. H. (Skipper) Chapman, after whom it was named. The preliminary testing proved sufficiently interesting for further work to be undertaken, and the structural remains uncovered assumed a role of fundamental importance in discussions of pits, their functions, and their possible use as types in chronological sequences. Preliminary reports were published by Parker (1959, 1960) and the site was also discussed in an important later paper by him (1962). Green mentioned it in two papers the following year (1963a, 1963b) and it was discussed in two MA theses in 1964 (Davidson n.d.; Groube n.d.). In 1965 Groube wrote of it as producing "the most puzzling and yet the most spectacular evidence of domestic activity so far recovered from controlled excavation" (1965, p. 16). The same year, Golson (1965) took up arguments involving the site which Green (1963b) had previously raised. No detailed results of the excavations were ever published, however. It is the purpose of this paper to record the information which can now be assembled about the site.

THE SETTING

Skipper's Ridge rises at the back of a narrow coastal flat behind the beach and runs inland to join the main ridge system behind Opito Bay. To the north and east is the sweep of the bay; to the south and west a stream valley and swamp. The stream is referred to as the Otama Stream in older publications, but as the Waitaha Stream more recently (Calder n.d.).

Skipper's Ridge is only one of a number of sites which have been investigated over the years at Opito and neighbouring Sarah's Gully, and several summaries of the area and its sites are available (Green 1963a, Calder n.d.). The setting is an attractive one for Polynesian settlement. The ridge itself is well drained and relatively sheltered, close to the beach and to the stream. The important Opito Beach Midden (N40/3) excavated by Golson is in the sand dunes to the northeast. A locality map, thought to be missing, has recently been found, and is discussed in a following paper (Davidson & Green, this volume). Approximately 2 km to the south is Tahanga Hill, source of the basalt used by the occupants of the site.

When Chapman first drew the attention of archaeologists to the site he suggested that the particularly luxuriant growth of green grass and the humpy appearance of the surface reflected extensive evidence of occupation. He had found an adze and patches of shell midden while fencing some distance up the ridge. The excavation was carried out near the tip of the ridge and uncovered only a small sample of the total site (estimated by Parker as covering 3.2 ha). In 1967, Bellwood excavated a second area, some 200 m further up the ridge. This has been designated Skipper's Ridge II (N40/73) and has been fully described elsewhere (Bellwood 1969).

THE EVIDENCE

The standard of excavation and recording at Skipper's Ridge was very high. Only some of the evidence has survived the passage of time, however, and for this reason, a final report cannot be as full and unequivocal as it might once have been. In order that the limitations can be fully understood, I shall list here the evidence used in this report, and indicate other evidence that is no longer available.

The basis for the description of the structural features lies in two full sets of plans. One set is in pencil on graph paper and has all the appearance of original field notes. On this set, all features of all periods are shown, with a few minor exceptions, and details of layer, depth of floors below site datum, depth and diameter of postholes are given; cross-sections through *rua* (underground pits) and through a "tunnel" feature connecting two pits, appear as marginalia. This set was kept in the Anthropology Department, Auckland University, until transferred recently to Auckland Museum. A second set consists essentially of the same outline information without details of depths, redrawn to the same scale in a form suitable for illustration in a published report. Separate plans show the features of each occupation and the combined structures of all occupations. These plans were retained by Parker in Otago until recently. They are now also in Auckland Museum.

In addition to the plans there are three notebooks. Two contain Parker's diary of the excavation from the initial testing until the commencement of the final excavation. These are very full and detailed and contain much useful information. The third notebook contains a summary of some of the portable objects found, and details of stratigraphic columns sampled in May 1959. Copies of the original plans of the test squares excavated in January 1959, together with a cross-section through each of the pits revealed in those squares, were kindly made available by Golson.

Photographic evidence consists mainly of colour slides taken by H. J. R. Brown during the final excavation. Mr Brown retains a number in his personal collection; copies of a representative selection are held in the Anthropology Department, Auckland, together with a small collection of black and white prints.

The whereabouts of some evidence is no longer known, in particular graph books containing all the cross-sections. It is thought that a diary should exist for the final excavations, comparable to those of the earlier investigations of the site. Photographs taken before the final excavations have also been mislaid.

The finds, including artifacts, midden and unworked stone, remained in the Anthropology Department, Auckland, until transferred recently to Auckland Museum. Although there have been some minor losses (noted below in the relevant sections) the bulk of this material, which was meticulously bagged and labelled, has survived in good order. Catalogue numbers refer to the catalogue of the Anthropology Dept., Auckland University, hence the prefix AU. The collection has not been recatalogued with Auckland Museum numbers. Some specimens also have field numbers (not cited here) assigned by Parker.

Although the loss of the cross-sections is much to be regretted, the surviving information provides sufficient basis for a full report. It is worth noting Parker's conviction that all details of stratigraphy and interpretation should be settled before leaving an excavation; on this basis, his assignment of structures to the various occupations is the end product of much serious consideration.

The Excavations

Initial testing of the site took place from January 23 to 27, 1959. A small party under the immediate direction of Parker, and the general supervision of Golson, was detached from a group working at nearby Sarah's Gully. The original aims were simply to determine whether the site had, in fact, been occupied, and to gain, if possible, some idea of its age. The question of a possible relationship between occupation on the ridge and at the Opito Beach Midden (N40/3) in the foredunes below was already considered, but Parker thought that the possibility of demonstrating a stratigraphic connection was low.

Inspection of the ridge top revealed an area near its lower end as most suitable, and visible surface features suggested several more specific objectives. The most obvious surface feature was a shallow ditch or drain running from the ridge top down the slope to the flat below, where it seemed to run parallel with, but not to enter, a rectangular enclosure formed by low ditches and banks. There was also a possible low scarp and some suggestion of extensive subsurface disturbance on the ridge top. Additional aims, then, were to investigate the drain and the scarp, and to determine whether occupation, if present, was widespread, or confined to the lee side of the ridge top.

A base line running approximately north-south across the ridge was laid down and two twelve-foot (3.66 m) squares, which subsequently became D7 and J7 in the site grid, were set out to the east side of it. In both squares parts of large rectangular buttress pits were found and extensions made to obtain cross-sections through the centre of the pits. At the end of the first investigation, it was concluded that there was evidence of substantial and prolonged occupation, which in at least one of its phases was also extensive. Parker believed he could recognise three separate occupations, one at the surface of layer 2, one represented by layer 3, and one within and sealed by layer 4. He believed at least layer 4 to be early and of moa-hunter age. The existence of a layer 3 occupation was at this stage less certain, and the question of continuous or discontinuous occupation was not settled. However, the drain was shown to be associated with layer 3, since it was stratigraphically later than layer 4 and earlier than layer 2. The question of continuous or discontinuous occupation depended partly on whether or not the large layer 4 pits had been filled deliberately, a point on which there was some disagreement.

In April, Parker paid a brief visit to the site and also to the Sarah's Gully pa, then being excavated by Birks. The similarity of the structures at Sarah's Gully pa (N40/10) and settlement (N40/9), and their differences from those at Skipper's Ridge seemed striking, and the relationship between the various sites became a matter for much thought. Already, Parker was considering the possibility that layers 3 and 4 on the ridge paralleled the complex layer at the Opito Beach Midden below, and tending to the view that the layer 3 and 4 occupations on the ridge were continuous.

A few days later, the carbon dates for the Opito and Sarah's Gully middens were announced. This had a considerable effect on the plans for the next excavation at Skipper's Ridge, because the similarity in date of the two beach middens appeared to contrast with the difference in structures at the two areas. The aims for the May excavation thus became: to clarify the relationship between layers 3 and 4, to expose as many structures as possible at both levels, and if possible to recover artifacts from secure associations. These aims could best be served by abandoning plans to link the two initial test squares and concentrating instead on opening a large area on the north side of the ridge, adjacent to D7.

The first major excavation took place between May 9 and 19, 1959. Six squares (D7, D8, E6, E7, E8, F6) and three baulks (D7/8, E6/7, D/E8) were opened. The excavation was not carried down to the natural throughout, owing to lack of time. Most of the structures were exposed, but the complexity in the area of E6 and F6 was not yet fully appreciated. However, the stratigraphy was confirmed, and the principles for establishing the chronology of structures on the basis of the level from which they were cut, their intersections, and a comparison of their fills, were fully worked out.

During the May period, a *rua* discovered by Skipper Chapman elsewhere in the vicinity (subsequently referred to as Les's *rua*) was opened and found to have a slotted door and traces of fern on the floor. A network of shallow "drains" was noted near this *rua*, suggesting the presence of at least two complexes of such "drains" in the general area which have escaped the notice of later recorders.

A brief visit was made early in June to continue filling in the May excavation and to carry out limited further work. Rain prevented full recording on this occasion of the intersection of pit G with pit C-3 (see below, p. 9).

Another brief visit was made in November, and following this, plans for the summer were finalised. A decision to work at both Opito and Sarah's Gully restricted the area that Parker could open at Skipper's Ridge. Thus his plan for the summer, which he was able to carry out successfully, was regarded by him as a necessary compromise and insufficient for a full understanding of the site. In particular, the very small part of the site exposed, meant that any sequence revealed there might not be typical of the site as a whole. Parker was particularly concerned with the problems of continuous versus discontinuous occupation, and of whether two different "cultures" were represented on the site or one. At this stage he had formulated no definite views on the function of any of the structures.

The final excavations began on December 20, 1959, and continued for about five weeks. The squares previously investigated were reopened and the excavation extended. The entire area opened, about 142.5 m^2 (excluding J7), was taken down to the natural.

Parker's published interpretations (1960, 1962) are based on the results of this final investigation. It was during this period, for which no diary has survived, that he seriously began to consider that some of the pits were dwellings.

Stratigraphy

At the conclusion of the initial test excavation, the stratigraphy of square D7 (Fig. 1) was described as follows.

Layer 1: Sand (probably blown) and humus.

Layer 2: Sand, humus, cultural material.

Layer 3: Sand, shell, cultural material.

Layer 4A: Disturbed natural plus cultural material.

Layer 4B: Similar to 4A but darker in colour. Streaked with discontinuous black patches which revealed sag lines in section.

Layer 5: Natural; waterlaid pleistocene deposits derived from rhyolitic rocks.

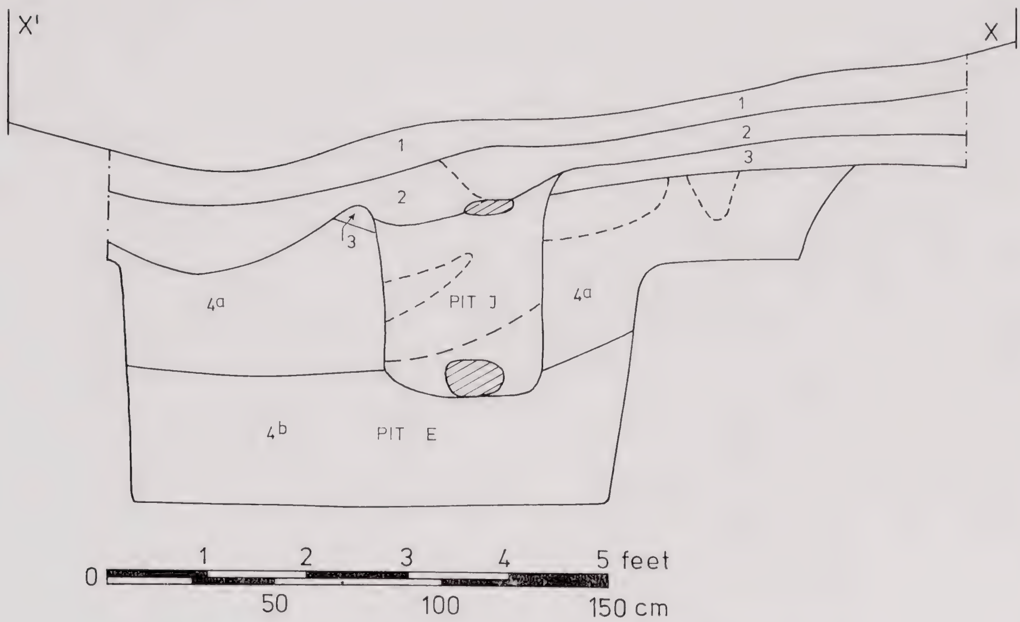


Fig. 1. Principal cross-section, through pit E, Skipper's Ridge, N40/7.

In square J7, layers equivalent to 1, 2, 4 and 5 were recognised.

Discussion elsewhere in the diaries adds the following information.

Layer 1 contained a few scattered cultural items but was generally sterile. Layer 2 contained quantities of *haangi* material. It is several times noted that cultural material was concentrated towards the top of the layer. The separation of layers 1 and 2 was queried by R. N. Brothers and R. C. Green, who considered them both part of the soil profile, with similar lithology. Parker accepted their interpretation, but continued to distinguish two layers because of the inclusions in the lower one.

The extent of layer 3 caused much discussion during the May excavation, as it varied considerably in different parts of the site, at times merging with layer 4 and at other times with layer 2. It contained cultural material, but in several places reference is made to the fact that "layer 3 structures" were cut through layer 3 and sealed with layer 2. At one point Parker defined layer 3 as natural affected by root action, weathering and human activity, which sealed the earliest occupation.

Layer 4 was at first recognised only in the fills of the earliest structures. The existence of layer 4 in other parts of the site, and the question of whether it was merely the upper part of the natural, or sealed the first phase of the occupation, was one of the main problems for investigation during the final excavations. The question was settled by finding (a) small stake holes sealed by it near the central area of the occupation; (b) a shallow scoop with charcoal sealed by it to the south-east of the stake holes; (c) parts of the edges of some of the occupation I pits covered by it. However, layer 4 was not present over all of the site, and in places occupation I structures lay directly under layer 3 (Parker pers. comm.)

The overall stratigraphy of the site at the conclusion of the excavation is described by Parker (pers. comm.) as follows.

Layer 1: Sand and humus, black.

Layer 2: Black sand and humus, cultural material and shell fragments.

Layer 3: Yellow soil, moderately hard.

Layer 4: Similar to layer 3 but darker and harder.

Layer 5: Natural, very hard.

The major problem arising from the lack of cross-sections is the difficulty of defining the precise relationship between the structures and the stratigraphic layers containing the portable evidence. Obviously, portable items from layer 4 are stratigraphically later than the structures from whose fills they were recovered, although they need not be much later, if later at all, in origin. It is not clear, however, whether the layer 3 finds come from the layer through which "layer 3 structures" were cut, from the fill of those structures, or from both. Although stratigraphically later, they could be of similar age to the layer 4 material, or younger. Only the layer 2 material seems certainly to be associated with an actual occupation, and clearly also, to be later than the other material from the site.

The occupation sequence at the site is summarised in Table 1.

Table 1. Correlation of layers and occupations at N40/7.

Stratigraphic layer	Occupation level
1	—
2	IV
3	III
3/4 transitional	II
4	I
5	—

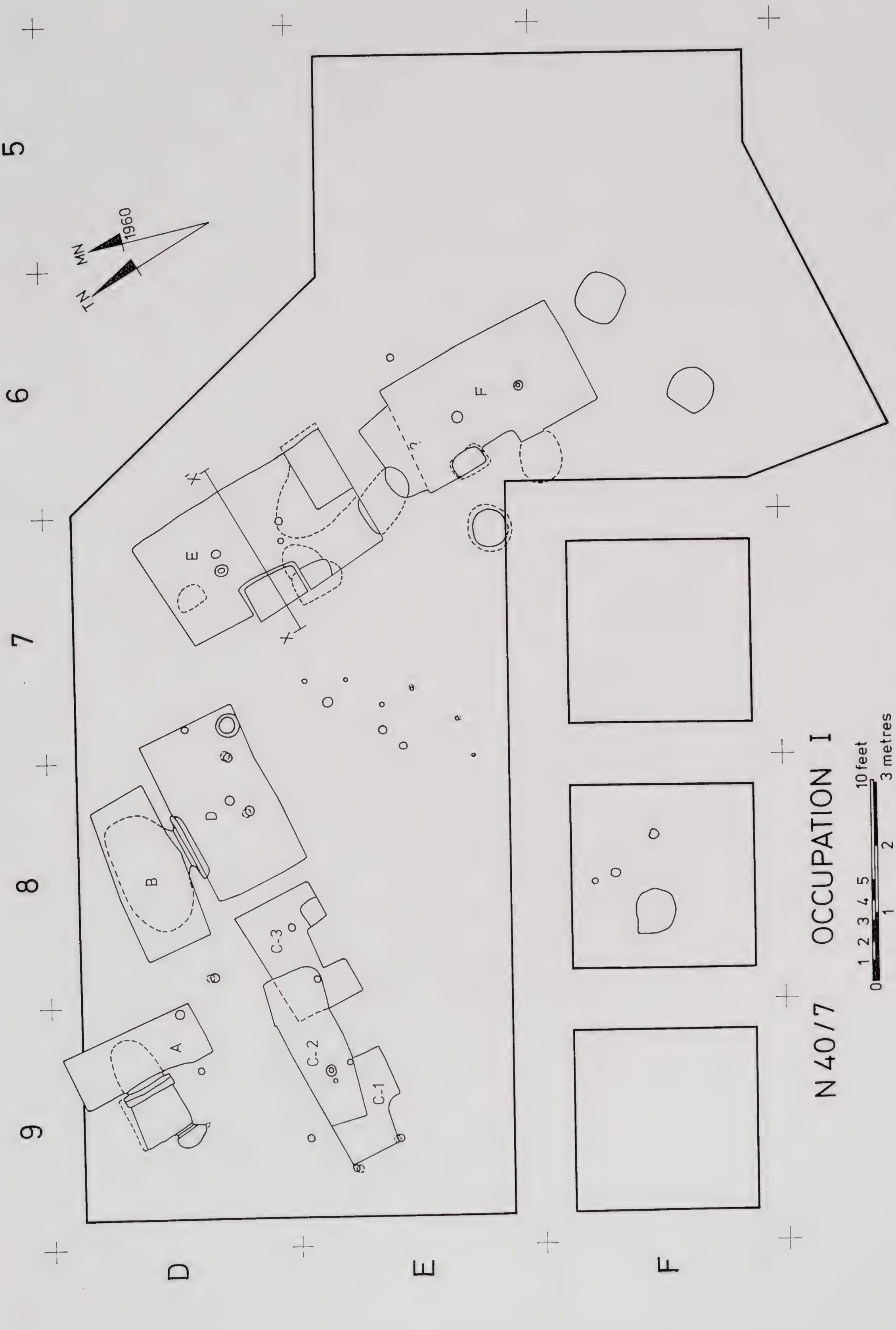


Fig. 2. Plan of structures associated with occupation I at Skipper's Ridge, N40/7.

Parker's original reasons for considering the occupation of the site to span a long period of time were based partly on what can now be considered unwarranted assumptions, current at the time, about climatic change. During the earlier excavations, his view that occupation IV was continuous with, and emerged from, occupation III, and his uncertainty about continuity or otherwise of occupation from layer 4 to layer 3, made it possible to consider the occupation of the site as continuous. During the final investigations, however, the question of continuity between layers 4 and 3 was resolved when occupation I material could be clearly shown to be, in places, sealed under layer 4. This implied discontinuity and suggested that where no layer 4 could be demonstrated, this was probably merely because it had been removed (Parker pers. comm.). During the final investigations Parker (pers. comm.) also abandoned the idea of continuity between occupations III and IV.

The Structural Evidence

Occupation I (*Layer 4*) (Fig. 2)

The most important and substantial structures are assigned to the earliest occupation. They include the large pits, some with buttresses, aligned in pairs around an open space, and the two large underground rectangular pits. The plans of these structures are given in Fig. 2 and some cross-sections in Fig. 3.

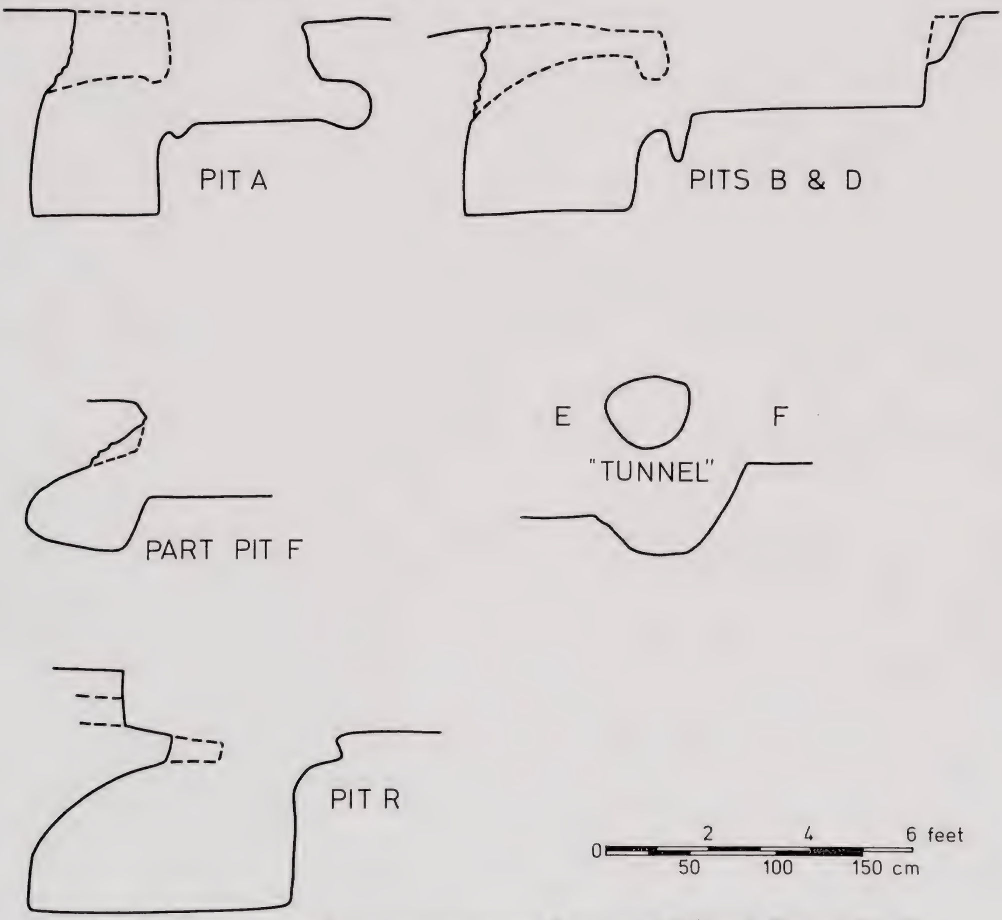


Fig. 3. Cross-sections through subterranean features at Skipper's Ridge, N40/7.

Pit A

A rectangular underground pit, entered from its own rectangular forepit. The floor of the main underground pit was 2.07 × 0.76 m, and the floor level was 1.67 m below site datum. The vertical-sided forepit was 0.9 × 0.85 m in plan with a slight shelf on the eroded northern wall. The entrance from the forepit to the main pit was well preserved, with a sill and pronounced slot for a door. At the opposite side of the forepit was a small scooped out cavity. The dotted line on the plan indicates the extent of roof collapse of the main pit.

Pit B

A rectangular underground pit entered from the adjacent pit D. The floor of this pit measured 2.3 × 0.97 m, and was 1.6 m below site datum and 0.6 m below the floor of pit D. The door slot of this pit was deep, with a maximum depth of 30 cm towards the centre, curving up to 20 cm to the southwest and 25 cm to the northeast. The door sill, 10 cm below the floor of pit D in the centre of the entrance, curved up to 5 cm at the edges.

The area of roof collapse of this pit was much larger than that of pit A, and the fill was complex. The upper part of the fill consisted of a dense midden of scallop shells (*Pecten novaezelandiae*) which protruded well above the level of the pit roof through layer 3 and into layer 2, suggesting that it was much later than the fills of other occupation I structures.

During the May excavation, it was thought that pit B was possibly associated with pit I of layer 3. Complete excavation of pit D revealed the undoubted association between pits B and D. The possibility remains, however, that B was a later addition, perhaps when the primary use of pit D had ceased.

Pit C

It is by no means clear whether one, two or three structures are involved in this complex. All are assigned to occupation I, but the crucial intersection between C-2 and C-3 was complicated by the presence of a later bin pit (G), assigned to occupation II, and an even later posthole. It was this important intersection which was not fully recorded during the June rain. During the May excavation, when squares D8, E8 and baulk were first excavated, it was assumed that C-3 was a complete pit. As can be seen from the plan (Fig. 2), there is some reason to accept this interpretation. However, Groube's version of the plan (1965, p.17) shows structure C as one long pit, rather than 3 smaller ones.

A surviving photograph of the north wall of square E9 before removal of the baulk shows no break in the fill of C-2 from top to bottom. Since it is deeper than C-1, it must either be contemporary with it or later. It is therefore possible to suggest a sequence as follows. First C-1 and C-3, aligned with each other and with D and therefore probably contemporary; then C-2, later and slightly deeper than both, either linking them into one large pit, or more probably replacing them; finally G, destroying the intersection of C-2 and C-3.

On this interpretation, C-1 would have been 1.4 × 1.2 m in plan with an eroded buttress in the southwest corner. A 15 cm-deep posthole in its eastern wall may have belonged to it. It should be noted that the natural to the west of the pit was heavily scoured by erosion, and the two postholes in its northwest and southwest corners are actually in erosion gullies. Both slant in such a way that it is hard to see how posts set in them could relate to the pit.

Structure C-2, recorded as a depression in the floor of C, would, if it was a separate structure, have measured between 1.5 and 2.4 m in length, with a maximum width of 0.76 m. Two 15 cm-deep postholes and one shallower one could form a slightly off-centre row for this pit.

Structure C-3 measured 1.8 × 1.2 m and was rectangular with an eroded buttress in the centre of its south wall. It had two postholes, the eastern one 18 cm deep and the western one 25 cm deep. There was also a shallow rectangular depression, 4 cm deep, immediately west of the buttress. The floor of the pit was 90 cm below site datum, but only 36 cm below the ground surface between pits C and D. If C-3 is regarded as a separate structure from C-2 and C-1, it can be seen as similar to, but very much smaller than, pit E.

On the other hand, if pit C is seen as one large structure, it would have been 4 m long with a maximum width of 1.28 m, and would have had three buttresses, an uneven floor, and an unsatisfactory set of postholes for such a large pit.

Pit D

This large rectangular pit without buttress measured 2.6 × 1.5 m. Its floor was 1.1 m below site datum, and at the southwestern end, the floor was 50 cm below the adjacent ground surface. Pit D was thus noticeably deeper than C-3. Two sloping postholes towards the southern side of the pit are not certainly associated with it. The only two definitely associated postholes are one at the northeast end, 23 cm deep, and one towards the middle of the pit but not on the centre line, 33 cm deep. There was also a "pot hole", 25 cm deep, with sloping sides and a flattish bottom, at the southeast corner.

Pit E

This was the largest and also the deepest structure revealed in the excavation. The floor of the pit measured 3.27 × 1.9 m and lay 1.45 m below site datum. A substantial buttress in the western wall was in very good condition. Its upper surface, 10-15 cm below the ground surface at the top of the pit, was flat and compacted, which led Parker and Golson to interpret it as a step. The internal arrangements of the pit were complex. An oval depression near the north wall, some 15 cm deep, was thought by Golson to show possible signs of burning. There were also two well defined small bins in the floor of the pit, both about 38 cm deep. One was in the corner formed by the south side of the buttress and the main pit wall, and undercut both the buttress and the pit wall. The other was in the southeast corner of the pit, and undercut the eastern wall slightly. The pit floor was eroded and disturbed on the edge of both bins, the dotted lines on the plan marking the limit of such disturbance. There were four postholes in the floor of the pit. The northern pair were both 20 cm deep, but the smaller of the southern pair was 15 cm and the larger 36 cm. It is possible that all four were required to support the roof. The pit was connected by a "tunnel" with the adjacent pit F; this feature is further discussed below.

Pit F

Although the main outline of this structure is clear, some problems are raised by the presence of three later pits in approximately the same position and alignment. As it was interpreted during excavation, the pit measured 3.29 × 1.7 m and had a buttress near the centre of the western wall and another at the northeast corner. On the north side of the central buttress there was a small bin, the depth of which has not been recorded, and on the other side of the buttress a small *rua*-like cavity was carved into the wall (Fig. 3). There were two central postholes, the northern 50 cm deep and the southern 41 cm.

An alternative interpretation is to draw the line of the northern wall of the pit from the corner of the presumed "corner buttress" and assign the left-over pit end to the earliest of the layer 3 pits (K). The principal justification for doing so is the presence here of a "layer 3" posthole, clearly marked on the original plan. This, however, would make it impossible for the curiously shaped "tunnel" to connect pits E and F (see below, p. 20). In this interpretation, the length of the pit would be reduced to 2.8 m, although the width would not be affected.

Pit T

Possibly also contemporary with occupation I was a large buttress pit, incompletely excavated in J7, south of the main excavation (Fig. 4). This pit was about 1.67 m wide at the floor, and had a buttress on its long northwest side, and an irregular shelf or step in the same wall towards the northern corner. Three central postholes exposed measured 41, 31 and 43 cm deep. It should be noted that this pit is roughly parallel with pits C and D, and its buttress, like theirs, is on the long side towards the central open space.

Other features

Two "pot holes" in square F6 are assigned to occupation I. Both were about 30 cm deep with almost straight sides. A similar feature in F8 was not clearly assigned to any occupation, but is most probably to be associated with occupation I. A feature in the corner of E7, 46 cm deep with slightly undercut sides, was thought during excavation to belong to layer 2, but is shown on the redrawn plan as a layer 4 feature.

Several postholes in squares E7 and F8 are assigned to this occupation. The row of four postholes in the northwest of E7 was definitely associated with layer 4. Their depths from north to south were 13 cm, 23 cm, 18 cm and 30 cm. The remaining postholes in the square were only provisionally assigned to this occupation; they were all 18 cm deep or less. Three postholes in F8 also belong to occupation I. Depths, from north to south, were 6 cm, 13 cm and 13 cm. There were also isolated layer 4 postholes in E9 (15 cm deep), D9 (23 cm) and D8 (sloping, 41 cm), and one belonging either to layer 4 or layer 3 in E6 (depth not recorded).

OCCUPATION II (*Layer 3/4 Transitional*) (Fig. 5)

Two structures were assigned to this occupation, on the grounds that they were clearly later than all occupation I structures but earlier than those of occupation III.

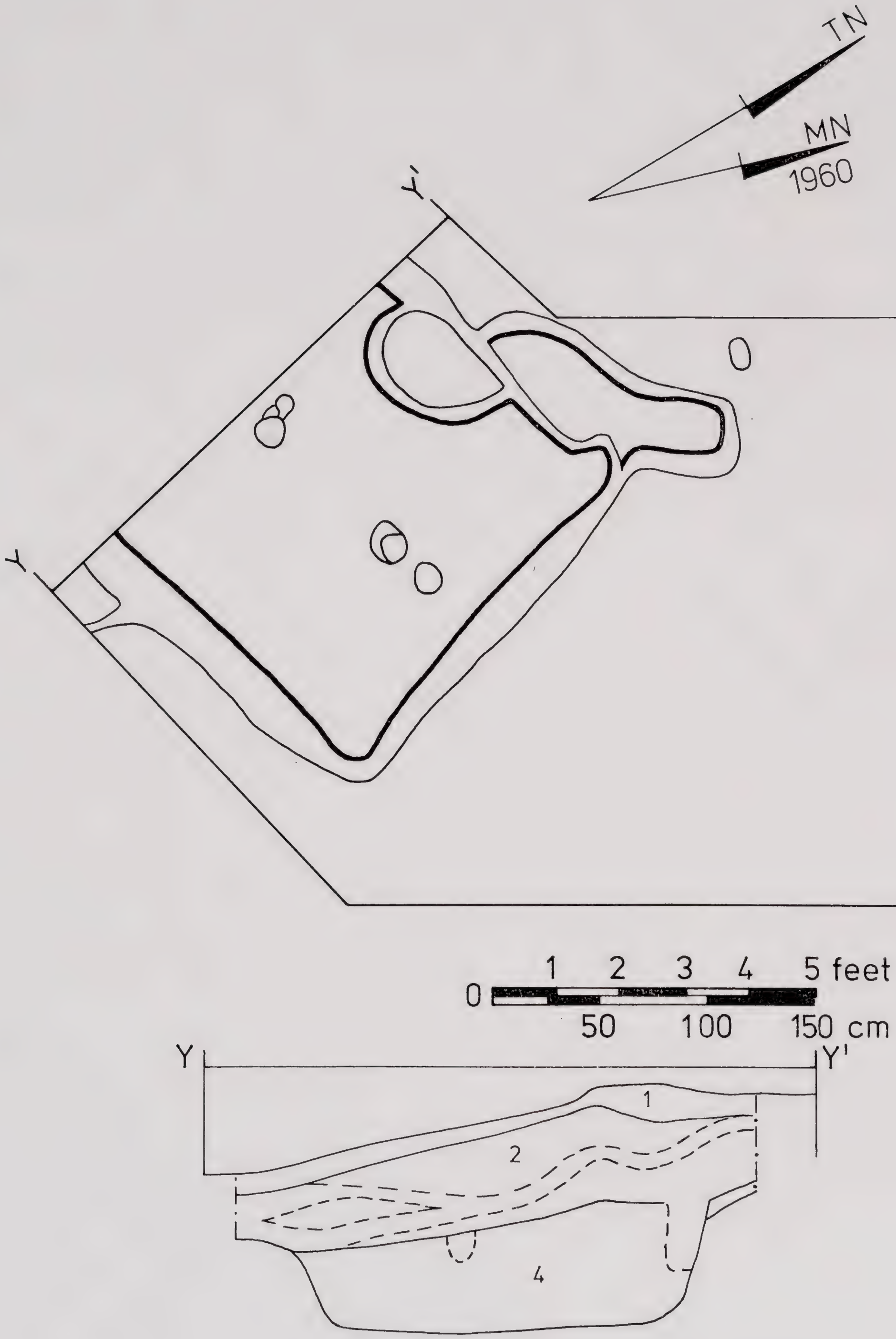


Fig. 4. Plan and cross-section of square J7, Skipper's Ridge, N40/7.

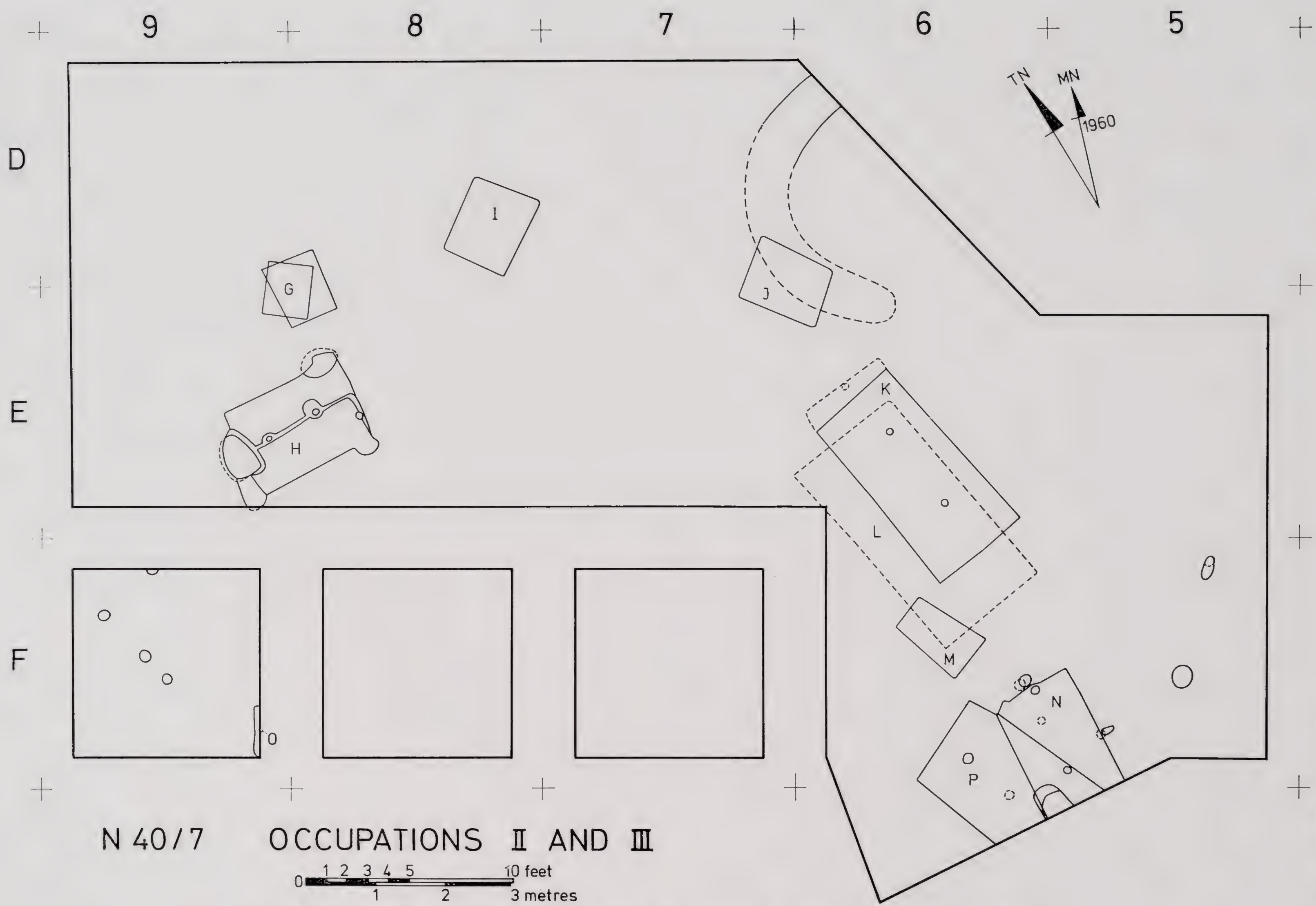


Fig. 5. Plan of structures associated with occupations II and III at Skipper's Ridge, N40/7.

Pit G

The exact position and dimensions of this pit are unclear, as they are shown differently on different plans. There is no doubt, however, that there was only one pit, of bin form, involved. As shown here, the slightly larger outline is taken from a faint sketch on the original plan, and the other, which may well derive from the missing graph books, from the redrawn plan. The dimensions were 90 × 73 cm (original plan) or 76 × 67 cm (redrawn). The depth is not recorded.

Pit H

This small pit was one of the most complex on the site. The basic dimensions were 1.86 × 1.31 m. The floor was in two levels, divided longitudinally; the southern half was approximately 7 cm lower than the northern. Two central postholes were set into the line of the longitudinal step; the larger was 43 cm deep, the other apparently very shallow. There was also a 23 cm-deep posthole near the eastern wall. Other features included a bin-like depression in the centre of and undercutting the west wall, whose floor was 13 cm below the lower floor level of the main pit; a "shelf" or "step" in the southwest corner 20 cm above the lower floor level (reminiscent of a feature in the buttress pit in J7); a scooped hollow in the northeast corner which undercut the corner of the pit and penetrated the wall of pit C-3; and a break in the southeast corner, at first thought to be a drain, which seemed rather to relate to erosion scouring on the natural surface nearby.

Photographs taken by H. J. R. Brown strongly suggest that "pit H" included at least two separate pits. The single eastern posthole would be a central end posthole of a small rectangular pit, the other posthole having probably been destroyed by the depression in the west wall. The two postholes on the line of the "step" would belong to a shallower pit of which only the northern half of the floor survived.

No other features were assigned to this occupation.

OCCUPATION III (*Layer 3*) (Fig. 5)

Although this occupation was referred to by Parker as one of long duration (presumably because in several instances pits intersect or are superimposed), its structures were, for the most part, less substantial than those of occupation I. They include both bin pits and shallow rectangular pits; the evidence of the latter, however, is not as satisfactory as could be wished.

Pit I

A relatively shallow rectangular bin pit, 1.19 × 0.94 m. The depth was not recorded.

Pit J

A slightly trapezoidal bin pit, 1.15 m long and varying from 85 to 94 cm in width. The floor of this pit was 20 cm above that of the large buttress pit into whose fill it was dug, and it would thus have been about 60-70 cm deep.

Pit K

Pit K was the earliest of the occupation III and IV features superimposed on pit F. As mentioned above, the exact position of the northern walls of pits F and K can be questioned. Pit K was cut almost entirely into the fill of pit F and was apparently similar in depth. According to Parker's interpretation, its dimensions were 2.89 m in length, varying in width from 1.37 to 1.46 m. There were two central postholes, both 23 cm deep. If the alternative plan suggested above is accepted, the length is increased to approximately 3.08 m and a third central posthole (13 cm deep) is added at the northern end.

Pit L

This must have been a very shallow pit, cut partly into natural and partly into the fills of pits F and K. The dimensions were 3.35 × 1.70 m. No features are recorded. A note on the original plan says "cut 9in [23 cm] below layer 4".

Pit M

Pit M was a slightly trapezoidal bin pit, 1.15 m long, and varying in width from 54 to 73 cm. The maximum depth was 71 cm.

Pit N

This was a shallow rectangular pit, only partly exposed, at the southern end of the excavation. It was more than 1.8 m long and about 1.24 m wide. There were at least two postholes in a central line, one near the northern end and one towards the centre. Both were about 13 cm deep. A third posthole may belong either to this pit or to pit Q. There were also two 20 cm-deep sloping postholes on the ground surface outside, close to the edge of the pit but perhaps not associated with it. This pit intersected pits P and Q. The latter is tentatively assigned to occupation IV and was therefore presumably later than the other two, but there is no indication of the relative ages of N and P, and a distant photograph of the relevant section is unhelpful.

Pit O

A small feature in the southeast corner of F9 was labelled on the original plan as the edge of a layer 3 pit. It is presumably, therefore, another bin pit, with one measurable side of 73 cm.

Pit P

This appears to have been similar to but probably larger than pit N which it intersected. Like pit N it was not completely excavated. It was 1.4 m wide and more than 2.3 m long. There was at least one central posthole 12 cm deep; a second of similar depth may belong either to this pit or to pit Q. An irregular depression in the floor, up to 18 cm deep, probably belongs to this pit, but could belong to pit N. The floor of pit P was marginally shallower than that of pit N.

Other features

A feature of considerable interest was the "drain" visible on the surface. During the excavation of D7 it was noted that it was clearly later than the occupation I buttress pit, and appeared to be cut through layer 3, but sealed by layer 2. During the May excavation its course was traced with difficulty through E6. Towards the south side of the square it was lost in disturbance, although it was thought possibly to bifurcate at this point. Its course is not shown on the original plan beyond the point of its intersection with pit E, and its position in Fig. 5 is taken from the redrawn plan. Notebook sketches, however, suggest that it made a right-angled turn and continued in a straighter course, parallel to the group of intersecting pits in square E6. Its relationship to these pits is unclear.

The only other features assigned to occupation III are some scattered postholes. The group in F9 were 18 cm deep, except for the southernmost, which was slightly shallower. Features in F5 consisted of a slanting posthole, 20 cm deep, and a small depression approximately 10 cm deep. As noted above, the isolated posthole in E6 may belong to either layer 4 or layer 3.

OCCUPATION IV (*Layer 2*) (Fig. 6)

A maximum of three pits may be assigned to this occupation, which consisted largely of *haangi*. In one publication, Parker referred to the *rua* (pit R) alone as belonging to layer 2, and in another he included pit S also. Both of these are shown on the original plan as belonging to layer 2, but pit Q, not shown on the original at all except for the two postholes possibly belonging to it, is indicated on the redrawn plan as belonging to either layer 2 or layer 3.

Pit Q

The evidence for the existence of this pit appears to be slight. As shown on the redrawn plan it was 1.43 × 1.16 m. Two shallow postholes 10 and 13 cm deep could either belong to it, or to pits N and P. Pit Q is not shown on the original plan.

Pit R

The underground pit R differed considerably from the earlier pits A and B. The floor was oval in plan with a maximum diameter of 1.58 m. The walls and roof formed a continuous curve except on the southeast side, immediately below the entrance, where the side was vertical. On this side, also, a slight entrance step was dug partly into a layer 4 "pot hole". Three small horizontal holes in the wall of the *rua* at floor level may have related to a framework of some kind on the floor.

Pit S

Pit S seems to have been the most recent of the complex of intercutting structures which also included pits F, K and L. It is clearly assigned to layer 2 in the original plan. It measured 1.7 × 0.91 m; no depth is recorded and there appear to have been no postholes.

Other structures

A large number of *haangi* were associated with this occupation. The intensity of cooking activity in the western part of the site is not adequately represented on the plan. In this area there were so many *haangi*, with so many intersections and overlaps, that outlines and depths of *haangi* depressions could for the most part not be recorded. Of the eastern group, the two in F5 were shallow (8 cm deep or less); that in E5 was about 30 cm deep. The oval *haangi* in D/E6 was about 40 cm deep, and appears to have been replaced at a later stage by a shallow circular *haangi* above the southern part of the oval one. The particularly concentrated group of *haangi* stones nearby was in the top of layer 2.

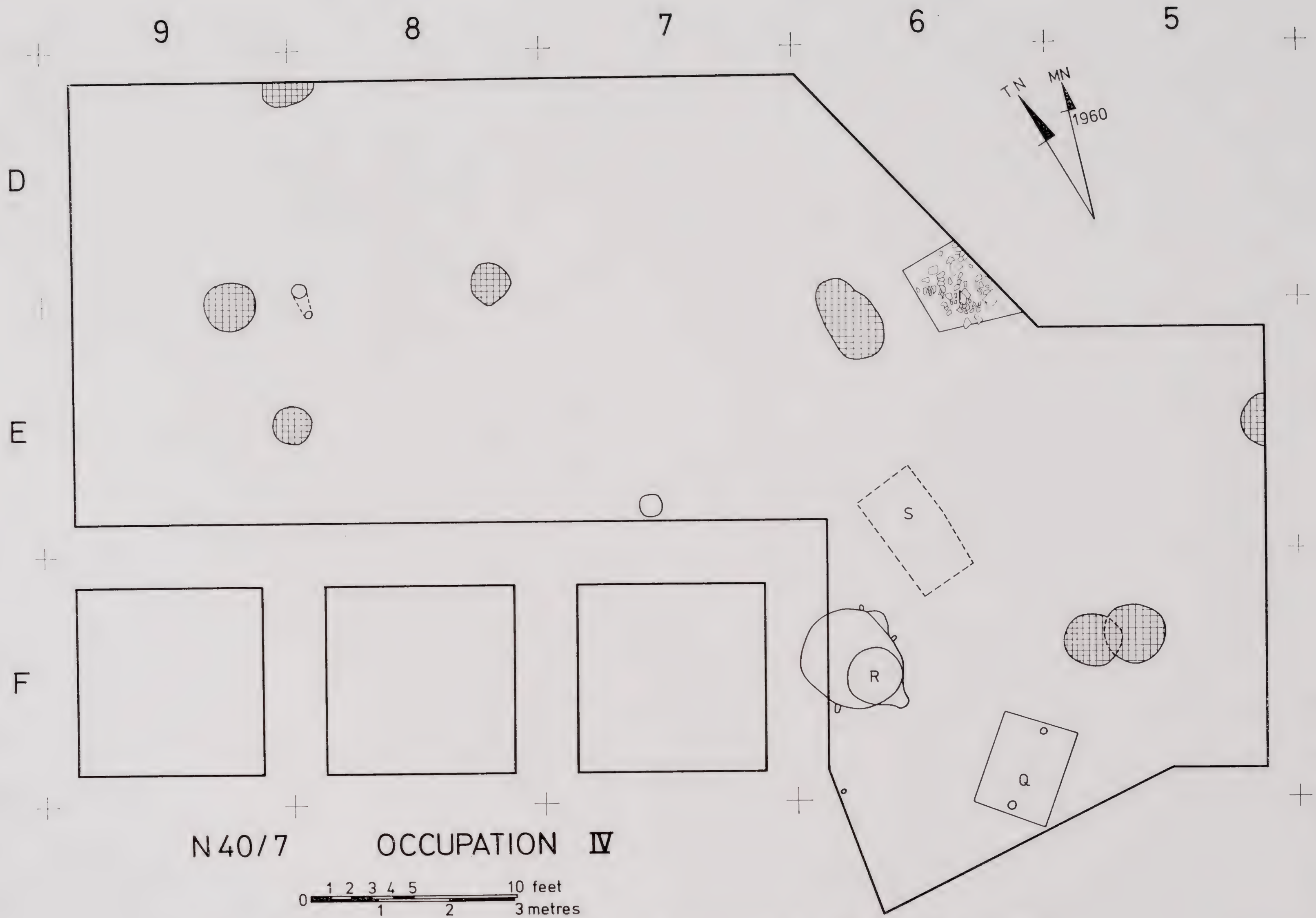


Fig. 6. Plan of structures associated with occupation IV at Skipper's Ridge, N40/7.

Hardly any postholes could be associated with layer 2, suggesting an absence of cooking shelters. There was one 18 cm-deep posthole in F6, and a large and very slanting posthole, 53 cm deep, in the complicated intersection of pits C-2, C-3 and G. The solitary feature in E7 is labelled as a "pot hole" on the redrawn plan and was therefore probably less than 20 cm deep.

DISCUSSION OF STRUCTURAL EVIDENCE

There have been many changes in interpretation of pits since Parker (1962) suggested a cultural sequence of Archaic A and B based on pit types at Skipper's Ridge and Kumara-Kaiamo. It is now generally accepted that most if not all pits (whether bin pits, *rua*, or rectangular pits) were storage structures rather than dwellings. Moreover, the usefulness of pits as cultural markers has been queried on a number of grounds (Shawcross 1966, pp. 65-67; Bellwood 1969, pp. 203-204). It is no longer possible to see the pits at Skipper's Ridge as a culturally diagnostic assemblage of dwellings with associated storage structures, as was done by several authors in the early 1960s. They remain, however, an interesting and important collection of storage structures, whose long suspected "early" age is now supported by a radiocarbon date (see below).

When the structures of all occupations are combined on one plan (Fig. 7), it is difficult to avoid the conclusion that occupation of the site from earliest to latest features was by a group of people who shared a common idea of how a settlement should be laid out. The plan of structures grouped around a predominantly open space (in which only light surface structures represented by small groups of postholes may occur), is most clearly evident in occupation I, but it is remarkable that all the structures of occupations II and III are aligned with or superimposed on those of the earlier occupation, and even the scattered *haangi* and the few structures assignable to occupation IV avoid the areas left undisturbed in the original lay-out of the first occupation.

The rectangular underground pits and paired side-buttress pits of occupation I are still not matched from any other excavation (although a single side-buttress pit was found on Mt Roskill in Auckland (Shawcross 1962, p. 82)). For whether C-3 and C-1 are regarded as separate, or part of one long structure, they appear to be part of the plan which included C, D, E and F. Only one pit of this group, D, lacked a side buttress, and it is just possible that the unusual slanting postholes in the floor of this pit may have fulfilled a related function to that of the absent buttress. Only one buttress, in pit F, remained in a condition in which it could have been used as a step, albeit a high step; the others were more eroded, although this would not have prevented them from acting as support for an entrance ladder as suggested by Fox (1974, p. 149). If buttresses were related to entrances, these pits were entered from the central open space. It is tempting to see the partly excavated buttress pit in J7 as part of the third side of the same open space. This can only be a very tentative correlation, however, since the three intervening unexcavated squares may contain surprises in both stratigraphy and lay-out. Nevertheless, the possibility remains that the open space was large, and surrounded by structures. Such a space within a settlement might be seen as an early New Zealand example of the secular *marae* found both in Western Polynesia and, historically at least, in New Zealand.

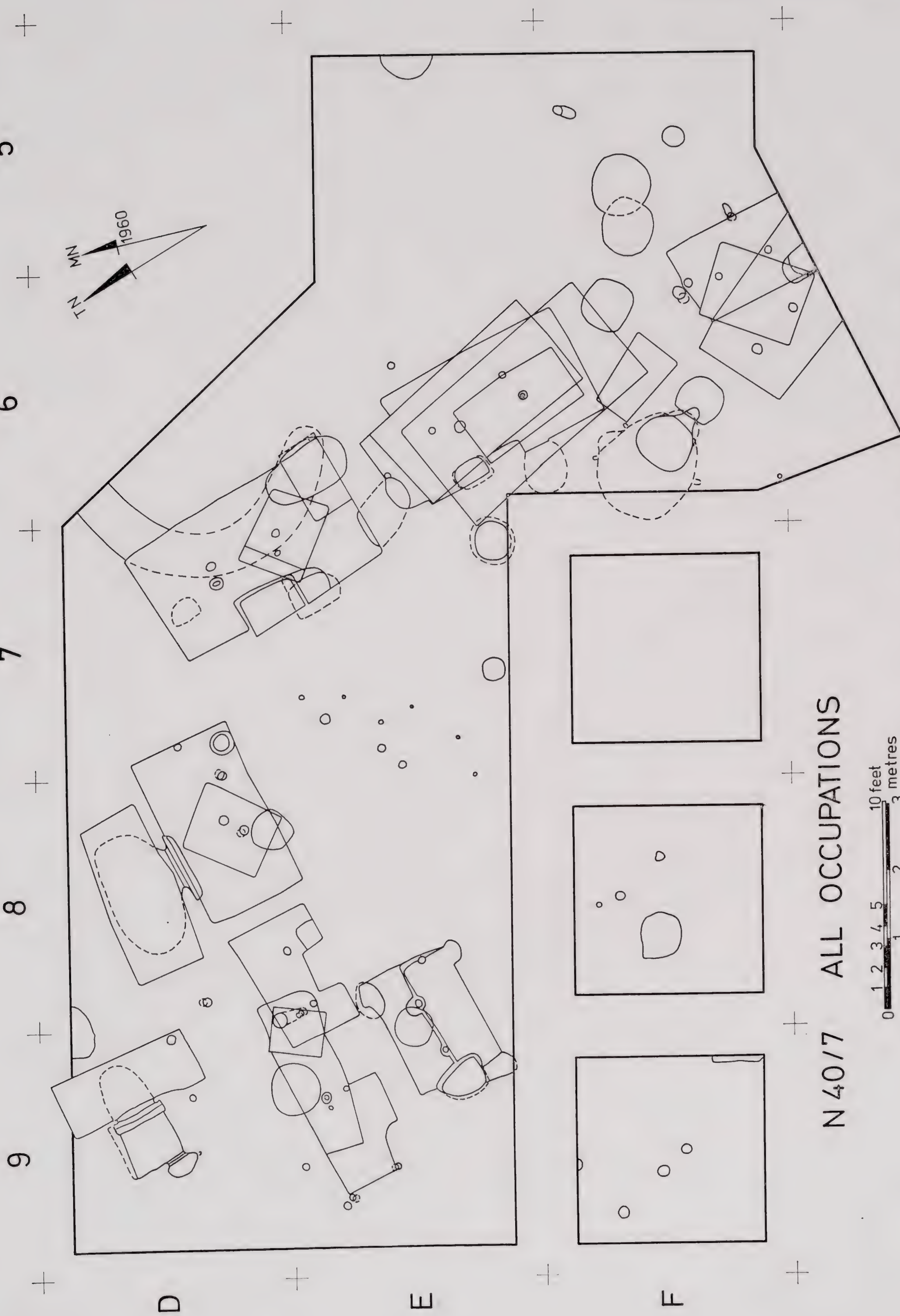


Fig. 7. Plan of all structures of all occupations combined, Skipper's Ridge, N40/7.

The question of roofing of the occupation I pits, which caused much discussion during the excavation and subsequently, was never fully resolved. It is by no means certain from the existing postholes that even pits E and F shared one roof. The postholes of pit D do not present an easy interpretation; indeed it may be wondered whether pit D in its final form was not, as Groube (1965, pp. 101-102) suggested, a forepit for pit B. It could be further asked whether this large forepit had engulfed a smaller structure similar to C-3. Similarly, it is difficult to design a satisfactory roof over the entirety of structure C, but rather easier to see C-3 and C-2 as separate and consecutive structures with their own roofs, while the roofing of C-1, like that of occupation II's pit H, presents more of a problem.

The presence of floor bins such as those in pits E and F have been noted on other and later sites; in contrast, the mini-*rua,* such as that opening off pit F or the one in the entrance to pit A are unusual, while the "tunnel" between E and F is unique. However, it seems indubitable from its cross-section (Fig. 3) that it was not a tunnel but a ventilation shaft or the collapsed remains of one or more mini-*rua.*

The later pits offer less scope for discussion. The bin pits are simple and vary in depth more than in other dimensions. An indication of the wide distribution of bin pits is given by Bellwood (1969, p. 202). The rectangular pits seem to belong to a very widespread form of pit. At Skipper's Ridge they are all shallow, which may be why they lack buttresses. Indeed all the pits on the site are shallow, even the deepest of the occupation I pits being less than 1 m, and all the others 50 cm or less below the surface of the natural. The three most clearly defined occupation III rectangular pits, K, N and P, have simple single post rows (Fox's (1974) Type 1), but by no means adhere rigidly to Parker's (1962) description of "Archaic B" as having notched posts in the end walls. Nor is there much, if any, evidence of hearths. However, the presence or absence of hearths in pits has long since ceased to be of vital importance, with the acceptance of the function of pits as storage structures rather than dwellings. It may nevertheless be worth placing on record that the only possible hearths in pits discussed as such in the existing records are one each in the occupation I pits E and T, excavated in January 1959, and in both cases the evidence is equivocal at best.

The pot holes are not readily interpreted, although they might well respond to a careful search for ethnographic analogues. It is unfortunate that their context is not clear in all cases, as it would be interesting to know whether they were really restricted to occupation I, or whether they were a continuous feature on the site.

The variation in the size and shape of *haangi* in layer 2 is interesting. It is seldom that sufficient *haangi* are uncovered or the details published, for contemporaneous diversity to be revealed. It is also noteworthy that there is virtually no indication of cooking huts or shelters. Any structures associated with the *haangi* must, if present at all, have been extremely flimsy.

The few postholes associated with layers 3 and 4 are not easy to interpret. They are too shallow to be seen as supporting raised storage structures of any substance, unless truncation of the ground surface is invoked, althought light racks or stages could possibly be suggested.

One of the most important features in the early stages of the excavation, the drain, remains shrouded in uncertainty. The balance of the evidence seems to suggest that it was earlier than occupation IV, but its function and ultimate direction remain unclear. Also its relationship to the rectangular "system" of drains on the flat below was not further investigated (Davidson & Green, this volume). An apparent resemblance of this drain to the feature at Skipper's Ridge II, identified by Bellwood (1969) as a potato clamp, is almost certainly illusory.

One final point must be made about the structural evidence from Skipper's Ridge. Parker's stylised drawings of Archaic A and B pits (1962) and Groube's slightly simplified plan of pit C (1965, p. 17) have tended to inhibit, rather than promote, useful discussions of pits between sites. Groube's plan, for instance, led to Shawcross's depiction of side buttress pits (1966, p. 66, pit type D) of a kind certainly not typical of Skipper's Ridge. Groube has himself drawn attention to the misleading nature of Parker's description of Archaic B pits (Groube 1965, p. 83). The point has been made many times before but bears repeating: it is only on the basis of full publication of excavation reports that useful intersite comparisons can be made.

The Portable Evidence

The cultural layers contained portable objects whose presence is due to human activity. Most of this material was carefully collected during the excavations, and much has survived for analysis. The certainty that some items have been mislaid, and the possibility that other material is missing, however, inhibit detailed statistical treatment. Nonetheless, it is likely that the remaining portable evidence is sufficient to give a reliable indication of what was originally present, and the analysis is here conducted on that assumption. The principal categories of material recovered were shell, unworked stone, and worked basalt, including both waste flakes and tools in the process of manufacture. These were the only materials recovered in sufficient quantity to permit quantitative analysis.

Layer 2 contained the largest amounts of all these categories. Moreover, it is probable that material excavated but not retained would further boost its totals in relationship to other layers. Thus layer 2 contained 50% of all unworked stone retained for analysis and 75% of all shell, but these figures do not include all the *haangi* stone present in the layer, nor the large quantity of scallop shells from the upper part of the fill of pit B, which should probably be included within layer 2. The layer contained 44% (by number) or 43% (by weight) of the worked basalt, other than actual adze pieces. The figures for obsidian and chert were also high compared with other layers.

The distribution of material between layers 3 and 4 was more variable. Layer 3 contained a high proportion of basalt (35% by number or 38½% by weight), but only 21% of the unworked stone and 14% of the shell from the site. Layer 4 had relatively more unworked stone (27%) and less shell (9%). Its basalt assemblage of rather small pieces comprised 17% by number, but only 12% by weight of the site total.

Layer 3/4 transitional, the smallest in volume, contained 2% of the unworked stone and shell collected, while its basalt comprised 4% by number but 6½% by weight of the site total.

Other material included small amounts of pumice, wood, *kokowai* (red ochre) and kauri gum, a minimal amount of bone, obsidian and other stone flakes, two possible shell artifacts, hammers and grinding stones. The various categories of material and their horizontal and vertical distributions are discussed in more detail below.

UNWORKED STONE

This constituent, which has not been subjected to detailed analysis, varies considerably in the kind of stone present. Much of it consists of fire-cracked stone presumed to derive from earth oven cooking, but in some squares there was also a quantity of smooth pebbles of various sizes which may be natural to the underlying material. In a few instances, pebbles were tentatively identified during excavation as moa crop stones.

In layer 4, stone was collected from only a small number of contexts. By far the greatest amount came from the fill of pit A (47% of the total unworked stone from layer 4) followed by pit B (27%) and square F6 (18%). There were smaller amounts from pits E and C and from square D8 outside the area of the pits.

The amount of stone in layer 3/4 transitional was small. Stones came from both pits G and H, but the bulk consisted of pebbles from pit G.

Most of the stone recorded from layer 3 came from three squares, D8 (25%), F6 (23%) and E8 (17%). Amounts of less than 10% of the total for the layer came from F5, D/E8, E7/8, E5/6, D7, F5/6 ext., F9 and F8. The absence of recorded stone from E6, E7 and E8, for example, is likely to be due to collection bias or subsequent loss, rather than actual absence.

More than half the stone collected in layer 2 came from E6 (54%), with a lesser amount from F6 (14%), probably reflecting a concentration of cooking debris in this part of the site. Amounts of 6% or less came from F8, E8 and E9 combined, F9, F5, E7/8, D9, D7, F7, D8 and E5 and baulk.

The above figures should be regarded only as a general indication of the distribution of unworked stone in the site, because of the problems of collection bias and post-excavation misplacement. Nonetheless, the amount of cooking stone present in all layers suggests that although actual *haangi* were found only in layer 2, cooking was being carried out in the close vicinity at most if not all periods of the site's occupation.

The sources and uses of the various kinds of unworked stone present in the site will provide an opportunity for further research.

FAUNAL REMAINS

Only two pieces of bone, both from layer 2, are present in the existing collection. One, from E6, is a fishbone, apparently a vertebral spine, exhibiting abnormal bone growth; the other is a fossilised or partly fossilised fragment of a larger bone from F6, which is almost certainly not related to food consumed at the site.

There is published reference to a dog jaw and tuatara bone from layer 3 (Parker 1960, p. 41). These bones were evidently found together in square D8, and at the time of excavation (May 1959) they were described as earlier than layer 2, but uncertainly of layer 3 or 4 age. A list of finds from the May excavation, in one of the notebooks, also mentions bones from layer 2, 3 and 4 in square D8. It thus appears that the absence of bone from the existing collections cannot be due to its failure to survive under local soil conditions. It is possible that fishbones were not saved during excavation, as prevailing opinion at the time was that they were largely unidentifiable. However, Mr R. J. Scarlett, who was present during the final excavations on the site, assures me (pers. comm. 23 November, 1973) that there was little or no bone found, and certainly no bird bone.

The shells are generally fragmentary, and a rather wide range of species was involved. In view of the small quantities, and the wide range of species, no new analysis has been undertaken. Table 2 presents the results of a percentage analysis by weight of shell species, originally carried out in 1963. Since then, some shells were taken by Bellwood for possible conchiolin dating (no results are available) and there has evidently been some diminution of shell as a result of handling and exposure, for shell weights in 1974 were generally slightly lighter than those recorded in 1963.

Table 2. Percentage by weight of shell at N40/7.

Shell	layer 4		layer 3/4		layer 3		layer 2	
	%	g	%	g	%	g	%	g
Amphidesma subtriangulatum	37		78		29		57	
Amphidesma sp. (fragments)	1				8		5	
A. australe	1.5				2		4	
A. ventricosum					2		1	
Struthiolaria papulosa	10		16		21		15.5	
Pecten novaezelandiae	17		1		18		9	
Lunella smaragda	3		1		5.5		2	
Neothais and *Haustrum*					7		2	
Alcithoe arabica	8							
Cookia sulcata	6				x		1.5	
Perna or *Mytilus* sp.	7				x		x	
Cellana sp.	3.5		2		x		x	
Haliotis iris	2				1.5		x	
Maoricolpus roseus	1.5				x		x	
Paphirus largillierti					x		1	
Dosinia anus					x		x	
Nerita melanotragus	x				x		x	
Crassostrea glomerata	x							
Chione stutchburyi					x		x	
Zediloma sp.	x				x		x	
Scutus breviculus	x							
Glycymeris laticostata							x	
Cominella sp.					x		x	
Tawera spissa							x	
Chiton			2					
unidentified	1				4		1	
Total weight		578		118		815		4483

x = less than 1%

The range of shell species at Skipper's Ridge is similar to that at some beach middens on the Coromandel coast and Great Barrier Island (Law 1972, pp. 95, 107; Davidson n.d., p. 125; Leahy 1974, p. 65), and reflects exploitation of several different zones, only one of which is immediately adjacent. The small quantities, however, make it unwise to regard the shell recovered as a firm indication of the diet of the site's inhabitants. Moreover, any apparent changes of quantity of various species through time must be regarded with caution, because the samples from different layers are so different in size. The fragmentary nature of much of the shell inhibits studies of seasonality or shell population structure.

The difference in bone remains at Skipper's Ridge and at adjacent beach middens which have a similar range of shell species is striking. It is regrettable that details of faunal remains at the Opito Beach Midden (N40/3) and Sarah's Gully (N40/9) are not available. However, the point may be made by comparing Skipper's Ridge (with one dog jaw, remains of one tuatara, and possibly a small amount of fishbone), with a midden further south in the same bay, N40/2, for which a faunal analysis (including birds, moa, dog, rat, tuatara and cetaceans) is available (Jolly & Murdoch 1973, pp. 71, 72). In view of the age of Skipper's Ridge suggested by radiocarbon and by obsidian hydration, it is not possible to attribute these differences to an "early beach midden/late pit complex" dichotomy. Nor, in view of the consistent evidence of cooking and other domestic activity at all levels at Skipper's Ridge, is it possible to see the site during the earlier occupations as a specialised storage area lacking living debris. The small amounts of shell cannot represent more than a fraction of the food probably consumed during any occupation, and it seems likely that most food refuse was dumped in a particular area, perhaps over the edge of the ridge. Even so, the complete absence of bird and mammal bone (other than the single dog jaw reported) suggests that the inhabitants of Skipper's Ridge, whether because of convenience, seasonal occupation changes or ritual prohibitions, to name but a few possibilities, preferred to butcher birds, mammals and fish and deposit remains indicative of their consumption, somewhere other than at Skipper's Ridge.

OTHER NON-ARTIFACTUAL REMAINS

Pumice was collected in small quantities from all layers. Only a very small amount was found in layer 4, from the fill of pit B. Small pieces were more widely distributed in layers 3 and 2, and there was one very large piece (weight 194 g), possibly artificially squared off, from E9, layer 3. Except for this piece and one small, possibly shaped piece from layer 2, none of the pumice showed any sign of working or use.

Two small pieces of kauri gum were found in layer 2. There was also one possible piece of red ochre. Neither type of material was found in the earlier layers.

Fragments of very decayed wood, on the other hand, were found only in layer 4, and were thought to be associated with pits B and E. The fragments from D8 appeared possibly to be part of the door frame or door of pit B; those from pit E, found at the bottom of the fill, were thought to belong to the posts or roof.

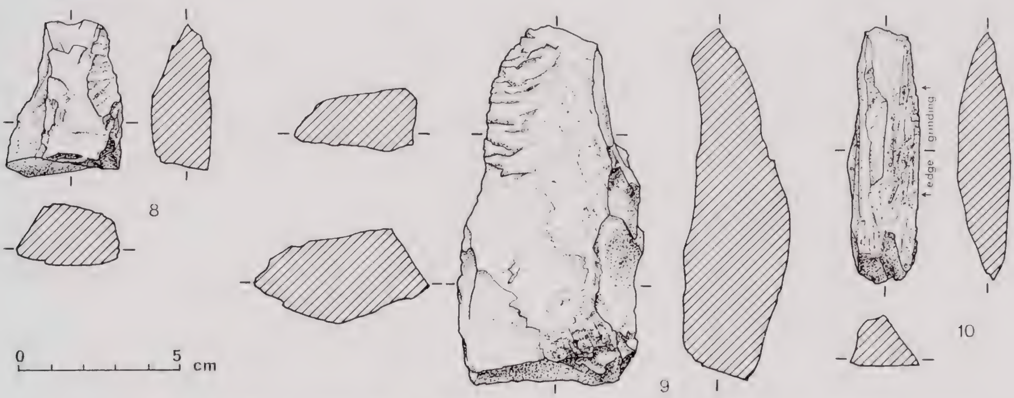
ADZES AND ROUGHOUTS

Only one complete adze was found, although there are several flakes or chips from fully or partly ground adzes. There is a substantial number of broken or unfinished roughouts. Some of these are in an advanced state of preparation, so that their intended form is clear, but others are less advanced, and the line between roughouts, and cores which may or may not be roughouts, is rather arbitrarily drawn. This section is primarily concerned with recognisable adzes and roughouts, but reference will also be made to ground and hammer-dressed flakes and pieces which are further discussed below.

Layer 4

Evidence for the use on the site of finished, and indeed highly ground stone tools, comes from a small chip from an adze made apparently not of Tahanga basalt, but of what is possibly an imported baked argillite. This fragment, AU1535/1, showing the intersection of two highly ground surfaces at an angle suggesting it came from an adze of rectangular section, was found in the lower part of the fill of pit E.

From the same pit fill came part of a small broken roughout, AU 1535/2 (Fig. 8). This is of irregular quadrangular section, with partial grinding on what would be the front and back surfaces.



Figs. 8-10. Artifacts from layer 4. 8. Adze roughout butt, AU 1535/2. 9. Adze roughout, AU 1536/5. 10. Basalt flake tool with extensive use wear, AU 1536/6.

A larger roughout, AU 1536/5 (Fig. 9), was found in the fill of pit C-3. This piece retains a strip of the weathered outer cortex of the rock on one surface, and has an area of hammer dressing on the opposite surface. It appears to be broken off at the bevel end, where, however, traces of hammer dressing are also present. It is not clear whether this specimen has been used as a hammer stone, as suggested by Bellwood (1969, p. 211) or whether the snapped and hammered end is part of the manufacturing process.

In addition to these items there are one flake showing grinding, and two core-like pieces from layer 4. The flake, from pit A, appears to be from an adze, and one of the cores, AU 1538/8, from pit B, may be a broken piece of a small adze roughout of quadrangular section.

A possible adze fragment, AU 1543/1, was also found in J7, in a posthole of the buttress pit T, a context which would make it probably contemporary with or earlier than the layer 4 assemblage from the northern part of the site. It could be the central part of an adze of quadrangular section and is flaked and partly ground, but also appears to have been water rolled.

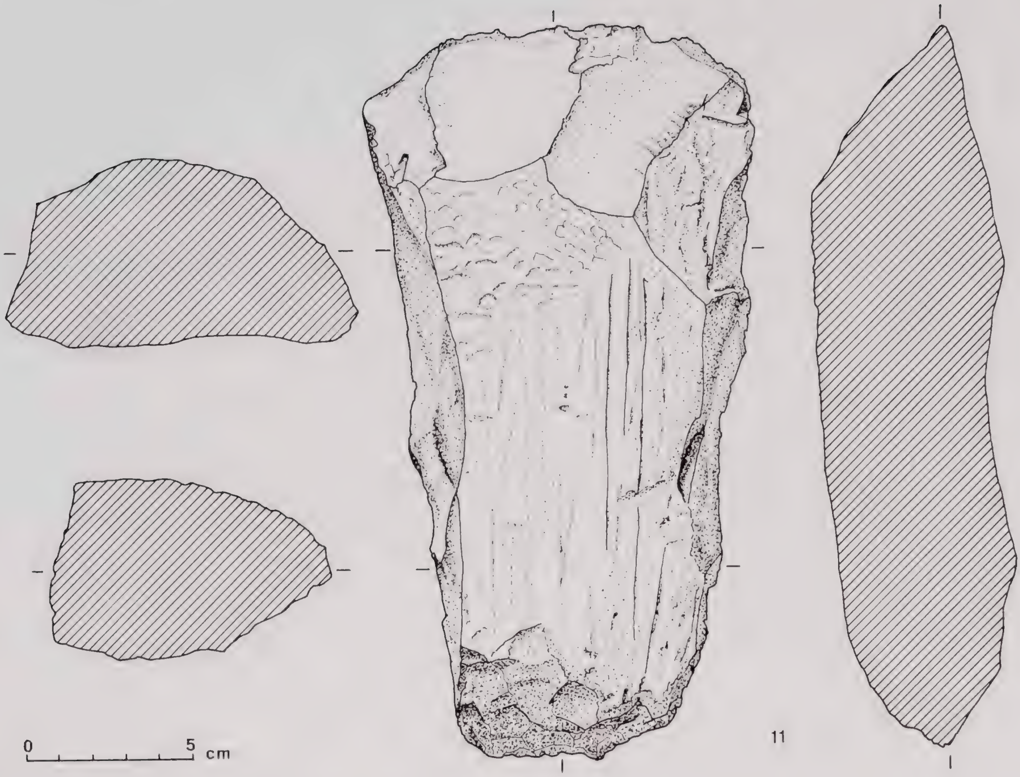


Fig. 11. Large adze roughout, AU 1533/1, layer 3/4 transitional.

Layer 3/4 transitional

A large heavy roughout, AU 1533/1 (Fig. 11) was found in the fill of pit H. It is simply made, with a minimum number of flakes removed, and an area of weathered cortex remaining on the back. Its maximum dimensions are length 21.1 cm, width 11.6 cm, thickness 7.1 cm. The width and thickness at the mid-point are 10.1 and 6.5 cm. The weight of this specimen, 2157 g, makes any analysis by weight of adzes and adze fragments, rather misleading.

A piece of worked basalt, AU 1533/15, from the same pit fill may be the broken bevel end of another large roughout. A surface formed by one flake scar meets a partly ground surface at an acute angle. If this is indeed a bevel fragment, it would be from a specimen with a cutting edge between 8 and 9 cm wide. From the same context came two fragments of cores which may be broken pieces of roughouts.

Layer 3

Twelve items from layer 3 have been classified as possible or probable adze pieces. There are also two pieces and one flake showing signs of grinding, and six core-like pieces, which are included in the analysis of other basalt items.

Four possible roughout fragments were found in square D7. Specimen AU 1435/20 (Fig. 12) has been worked from a single flake, and one long surface is formed by the flake scar. A patch of weathered cortex remains on the opposite surface. What is presumably intended to be the bevel is steeply flaked. There is an area of hammer dressing on a protuberance from one side near the "bevel end". The hammer dressing may be due to attempts to reduce this protuberance. Specimens AU 1435/21 (Fig. 13) and 1435/22 (Fig. 14) are also made on single flakes, and each has one large surface formed by the flake scar. AU 1435/21 is one half of a flake which has probably snapped at or near the centre. It has slight signs of grinding on a median ridge along its long axis. AU 1435/22, which does not appear to be broken but has no definite sign of a bevel or cutting edge, has some grinding on the main flake scar surface. The final specimen in this group, AU 1435/23 (Fig. 15) is not made from a single flake. It is otherwise similar in size and extent of working to AU 1435/20.

One of two specimens from D8, AU 1442/13 (Fig. 16), is rather similar to the group from D7. Its companion, however, AU 1442/14 (Fig. 17), is the bevel end of a fairly small adze with triangular section, apex up, which was fairly close to completion. It has grinding on the front medial ridge, and on parts of the bevel and lower back surfaces.

Two other examples from layer 3 also have triangular sections, but their intended final form is less certain. AU 1447/1 (Fig. 18) from D7/E6 (presumably from the layer 3 seal of pit E), is the butt end of a rather irregular specimen, whose apex might have been intended to face either way. AU 1451/32 (Fig. 19), is a carefully worked and so far apparently unbroken example with trapezoidal rather than triangular cross-section. Further work might have reduced it either to triangular with apex down, or to a more quadrangular-sectioned specimen. It has as yet little sign of a bevel, the bevel end being steeply flaked. Traces of grinding appear on the front and a small area of cortex remains on the back.

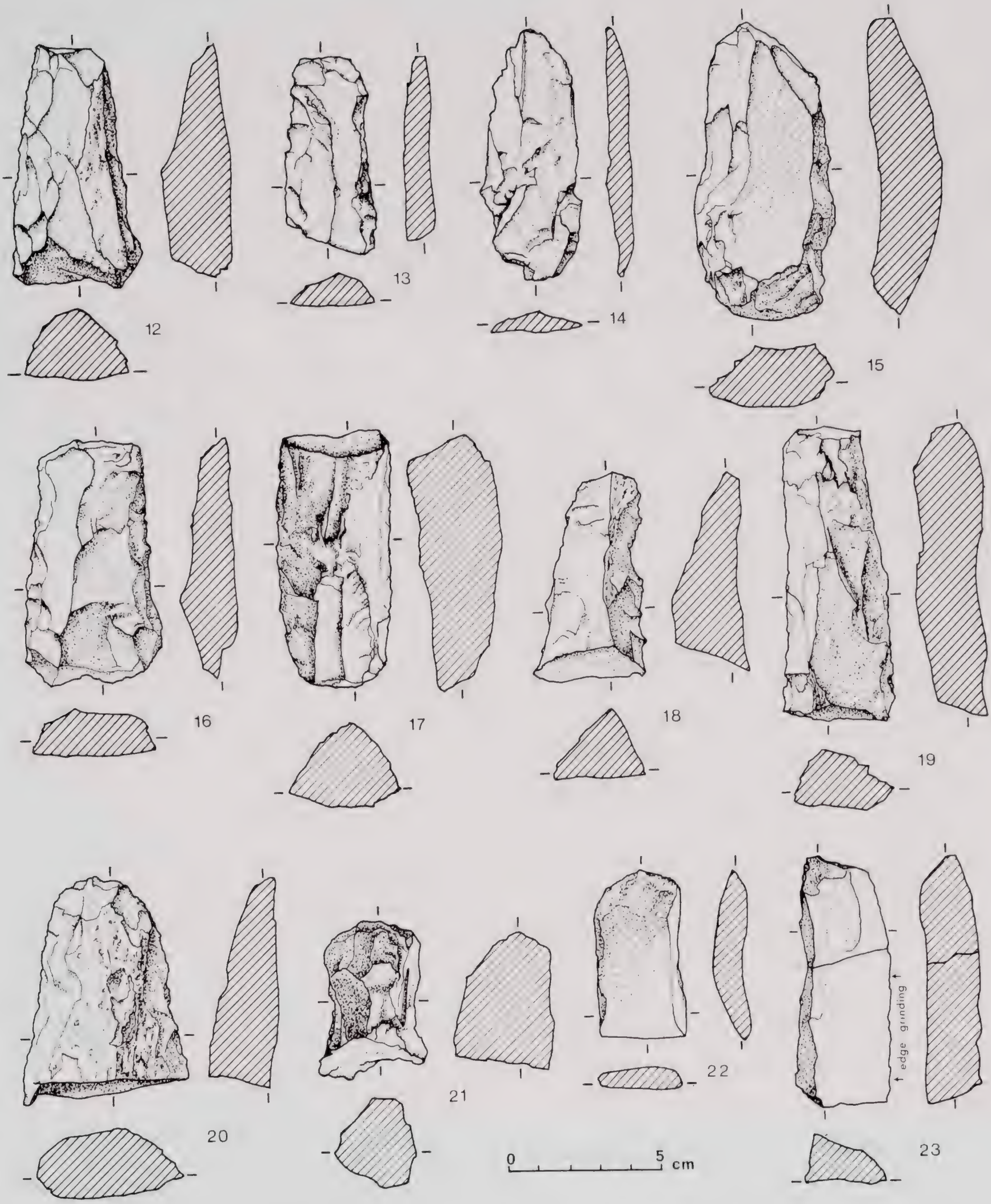
From the same square came a rounded, hammer-dressed butt end of a specimen of rounded quadrangular section, AU 1451/31 (Fig. 20). A considerable area of cortex remains on one surface, but hammer dressing is quite extensive on one side.

Another extensively hammer dressed butt end, AU 1449/22 (Fig. 21), with slight evidence of grinding, was found in F5. This specimen is quite thick in relation to its width, but it is too small for the overall form to be determined from the existing fragment.

A complete, well-ground small adze, AU 1443/6 (Fig. 22), was found in E6. It has an irregular rectangular cross-section, a fairly short bevel and a pronounced facet on the junction between front and bevel surfaces. Its length is 5.5 cm, and maximum width and thickness are 2.8 and 1.4 cm.

In addition to these items, a roughout fragment weighing 111 g is listed from D/E9. This specimen was included in the 1963 analysis but has since been misplaced.

Two specimens from layer 3, AU 1435/20 and 1442/14 have been examined in thin section by S. Best (pers. comm.) and found to be typical of Tahanga basalt.

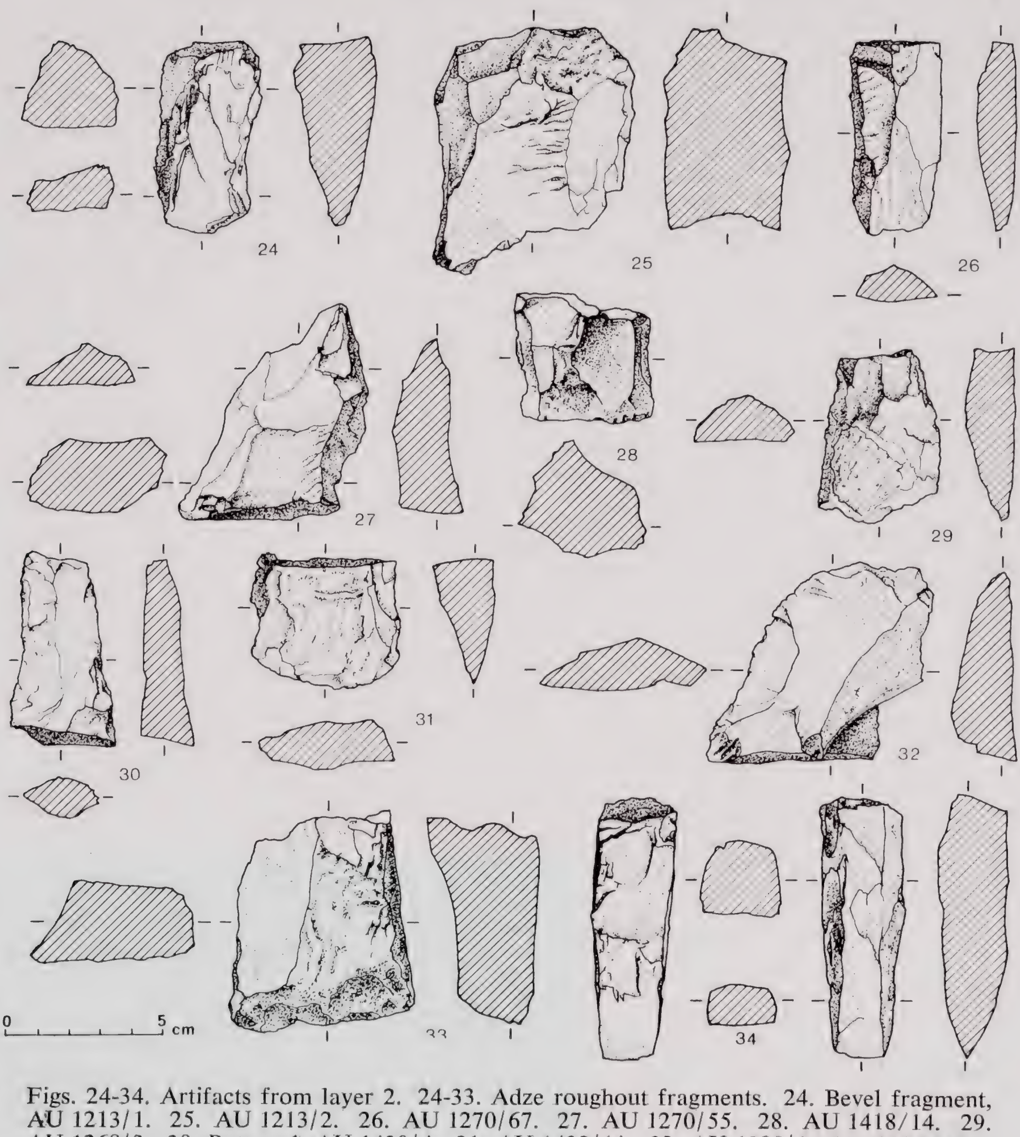


Figs. 12-23. Artifacts from layer 3. 12-21. Adze roughouts. 12. AU 1435/20. 13. Broken roughout, AU 1435/21. 14. Roughout (?), AU 1435/22. 15. AU 1435/23. 16. AU 1442/13. 17. Bevel end, AU 1442/14. 18. Butt end, AU 1447/1. 19. AU 1451/32. 20. Butt end, AU 1451/31. 21. Butt end, AU 1449/22. 22. Adze, AU 1443/6. 23. Basalt flake tool with extensive use wear, AU 1450/19 & 44.

Layer 2

Eleven specimens which appear to be parts of roughouts were found in layer 2. There are also two flakes with grinding and one with hammer dressing, and five pieces with grinding. Two of the latter are certainly broken chips off finished and well ground adzes. Five core-like pieces were found, some of which may be parts of roughouts. In J7, layer 2, a ground flake was found. The few flakes from this square have been excluded from the general layer 2 analysis.

Two rather battered roughout fragments were found in D7. AU 1213/1 (Fig. 24) is the bevel end of a small roughout, probably intended to be of triangular section,



Figs. 24-34. Artifacts from layer 2. 24-33. Adze roughout fragments. 24. Bevel fragment, AU 1213/1. 25. AU 1213/2. 26. AU 1270/67. 27. AU 1270/55. 28. AU 1418/14. 29. AU 1268/3. 30. Butt end, AU 1430/4. 31. AU 1432/11. 32. AU 1308/1. 33. AU 1433/1 34. Adze fragment, bevel part, AU 1421/52.

apex upwards. AU 1213/2 (Fig. 25) is apparently the central section of a larger and fairly thick quadrangular-sectioned roughout.

Three fragments came from E6. AU 1270/67 (Fig. 26) is, like several specimens from layer 3, a small item made on a flake with a patch of cortex on the opposite surface. AU 1270/55 (Fig. 27) is probably the butt end of a roughout, but not certainly so. The central break is not at right angles to the long axis of the artifact, giving it an asymmetrical appearance that is more apparent than real. AU 1418/14 (Fig. 28) is the central section of a fairly thick small roughout, with a tiny area of ground surface. Also in E6 was AU 1418/15, a small piece with three intersecting ground surfaces, evidently broken from a ground and finished adze.

From the adjacent E5-6 baulk and square E5 came another fragment which is probably part of a roughout. Like AU 1270/67, this specimen, AU 1268/3 (Fig. 29), is made on a flake, and has some cortex remaining on the opposite surface. It has a thicker oval section, however, and there is some suggestion that the striking platform of the original flake was on the side rather than the end of the developing roughout. Another small piece from a finished adze, AU 1321/3, was also found in this area. In addition to the two pieces from finished adzes, there were three other items with some grinding (two flakes and one chip) from E5 and E6, suggesting that this part of the site was probably an area of tool use during the formation of the layer 2 deposit.

Specimen AU 1430/4 (Fig. 30) from F5 is the butt end of a small adze of indeterminate form; the cross-section at the break is diamond shaped. From F5 or F7 is a small bevel fragment, AU 1432/11 (Fig. 31), also indeterminate, but possibly intended to have a curved cutting edge. There is an extensive area of cortex on one surface. A very rough core fragment frm F5, AU 1308/1(Fig. 32), may also be part of a broken and rejected roughout.

Specimen AU 1433/1 (Fig. 33) from F8 is the hammer-dressed and partly ground central part of a thick quadrangular-sectioned specimen. S. Best has examined this specimen and reports that it is made in a particularly coarse-grained variety of Tahanga basalt.

The final specimen from layer 2, AU 1421/52 (Fig. 34), is the bevel part of a small well finished adze of thick trapezoidal section, front narrower than back. In the relationship of cutting edge width to thickness it is similar to hogbacked adzes, although it cannot be described as triangular in section.

Discussion

Few of the items described above were considered "diagnostic" at the time they were excavated (and very few of them could safely be classified according to Duff's (1956, 1959) typologies). Nonetheless, they form a substantial corpus of tools from the site. All except the highly ground fragment from layer 4 are made of Tahanga basalt. It is unfortunate that no detailed study has yet been made of manufacturing techniques used at Tahanga against which the Skipper's Ridge assemblage could be assessed. Several features which occur at Tahanga may be noted, however, in particular the regular if minority occurrence of adzes of all sizes made on single flakes or blades, and the fairly frequent presence on roughouts of the distinctive weathered cortex of the stone. This, as Best (n.d.) has shown, may be related to the structural properties of the stone. Moreover, as is the case with most assemblages derived from Tahanga, both quadrangular- and triangular-sectioned specimens in a fairly advanced state of manufacture are present, together with rougher and less finished specimens.

Although there are three triangular-sectioned specimens from layer 3, it is not certain that they comprise two examples of Duff's type 4a and one of type 3 (Parker 1962, p. 223). Moreover, the single complete adze from layer 3 can hardly be safely described as belonging to Duff's type 2b. It must rather be seen as one of the small untanged quadrangular adzes which appear to have been present in Coromandel assemblages from an early date, and is very similar to a specimen from layer 5 at Hot Water Beach (N44/69) for example (Leahy, 1974, p. 48). This is perhaps not the place to discuss the questions of whether a 2b adze can be made from Tahanga basalt, and if not, whether the distinction is in the mind of the adze typologist or of the Polynesian tool maker. But it must be asserted that just as the adze assemblage from Skipper's Ridge cannot be confidently identified as Archaic in Golson's (1959) terms by the presence of indisputably Archaic types, so it cannot be regarded as Classic Maori by the indisputable presence of Type 2b (cf. Bellwood 1969, p. 204).

The sample of roughouts from the various layers at Skipper's Ridge offers no convincing evidence of change through time. Detailed study of large numbers of adze roughouts of Tahanga basalt from dated contexts may eventually reveal changes in manufacturing techniques and/or in the adzes produced. At present, however, there is little indication of such change, and no certainty about the length of time that Tahanga was in use. It seems likely, nevertheless, that the Tahanga quarry was used, at least for local supply, throughout the span of New Zealand prehistory, and possible that manufacturing techniques employed there changed little if at all through time. The lack of any obvious change in the assemblage at Skipper's Ridge, therefore, cannot be used to argue that all four occupations on the site succeeded each other within a short period.

BASALT FLAKES AND PIECES

The remaining basalt items from the site comprise an assortment of flakes and material derived from flaking, and a small number of cores.

The distribution of basalt on the site differed from layer to layer. Most of the layer 4 assemblage came from pit B (78% by number or 65% by weight). From pit A came 11% (16% by weight) and there were lesser amounts from pit E, pit C-3 and squares E9 and F8.

In layer 3, the largest collection of basalt came from F5-6 ext. (28% by number, 30% by weight). Next came D-E8 (16%, 13%) and F5 (11%, 8%), then D7 (8%, 13%), D8 and F6 (8%, 7%) and F8 (8%, 2%). Lesser amounts were collected from F9, E5-6, E7-8, E8 and E6-7.

In layer 2, the largest concentration was in E6 (44%, 40%), followed by E8 and E9 combined (20%, 24%) and F5 (11%, 9%). The remainder was fairly evenly divided between most remaining squares, although there is none from D7 or E7.

The above figures should be taken only as a general guide, as there are some discrepancies between figures recorded in 1963 and 1974, as well as the possibilities of collection bias and loss between 1959 and 1963.

Although at first glance most or all of the material appears to be "flakes", a substantial proportion lacks clearly defined striking platforms and actually consists of broken pieces, rather than complete flakes. This distinction has been recognised in the preliminary analysis of the material. The numbers and weights of each category in each layer are shown in Table 3.

Table 3. Analysis of the basalt assemblage, N40/7.

	Flakes		Pieces		Cores	
	no.	wt. (g)	no.	wt. (g)	no.	wt. (g)
layer 2	82	1781	114	892	5	365
layer 3	78	1932	76	639	6	253
layer 3/4 trans.	12	340	4	27	2	113
layer 4	53	663	21	171	2	69

The presence of grinding or hammer dressing on both flakes and broken pieces and the presence of weathered cortex were noted. Items were examined briefly by eye for evidence of use, but not microscopically unless suggestions of use wear had already been detected.

Of 52 ordinary flakes from layer 4, one from pit A had a ground surface suggesting it was derived from a finished adze. None of these flakes showed signs of use. Nine flakes, with considerable size range, had weathered cortex. There was also, from E8, an exceptional elongated flake, AU 1536/6, with very extensive edge grinding or polish on one long edge and some surface grinding (Fig. 10). There were 21 broken pieces, a few with cortex and none with signs of use. A piece from a highly ground adze (described above) is probably not basalt. One of the two cores, as mentioned above, may be part of a small roughout. The other, AU 1535/3, apparently part of a snapped core of blade-like proportions, has one edge which may have been deliberately retouched to make a working edge.

There was relatively little basalt from layer 3/4 transitional. Three of the largest flakes are from pit G and the remainder of the material from pit H. Two flakes have cortex, and one of the smaller flakes from pit H shows possible evidence of use.

The 78 flakes from layer 3 include a large broken blade-like flake with grinding or polish on one long edge. It is actually in two pieces, but as these fit together and were found in the same square (F5-6 ext.) they are treated as one item, AU 1450/19 & 44 (Fig. 23). Two other flakes have edges indicating possible use and one has slight signs of grinding. Fifteen have cortex. Two of the 76 broken pieces have grinding and several have cortex.

Parker's references to a "rectangular stone knife of good quality" (1959, p. 19; 1960, p. 40) suggest that it must have been found in the fill of pit J assigned to layer 3. No item from this or similar context which would fit the description is now identifiable, and it is assumed to have been mislaid.

Eighty-two flakes from layer 2 include two with grinding and one with hammer dressing. Six show signs of possible use; two of these, on which use marks are almost certainly present, are long straight blade-like flakes, although one has snapped so that only a part survives. There are five ground items and several with cortex among the 114 pieces. In addition to the five core-like pieces listed, there is one other doubtful core, which was not included in the analysis because it may not be man-made.

As can be seen from Table 3, the broken pieces in all layers are on the average lighter (and smaller) than the true flakes, as is only to be expected. Some pieces are clearly the distal fragments of snapped blade-like flakes, although it has not so far proved possible to match these with snapped flakes, except in the case of AU 1450/19 & 44 from layer 3.

The length/breadth dimensions of flakes from each layer are shown in Fig. 35. The tendency of layer 4 flakes to be smaller and less variable in proportion may be because nearly all of them came from one pit fill, and may have resulted from one piece of work, whereas the flakes from other layers were more widely scattered about the site. The dimensions of flakes from Skipper's Ridge can be compared with those from other sites, including Bellwood's site further up the ridge (Bellwood 1969, p. 208), a coastal midden at Whangamata (Shawcross 1964, p. 18), where the material is almost certainly Tahanga basalt, and two sites on Motutapu Island, where the flakes are of greywacke (Leahy 1970, p. 76; Davidson 1970, p. 52). Although the flakes from Skipper's Ridge I tend to be smaller than those of Skipper's Ridge II, they also tend to be larger than those from the other three sites. It seems likely that although they are mostly waste flakes from core tool production they represent either an earlier stage in the manufacturing process, or the production of larger tools.

No analysis of such features as edge or striking platform angles of the flakes has been undertaken, in view of the probability that most of them are waste flakes from core tool production. Any further analysis should probably form part of a study of adze manufacture on this and other sites using Tahanga basalt, now that the flaking properties of the rock are better understood (Best n.d.).

In regard to use, as well as size, the flakes from Skipper's Ridge I differ from those of Skipper's Ridge II, where 33 out of 96 flakes analysed showed use wear (Bellwood 1969, p. 208). The two obviously and extensively used flake tools are both of blade-like proportions and have one or more long straight edges showing the characteristic polish indicative of considerable wear. Flakes with possible use wear are absent or rare in all layers, but the largest number is from layer 2, possibly indicating a trend towards an increase in the sort of activities later performed at Skipper's Ridge II.

OBSIDIAN

The obsidian assemblage from the site is small. There were originally three pieces of obsidian from layer 4, but these were used by Green for hydration rim analysis, as were two from layer 3 and three from layer 2. There is one piece from J7, layer 2, and one from "Les's *rua*" which are omitted from the analysis which follows. The layer 4 pieces were all green, and were assumed to be from Mayor Island. There is one grey piece from layer 3, the remainder being green. The layer 2 assemblage includes both green and grey pieces, as well as some that are indeterminate. No obsidian was found in layer 3/4 transitional. The obsidian, like the basalt, includes both true flakes and pieces or chips, as well as some cores.

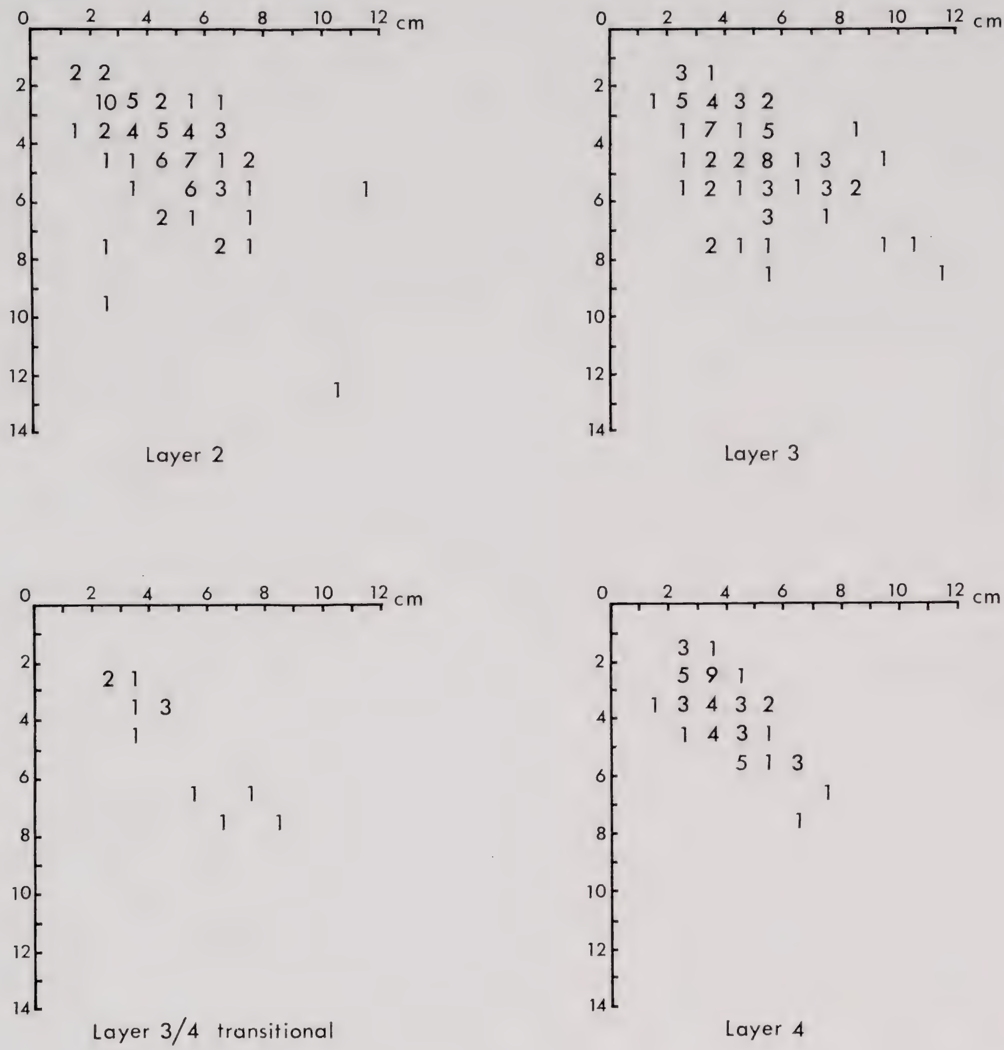


Fig. 35. Dimensions of basalt flakes, Skipper's Ridge, N40/7.

Surviving fragments of two of the three pieces from layer 4 show signs of use.

The obsidian from layer 3 comprises two cores from D7, one showing signs of retouch; three flakes from E6, all with signs of use; and four chips from F5-6 ext., all showing possible signs of use. It is one of these last which is grey. The two pieces used for hydration rim analysis were from Mayor Island.

The obsidian from layer 2 was widely scattered over the site with one or more pieces from most squares. The existing collection comprises 14 flakes (4 grey, all with evidence of use and 10 green, 6 used); 4 grey pieces (1 used) and 8 green; 3 grey cores and 4 green cores (2 of which are only tentatively identified as green); and 4 detrital pebbles of indeterminate colour. The three pieces used for hydration rim analysis consisted of two green and one grey. Remaining fragments of two of these show signs of use. One other obsidian item from layer 2, listed in the catalogue, has been mislaid.

OTHER STONE FLAKES AND CORES

There were very few pieces of worked stone other than basalt and obsidian. None was recovered from layer 4, apart from the adze flake described above, and none from layer 3/4 transitional. From layer 3 in square F6 came one core-like piece of white siliceous stone, and one fragment of a hammer stone, or possibly of an adze, made from baked argillite or chert. There is a slightly larger assemblage of siliceous stone from layer 2, comprising one flake, one core and three core-like pieces from E6; one core-like piece from D7; one chip from D8; and one core, possibly used as a hammer stone, from F5 or F7. The core-like pieces may be part of the unworked stone constituent, rather than artifacts, although they have some appearance of being worked.

GRINDSTONES AND FILES

Despite published reference to files being found in layers 2 and 3 (Parker 1960, p. 40), there is very little in the existing assemblage which can confidently be identified as an abrasive tool. A piece of a sandstone grindstone weighing 539 g was found in the layer 4 fill of pit E in square E7. It is rectangular in shape, measuring 8.5 × 9.3 cm in plan, with one hollow ground surface. It has a maximum thickness of 4.8 cm. A possible file fragment was found in the fill of pit A, also in layer 4, but no definite files are present from the other layers.

HAMMER STONES

The presence of a possible hammer stone of siliceous material in layer 2, and a fragment of one in layer 3, has been noted. In addition, there was one hammer stone from the layer 4 fill of pit B, recorded in 1963, but since mislaid; and one or more possible hammer stones from F6, layer 3, also now mislaid.

SHELL ARTIFACTS

Two possible shell artifacts were found. In E7, layer 3, was a right valve of a *Pecten* with a perforation which may be deliberate. In D7, layer 2, was a small, apparently worked sliver of shell, 2.9 cm long and about 2 mm wide at one end, tapering to a fine point at the other.

DISCUSSION

The artifactual assemblage from Skipper's Ridge is of a kind now becoming familiar from open ridge sites. In particular it can be compared with the assemblage from Bellwood's site further up the same ridge, and with two ridge settlements on Motutapu Island. All these sites have evidence of stone working or use in some quantity, but relatively little else in the way of artifacts.

The contrast between Skipper's Ridge I and II has already been drawn by Bellwood, who suggested that basalt working at the lower site was largely confined to adze manufacture, but that other and perhaps specialised activities had also been performed at the upper site (1969, p. 211).

The basalt assemblage from Skipper's Ridge can be compared with the greywacke assemblage from N38/30 on Motutapu, a site where adze making was also an important activity. The adze fragments themselves can also be compared, and it is interesting to note in both sites the presence of roughouts which have been quite carefully shaped but with little or no attention yet given to the formation of the bevel.

Although the greater part of the basalt assemblage from Skipper's Ridge I is, as Bellwood noted, unused waste material, the presence of a few tools showing very extensive use should not be overlooked. The few which do show indisputable evidence of use are of blade-like proportions, indicating selection of a particular shape of flake for use. Since the ability of craftsmen using Tahanga stone to produce adze roughouts from single large flakes is repeatedly evident, it is hardly surprising that they could and did strike flakes of similar proportion to use in other ways.

The presence of hammers and a grindstone is further evidence of stone working on the site. Whether unsatisfactory roughouts were used as hammers, as suggested by Bellwood, is open to question. Most if not all of the hammer dressing on the specimens found can be more simply explained as part of the normal process of manufacture.

That adzes were used on the site is suggested by the few flakes from ground adzes found in each layer. Some of these, at least, are as likely to derive from adzes accidentally broken or chipped during use, as from the reworking of damaged adzes.

Activities taking place on the site, then, can be seen to include the manufacture, repair and use of adzes, and other activities which involved the use of obsidian and of a few blade-like basalt flakes.

The complete absence of bone artifacts, including fishhooks and evidence of their manufacture, and the virtual absence of siliceous stone flakes may be related. It must not be overlooked, however, that only a small part of the site was excavated. The much smaller excavation at N38/30 (Leahy 1970, 1972) indicated clearly how very specialised the distribution of artifacts on a small living site can be.

Evidence of Age

A single radiocarbon date has recently been obtained for Skipper's Ridge (Davidson 1974). The sample was charcoal from the very base of the fill of pit E, and was identified as *Panax* sp. It was apparently found barely 1 cm above the pit floor, resting on a thin dark layer of "occupation debris" which was present on the floor of this pit and pit D. The charcoal therefore appears to belong to the beginning of the abandonment or refilling of the pit, and is not a contextless sample from the middle of the fill.

The result, of 807 $\pm$ 57 bp (NZ 1740), when adjusted for the new half life and corrected for secular effect becomes AD 1170 + 60 − 50.[1] The dangers of accepting a single date have been enumerated many times; nonetheless there are grounds for considering this an acceptable result.

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[1] I am here adopting a convention now widely accepted in British archaeology, where ad, bc and bp are used for dates expressed in radiocarbon years and AD, BC and BP for dates converted to calendar years.

Measurement of obsidian hydration rims, performed during pioneering work in this field, suggested that material from layers 3 and 4 was close together in time and broadly contemporary with layer 4 at the Opito Beach midden (Green 1964, p. 135), and that layer 2 was somewhat more recent. Restudy of the same samples gave similar readings on the samples from layers 2 and 4, but rather older readings for the two from layer 3 (Green, pers. comm.). This raises the problem of redeposition of artifacts from old contexts in younger layers, in addition to the problem already recognised by Green of the re-use of obsidian in this and other sites, resulting in different hydration readings on different surfaces.

The application of hydration rim measurement in New Zealand archaeology is still in too tentative a stage for the results to be taken as more than a very general indication of relative age. Nevertheless, it appears that there is some obsidian in layers 3 and 4 at Skipper's Ridge which gives readings similar to those for obsidian from Tairua (N44/2) or layer 4C at Opito Beach (N40/3), whereas other pieces give readings comparable to layer 4B at Opito Beach, or younger. The youngest readings on obsidian from layer 2, comparable to results for the early occupations at Kauri Point Pa (N53-54/5) place an upper time limit on the underlying layers. There are several explanations for the older readings, including redeposition on the site of obsidian from an earlier occupation (? occupation I), collection of obsidian from older sites in the general vicinity, or acquisition of obsidian cores with old surfaces previously exposed at the source. These perplexities, however, do not alter the general conclusion that the obsidian at Skipper's Ridge is certainly old enough to indicate the probable contemporaneity of the site with Archaic beach middens.

The evidence of the radiocarbon date suggests that occupation I at Skipper's Ridge may be old as any dated site on the Coromandel Peninsula with the possible exception of Tairua (N44/2). The similarity of lay-out from occupation I to occupation III suggests that relatively little time may have elapsed during these three occupations. The position of occupation IV is less certain. The general similarity in material recovered and to some extent also in site lay-out make it possible that the entire occupation on this part of the ridge belongs to the period before AD 1300. On the other hand, the obsidian results tend to support continuity in occupation from occupations I to III but a hiatus before occupation IV. In this case the continuity in site plan (for which the occupation IV evidence is weakest) must be restricted to the first three occupations.

Discussion

The excavation at Skipper's Ridge uncovered one corner of an extensive settlement which, at least during the first part of its history, was neatly set out around an open space. The isolated square to the south of the main excavation (J7) indicates the possible extent of this central open space.

It would not be seriously suggested now that any of the structures revealed at Skipper's Ridge was a dwelling. Instead they can be seen as different kinds of storage structures. It is extremely probable that some, if not all of them, were used for the storage of kumara. The consistent presence of cooking stone and shell midden, and the basalt flaking debris and stone tools, however, show that this was not merely a specialised storage site, but one where a certain amount of domestic activity took place. It can be assumed that in the unexcavated part of the ridge there may have been one or more cooking areas belonging to the earlier occupations, and some houses. It appears that a substantial and well planned settlement was already in existence in the twelfth century.

The similarity in site plan during occupations I to III strongly suggests that these three occupations were continuous, and may have taken place within a relatively short period. Although there appears to have been a major change in pit construction from the buttress pits and rectangular underground pits with forepits of occupation I to the bin pits and rectangular pits without buttresses of occupations II and III, little other change can be documented during this part of the site's history.

Occupation IV, on the other hand, marks a change in use of the excavated part of the site (thought to be only a small proportion of the total site) from storage to cooking with a minor storage component. This change was accompanied, naturally enough, by an increase in cooking stones and shell midden in comparison with earlier layers. There is a suggestion, however, that the central open space was still preserved, even though the activities on this part of its periphery had changed. Occupation IV, therefore, could also be continuous with earlier occupations, and the change of use perhaps a reflection of a feeling that the usefulness of the area for pit construction had been at least temporarily exhausted.

The portable evidence from occupation IV provides no evidence of change beyond what might be expected to result from the change of use of this part of the site. The obsidian hydration results, however, suggest that occupation IV may have been rather later than the other occupations and separated from them by a period of abandonment longer than would be possible between occupations I, II and III if these were by people who held to the same site plan with each rebuilding.

The question of continuity of occupation, therefore, cannot be fully answered on the present evidence.

The similarity in the quantity and range of portable evidence found in association with structures on open settlements at Skipper's Ridge, Kauri Point (N53-54/6) and at Motutapu Island suggests that sites of this kind are not unique or unusual. Moreover, the existing evidence for their ages indicates that Skipper's Ridge and at least one of the sites (N38/37) on Motutapu are widely separated in time. It is probable that sites of this kind have been part of a northern New Zealand settlement pattern during much of the known span of New Zealand prehistory.

The interpretation of the pits at Skipper's Ridge as storage structures, and the inference that they were for kumara storage, implying agriculture, are no longer as open to challenge as they once were. The existence of agriculture as early as the twelfth century can now be accepted in view of the number of carbon dates for field systems and garden soils in widely separated parts of the North Island (Leach & Leach 1971; Groube 1966, p. 112; Peters n.d.; Sullivan pers. comm.). The evidence for pit storage as early as the earliest dated field systems, however, has until recently been suggestive but less definite. The early carbon date for occupation I at Skipper's Ridge supports the solitary date for Phase I at Sarah's Gully Pa (Birks & Birks 1970). These two dates in turn support the probability that the pits at Sarah's Gully settlement, correlated by Golson with the thirteenth to fourteenth century Archaic midden at Sarah's Gully, and regarded by Parker as similar to occupation III at Skipper's Ridge, are also of comparable age.

It is possible to consider not only what activities were represented at Skipper's Ridge, but what activities were not. The most striking feature is the absence of bird and sea mammal bone, and of fishhooks and bone artifacts generally, as well as all evidence of their manufacture. These are the very items that are most typical of the Archaic beach middens of the Coromandel coast, including many of those at Opito. If the early date of Skipper's Ridge is accepted, the early beach midden/late pit complex dichotomy becomes untenable, and alternative explanations are required, in which the two types of site are viewed as contemporary.

Fishhook manufacture and certain fishing and hunting activities are specialised male pursuits in some parts of Polynesia, and it might be argued that beach middens containing evidence of these activities were the sites of specialised men's houses. Although the men's communal house appears not to have been a feature of New Zealand settlements at the time of European contact, this need not mean that it was never present. The men's house hypothesis would provide a satisfactory interpretation of the situation if indeed Skipper's Ridge and the Opito Beach midden (N40/3) were linked parts of a single contemporary settlement, as Golson and Parker tentatively considered.

It is as likely, however, that the beach middens were seasonal camp sites, and that those at Opito were used by people from elsewhere in the general vicinity who camped on the beach in the same way as those observed by Cook and Banks in Mercury Bay in AD 1769 (Beaglehole 1962, I, pp. 427-8).

Skipper's Ridge also emphasises again the value of intensive study of small areas. It is the possibility of comparing in detail the portable evidence from Skipper's Ridge and N40/2, for example, that demonstrates their complementary nature. Detailed publication of other excavations in the area would facilitate renewed study of settlement patterns, for the summary and progress reports published during and immediately after the investigations now tend to obscure or gloss over the very details that might throw light on the specialised activities appropriate to the various sites.

Even if it is now accepted that there has been continuity in agriculture, in open ridge storage and settlement sites, and in use of Tahanga stone at Opito for centuries, there is still much to be investigated on the Kuaotunu Peninsula. For example, the range of time spanned by beach midden/working floors may well extend to the proto-historic period, although this has yet to be adequately demonstrated. The earliest appearance of fortifications on the Kuaotunu Peninsula also poses an important problem for investigation.

Wider problems are raised by the evidence from Skipper's Ridge. If the early dating of occupation I is correct, where and when is the origin of these sophisticated storage structures to be sought? At present no answer can be given. The single side-buttress pit in the early part of the Mount Roskill sequence is a solitary hint that such pits may eventually prove to be widespread. The only dated pits of comparable age to occupation I at Skipper's Ridge are those of Phase I at the nearby Sarah's Gully Pa (Birks & Birks 1970), which were, however, large bell-shaped pits entered vertically. This merely emphasises the proliferation of pit types on the Kuaotunu Peninsula at an early date and underlines the lack of similarly early evidence elsewhere. The resemblances noted by Parker between pits at Kumara-Kaiamo in North Taranaki and Skipper's Ridge now appear less striking than they did in the early 1960s, although a full report on Kumara-Kaiamo is necessary for the pits there to be adequately assessed. The complexities of that site, however, were so great that the fundamentally important sequence of structures in the first two occupations was differently interpreted by Parker (1962, pp. 224-5) and Buist (1964, pp. 95-6).

Evidence is now beginning to accumulate for considerable contact between the Coromandel and Northland during what, for want of a new definition, can still be called the Archaic Phase. It is possible that not only Mayor Island obsidian, but Tahanga basalt and perhaps other Coromandel stone was reaching at least as far north as Houhora (Best n.d.). It is not unreasonable to suppose that storage pits of comparable age to those at Opito may be found in the north, although there is at present no reason to assume that such pits developed in the north rather than in the Coromandel/Bay of Plenty area. Indeed, the question of the development of kumara storage techniques continues to offer a fruitful field for speculation. Skipper's Ridge, however, provides some constraints. The origins of pit storage are to be sought in the earliest period of New Zealand prehistory, and it is now necessary to replace speculation about the primacy of Northland with some firm evidence. In the absence of such evidence, a convincing case can be made instead for the primacy of the Coromandel Peninsula.

If agriculture is firmly established in the Archaic phase and some ridge settlements with pits are known to be contemporary with or earlier than typical Archaic beach middens, cultural sequences depending partly on economic criteria can be misleading. The question of defining phases, at least in a region such as the Coromandel, becomes once again a problem of artifact typology. Yet it is more than ever apparent that many sites of all ages are not going to produce finds amenable to typological study. The increased use of independent dating methods to order sites chronologically becomes extremely important. Only when many different kinds of sites within a region can be chronologically grouped by independent methods will it be possible to identify in which parts of the cultural system there has been change at various times and in which there has been continuity.

Summary

Excavations at Skipper's Ridge revealed one small corner of an extensive site with evidence of continuous or continual occupation involving the rebuilding of storage structures in approximately the same alignment around an open space. This occupation may have begun in the twelfth century A.D.

Portable material recovered in the excavation indicated that cooking, manufacture, repair and use of stone adzes, and other activities involving obsidian and stone flakes took place on the site. Shellfish and possibly fish were consumed, but there was no trace of the bird and sea mammal remains found in contemporary beach middens in the same bay, or of bone artifact manufacture, also a feature of nearby beach middens. This implies segregation of activities at a relatively early date, and shows that absence of what have hitherto been regarded as diagnostic Archaic features need not preclude a site from being early.

In the range of activities represented, Skipper's Ridge has some resemblance to undefended settlements occupying similar ridge end situations on Motutapu Island, near Auckland, and contrasts with the later site on the same ridge at which specialised storage and industrial activities appear to have taken place.

The possibilities for comparison between these sites and beach middens in the same area emphasise the need for publication of other relevant sites, so that questions of settlement pattern, economy and division of activities in this and other areas can be more fully explored.

Acknowledgements. I am deeply indebted to Mr R. H. Parker for making available his notebooks and plans of the excavations and enabling me to write this report. I am grateful to Professor J. Golson for providing plans and sections of the initial test excavation, and to Professor R. C. Green for his unpublished notes on the obsidian analysis.

Professor Green also provided invaluable encouragement throughout the project, and the writing of the report in England could not have been successfully completed without his assistance in checking details of the material in Auckland.

Finally, it is a pleasure to take this opportunity of expressing the gratitude of all archaeologists who have worked at Opito to Skipper Chapman, the landowner and discoverer of N40/7 which carries his name.

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A LOCALITY MAP FOR SKIPPER'S RIDGE (N40/7), OPITO

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Abstract. The discovery of two incomplete plans made in 1959 enables a map to be published showing the setting of the excavation at Skipper's Ridge (N40/7) at Opito, its probable relationship to the Archaic beach midden N403, and other important field evidence.

Two faint and incomplete plans showing the setting of the excavations at N40/7, Skipper's Ridge (see Davidson, this volume) and adjacent features, have recently been discovered in the Anthropology Department, University of Auckland. From these, the map reproduced here as Fig. 1 has been reconstructed.

The plans were found by Green in a drawer of old NZMS 1 maps. They have been drawn in pencil on the backs of two separate sheets, which have clearly been attached at some time to a drawing board. The more complete version, henceforth referred to as plan A, is on the back of an old copy of Sheet N49 (1st edition); the other, plan B, is on the back of a copy of N44 (1st edition), these maps being of adjacent areas on the Coromandel to N40. Both plans have been drawn according to the same system and it seems likely that plan B is an earlier discarded version.

According to Parker's diary of the excavations at Skipper's Ridge, a base map of the site and its surroundings was made by L. M. Groube at the beginning of the excavation in May 1959. It seems very probable that the plans discussed here are those made by Groube, particularly since the extent of the excavations shown on plan A correlates well with the area of the site known to have been open at that time.

In both versions, a base-line was laid out along the tidal beach flat and several lines were run inland from it at right angles, passing through the various areas to be mapped. These lines were 30 feet (9.14 m) apart; there are three on plan B and four on plan A. Thus even on plan A, only a strip 90 feet (27.43 m) wide is covered in detail. Along each line, distances inland towards the Otama Stream were measured to numbered points, whose elevations were apparently recorded elsewhere. Fortunately, sufficient contouring (at one-foot (0.3 m) intervals) has been sketched in on plan A to enable us to complete the contours within the strip with a high degree of confidence. We have assumed that the part of the Otama Stream shown, which is tidal, is close to the same elevation as the base-line, an assumption confirmed by one point marked on the stream bank as one foot.

Certain features in addition to the contour points are shown on one or both plans. The "enclosure" below the excavation appears on both, as does the dry stream bed. The Otama Stream, the fenceline, the excavations on the ridge, and the drain running down from the excavation are shown on plan A. The edge of the dunes at the top of the beach is shown as a scarp on plan B.

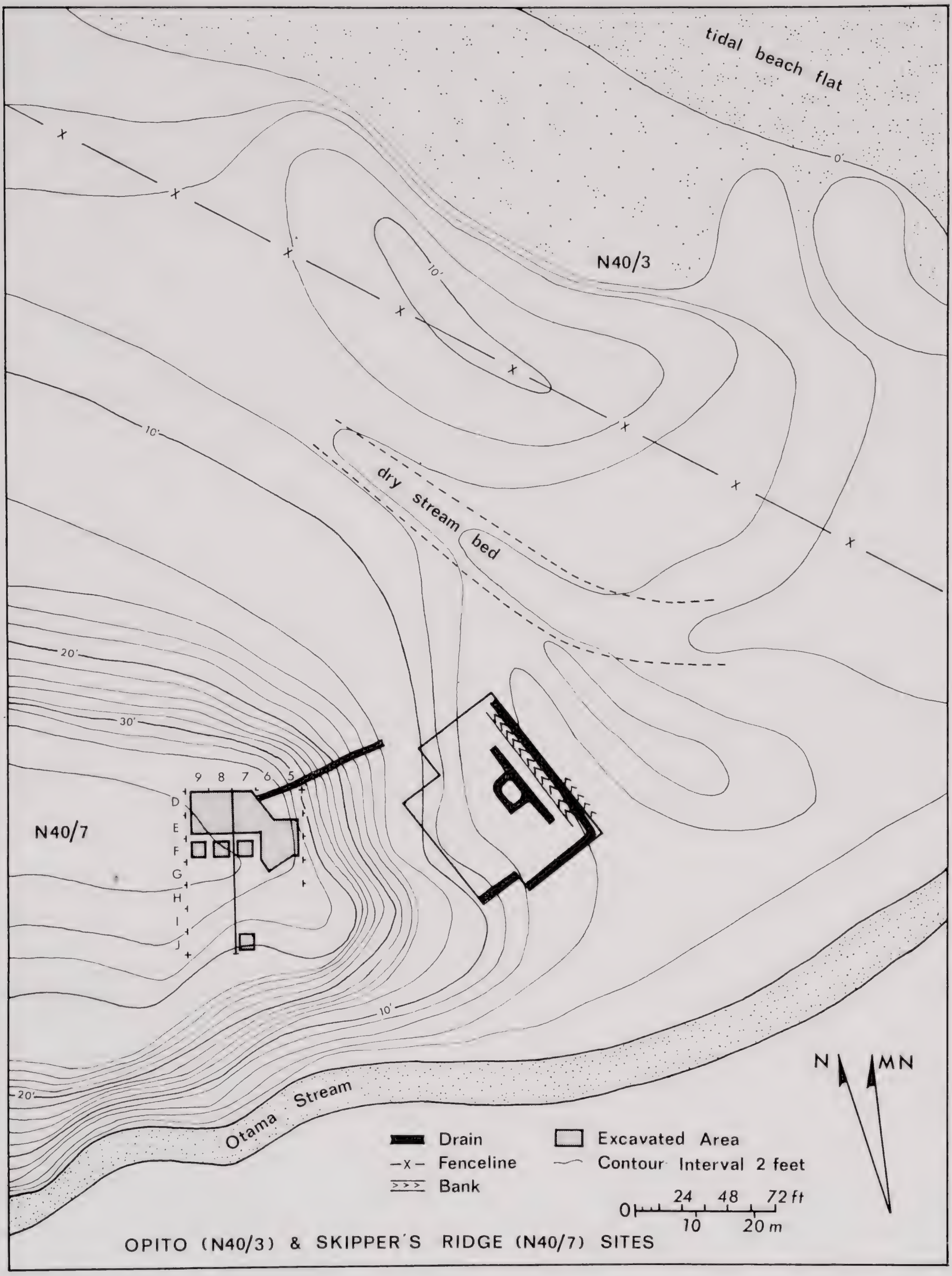

Fig. 1. Locality map for the Skipper's Ridge site (N40/7) at Opito.

We have used contemporary photographs and a sketch plan in Parker's diary to add marginal details on Fig. 1. The periphery, particularly on the east side, has been completed with a lower degree of confidence than the centre. We have not been able to show a gate and second fenceline running south-west towards the stream and passing east of the "enclosure".

Although the Skipper's Ridge site is not labelled on either plan it can be securely identified from the features shown on plan A. These include the "drain" running down-hill from the excavation, the original base-line with squares D7 and J7 (already excavated in January 1959) blocked in, and four more squares (D8, E6-8) in outline. These details are sufficient to enable the total area subsequently excavated to be shown on Fig. 1.

The Archaic beach-front midden, N40/3, is not marked on either plan. However, its probable position is indicated by a beach-front scarp on plan B and steep contouring of the beach dune face on plan A. Moreover, it seems not unlikely that the plans were designed to include both the excavated sites in the vicinity, particularly since in May 1959 excavations on the flat between the two sites were still considered a distinct possibility. This argument, together with evidence from photographs and memories of people familiar with the sites, particularly R. G. W. Jolly (pers. comm.) suggests that N40/3 was close to the beach face, either as shown on Fig. 1, or slightly to the north.

One of the most interesting aspects of the plans is the information they contain on the "drain" running down the hill from the site, and the surface features referred to as "the enclosure" on the sandy flat at the base of the ridge, which have now been destroyed by roading and subdivision. Although more recent fieldworkers have not recorded these features, they assumed considerable importance in the approach to the excavations at Skipper's Ridge, as the following extracts from Parker's diaries indicate.

> The "drain" ran N-S for a distance of about 10 feet [3.05 m], then turned eastward and ran down over the edge of the ridge. From the top it seemed to run perfectly straight to the foot of the ridge and to have a possible connection with a number of shallow elongated depressions on the flat which looked like the remains of modern field drains. Skipper questioned about this later said that as far as he knew no field drains had ever been dug on the flat and that in any case the soil was so sandy that it was hard to imagine any need for field drains. (January 1959).

> It seems curious that while the shallow layer 3 drain gave clear surface indications the deep layer 4 pits gave none. (7 April 1959).

> The "field drains" at the bottom of the slope seem to form a rectangular enclosure of low bank and ditch. The drain down the hill does not look as if it enters this system but seems to run parallel to and close beside the western side of the "enclosure". It seems to be important to determine the exact relationship between these two systems. (6 April 1959).

> The status of the lower end of the drain in relation to the "enclosure" also seems to me to require clarification. One or two squares laid out across the two ditches in an E-W line would probably do this at least as far as deciding whether the two ditches are contemporary or not and giving some indication of soil conditions inside and outside the enclosure . . . In the time available in May it would be impossible to follow the whole course of the drain but some investigation of the lower end would be helpful in assessing whether or not the occupation extends on to the flat and at what periods . . . (11 April 1959).

Parker also noted the possible existence of another area of "drains" near an isolated *rua* which was excavated during May. The site of this *rua* has not been recorded, but it was probably outside the area of the present map.

None of the "drains" was tested by excavation at any stage during the investigations at Opito, except for the upper part of the "layer 3 drain" on the ridge top. However, the Opito evidence, as shown on the plans and described in Parker's diary, can be compared with excavated features at Sarah's Gully Settlement (N40/9), and the much clearer field evidence from parts of Northland, notably at Tupou Bay (Nicholls 1965) and Moturua Island (Peters, in press). At Sarah's Gully, a number of "drains" which did not show on the surface were uncovered by excavation at the rear of the consolidated marine terrace behind the Archaic beach midden (photographs in Anthropology Department, University of Auckland). That some of the features really functioned as drains is shown by the fact that they ran out of pits, in a manner more recently noted in other excavations (e.g. N38/37, Davidson 1970, pp. 39, 40). The function of the features at Tupou Bay and Moturua, however, is much less certain, the plausible alternative that they were field boundaries having been suggested in both instances (Nicholls 1965, p. 149; Peters, in press).

As the Opito features, at least in this part of the bay, have now been destroyed, their interpretation can never be certain. It remains possible that the "enclosure", at least, was a late, even protohistoric or European feature, unconnected with the ridge and not part of a prehistoric field system. It is also possible, however, that the enclosure and the possible drains near the isolated *rua* were the most distinct surviving features of an extensive field system comparable in nature and extent to the Tupou Bay and other Northland field systems. In this case, the intriguing possibility must be considered that the "drain" running down the ridge from the excavation was not, as the excavators expected on the basis of the Sarah's Gully experience, a drain from a pit, but one of the major boundary markers of a field system of which the "enclosure" was a subdivision. This interpretation would explain why expert excavation of the upper part of the "drain" failed to demonstrate its association with any of the pits nearby. The stratigraphic position of the upper extremity of the "drain" could then be used to relate the system to the sequence of pits on the ridge.

These interpretations must remain speculative, since they can no longer be tested in the field. The discovery of the maps, however, restores data thought to have been irretrievably lost, shows the setting of the ridge excavations described in a preceding paper by Davidson (1975) more clearly than would otherwise be possible, and provides at least some information on a potentially most important form of field evidence not otherwise recorded at Opito.

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RADIOCARBON AGE ESTIMATES FOR RUARANGI PA (N20/41), WHANGAREI

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Ruarangi pa, located on a former burial reserve near Whangarei, was a terraced ridge peak fortification in which major earthwork defences such as ditches were lacking, and in which other artificial defensive structures were fairly minimal. Only during an early stage was any evidence found of wooden palisading along terrace perimeters, and then only for the central area of the site. Otherwise defence depended largely on the use of high steep scarps, sometimes supplemented by stone banks (Hougaard 1971, p. 20).

Significant features of the pa included substantial evidence in the form of stone pavements and alignments, house floors, hearths, shell midden and portable artifacts attesting to its use for domestic activities. The artifacts included six adzes of Duff Type 2B. While the evidence for residence within the pa was abundant, none for food storage was present. Rather pits for *kumara* storage lay outside the defensive area some distance away, indicating that this pa did not function as a defended food store.

Hougaard (1971, p. 18) made no attempt to date the site in her excavation report, as C14 age estimates were not then available. She did note that nothing diagnostic of the Archaic culture complex had been discovered and that no early European artifacts of the contact period had found. This suggested that the site belonged somewhere in the long period in between. Some, of course, would see the 2B adzes as a basis for assignment of the pa to the Classic Maori period, but apart from the traditional evidence there was no other indication of its antiquity. Hougaard did stress that she saw no reason to infer that more than one group of people were involved throughout the successive occupation levels, or that there was any major interruption in the occupation sequence despite being able to divide it stratigraphically into four occupations. In local Maori tradition the founding ancestor of the pa, named Torongare, is placed some eleven generations before the present, suggesting that occupation began 250-300 years ago (Oppenheim 1971, p. 24).

Three radiocarbon samples were processed by the New Zealand Radiocarbon Dating Laboratory and results are recorded according to current practice adopted by the Laboratory (Grant-Taylor 1974). Two now provide reasonable age estimates for pa occupation but a third result is rejected.

Sample AU 2092, NZ 1894, was of charcoal collected from a fireplace of occupation I in area C and should have provided the oldest age estimate. A result indicating that the sample consisted of modern (post-bomb) carbon is inconsistent with all evidence for the prehistoric age of all occupation on the site, and can only indicate massive contamination of very recent origin. The result, which cannot be explained, must be discounted as a useful estimate of the site's antiquity.

Sample AU 2115, NZ 1895, was on *Amphidesma australe* shell collected from Area B, occupation III, layer 5, of square L 20-21. X-ray diffraction indicated calcite and aragonite, so that prior to processing, the outer one-third of the shell used was evolved off. The results are:

NZ 1895 A	old $T\frac{1}{2}$	Age: 320 ± 80	before 1950.
NZ 1895 B	new $T\frac{1}{2}$	Age: 330 ± 80	before 1950.

AU 2113, NZ 1896, was on *Chione stuchburyi* shell collected from Area B, occupation IV, layer 2 of square L 20-21. X-ray diffraction indicated calcite only, and despite the evolution off of the outer one-third of the shell prior to processing, the result must be treated with caution, due to the calcite structure. The results are:

NZ 1896 A	old $T\frac{1}{2}$	Age: 170 ± 60	before 1950.
NZ 1896 B	new $T\frac{1}{2}$	Age: 170 ± 60	before 1950.

Corrections for secular effect are not at present applied to shell, so precise calendrical age in years A.D. is not advised (Grant-Taylor 1974).

Discussion

The two results, when uncorrected for secular effect, overlap at less than two standard deviations and therefore need not be taken as significantly different estimates of age. However, as they come from stratigraphically separated horizons, they cannot be pooled to form a single estimate. At one standard deviation, each date range could be taken as a reasonable estimate of age for its respective occupation, one that is acceptable in relation to the stratigraphic, archaeological and cultural context in which it occurs. The results are also reasonably in line with those suggested by genealogical dating.

On this basis a sixteenth to early seventeenth century age is indicated for the initial occupation of the pa. It was then re-occupied by the same people over perhaps a century without any sign of a major interruption or break in use of the locality for residence. Such an age for a terraced ridge peak pa is in no way exceptional, as it joins the increasing evidence of residential pa from this period in the North Island of New Zealand.

Correlating the archaeological evidence with the traditional records Oppenheim (1971, pp. 24-25) suggests that the short occupation of the pa lasted some two generations after Torongare to the time of generation nine and Ruangaio, at which point the pa was deserted. Ruarangi cave was thereafter used as a burial place for the "deceased issue" of Ruangaio, which use would date from the late seventeenth century A.D.

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FURTHER SALVAGE EXCAVATION ON HAMLINS HILL (N42/137), AUCKLAND, NEW ZEALAND

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Hamlins Hill, some 60 metres high, is located between the Tamaki River and an upper reach of the Manukau Harbour a little to the north of the portage which linked the Waitemata and Manukau harbours of the east and west coasts respectively.

The uniqueness of certain features of N42/137, the archaeological site on the hill, have been recognised by archaeologists (Davidson 1970, p. 105). It is singular in its situation on a clay instead of a volcanic hill and also in the absence of surface evidence of earthwork fortification. It may well represent a functionally different class of site to the fortified volcanic cone sites more characteristic of the Auckland isthmus. Further, the site offers possibilities for the study of prehistoric subsistence strategies, being located close to a wide range of resource zones including those of volcanic soil and the two harbours. More distant resources would have been readily accessible by water. Finally, the proximity of the site to a line of prehistoric communication adds yet another dimension of study.

The site, which consists of surface evidence of pits and terraces, is spread out over a large area of the hill. However, part of it may have been destroyed in the past when a water reservoir was constructed at the summit.

In February 1969, Janet Davidson of the Auckland Institute and Museum carried out a salvage excavation on the smaller knoll to the east of the reservoir after discovering that it was to be quarried for spoil (Davidson 1970). Apart from a terrace which was examined with somewhat equivocal results, the major area of interest was in the excavation of several pits together with five squares on a flat area apparently in association with them. According to the priorities which are the attendant and necessary evil of rescue excavation with limited resources of time and labour, Davidson took advantage of the relatively simple stratigraphy and excavated on an extensive rather than an intensive basis. Structural features of some importance were discovered and partly uncovered but economic evidence on the site received correspondingly less emphasis. Nonetheless, between an estimated one-half to two-thirds of a small and discrete midden was excavated and certain general but tentative economic conclusions were drawn. These included observation of shellfish species present, minimum numbers of individuals, relative importance of species, size ranges of individuals and implications for gathering selectivity. In addition, other faunal remains and a small quantity of artifacts were described.

In essence, the evidence recovered pointed to the former existence at the site of three major classes of activity postulated by Groube (1965) for the domestic and communal units of Maori settlement (Davidson 1970). The three components consist of underground storage pit, house and cooking area. All three elements were found on Hamlins Hill where it was considered that their relative spatial arrangement had altered through time. Basically the site appeared to represent an undefended and generalised living site of hamlet size. It is noted that in the excavated area there were problems in establishing the relative ages of the three elements. The material remains of cooking were generally superimposed over evidence of houses but it was difficult to establish the relative age of either of these to the pits by stratigraphic means.

The evidence for houses consisted of at least two superimposed structures of a type also encounered at excavations at two swamp sites at Lake Mangakaware in the Waikato (Bellwood 1969, 1971; Peters 1971). So in addition to the other unusual characteristics mentioned above, Hamlins Hill was producing evidence for the size and structure of houses which have long been an elusive element in the New Zealand archaeological record. However, due to shortage of time, it was not possible to uncover the complete structures. Their total size and complete plan remained unknown (Davidson 1970, Fig. 4). On account of the unresolved problems, a further small-scale rescue excavation was undertaken in August 1969 by the present author who had already assisted Miss Davidson with the first excavations. The emphasis was on the structural evidence while the midden received relatively cursory attention. The major concern was to excavate in plan before the site was quarried.

Excavation

Four 2.5 metre squares were laid out as a continuation of Davidson's grid. Accordingly they were serially labelled 6, 7, 8 and 9 (Fig. 1). The squares were separated by 50 cm baulks. Square 6 was located immediately west of Davidson's Square 4, while Square 7 was adjacent to her Square 1. Subsequently the baulks between the initial excavation and the writer's extension were removed. The effect of this was that the major section b - b^1 (Fig. 2; see also Davidson 1970, Figs. 2 and 5), now applied to the north-south axis along the eastern side of the new excavation. The stratigraphic relationship of the two excavations was established. Finally a metre-wide extension was dug south from Square 6 in an attempt to establish a stratigraphic link with Pit B (Fig. 2). Generally, the overall stratigraphy proved to be as described for the earlier excavation, namely ". . . a thin layer of topsoil without cultural material, then a layer of dark sooty soil with shell midden, some bone, and several *haangi,* overlying clay natural in which a number of features had been dug." (Davidson 1970, p. 112). Excavation was done with trowels. The material was not sieved but all cultural debris that could be collected by hand-picking was retained for analysis with the exception of shell which was sampled only. Cooking stones were weighed by quadrant then discarded.

The Midden

It was possible to determine the spatial distribution of the midden layer to the north and south in squares 7 and 6 respectively and to the west in the same squares or else in the baulk which separated them from squares 8 and 9. The layer was nowhere found to continue into the latter two squares (Fig. 2). Davidson's (1970) prediction that the midden was a small discrete scatter predominantly representing the remains of cooking

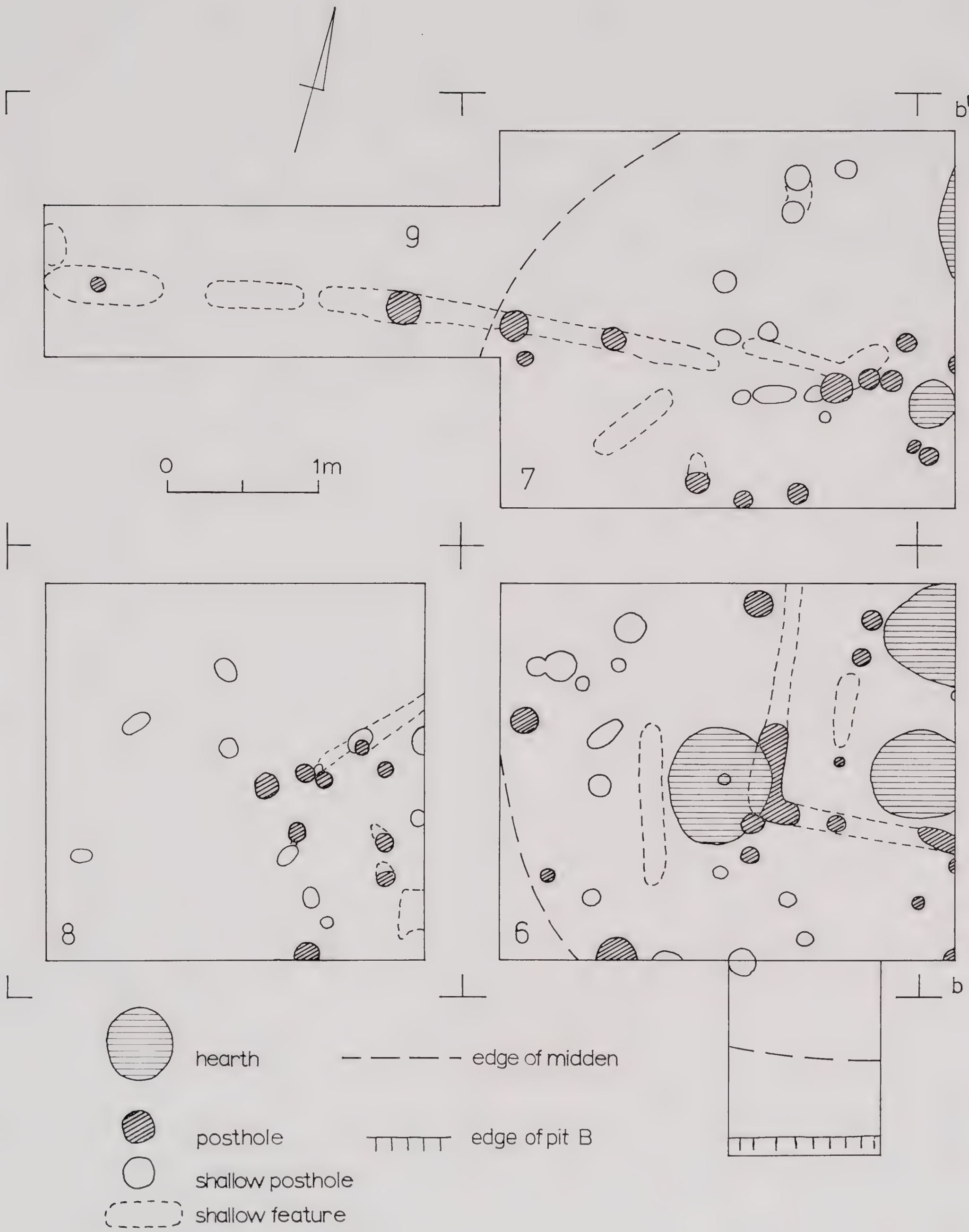

Fig. 1. Plan of the excavation.

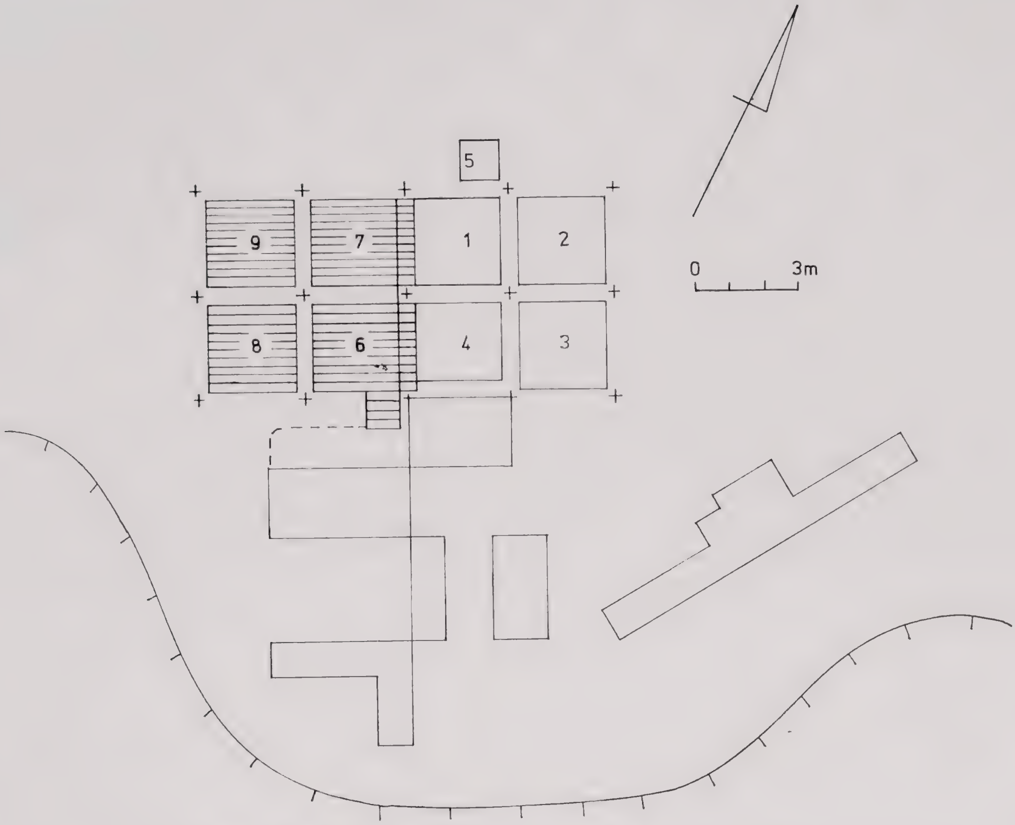

Fig. 2. Plan of features uncovered by excavation.

activity seemed confirmed. Below the midden, four shallow circular depressions cut into the clay natural provided evidence of burning. These were interpreted as *haangi*. Each of these structures contained the same material as composed the layer as a whole implying that their original contents had been removed. However, cooking stones occurred in abundance in the immediate vicinity scattered through the deposit. A lens of clay within the midden and visible in section (Fig. 3), is interpreted as the spoil deriving from initial digging of one of these features.

Structural Evidence

Also below the midden and apparently sealed by it was a profusion of postholes, some of which were associated in linear alignments taken to be the remains of surface structures and specifically of houses. Typically, the postholes were cut to a depth of *ca.* 25 cm into the natural. Normally they were circular in plan but a few had dimensions greater along the line of a posthole alignment than across it, suggesting that they formerly held wall slabs. Between the slab holes and postholes were continuous slots of approximately the same width as them but shallower in depth — *ca.* 15 cm. The evidence is entirely consistent with the view that construction consisted of posts or slabs set at intervals and interspersed with sections of wall of lighter construction (Davidson 1970, p. 116). These sections may have been made of split planks but at present there is no direct evidence to support the suggestion.

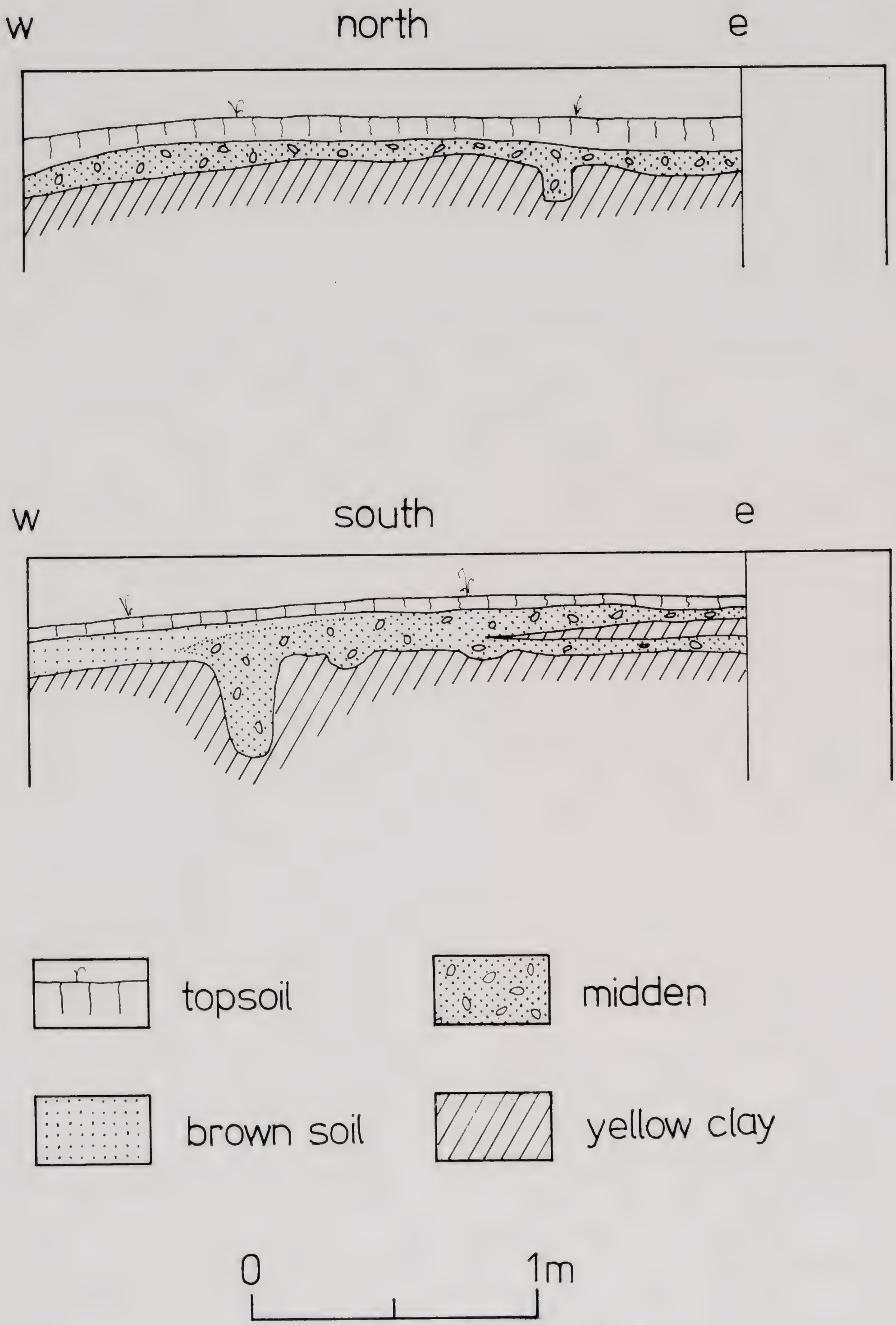

Fig. 3. Typical cross-sections, Square 6.

The evidence in Square 6 complements that of Square 4, namely that two or possibly three houses were superimposed and presumably succeeded one another in time without significant interval since they were found to be on the same alignment. It is now apparent that the length of the southern wall of the most recent house was in the region of three metres (Fig. 2; Davidson 1970, Fig. 4). It is noted that the most recent house is taken to be that least obliterated by subsequent activity.

In Square 6 both to the east and west of the western wall of the most recent house are the remains of the other two probable wall slots, which replicates the situation of Square 4. It may therefore be inferred that the southern walls of the three successive structures were of much the same length, although this inference is offered tentatively. It is more difficult to establish the other dimension of the latest house, since evidence for the same form of construction has not been found along the northern side. Here the situation is confused by a profusion of postholes and complicated by the absence of wall slots connecting them. Nonetheless it would seem safe to estimate the length of the most recent house conservatively at *ca.* 3 m.

Absence of continuous wall slotting has an interesting parallel with other cases of houses revealing this form of construction. At Mangakaware 1 the houses may also have been of lighter construction along their northern (and warmer) sides, although the position is not entirely clear (Peters 1971, p. 134).

The presence at the site of another house is implied by a further continuous posthole/wall slot structure, which starts in Square 7 and runs across Square 9 (Fig. 2). It has a minimum length of 4.5 metres. No evidence for a parallel wall is found inside the excavated area so presumably one may lie outside to the north. It is noted that this new structure does not overlap the other house area and moreover it has been found to be on the same alignment. This latter fact carries with it the suggestion that two structures may have been contemporary. Furthermore, the new putative house structure of squares 7 and 9 lies parallel to an alignment of some ten substantial postholes running diagonally across squares 1 and 2 described by Davidson as forming a "fence" or "stockade" (Davidson 1970, p. 119, Fig. 4). Had this stockade continued far enough west it would have lain adjacent to the new house as well as parallel to it. While this remains speculative, the alignments of the various structures argue for their contemporaneity. Finally, it is noted that the portion of the new wall which lay in Square 7 was located stratigraphically below the midden layer (Fig. 2) as did the succession of the two — possibly three — superimposed houses discovered previously.

As described above, a metre-wide extension of Square 6 was excavated south to the edge of Pit B in an attempt to ascertain problematical stratigraphic relationships. It was found that the midden did not reach the pit's edge. Had midden been found in the fill of the pit it would have established the latter as being the earlier. Conversely, had the pit been cut through the midden, the pit would logically have been later. Certainly, had the pit and the midden been contemporary one would not expect the midden to reach beyond its edge, and this was indeed the case. However, equally, the distribution of midden may be independent of the location of the pit. At present, all that can be said is that the evidence for houses lies below the midden while the temporal relationship of each to most of its pits remains unknown. Further excavation in progress at the time of writing is intended to reveal more information as to the disposition and relative ages of the features found in the site.

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CYCLICAL ASPECTS OF EARLY MAORI AGRICULTURE

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Abstract. A description of some aspects of Maori agriculture of the late 18th and first half of the 19th Centuries using Maori and European sources, is presented.

This paper is intended as an attempt at ethnohistoric reporting. To a certain extent because of the nature of the evidence it must also involve some reconstruction. Late prehistoric and early protohistoric agricultural practices were recorded in the 18th and 19th Centuries by European travellers, very few of whom were in the country long enough to see the seasonal cycle of activities in any one place. We can infer such from later knowledge and thus fit the earlier reports into a reconstructed cycle. This paper does not attempt to present a complete description of a reconstructed cycle for any one region but gathers information which may help in defining such cycles. Maori sources rarely refer to such mundane activities in detail, the emphasis being placed quite naturally on the religious observances and cautionary tales associated with agriculture. The later missionaries and administrators though, were able to make more extensive observations even though the agricultural pattern had changed somewhat by the time their observations were made. There is a danger inherent in the later observations that material is incorporated in them that is taken to reflect late prehistoric practice yet may be purely post-historic, or reflect the origin of the recorder.

Late 18th Century and early 19th Century observations during the summer period indicate a wide variety of practices in agricultural and associated gathering activities which vary from region to region yet have an underlying pattern in common.

At Anaura Bay on the East Coast, North I, during Cook's First Voyage in 1769 (Beaglehole 1962, 1, p. 417) there were fewer than 100 people living. The houses were dispersed as were the cultivations. Banks (*op. cit.*) estimated that there were between 150 (60.71 ha) and 200 acres (80.94 ha) in cultivation in fields ranging in size from one (0.41 ha) to ten acres (4.05 ha). Monkhouse estimated 100 acres (40.47 ha) (Beaglehole 1968, p. 584). Banks suggested that the size of field depended on the size of family, and his general report (Beaglehole 1962, 2, p. 26) would suggest six (2.5 ha) or seven acres (2.9 ha) per extended family unit. Kumara were planted in neatly arranged hillocks, gourds in hollows, taro (cocos) on flat land. This was in October 1769; the crops had just been planted. The main foods at Anaura and at Tolaga Bay at this time were fern root and fish (Beaglehole 1962, 1, p. 416). In the Bay of Plenty the fortified pa was on a hill with plantations nearby (Beaglehole 1968, p. 191).

At Whitianga on the Coromandel Peninsula, on the Puringa River, Cook and Banks saw a group of people living in the open, with great piles of fresh shell (mainly paua), and also some very old heaps. The people also had large quantities of fern root to take away with them (Beaglehole 1962, 1, p. 427). In this instance the group involved can be identified. They were Ngati Whanaunga who were normally resident at Whakatiwai and the Clevedon area on the Auckland side of the Hauraki Gulf (White 1888, p. 121). Information recorded from Horeta Te Taniwha before he died in 1853 was (Thomson 1859, p. 158), "Our tribe was living there at the time. We did not live there as our permanent home, but were there according to our custom of living for some time on each of our lands." Te Taniwha as a child remembered his meeting with Cook and kept a nail given by Cook to him as a pendant instead of a tiki. Food given to Cook's men was kumara, fish and fern root. White potatoes given them by Cook were planted at Hunua. They were called parareka because they looked like roots of the horseshoe fern (*Marattia salicina*), a plant cultivated for its long starchy root. It is still a name for one variety of Maori potato in the Hauraki area. The reference by Te Taniwha to kumara being given to Cook is not substantiated by the European sources.

Another reference in the same account by Te Taniwha refers to attacks on the Ngati Te Ata of South Manukau Head and the Ngati Whatua of the Auckland isthmus. The former were fishing for sharks off Puponga Point and drying them near Onehunga; the latter were fishing off Ngahuwera at the foot of Queen Street, also for sharks. Both were engaged in "the summer season of fishing for shark" (White 1888, p. 133). Dried fish supplied the main salt requirements.

When Cook was at Mercury Bay, Coromandel, he also visited the Ngati Hei pa to the north of Whitianga, Wharetaewa, which had half an acre in kumara and gourds (Beaglehole 1962, p. 433). Today, approximately four or five acres of garden can be traced on the ground, but these may be earlier or later in date than those to which Banks referred. It is also very probable that the main cultivation areas of the Ngati Hei of Wharetaewa were on the offshore islands, for example Ohinau, which were part of their territory. Wharetaewa was the pa Cook (Beaglehole 1968, 1, pp. 198-201) described in detail in which there was "an immense quantity of fern roots and dried fish." In the Bay of Islands, North Auckland, where between 40 and 50 acres were seen in gardens, pa were seen but also undefended small villages. One cove on an island (probably Moturua) had a small village and large plantations of kumara, yam and taro (Beaglehole 1962, 1, p. 444).

In the Marlborough Sounds, South I, Motuara Island had a pa (Beaglehole 1968, p. 239). It "contained a good number of people", "a prodigious quantity of drying fish and much fern root". For all the Sounds, Cook says (Beaglehole 1968, p.247) that there were not more than 3-400 people. "They live dispersed along the shore in search of their daily bread, which are fish and fern roots, for they cultivate no part of the lands" (Beaglehole 1968, p. 247).

Cook's and Banks' observations cover only one season, the summer of 1769-1770 from October 9 to February 20. In general in the agricultural areas at this time the crops were planted and people were living on fish and fern root. At Purangi River the people who had come to that locality from a region with an agricultural base, as well as the people of Queen Charlotte, who possibly had no agricultural base, were collecting and drying fish and fern root. It is probable that the Queen Charlotte area was, in fact, a seasonal station for people who had an agricultural base elsewhere, the likely area being Durville Island.

At Anaura Bay, Wharataewa, and Bay of Islands, the people were living in their base agricultural area either because of imminent attack as at Wharetaewa, or because their access to sea resources was close and fruitful. In some cases then, the move to seasonal stations need not have yet taken place. This period in the agricultural cycle involved planting the crop, then living on fish and fern root which often also involved some form of dispersal to coastal areas or along coastal areas. In Wharetaewa pa the people had a large seine net (Beaglehole 1962, 1, p. 444). This net was 73.16 m long and would require a body of people to pull it. The return provided by such a net, where conditions were suitable, i.e. sandy beach, would enable the people to stay in larger groups. It is perhaps significant that Anaura Bay and other bays along that coast are also suitable for seine net fishing where the net is hauled from the shore. Seine nets as reported by Williams (Hamilton 1908, p. 61) from the East Coast could be over a kilometre in length. Anaura Bay, Tolaga Bay and Tokomaru Bay are very suitable for this type of activity. In 1772 Le Roux reported nets up to 183 m in length in the Bay of Islands (Best 1929, p. 10).

Regional variations in the agricultural cycle and associated practices are evident in these early accounts. The local situation, topography and climate are all factors which limit or expand the items chosen from the repertoire of techniques available. That there is an extensive repertoire from which possible choices can be made is also abundantly demonstrated by the early first contact reports. The particular type of response to the demands of the early summer period of the agricultural activity cycle is determined by the local situation, whether political, demographic, topographic, or climatic. The overall similarity is that during this period, when the crops are planted, the food is mainly fern root and fish, large quantities of which are prepared for storage.

A number of factors in the years immediately following the first contacts profoundly changed the nature of the agricultural cycle. Important factors were the presence of Europeans who introduced new crops and the consequent demographic changes which resulted from competition for areas where trade could be carried on with the ships. In particular, account needs to be taken of the introduction of white potatoes, which not only could be harvested in the period between planting and harvesting of kumara, but could be used to open up previously marginal or unfavourable areas to agriculture (Simmons 1969, p. 28; 1975, p. 211). Other changes including the introduction of domestic animals also provide a different perspective from that in the early contact accounts.

On Cook's Second Voyage, and even more so on the Third, the changes set in train by his presence were already being felt. It is interesting to note that the pa on Motuara Island was deserted on the Second Voyage (Beaglehole 1968, p. 172) and there is no mention of it being reoccupied during the many return visits paid to the area. On the Third Voyage it had been repaired but was not occupied (Beaglehole 1968, p. 62, p. 800). In 1820, when Bellingshausen put into Queen Charlotte Sound he found a permanent village of about eighty people on the west end of Motuara. These people had plantations of white potatoes newly dug on the headland of the shore opposite (Debenham 1945, pp. 206-210).

The more detailed accounts of the agricultural cycle of activities belong to the 19th Century.

Methods of cultivating and preparing the ground for kumara are described in an Aupouri account written down for the Rev. Puckey at Kaitaia before 1854 (Shortland MS). These techniques could also apply to potatoes required for early crops from the sheltered environment in a bush garden.

> "An area of bush is chosen — we are called to clear it of small growth. When that is done the large trees are scarfed. (This is winter work). They are felled and left to dry in the sun until the eighth or ninth (month) then they are burnt and left to lie again for a short time. When the fourth comes then they are cut small to make the soil rich. When that job is finished and all the burning has ended, the ashes are raked into heaps by the *ko* and the tubers planted in the middle.
>
> When summer comes weeds grow, they are weeded out and left to be eaten by the sun — the kumara are left to grow again. In the autumn they are harvested.
>
> The garden is left and is covered in regrowth. The next year it is renewed and grows sweet food. For two years it is worked but on the third year is left that is until the fourth, fifth and sixth years. It is left completely and is overgrown with brushwood. It is left for the tribe to work. The places where good fern root grows are kept as a place for digging roi (the best fern)."

This Aupouri account and another very similar one from Maketu which he obtained in 1842 were the basis of Shortland's (1854, pp. 186-188) characterisation of agriculture as follows.

> "At the time of the discovery of New Zealand, its inhabitants were found to have made many of the first steps towards civilisation. They lived in comfortable houses, more or less ornamented with carved work, and with scrolls delineated with red and white colours on the posts and beams which supported them. Their villages were fortified with palisades and trenches, and were surrounded by extensive gardens planted with the sweet potato, the *taro,* and the melon. Their knowledge of the art of horticulture was not inconsiderable; for they even employed the method of forming an artificial soil, by mixing sand with the natural soil, in order to make it light and porous, and so render it more suitable to the growth of the sweet potato. In parts of the Waikato district where this plant was formerly much cultivated, the traveller frequently meets with large excavations, from twenty to thirty feet in depth, like the gravel pits one is accustomed to see in England near public roads; and in reply to his inquiries, he learns with surprise that they were formed by those who resorted there, year after year, to procure sand for manuring the ground in the manner described.
>
> Their intelligence and industry is still further illustrated by their mode of cultivating the common potato. The spots generally selected for the growth of this plant are situated in forest lands, and sometimes in swamps, which have been reclaimed on purpose by draining. Suppose a wood is the spot selected — the first work is to cut down all the small trees and brushwood, after which the larger trees are felled, till a sufficient space has been cleared. This is done in July. The trees and branches are left to lie on the ground till January or February of the year following, at which time, having become dry, they are set on fire. Nothing more is done till the following September, when the larger logs, only partly consumed by the fire, are split up into small pieces, gathered into heaps, and burnt. This work being finished, seed potatoes are brought to the ground and planted one by one in small holes made with a sharp-pointed wooden implement, called a *ko*. During the summer, the weeds which spring up are carefully hoed, but are left to lie on the ground between the young potato plants for the sun to scorch; and in the month of February the crop is fit to be removed from the ground and placed in store.
>
> During the two succeeding years seed potatoes are similarly planted in the same ground with the *ko*. On the fourth year, the ground is for the first time dug up with the spade, and the potatoes are planted in small mounds of earth, three or four seeds in each mound. These mounds are arranged with great regularity in quincunx, and give a

remarkably neat appearance to the garden. The same method is followed in the fifth, sixth and seventh years — a striking instance of the fertility of the soil. The garden is not tilled afterwards, but the residue of the crop left in the ground the year before produces an early crop the eighth year, which is fit to dig in the summer; and for many years the parts on which the fern springs up naturally are resorted to for the purpose of procuring its root, which is much esteemed when growing in such localities."

This system is also that used for the *uwhi* potato as described by Servant in 1842 (Simmons 1973).

Richard Taylor (1855, pp. 377-379) has a similar account but with extra details.

"The New Zealanders have always been an agricultural people; their country not naturally affording the means of subsistence in sufficient abundance to support them, without the cultivation of the soil.

Their ancestors brought the *kumara,* or sweet potatoe — the *taro* — an *arum* — and the *hue,* or calabash, with them from Hawaiki: these were the only vegetables they possessed, and they carefully cultivated them in large quantities, until the arrival of Europeans, who gave them the potatoe, the value of which was so soon discovered, that now it may be said to be their staple article of food. It is far more universally cultivated than the *kumara,* from its taking less labour in planting, and yielding a more certain and larger return. The *kumara* requires not only a warm aspect, but also, in general, an artificial soil; sand or gravel being laid on the ground to the depth of six inches. So also the *taro,* which needs the aid of bush screens and other expedients to make it flourish. These also soon exhaust the soil; three years' cropping with *kumara* being, in general, all that can be obtained from one spot. The place is then abandoned, and another selected; but this abandonment is only for a certain space of time. Instead of turning up the soil, and suffering it to lay in fallow a season, their method of renewing it is to allow it to remain unoccupied until it is covered with a certain growth of wood, if situated in woodland, or of fern, if situated in fern land, which requires a period of from seven to fourteen years, when the spot is again cleared and planted. Thus, many places, which appear never to have been touched by the hand of man, are pointed out as having been the farms of some ancestor, and, when the place is more closely regarded, it will be found destitute of all old timber. The *kumara, taro,* and even potatoe grounds, are generally selected on the sides of hills, having a northern aspect; by this declivity towards the sun, they gain an increased degree of heat.

The *hue* (or gourd) is everywhere raised, and it is, indeed, an excellent vegetable. It bears a white flower, and produces a calabash, which is sometimes of very large dimensions. When young, it is a delicious vegetable, sweet, juicy, and extremely savoury. When ripe, it is of the greatest use, supplying the place of crockery. In it, the New Zealander carries his water, his stores, potted birds, fish or flesh; he also uses it as a dish, and even as a lamp. It is often beautifully ornamented with tattooing. The natives have a very singular idea respecting the *hue,* that the seed can always be procured from the entrails of the sperm whale, which they affirm they have frequently verified. They account for it by saying that in Hawaiki the *hue* grows spontaneously, and hangs over the cliffs in great quantities, which, when ripe, fall into the sea and are devoured by the whales, which frequent that part.

The melon and pumpkin are now also cultivated, as well as the cabbage and turnip, which grow wild, having been introduced by Cook; maize and wheat have been more recently raised, but are now grown in large quantities.

To a stranger, the natural means of support may appear few and insignificant; but, in early times, when wars raged, or unfruitful seasons destroyed the hopes of the *kumara* harvest, the New Zealanders had recourse to the indigenous productions of the land. Almost every spot produces some kind of food, the plains being covered with the *pteris esculentis,* or edible fern; although that which is selected for food only attains a proper size on rich land. The roots chosen for this purpose are found about a foot and a half or two feet deep, and are dug up with a long strong pole, sharpened at one end, with a rest for the foot, called a *ko.* The upper roots are stringy, hard, and harsh to the palate; but the lower ones contain more farinaceous matter. When dug up, they are either stacked to dry, on the spot for future use, or eaten fresh. The way of preparing it is to lay it on the embers for a short time, till it is sufficiently roasted; it is then scraped with a shell, to take off the blackened outside, and afterwards beaten with a wooden or stone mallet, to loosen the fibres. The natives sometimes pound it into masses, pulling out the fibres, and putting it into calabashes, containing the juice of the *tupahiki*. It is eaten immediately it is cooked, and is by no means unpalatable; neither is it an astringent, as is generally supposed, but rather the contrary. Even to the present day, it is an article much prized, especially by the sick, who often prefer it to other food; and it is always taken by persons going on a voyage, as the best antidote for sea-sickness."

In the manuscript of Aperahama Taonui of Omanaia, Hokianga, written in 1849, there is mention of soil quality. A young man came from Tamaki (Auckland) to the Puketona district near Kaikohe. He had decided to return home but went out on a kiwi hunting expedition. To quote from a translation (Simmons 1975, p. 67, Taonui MS. pp. 16, 17).

"When he saw Taiamai, he saw the beauty of the soil and said: "The soil of this village is very like mine at Tamaki". He pressed it in his hand and the soil stuck to his hand. Then he took some of that earth on his back to be seen by the woman; . . . So we claim Taiamai, seen by our ancestor, he who cleared it."

There are a number of distinct words in Maori for the different types of soil. Best (1925, p. 19), for example, lists thirty-five such names.

A child's game recorded by Shortland (1854, pp. 159-160) emphasises the relative values of the gathered and cultivated foods.

"What is your husband?"
"My husband is a grower of kumara".
"Go to a land where the soil is rich".
"What is your husband?"
"My husband is a fisherman".
"Go to a place where the sea is calm".
"What is your husband?"
"My husband is a digger of fern root".
"That's better. You have the putting into store and taking out again".

There are many karakia associated with kumara, some of which are said to be important because tribes not using them lost their kumara or put kumara and fern root together. There are also traditions on the East Coast and in the Bay of Plenty of canoes being sent back to Hawaiki to obtain kumara for people who did not have them. Even in the north some tribes are said to have had kumara while others either did not cultivate kumara at all or had lost it. The movement of Ngati Whatua from the North Cape (Tuhaere MS.) is said to have been because Ngati Mateika to the south of them had no kumara and raided Ngati Whatua to get supplies. Ngati Whatua retaliated and took over the North Hokianga and eventually Auckland.

Perhaps a lot of the wars mentioned in tradition can be understood in terms of the proverbial saying:—

"When kumara are being planted, one hundred will help.
When kumara are being put in rua, two hundred will help."

DISCUSSION

The early contact reports relating to the summer period record two major food getting activities being practised concurrently as part of the total cycle of subsistence activity. One is the planting of the kumara and other crops, the other is the exploitation of certain resources — fern root and fish — for daily food, excess amounts of which are prepared for storage. There are marked local differences in the techniques employed and in the amount of movement required by the group, but the overall pattern is similar.

The later reports of the methods of preparing the ground and growing crops again exhibit an overall similarity, though there are local variations in the techniques employed. The Aupouri account gives a definite timetable for ground preparation as well as the use of the ground, after cultivation was ended, for fern root. In this respect the fern, while a naturally occurring plant, is actually semi-cultivated. The children's song quoted gives pride of place to a digger of fern root and this reflects the importance of fern root as the major staple food despite the ritual and social importance given to kumara.

Shortland's and Taylor's accounts emphasise the shifting nature of the cultivations, the methods employed, and the cycle of activities. While recorded in the 19th Century, it is more than probable that the overall pattern exhibited by these accounts is not very different from prehistoric practice. The repertoire of techniques available for producing garden areas was common to all Maori agriculturalists and allowed for the nature of the soil and vegetation (Simmons 1975, p. 208). The desirability of the rich volcanic soils of Taiamai and Tamaki, the marginal nature of kumara growing and the need for all the warmth possible in more southern areas, these and other factors influenced the particular use of any of these techniques in the local situation but did not radically alter the general cycle of garden preparation, planting and harvesting. The associated activities of fern collecting and fishing in the summer were complemented by forest collecting and birding in the autumn when forest products and fruit were available (Colenso, 1881; Simmons 1969, Fig. 2). At the same time the first steps were being taken to prepare new gardens.

CONCLUSION

Maori agricultural practices consisted of two broad activities, one associated with the preparation and planting of new gardens, the other with the exploitation of already existing gardens. During the year these two activities inermeshed to produce a single cycle, while the full agricultural cycle itself took a minimum of three years to complete. If the full cycle is considered to mean the renewal of agricultural activity on a particular plot after a period of fallow, then the period is much longer yet, and varies from place to place depending on the quality of the soil.

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NEW AND INTERESTING RECORDS OF ADVENTIVE PLANTS FROM THE AUCKLAND INSTITUTE AND MUSEUM HERBARIUM 1

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Abstract. Some recent additions to the Auckland Institute and Museum Herbarium (AK) and re-identification of earlier gatherings, provide information on the distribution of adventive species.

The following list of records from the Auckland Institute and Museum Herbarium has two main sources; one is from the addition of material, particularly my own collecting and that of the Herbarium staff; the other is from the review of earlier gatherings, which often reveals erroneous or inadequate identification. Records of uncommon species have sometimes to be changed to those of more common ones (as may be seen below in *Lotus angustissimus* and *L. tenuis*), and *vice versa.*

A. J. Healy has already done much, in his many papers, to correct long-standing errors as seen below in *Ranunculus bulbosus* and *Veronica agrestis.* He has also called attention to the existence of segregate species, the distribution of which needs to be followed up, in well known aggregates such as *Nasturtium officinale* and *Aphanes arvensis.*

The nomenclature adopted, except where reference has been made to recent monographs, is that published by New Zealand Weed and Pest Control Society (1969). Specimens are cited by collector's number or, in the absence of these, by the AK Herbarium number.

RANUNCULACEAE

Ranunculus acris L.

North Cape, Tokatoka Point, 1969, J. P. Croxall, AK 128014 as *R. bulbosus* L. According to Healy (1948) it is usually *R. sardous* Crantz with which *R. bulbosus* has been confused in the past. There is no New Zealand specimen of *R. bulbosus* in the Herbarium; *R. sardous* is well represented and *R. acris* by only three other gatherings.

Ranunculus ficaria L. var. *grandiflorus* F. Schultz

Specimens of this ornamental variety of the lesser celandine are from: Waitakere Range, Scenic Drive, 1972, A. E. Orchard 3376; Huapai, 1972, C. Soulјé, AK 133974; Auckland Domain, gully, 1974, J. H. Goulding 571 and E. B. Bangerter; Mairangi Bay, roadside ditch, E. B. Bangerter 5177. A garden specimen, Auckland, 1954, P. Hynes, AK 48887, is also in the Herbarium. This variety is much larger in leaf and flower than *R. ficaria* var. *ficaria* (which occurs in New Zealand) and might account for some early mentions in literature of *Caltha palustris* L.

CRUCIFERAE

Arabidopsis thaliana (L.) Heynh.

Mt Albert, garden, 1965, K. Wood, AK 106965, as *Arabis hirsuta* L. Although this species is listed by Thomson (1885) as occurring near Dunedin, it does not appear in other early accounts of adventive plants. According to a note on one of the few gatherings in the Herbarium of Botany Division, DSIR, Christchurch, no specimen has been traced to substantiate the Thomson record. These gatherings are all from the South Island between 1957-1971. No other New Zealand specimen is in the Auckland Herbarium.

Nasturtium microphyllum (Boenn.) Rchb.

Waimea County, Redwood Valley, 1971, C. Soulјé, AK 134022, as *N. officinale* R. Br. Healy (1954) gives a number of earlier records for this and the following species.

Nasturtium officinale R. Br.

Recent records from the Auckland Herbarium are: Whangaparaoa, Tindalls Beach, among rocks in stream, 1966, J. H. Goulding 90; Whangarei County, Mokau Bay, wet gully, 1972, A. E. Orchard 3876; Browns Bay, Freyberg Park, ditch, 1973, E. B. Bangerter 5126.

Sisymbrium orientale L.

Auckland, Railway Reclamation, 1919, T. F. Cheeseman, AK 31355, 31360. Four sheets from this locality were under *Diplotaxis muralis* DC., two being correctly named. The other two, cited above, are *S. orientale*. A recent addition is: Browns Bay, laneside near beach, 1974, E. B. Bangerter 5223, the latest gathering otherwise being Palmerston North, waste ground, 1929, H. H. Allan, AK 67852. Allan (1933) gives Thames as a further locality.

GERANIACEAE

Geranium purpureum Vill.

Auckland, Mt Albert, 1970, K. Wood, AK 128556, det. A. E. Esler; Mairangi Bay, side of creek, 1974, E. B. Bangerter 5214. *G. purpureum* differs from *G. robertianum* L. in its yellow pollen, deeply ridged mericarps and petals not exceeding 9 mm. Carolin (1964) gives detailed descriptions of these species.

ROSACEAE

Acaena agnipila Gandoger var. *protenta* Orchard

Tauranga, Omokoroa Point, grassy waste area, 1974, E. B. Bangerter 5210. This is an additional record to those cited by Orchard (1973) in his account of the *A. ovina* complex.

Aphanes arvensis L.

Christchurch, New Brighton, 1947, A. Wall and B. Molesworth, AK 22448 as *Alchemilla* indet. This is additional to records given by Healy (1954), where this species and the following are discussed.

Aphanes microcarpa (Boiss. & Reut.) Rothm.

Nelson, Wairau Valley, Rainbow Station, river flats, 1965, P. Hynes, AK 131280 as *Alchemilla arvensis* (L.) Scop.

PAPILIONACEAE

Lotus angustissimus L.

Two gatherings: Auckland, Huia, 1952, K. Wood AK 29079; Mt Roskill, volcanic cone, 1972, P. Hynes AK 131280, both as *L. tenuis* Waldst. & Kit. There is no New Zealand example of the latter species in the Herbarium.

Vicia disperma DC.

First recorded erroneously as *Lens esculenta* Moench by Cheeseman (1883) as "abundantly naturalised in the Auckland Domain, having doubtless escaped from some garden in the vicinity". His specimens, AK 75815, 71856, 71857 and 75818 are labelled "Auckland Domain" and are undated. Allan (1940) repeats the record adding "still there plentifully in grassland". Healy (1946) corrects the identification and gives Wellington and Upper Hutt as further localities. The Herbarium also includes three sheets: "Auckland Domain, over grass", 1944, B. Molesworth, AK 76139, 76140 as *V. tetrasperma* ? and AK 33789 as *Lens esculenta.* The only addition is a recent one: Auckland Domain, under *Cordyline* beside south entrance to Museum, 1974, J. H. Goulding 589. Miss Goulding informs me that she has not observed the plant elsewhere in the Domain.

SCROPHULARIACEAE

Veronica persica Poir.

Little Barrier Island, 1897-1910, E. M. Smith, AK 118133 det. R. C. Cooper as *V. agrestis* L.; Manawatu, fields & waste places, 1947-8, M. J. Lockie, AK 133641, as *V. agrestis.* These are examples of mis-identification of the annual prostrate species of *Veronica.* Healy (1954) discusses the supposed abundance of *V. agrestis,* which may have been confused often with *V. persica.* There are many gatherings of the latter in the Herbarium but very few *V. agrestis.*

VERBENACEAE

Verbena litoralis H. B. K.

Auckland Domain, beside duckpond, 1973, J. H. Goulding 515 & E. B. Bangerter; Mairangi Bay, alongside drive with tall grasses, E. B. Bangerter 5025. Further critical examination of herbarium material is necessary as it is possible that many specimens at present named *V. officinale* L. may be this species. Perry (1933) gives keys in her account of North American species.

AMARYLLIDACEAE

Leucojum aestivum L.

Mairangi Bay, grassland behind beach, 1974, E. B. Bangerter 5171; Auckland Domain, gully, 1974, J. H. Goulding 582. These two gatherings, which may be garden escapes, comprise the total representation from New Zealand of this species in the Herbarium. *L. aestivum* was first recorded as an adventive by Healy (1958), the earliest gatherings being in 1953. As it flowers in the company of the more common *Allium triquetrum* L. to which it bears a superficial resemblance, it may have been overlooked by earlier recorders.

GRAMINEAE

Echinochloa crus-pavonis (H. B. K.) Schultes

Muriwai Lake, Okaihau, swamp, 1966, P. Hynes, AK 109063 as *E. crus-galli* (L.) Beauv.; Mairangi Bay, roadside, 1973, E. B. Bangerter 5012, both det. P. W. Michael. Of three specimens labelled *Panicum crus-galli* L. in Herb. Cheeseman, AK 98842, Fairdown, near Westport, no date, W. Townson 776, Dr Michael says that two are *E. crus-galli* and the third *E. crus-pavonis*. Townson (1907) includes *P. crus-galli* in his list of naturalised plants of the Westport District. If his specimens are vouchers for the list, a very early record for *E. crus-pavonis* is revealed.

Acknowledgements. I am indebted to Dr A. E. Orchard and Miss J. H. Goulding of the Auckland Institute and Museum staff for assistance and encouragement in the preparation of this paper. My thanks are also due to Miss B. Macmillan, Botany Division, DSIR, Christchurch, for information concerning *Arabidopsis thaliana,* and to Dr P. W. Michael, University of Sydney, for the identification of my specimens of *Echinochloa crus-pavonis.*

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NOTES ON THE CHEESEMAN HERBARIUM

Part 2. Exchange with European herbaria before 1900

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AUCKLAND INSTITUTE AND MUSEUM

Abstract. Early exchanges between T. F. Cheeseman and botanists in the British Isles, Switzerland, Italy, Austria, Hungary and Germany are traced through specimens in the Auckland Institute and Museum Herbarium (AK) and through letters to Cheeseman in the manuscript collection of the Auckland Institute and Museum Library.

History of exchange

In 1877 T. F. Cheeseman, curator of the Auckland Institute and Museum from 1874 to 1923, wrote to European museums with the purpose of initiating an exchange of plant specimens between the Auckland Museum and European herbaria. He also advertised for exchange with British herbaria in *Journal of Botany* Vol. 8, May 1879 (p. 160), as follows:

> "Mr T. T. [sic] Cheeseman, of the Museum, Auckland, New Zealand, wishes to exchange the plants of that country for British ones. He is prepared to send any number up to 600 of well-dried and accurately named Phanerogams and Ferns."

It is apparent that in the 1870s Cheeseman collected many duplicate specimens, "in all branches of natural history" (*Report of the Auckland Institute for 1877-78,* p. 10) with an eye to the advantages of overseas exchange in building up the Museum collections. He took pride in preparing first class plant specimens and was often complimented on this quality by recipients of his exchanges in other countries. In like manner most of the overseas plants sent in return were well presented though sometimes accompanied by meagre, hand-written labels not easy to decipher.

As with Cheeseman's dealings with American herbaria (Goulding 1974) the early European exchanges often came through the auspices of private collectors and botanists, but it was from the established institutional herbaria such as at British Museum, Kew and Geneva that Auckland Museum received the most valuable duplicates.

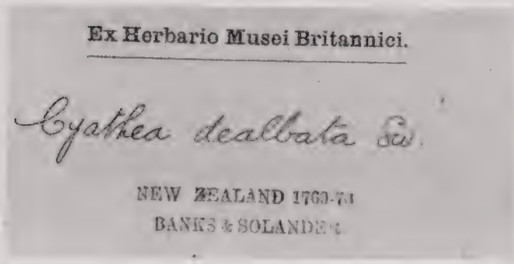
BRITISH ISLES

British Museum (Natural History)

Although no definite exchange programme existed before 1900, the Auckland Institute and Museum Herbarium is indebted to the British Museum for one of the most important collections ever received. The specimens were from the Banks and Solander collections made during Captain Cook's first visit to New Zealand, in the "Endeavour", 1769-70. Duplicates from this first collection of New Zealand plants made by European botanists were obtained from the British Museum (Natural History) in 1895, by the New Zealand Government, who subsequently forwarded a set to

Cheeseman in 1900. At the same time Cheeseman also received "182 prints from engraved plates of New Zealand plants obtained during Cook's First Voyage." (New Zealand Department of Education, Wellington, to Cheeseman, 4 April 1900). Both the Banks and Solander specimens and the engravings were made available to Cheeseman for the preparation of his *Manual of the New Zealand Flora* (Cheeseman 1906), and remain invaluable assets in the present-day Herbarium. The engravings are of special interest because, unlike the Banks and Solander plates of Australian plants, they have never been published as a whole. Individual plates have been reproduced as illustrations, for example, in a Handbook of the Auckland War Memorial Museum (Brooker & Cooper 1962), and a group of eight plates in the handsome volume of botanical engravings, *Captain Cook's Florilegium* (Blunt & Stearn 1973).

The specimens collected by Sir Joseph Banks and Dr Solander, of historic significance to New Zealand botanists in particular, are mostly well preserved and many of the 200-year-old specimens, especially the ferns, look no older than those collected by Cheeseman a hundred years later. Most of the old grey labels with the Banks and Solander plants are printed (Fig. 1) but occasionally there is also a hand-written one (Fig. 2) — not in the hand of Banks or Solander but perhaps of Robert Brown, who had charge of the original Banksian herbarium and later became first Keeper of the British Museum Herbarium.



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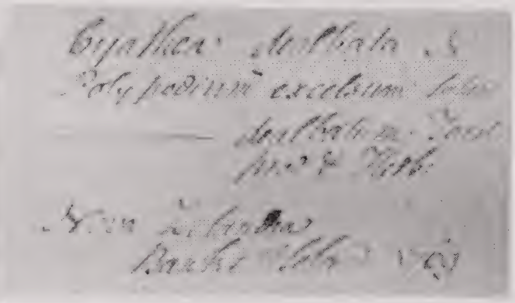

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Figs. 1, 2. Herbarium labels. 1. Printed label of Banks and Solander collection ex British Museum Herbarium (11.8 × 6.2 cm, grey). 2. Hand-written label (9.7 × 6 cm) on same collection as Fig. 1.

Banks and Solander specimens are still being included in duplicate Australasian collections sent to Auckland Museum Herbarium by the British Museum (Natural History) — some in a package received as recently as January 1974. There were no Cheeseman duplicates recorded as at the British Museum Herbarium up to 1902 (Murray 1904), and it appears that all his earliest collections went to Kew for determination.

Royal Botanic Gardens, Kew

At the age of twenty-one, Cheeseman was corresponding with, and sending specimens for identification to, the Director of the Royal Botanic Gardens, at Kew, J. D. Hooker. Hooker's *Flora Novae-Zelandiae* was the first full account of the New Zealand flora (Hooker 1852-1855). Of this work Cheeseman later wrote (Cheeseman 1925 p. xxvii):

> "The publication of this important work, in every way worthy of the reputation of its distinguished author, marked a new era in the history of the botany of New Zealand. For the first time the student was provided with an account of the flora characterized by aptness of description and accuracy of detail, and prepared by a botanist who had not only studied and collected a large proportion of the species in their native habitats, but whose position gave him ample opportunities of examining the material upon which the publications of his predecessors were founded."

The earliest letter from Hooker to Cheeseman, in the Auckland Institute and Museum Library's manuscript collection, is dated October 22 1867 (Fig. 3). After Cheeseman became Curator of the Auckland Museum in 1874, a great number of New Zealand plant specimens, some of them new species, were forwarded to Kew for (the then) Sir Joseph Hooker's appraisal. "We shall look forward impatiently to your coming novelties", wrote Hooker to Cheeseman in May 1881, and in June the same year — "I lose no time in sending you a note on the charming and beautifully dried specimens which you have sent me."

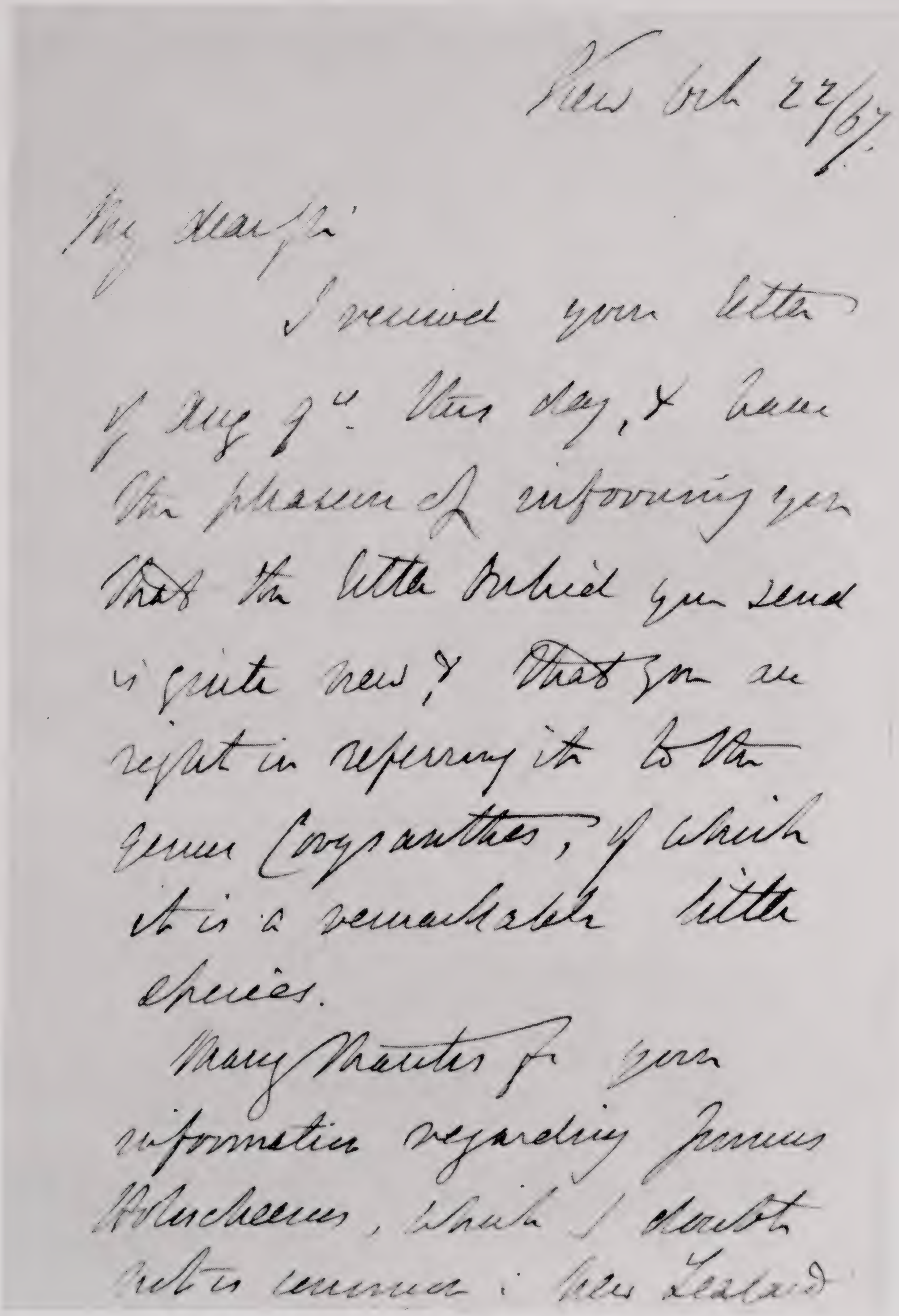
Actual exchange between Kew and Auckland began in 1882. "We are putting up a collection of Herbarium specimens for you, Ferns and Tasmanian plants which I hope will prove acceptable." (Hooker to Cheeseman, 5 September 1882). This was in response to Cheeseman's request to European herbaria for exchange specimens. Many Tasmanian collections from "Herb. Spicer", now in the Auckland Institute and Museum Herbarium, have "Ex Kew" in Cheeseman's handwriting, in pencil (Fig. 4), and on others he wrote "Ex Kew — Ex Herb. R.Br." (Fig. 5). It is possible that the small labels on these latter specimens are in Robert Brown's hand. None of this "Ex Kew" material has printed Kew Labels.

The fact that the herbarium at Kew was not founded until 1853 accounts for Hooker's own New Zealand collections in the Cheeseman Herbarium being labelled "Ex Herbario Musei Britannici". The British Museum Herbarium was established in 1827 with the acquisition of the Banksian Herbarium, and Hooker, between 1845 and 1854, presented "1,404 species, being all the phaenogamous and great part of the cryptogamous plants of New Zealand collected during the voyage of the *Erebus* and *Terror*, 1839-43" (Murray, 1904).

After Hooker retired from Kew in 1885 he continued to write to Cheeseman from "The Camp, Sunningdale". At Kew, W. Botting Hemsley took over the correspondence with Auckland Museum and was in constant communication for many years. He assisted Cheeseman in the preparation of the *Illustrations of the New Zealand Flora* published in 1914 (Cheeseman 1914). The plates for this volume were drawn by Miss Matilda Smith at Kew, from dried specimens specially sent by Cheeseman.

Arthur Bennett (1844 - 1929)

In the Cheeseman Herbarium, Arthur Bennett's name appears on a variety of labels on hundreds of British and European plants. Even more numerous than the printed labels "Ex Arthur Bennett, F.L.S. England" or "Collected by A. Bennett, Croydon, Surrey" (Fig. 6), are the hand-written additions of "Com. Arth. Bennett" and "From A. Bennett, England", on labels of other collectors (Figs. 7-9). Bennett was a corresponding member of the "British Exchange Club" and he also carried out a personal exchange programme with many botanists and institutions throughout the world.

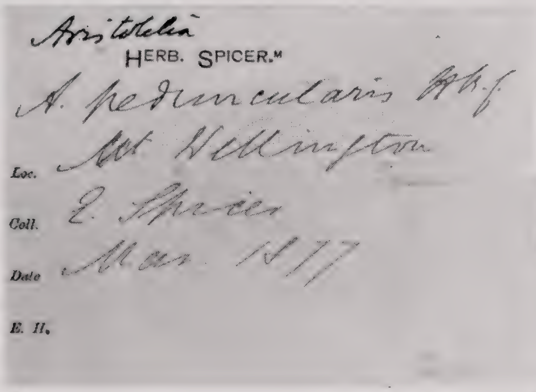

Kew Oct 22/67.

My dear Sir

I received your letter of Aug 9th this day, & have the pleasure of informing you that the little Orchid you send is quite new, & that you are right in referring it to the Genus Corysanthes, of which it is a remarkable little species.

Many thanks for your information regarding Juncus Holoschoenus, which I doubt not is common in New Zealand

Fig. 3. Portion of letter from J. D. Hooker, 22 October 1867.



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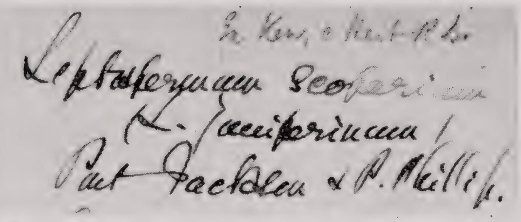

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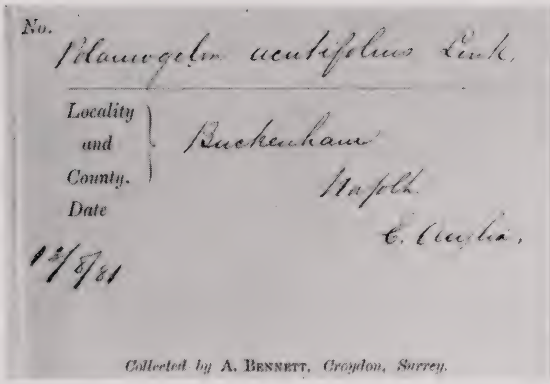

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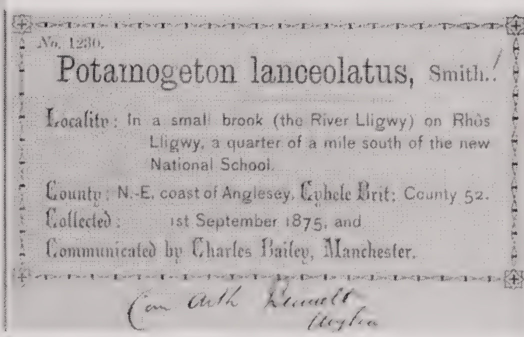

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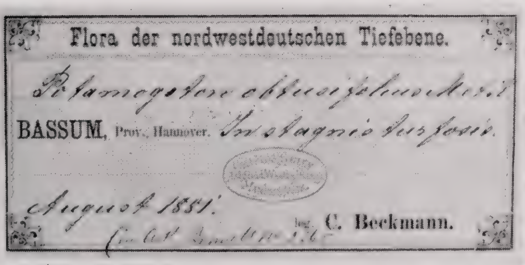

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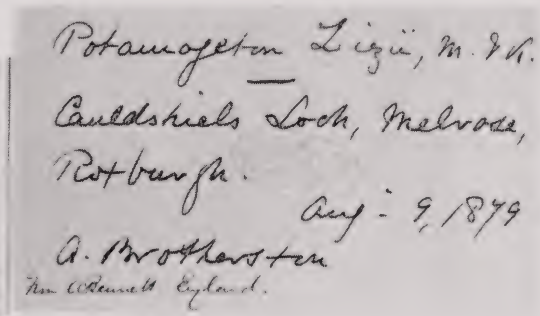

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Figs. 4-9. Herbarium labels. 4. Label ex Kew, ex Herb. Spicer (12.5 × 9 cm) — collector E. Spicer, 1877. 5. Label ex Kew, ex R. Brown (8.5 × 3.2 cm). 6. Label of A. Bennett, 13 August 1881 (12 × 8 cm). 7. Label of Charles Bailey, 1 September 1875, ex Bennett (11 × 6.8 cm). 8. Label of C. Beckmann, August 1881, ex Bennett (14.3 × 7.5 cm). 9. Label of A. Brotherston, 9 August 1879 (10 × 6.4 cm).

Born and educated at Croydon, England, Arthur Bennett worked there for his father, a builder and house decorator, and eventually carried on the business himself. He was regarded as one of the great amateur botanists of his time and contributed many papers to *Journal of Botany* from 1878 until 1929. Many new plant records for Scotland and the Eastern Counties of England were reported by him. Aquatics were his specialty, particularly *Potamogeton*, for which he was claimed the "best British expert" of his day (Salmon 1929). In 1883, a New Zealand *Potamogeton* sent to him by Cheeseman (collected at St. John's Lake, Auckland, December 1881) was named by Bennett in Cheeseman's honour, *P. cheesemanii* A. Benn. (Bennett 1883, p. 66).

Bennett first wrote to Cheeseman from Croydon in October 1880, "In Journal of Botany (English) you mention your wish to exchange plants with British Botanists — am I too late?" He went on to offer in exchange "a set of our British *Potamogetons* & *Characeae* so far as obtainable . . ." and mentioned other water plants he was partly interested in (Fig. 10).

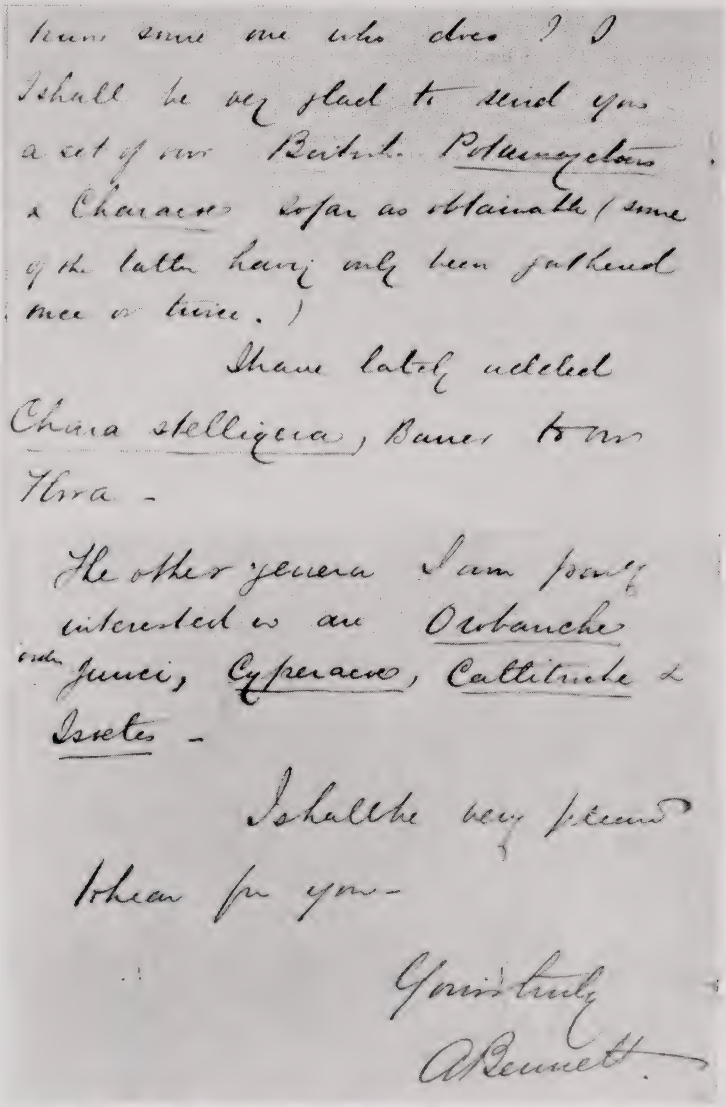

know some one who does ? I
I shall be very glad to send you
a set of our British Potamogetons
& Characeae so far as obtainable (some
of the latter having only been gathered
once or twice.)
I have lately added
Chara stelligera, Bauer to our
Flora —
The other genera I am partly
interested in are Orobanche
Junci, Cyperaceae, Callitriche &
Isoetes —
I shall be very pleased
to hear from you —
Yours truly
A Bennett.

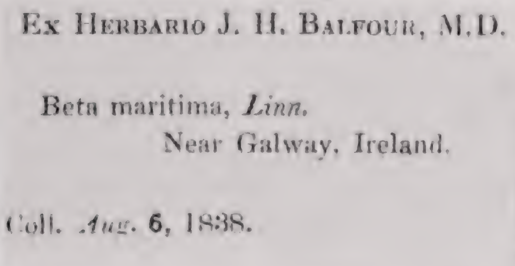
Fig. 10. Portion of letter from Arthur Bennett, 18 October 1880.

It was not until the end of 1882 and after much correspondence regarding the despatch of specimens, that Bennett received his first box of New Zealand plants — "About half-an-hour ago your Box came safely to hand & I hasten to acknowledge its arrival at *once*, as my former letters will doubtless make you think it would not turn up & really I began to think it was lost." (Bennett to Cheeseman, 5 December 1882). The first box for Cheeseman did not leave until February 1883 and contained "a nearly complete set of British Cyperaceae . . . several Junci — a nearly complete set of British Potamogetons & Characeae." (Bennett to Cheeseman, 26 February 1883). Carices numbered 55 in the incomplete list of specimens which preceded the box of plants which was shipped from England by Owen and Graham, who handled all the European shipping arrangements for Cheeseman. Owen and Graham were well-known as merchants and importers, as well as shipping agents, in Auckland in the 1880s.

European collectors whose specimens are included in the ex Bennett material now in the Auckland Institute and Museum Herbarium are: C. G. Baenitz, C. Bailey (Fig. 7), C. Beckmann (Fig. 8), W. E. Beckwith, W. H. Beeby, A. Brotherston (Fig. 9), J. Bubela, J. Cunnack, G. C. Druce, A. Fryer, F. J. Hanbury, H. C. Haussknecht, J. Lange, L'abbé Letendre, E. F. Linton, Ch. Magnier, H. T. Mennell, H. A. Moller, R. P. Murray, G. Nicholson, O. Nordstedt, A. Orbony, H. du Pavillon, R. Renton, G. Rigo, H. Searle, E. Straker, A. Sturrock, G. Tiselius, R. F. Towndrow, R. F. C. von Uechtritz, A. R. Waller, C. Waterfall, G. Webster, J. Whitehead, W. Wilson, A. P. Winslow, J. Zimmermann. Bennett also sent Cheeseman duplicates from North American botanists (Goulding 1974).

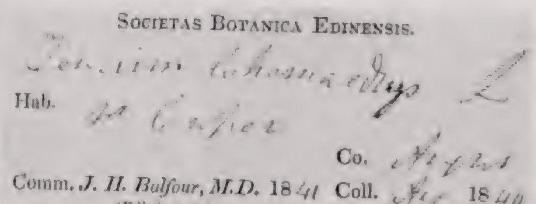
John Hutton Balfour (1808-1884)

There are many British plant specimens in the Auckland Institute and Museum Herbarium which were sent to Cheeseman by Professor Balfour from the Edinburgh Herbarium in 1879 (Fig. 11).


Ex Herbario J. H. Balfour, M.D.

Beta maritima, *Linn.*
Near Galway, Ireland.

Coll. *Aug.* 6, 1838.


Societas Botanica Edinensis.

Hab.

Co.

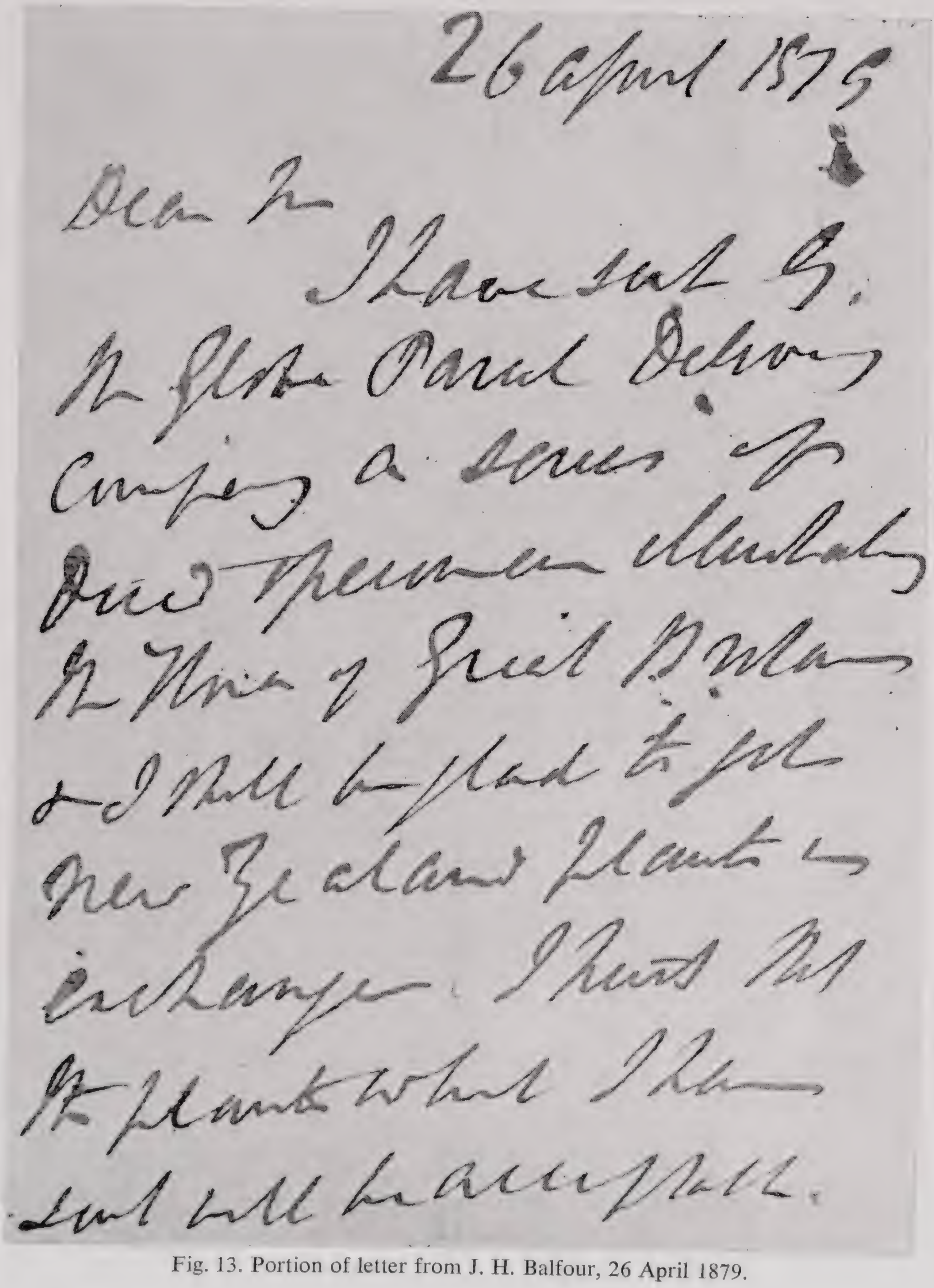
Comm. *J. H. Balfour, M.D.* 1841 Coll. 1840
(Edinburgh.)

11 12

Figs. 11, 12. Herbarium labels. 11. Label of J. H. Balfour, 6 August 1838 (7 × 3.5 cm). 12. Label of Societas Botanica Edinensis, August 1840 (8 × 3.5 cm).

After graduating in medicine at Edinburgh University and after further studies in Paris, J. H. Balfour took up a medical practice in Edinburgh in 1834. An interest in Botany begun in 1825 led to his establishment of the Botanical Society of Edinburgh in 1836 (Fig. 12). "Plants gradually drew Balfour away from patients and in 1840 he carried the divorce so far as to establish himself as a teacher of Botany in the Extra-mural Medical School in Edinburgh . . ." (Balfour 1913). In 1842 he became Professor of Botany at Glasgow University, succeeding W. J. Hooker, who moved to Kew, but by 1845 Balfour was back in Edinburgh. He was appointed "Professor of Medicine and

Botany and Keeper of the Royal Botanic Garden", at Edinburgh University, for which position J. D. Hooker had also been a candidate. Professor Balfour attained distinction as a teacher of botany, extending field-work and establishing laboratory classes at the University; also, under his administration the Botanic Garden trebled its size (Balfour 1913).



26 April 1879

Dear Sir

I have sent by the Globe Parcel Delivery Company a series of Dried Specimens illustrating the Flora of Great Britain & I shall be glad to get New Zealand plants in exchange. I trust that the plants which I have sent will be acceptable.

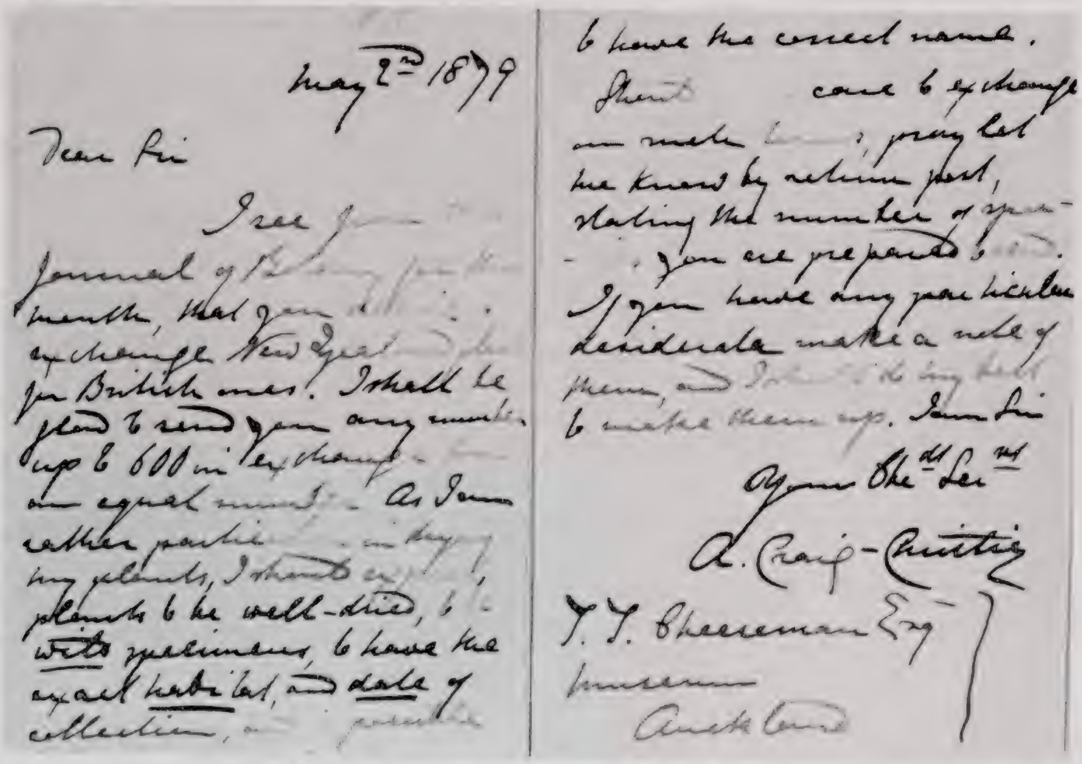
Fig. 13. Portion of letter from J. H. Balfour, 26 April 1879.

Just before his retirement from Edinburgh University, in 1879, Professor Balfour wrote to Cheeseman in answer to inquiries about exchange. "I have no doubt that the Herbarium in the Botanic Garden could present you with the British and European plants you want." (Balfour to Cheeseman, 15 April 1879). Again, on 26 April 1879 he wrote, "I have sent by the Globe Parcel Delivery Company a series of our specimens illustrating the Flora of Great Britain & I shall be glad to get New Zealand plants in exchange" (Fig. 13).

It is recorded (Hedge & Lamond 1970, p. 68) that Edinburgh Herbarium has a large collection of Cheeseman specimens, but Auckland Museum has no record of how many were sent or how many specimens were received from Balfour. The following collectors were represented in the ex Balfour material sent to Auckland: W. Brand, Mr Culross, W. Gourlie jun., W. S. Hore, J. Knapp, Dr Macnab, Thos. Moore, A. G. More, W. Pamplin, Rev. C. E. Parker, R. C. A. Prior, T. B. Salter and H. C. Watson.

Alexander Craig-Christie (1843-1914)

Mr Alexander Craig-Christie, of 36 Findhorn Place, Edinburgh, was one of those who answered Cheeseman's request for exchange in 1879. Writing to Cheeseman on 2 May that year he said, "I see from the Journal of Botany for this month, that you desire to exchange New Zealand plants for British ones. I shall be glad to send you any number up to 600 in exchange for an equal number. As I am rather particular in drying my plants, I shall expect plants to be well-dried, to be *wild* specimens, to have the exact *habitat* and *date* of collection and if possible to have the correct name." (Fig. 14). These instructions were hardly necessary for Cheeseman. In September 1879 Craig-Christie wrote saying he was sending a set of 500 specimens through the London agents Messrs Owen and Graham (Fig. 15).


May 2nd 1879

Dear Sir

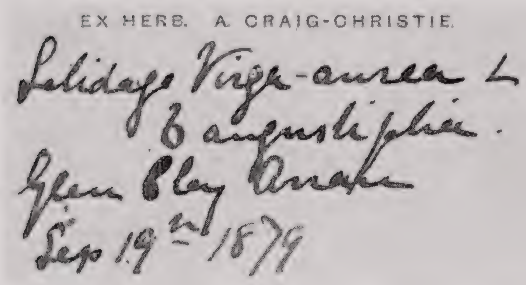
I see [illegible]
Journal of [illegible]
month, that you [illegible]
exchange New Zeal[illegible]
for British ones. I shall be
glad to send you any number
up to 600 in exchange
an equal number. As I am
rather partic[illegible] in drying
my plants, I shall expect
plants to be well-dried, to
wild specimens, to have the
exact habitat, and date of
collection, [illegible] possible

to have the correct name.
Should [illegible] care to exchange
on [illegible], pray let
me know by return post,
stating the number of spec-
[illegible] you are prepared [illegible].
If you have any particular
desiderata make a note of
them, and [illegible]
to make them up. I am Sir
Yours Obedt Servt
A. Craig-Christie

T. F. Cheeseman Esq
Museum
Auckland

Fig. 14. Letter from Alexander Craig-Christie, 2 May 1879.

Collections made by Colonel Henry Halcro Johnston (1856-1939) were included in material sent by Craig-Christie (Fig. 16). Colonel Johnston came from the Orkney Islands and was noted for his survey of the flora there as well as for collections made in India and Pakistan. Some of his Orkney plants came to Auckland. Cheeseman specimens are to be found in the H. H. Johnston material in Edinburgh Herbarium (Hedge & Lamond 1970) so perhaps a mutual exchange was also made or did Craig-Christie pass on the New Zealand plants to Johnston? It is likely that they were both members of "Societas Botanica Edinensis" near the turn of the century.



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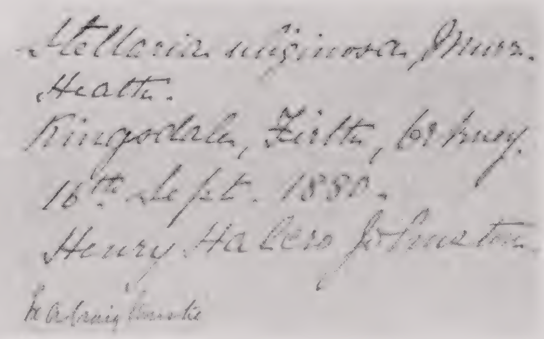

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Figs. 15, 16. Herbarium labels. 15. Label of A. Craig-Christie, 19 September 1879 9 × 5.5 cm). 16. Label of Henry Halcro Johnston, 16 September 1880 (10 × 6.2 cm).

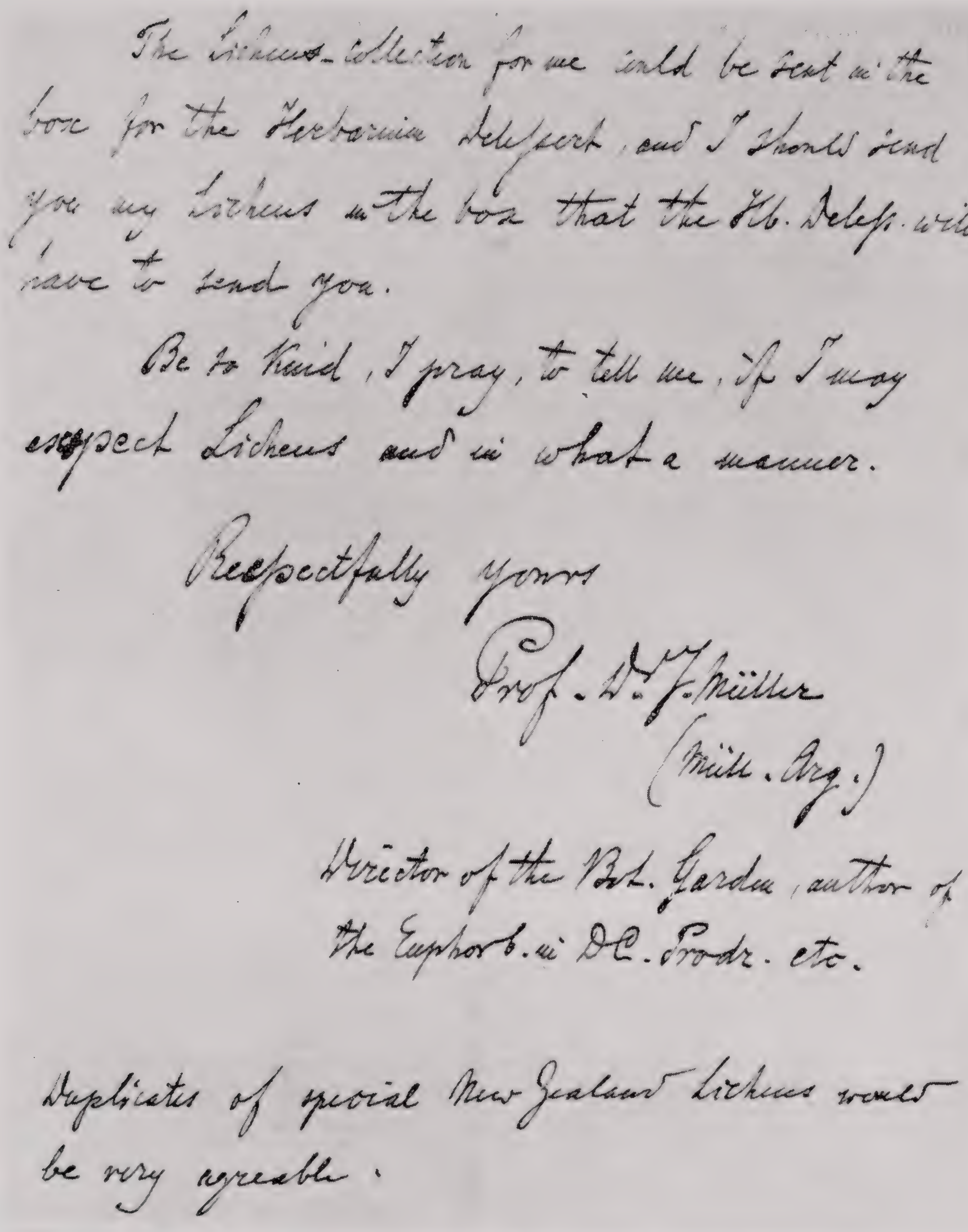
British collections, pre 1900, in the Cheeseman Herbarium not labelled ex Bennett, ex Balfour or ex Craig-Christie (although more than likely from one of these sources) came from the following collectors: C. Bicknell, T. R. A. Briggs, W. Curnow, G. Dickie, J. Fraser, W. Gardiner, R. K. Greville (probably ex Balfour), J. E. Griffith, H. & J. Groves, J. S. Henslow, W. M. Hind, T. Kirk (specimens from Warwickshire, 1854, before he emigrated to New Zealand), R. M. Lingwood (ex Soc. Bot. Edinensis), M. T. Masters (ex Groves), T. Rogers, R. A. Rolfe, J. Saunders, R. J. Shuttleworth and W. C. Trevelyan. No correspondence has been found between any of these collectors and Cheeseman.

Switzerland

Joh. Müller (1828-1896)

Duplicates from the world-wide herbarium at Geneva came to the Cheeseman Herbarium through Dr J. Müller, Director of the Botanic Garden and Herbarium Delessert in 1877. Letters to Cheeseman were signed "Prof. Dr J. Müller (Müll. Arg.)" (Fig. 17). "Müll. Arg." is the abbreviation for J. Müller of Aargau (Tutin et al. 1964, p. 392) and as author of a section of *Euphorbiaceae* in De Candolle's *Prodromus* his title was "Joh. Müller argoviensi".

Professor Müller first wrote to Cheeseman in 1877 concerning the exchange of botanical specimens. Cheeseman's wish for an exchange of Swiss plants had been brought to Müller's notice by M. Henri de Saussure of the Musée d'Histoire Naturelle Genève, who had begun an exchange of birds and insects with Cheeseman at the Auckland Museum.



The Lichens-collection for me could be sent in the box for the Herbarium Delessert, and I should send you my Lichens in the box that the Hb. Deless. will have to send you.

Be so kind, I pray, to tell me, if I may expect Lichens and in what a manner.

Respectfully yours

Prof. Dr. J. Müller
(Müll. Arg.)

Director of the Bot. Garden, author of the Euphorb. in DC. Prodr. etc.

Duplicates of special New Zealand Lichens would be very agreable.

Fig. 17. Portion of letter from J. Müller, 28 January 1877.

At the Conservatoire et Jardin Botaniques, Genève, Müller was in charge of the Herbarium Delessert which, when presented to the city of Geneva in 1869 "became the basis of the collections of the *Conservatoire botanique*. Here they received excellent care; and Genève, with the *Conservatoire botanique*, the Candollean and the Boissier herbaria, became one of the most important centers of plant taxonomy of the world" (Stafleu 1970, p. 934).

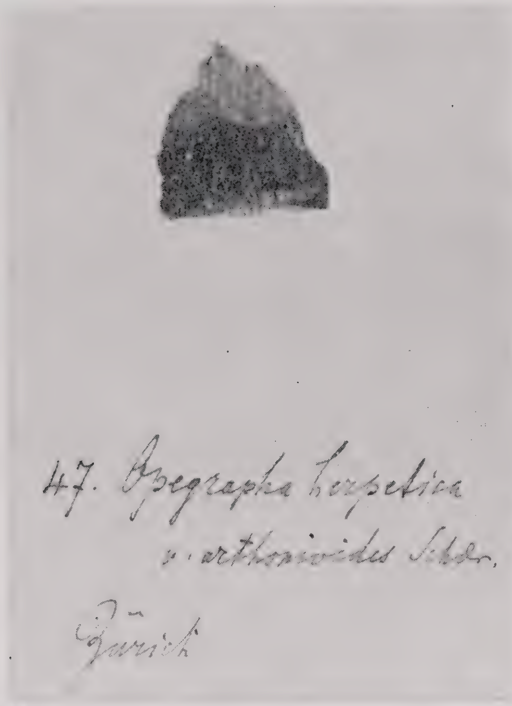
Benjamin Delessert (1773-1847), French philanthropist and amateur botanist, had one of the richest private herbaria and botanical libraries of his time (Daniels & Stafleu 1974, p. 540). His herbarium of world-wide collections made by professional botanists was always available for taxonomic research, first in Paris and later when presented to Geneva. New Zealand is represented in the original Delessert herbarium by a collection of plants made by Allan Cunningham in 1825-26 and described by Antoine Lasegue (1845, p. 286) as "une belle collection de plantes cryptogames."

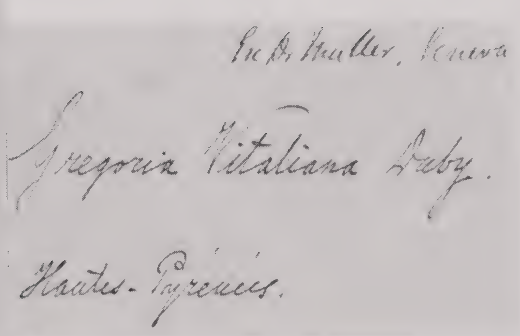
In August 1878, Müller received his first parcel of New Zealand plants from Cheeseman and had, ready for despatch, his "first series of circ. 530 European, particularly Swiss plants, and a first series of circ. 200 of my Lichens." (Müller to Cheeseman, 19 August 1878). Again, in 1882, Müller wrote that he was sending a box containing a good 1000 species of Phanerogams and 360 lichens. "The phanerogamical plants are sent from the Herbier Delessert, the Lichens from myself personally." (Müller to Cheeseman, 22 July 1882). Apparently lichens were Müller's special interest at that time and he offered to return named specimens to Cheeseman of any unidentified New Zealand lichens sent.

The lichens sent to Auckland from Geneva corresponded "to the 2nd series of Dr Hepp's Exsiccata of European Lichens" (Müller to Cheeseman, 22 July 1882) and the specimens, now incorporated in the Auckland Institute and Museum Herbarium, were "fixed on the labels, so that not any confusion or mixture can bring doubts on the names". (Müller to Cheeseman, 19 August 1878). The "labels" are pieces of paper (plain on one side and perhaps Dr Hepp's list of Exsiccata on the reverse) cut to *ca.* 11 × 7.5 cm, with a number, name of specimen and locality, such as "Zurich", hand-written below the well-fixed lichen (Fig. 18). It is disappointing to find no reference to date of collecting and rarely a collector's name. The phanerogams as a rule are better labelled than the lichens, thanks in part to notes in Cheeseman's hand — e.g. "Ex Müller, Geneva" or more simply, just "Ex Müller".

Müller's first concern was that the specimens he sent to Auckland were correctly named. "It is trew that the specimens are not allways fine-ones and contain not very often in the same time flowers and fruits, nor are they allways richely given, but they are allways in an useful state and are correctly named, which is the best for your Museum." (Müller to Cheeseman, 19 August 1878). At the same time it would have been of much benefit to the Cheeseman Herbarium had Müller included dates of collections and collectors' names on all the labels. The phanerogamic labels were slips of plain paper varying in size from approximately 8 × 3.5 cm to 11 × 6 cm and very often in Müller's handwriting (Fig. 19).

The many European specimens with printed labels: "Reliquiae Herb. Schleicher . . . communicavit Herb. Boissier 1898" (Fig. 20), must have come from Geneva, in the first place, but were certainly not sent to Cheeseman by Müller, who died in 1896. Perhaps they were sent by M. Eugene Aubrany, whose letter to Cheeseman dated 21 March 1899 was headed "Herbier Boissier Chambésy près Genève", although he was only writing about an exchange of publications with Cheeseman — also asked for his portrait "de pouvoir placer votre photographie dans notre Galerie de botanistes". No other letters from Swiss botanists, before 1900, were found in the manuscript material in the Auckland Institute and Museum Library.





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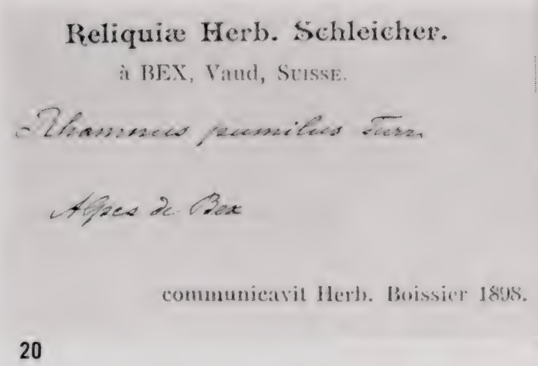

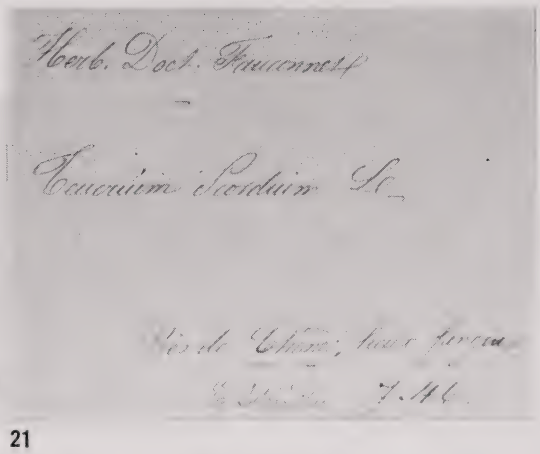

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Figs. 18-21. Herbarium labels. 18. Label and lichen specimen from J. Müller (11 × 7.5 cm). 19. Label from J. Müller (8.5 × 5.5 cm). 20. Label from Herb. Boissier, 1898 (11.5 × 6.2 cm). 21. Label from Herb. Dr Fauconnet, ex Müller (9.5 × 7 cm).

According to Müller he despatched almost 2,000 specimens to Auckland Museum. These included collections made by H. Bordère, E. Burnat, C. I. Fauconnet (Fig. 21), F. Fillion, F. Graf, A. Moreau, Munch, H. A. Romieux, Schneider, and S. Sommier, as well as his own.

ITALY

Emile Levier (1839-1911)

The Cheeseman Herbarium received several hundreds of specimens "ex Herb. Levier" all well labelled and well documented. The printed labels are often headed "E. Levier — Plantae Italicae" or "E Flora italica" followed by various localities, e.g. "Plantae Neapolitanae", "Plantae Venetae", "Plantes des environs de Bormio" (Fig. 22), "Iter Corsicum; 1880", "Iter Ispanicum 1879", "Herbarium etruscum", "ex Etruria (Toscana)" and "ex Agro Florentino".

It is recorded that Dr Emile Levier was a "physician and botanist in Florence" (Clokie 1964) and that his original herbarium is at "Herbarium Universitatis Florentinae, Firenze" and includes collections from T. F. Cheeseman (Chaudri et al. 1972, p. 437).

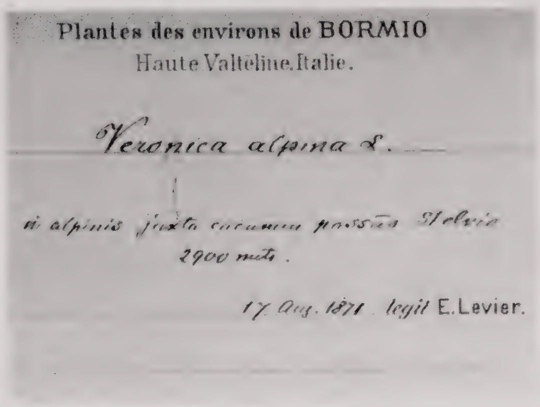
Exchange with Levier began after Cheeseman's correspondence, in 1877, with H. H. Giglioli of the Natural History Museum in Florence. Giglioli sought zoological specimens from the Auckland Museum — New Zealand bats, birds, reptiles and fish. He was also hoping to receive "ethnographical specimens relating to the Maori and Polynesian races . . ." (Giglioli to Cheeseman, 23 November 1877). In this letter he also wrote that his colleague in charge of the Botanic department, Professor Arcangeli, "and a botanic friend of mine Dr Levier, are setting aside for you a set of Italian Phanerogams and Cryptogams in exchange for New Zealand plants; the latter gentleman desires particularly Mosses."

It was through Dr Levier that Cheeseman received identifications of his mosses from A. Geheeb of Berlin. In his letter of 1 February 1882 Levier lists 100 "Musci Aucklandici" determined by A. Geheeb. In turn, Geheeb referred some of the mosses to C. Müller (not J. Müller of Geneva) who described several as new species — one as *"Bryum Cheesemanii"*.

New Zealand liverworts were also sent by Cheeseman to Florence and after receiving his first batch in a parcel of specimens including "66 phanerogams, 14 ferns", Levier wrote, 18 October 1895:

> "What delighted me, was to find also a set of splendid and splendidly prepared *Hepaticae*, and I thank you sincerely for having so generously answered my old desire . . .
>
> I am very grateful for your diligent labour of preparation and for having isolated the different species. But I would also beg you to send me, for the future, *rough materials* and *mixtures*, as mosses and liver-worts grow in their natural stations, and, if possible, dried without pression. Such mixtures often contain the rarest species and unexpected novelties . . . Doing so, you would spare time, labour and paper, and procure me the high pleasure of an exploration amongst your cryptogamical treasures, brought back to life with some water in their natural association and with their genuine colour and odour."

Levier often remarked on the excellence of Cheeseman's specimens (Fig. 23), but more than once he took him to task over the lack of labels with *Hepaticae* (Levier to Cheeseman, 29 September 1896):



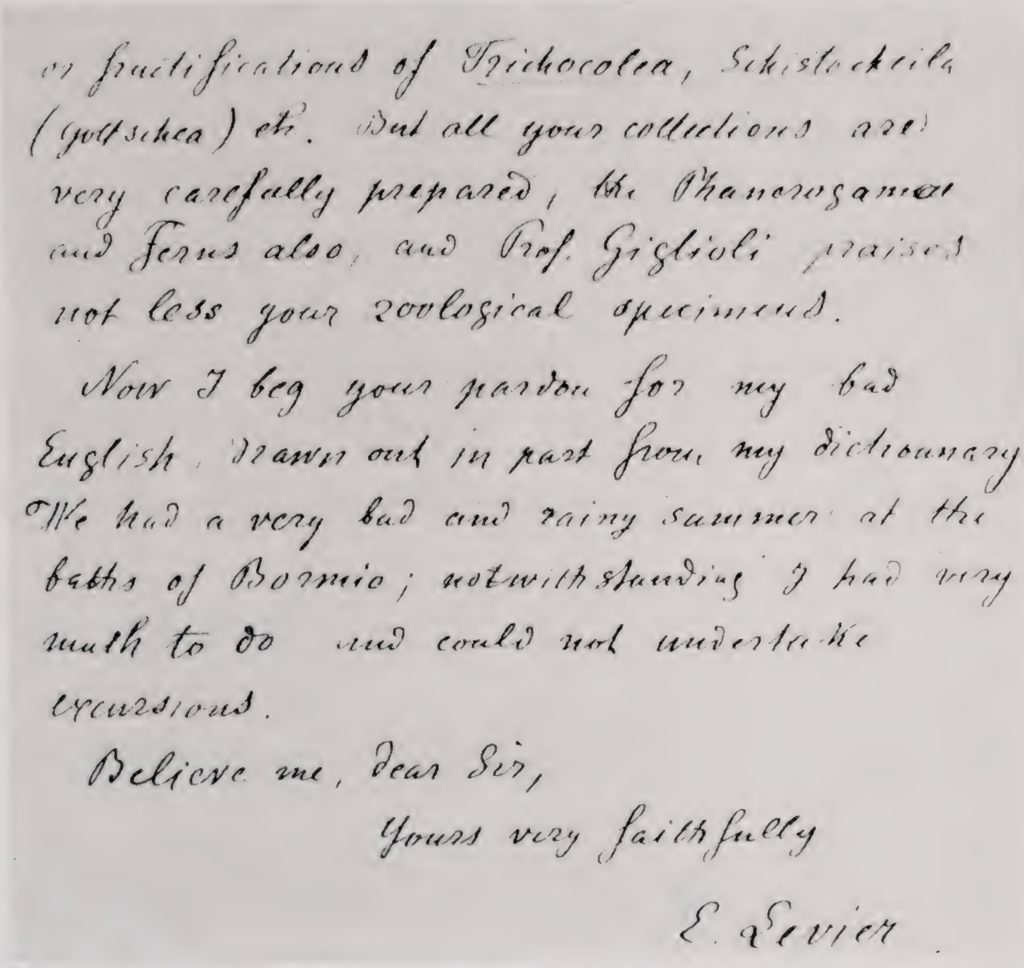
Plantes des environs de BORMIO
Haute Valteline, Italie.

Veronica alpina L.

in alpinis juxta cacumen passus Stelvio
2900 metr.

17 Aug. 1871 legit E. Levier.

22



or fructifications of Trichocolea, Schistochila (Gottschea) etc. But all your collections are very carefully prepared, the Phanerogamae and Ferns also, and Prof. Giglioli praises not less your zoological specimens.

Now I beg your pardon for my bad English, drawn out in part from my dictionary. We had a very bad and rainy summer at the baths of Bormio; notwithstanding I had very much to do and could not undertake excursions.

Believe me, dear Sir,

Yours very faithfully

E. Levier.

23

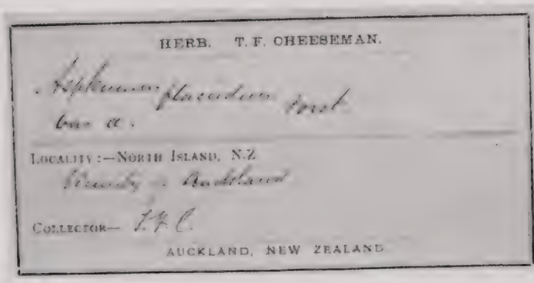
Figs. 22, 23. Herbarium label and portion of letter. 22. Label from E. Levier, 17 August 1871 (9.8 × 7 cm). 23. Portion of letter from E. Levier, 29 September 1896.

"As no labels accompanied your collection, I noted everywhere: *dist. of Auckland, 1895*. Was it rhigt [sic]? If not, please give me those localities and collecting time you remember."

Again, in February 1899, Levier wrote:

"Professor Victor Schiffner, one of our first younger Hepaticologists, writes me in regard to your Treubia . . . and desires to know the *exact locality* where you found it. At the same occasion, I hope you will have the kindness to give me some particulars on the localities of your other Hepaticae, sent in 1895, and of which I returned to you small portions with Hr Stephani's determinations. I labelled them all with the simple indication: *Auckland*, 1895. Is it right?"

In this last letter Levier remarked that he had been somewhat disappointed by Cheeseman's silence and as this seems to be the end of the correspondence it is unlikely that Levier ever received the data he sought for the liverworts. The inadequacy of "District" or "Vicinity of Auckland" (Fig. 24) sometimes seen on Cheeseman labels has proved a stumbling block not only to Dr Levier but also to some New Zealand botanists. As a rule, however, the old Cheeseman Herbarium labels are well documented. (Fig. 25).



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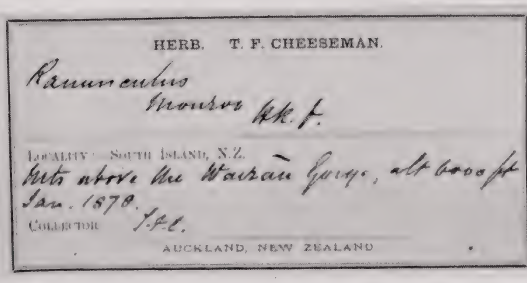

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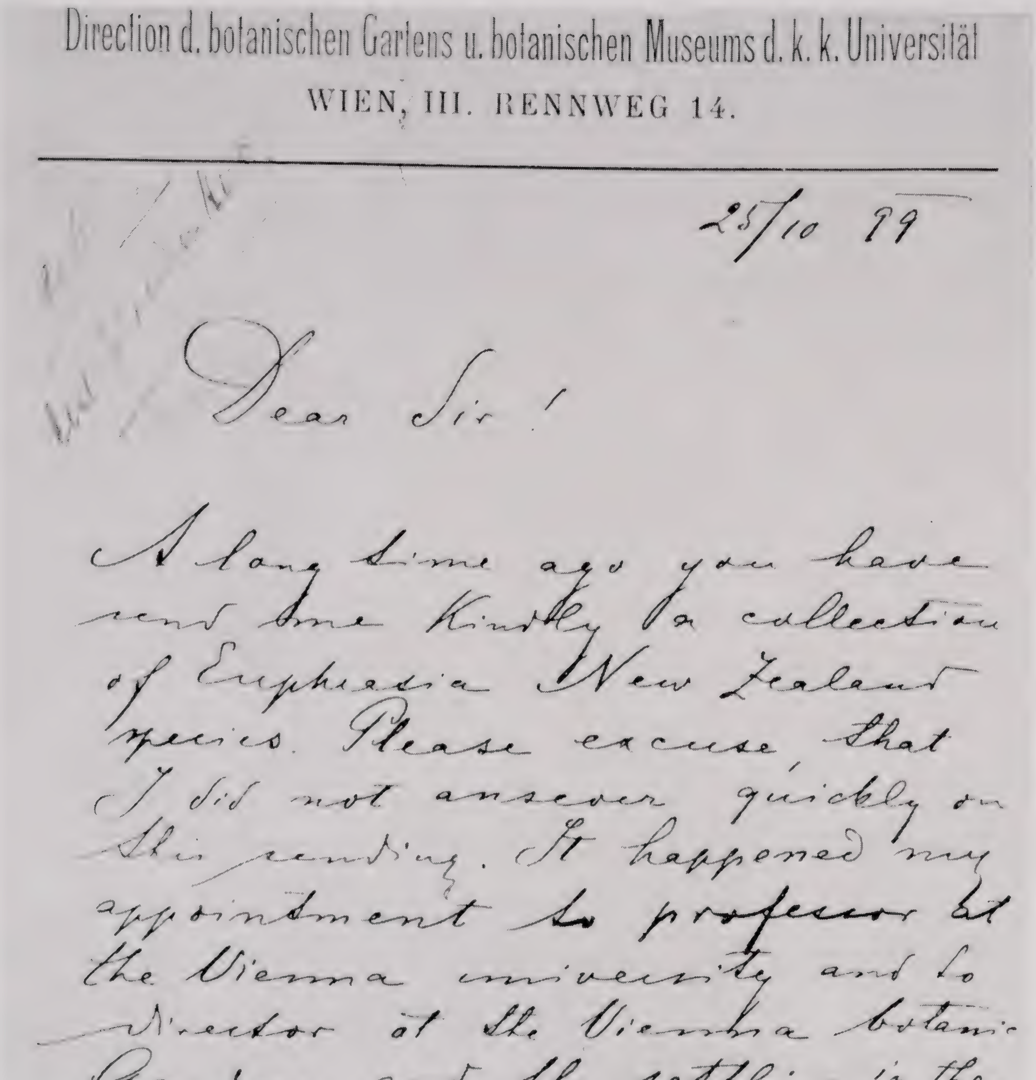
Figs. 24, 25. Herbarium labels. 24. Label from T. F. Cheeseman (13 × 7.5 cm). 25. Label from T. F. Cheeseman, January 1878 (13 × 7.5 cm).

After forwarding the bryophytes and hepatics to Adalbert Geheeb, Carl Müller and Franz Stephani for determination, Levier returned named portions of the New Zealand specimens to Cheeseman. Along with the letters (15 in all) a few lists of mosses and liverworts were found written in Levier's neat hand — also a faded old photograph of "La famille Levier sur le sommet du Piz Umbrail (été 1892)". Emilio, with bushy beard, stands against a rock cairn. Madame Levier, "très fatiguée d'avoir grimpé a 3100 m (10,000′)", reclines at his feet and one of his sons stands beside a camera on a tripod. Another son is credited with the photograph.

In the Cheeseman Herbarium there are specimens from joint collections made by Levier and H. Groves in Italy, 1874; from an expedition to Spain by Boissier, Leresche and Levier, 1879, and from Levier and Sommier, "In Promentoria Argentario", 1886. Other collectors represented in the ex Levier material include: V. Borbás, H. Bordère, R. Fritze, H. Gander, G. Leimbach, C. I. F. Major, H. Papou, E. Rostan, W. Schultze, S. Sommier, J. A. Tauscher, and M. Wetschky.



Direction d. botanischen Gartens u. botanischen Museums d. k. k. Universität
WIEN, III. RENNWEG 14.

25/10 99

Dear Sir!

A long time ago you have send me kindly a collection of Euphrasia New Zealand species. Please excuse, that I did not answer quickly on this sending. It happened my appointment to professor at the Vienna university and to Director of the Vienna botanic Garden and the settling in the other place did not allow me to work. I thank you cordially for your sending and send at the same also a list of my determinations № 14 and

Fig. 26. Portion of letter from R. Wettstein, 25 October 1899.

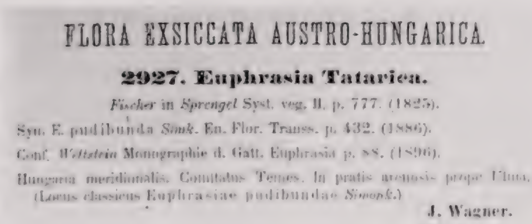
Austria

Richard von Wettstein (1863-1931)

Many overseas specimens in the Cheeseman Herbarium are labelled "Flora Exsiccata Austro-Hungarica" and once again an old letter to Mr Cheeseman can solve the question as to the origin of an early exchange. A letter from Professor R. von Wettstein, written in 1899 (Fig. 26), explains how an exchange with Vienna developed after Cheeseman had sent a collection of *Euphrasia* to Wettstein, an authority on this genus. Subsequently Wettstein named *Euphrasia zelandica* and *E. cheesemanii*; the latter, "expressing my thankfulness" (Wettstein to Cheeseman, 25 October 1899 . Cheeseman in turn, in his *Manual of the New Zealand Flora,* acknowledged Wettstein's help in respect to the genus *Euphrasia*: "I have to express my indebtedness to Dr R. von Wettstein's elaborate monograph for much information respecting the New Zealand forms, all of which are endemic." (Cheeseman 1925, p. 838).

Dr von Wettstein wrote, in 1899, that he was sending "some Centuries in a box" of Flora Exsiccata Austro-Hungarica put out by "the Botanic Museum of the Vienna University" and that he also intended to send "the future Centuries of this Exsiccata". It is not known how many hundreds of these specimens were sent to Cheeseman, or how much he sent in return but it is likely that Exsiccata from the Botanisches Institut und Botanischer Garten der Universität Wien continued to be sent to Auckland Museum long after 1900.

The clearly printed Flora Exsiccata Austro-Hungarica labels have general localities but no collecting dates (Fig. 27). The following collectors are some of those whose names, printed in bold type, appear on the labels in the Cheeseman Herbarium: Borbas, Bornmüller, Derganc, Fick, Haynald, Huter, Keck, Kerner, Marchesetti, Mulley, Palla, Pichler, Pernhoffer, Rigo, Sarntheim, Schafferer, Schönach, Stohl, Strobl, Wagner (Fig. 27), Wettstein, Wolff, Zimmeter.


FLORA EXSICCATA AUSTRO-HUNGARICA.

2927. Euphrasia Tatarica.

Fischer in *Sprengel* Syst. veg. II. p. 777. (1825).

Syn. E. pudibunda *Simk*. En. Flor. Transs. p. 432. (1886).

Conf. *Wettstein* Monographie d. Gatt. Euphrasia p. 88. (1896).

Hungaria meridionalis. Comitatus Temes. In pratis arenosis prope [illegible]. (Locus classicus Euphrasiae pudibundae *Simonk*.)

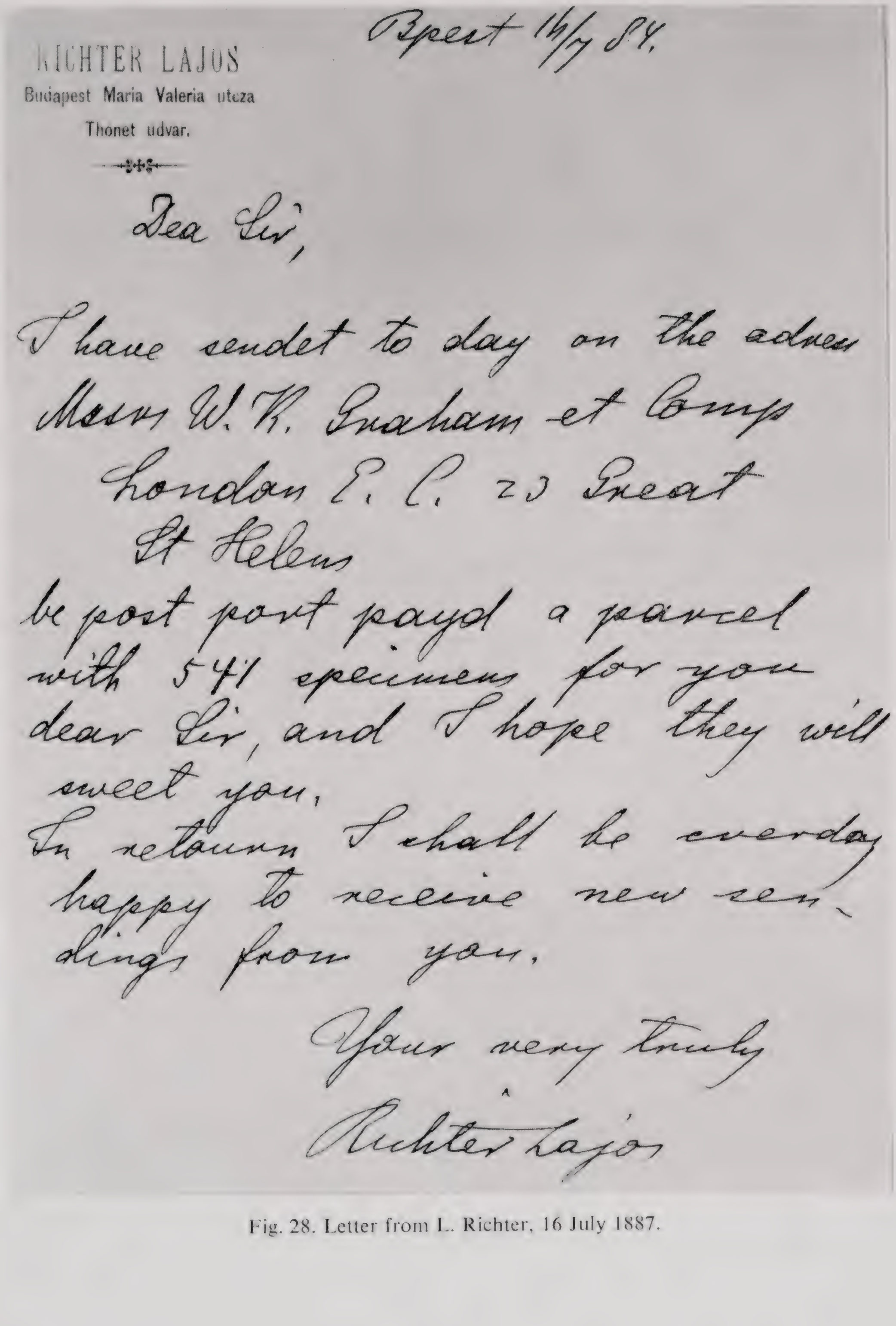
J. Wagner.

Fig. 27. Herbarium label. Flora Exsiccata Austro-Hungarica (14 × 6.5 cm).

Hungary

Lajos Richter (fl. 1880-1900)

The only existing letter from Lajos Richter to Cheeseman announced the dispatch of over 500 specimens from Budapest via London in July 1884. Prior to this there must have been some sort of correspondence between them as Richter knew the name of Cheeseman's London agents and also wrote that he was hoping for "new sendings" from Auckland. As seen in his letter (Fig. 28), his quaint use of English is amusing. His distinctive hand-writing can be seen on the many "Flora Hungarica" labels, "Ex herb. Richter", in the Cheeseman Herbarium (Fig. 29).



RICHTER LAJOS
Budapest Maria Valeria utcza
Thonet udvar.

Bpest 16/7 87.

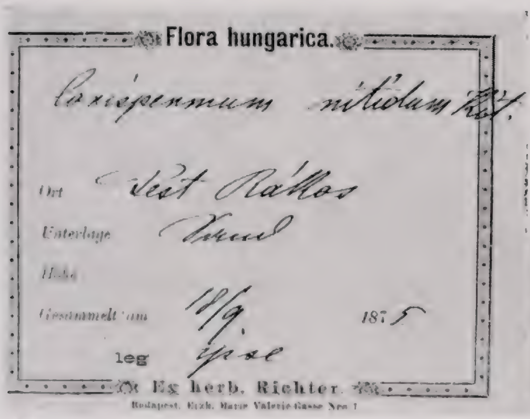
Dea Sir,

I have sendet to day on the adress
Messrs W. K. Graham et Comp
London E. C. 23 Great
St Helens
be post port payd a parcel
with 541 specimens for you
dear Sir, and I hope they will
sweet you.
In retourn I schall be everday
happy to receive new sen-
dings from you.

Your very truly
Richter Lajos

Fig. 28. Letter from L. Richter, 16 July 1887.

Richter Lajos, as he signed himself, was a clerk in Budapest (Clokie 1964) and gave his address as Marie Valerie Street (Fig. 29). His large "Ex herb. Richter" labels were often printed in purple ink. Many smaller purple-inked labels (Fig. 30) on material in the Cheeseman Herbarium, collected by W. Steinitz of Hungary, were probably Ex Herb. Richter also. Most of the exchange specimens from Budapest were collected by Richter himself (see "leg ipse" Fig. 29), but occasionally other collectors names are seen on the large labels, e.g. Ebenhoch, Lang and Pontarlier.



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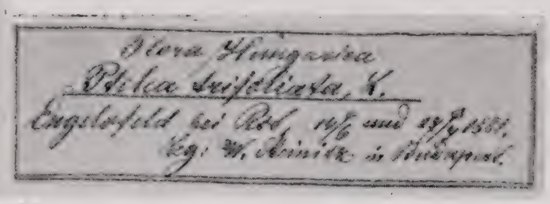

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Figs. 29, 30. Herbarium labels. 29. Label ex herb. Richter, 18 September 1875 (15 × 12 cm). 30. Flora Hungarica label — collector W. Steinitz, 27 July 1881 (10 × 3.5 cm).

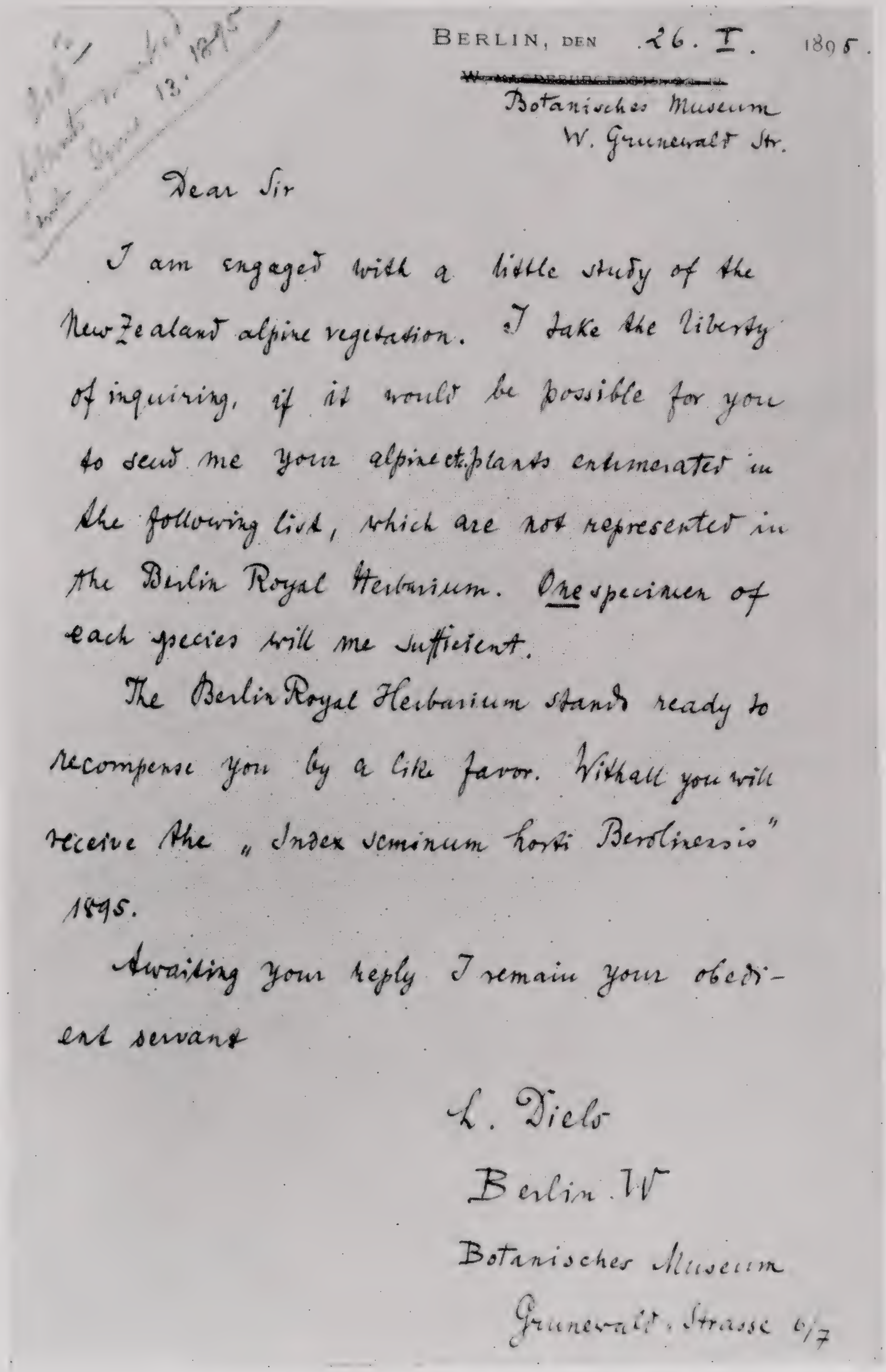
GERMANY

Friedrich Ludwig Emil Diels (1874-1945)

Dr Diels of Berlin Botanisches Museum wrote to Mr Cheeseman in January 1895 requesting specimens of New Zealand alpine plants, adding, "The Berlin Royal Herbarium stands ready to recompense you by a like favour." (Fig. 31). A mutual exchange of plants would presumably be the outcome of this statement, but no trace has been found in the Auckland Institute and Museum Herbarium of any specimens sent from Berlin about 1900. The requested alpine material was sent from Auckland in June 1895 and acknowledged by Diels in a postcard dated 28 August 1895. Later correspondence from Diels revealed that several more requests were met, including New Zealand specimens for Professor Engler. Dr Diels also visited Cheeseman in Auckland in 1902.

A paper by Diels, "Vegetations-biologie von Neu-Seeland" (Diels 1896) was given faint praise by Cheeseman, who wrote (Cheeseman 1925, pp. xxxiii-iv) that the paper:

> "deserves special mention on account of being the first attempt to prepare an account of the flora of the colony from an oecological standpoint. Although based entirely on herbarium maerial and on the observations of other botanists and collectors, and consequently containing errors both of omission and commission, it is nevertheless a work of considerable originality and merit, and is well worth the attention of all students of the flora."



BERLIN, DEN 26. I. 1895.

Botanisches Museum
W. Grunewald Str.

Dear Sir

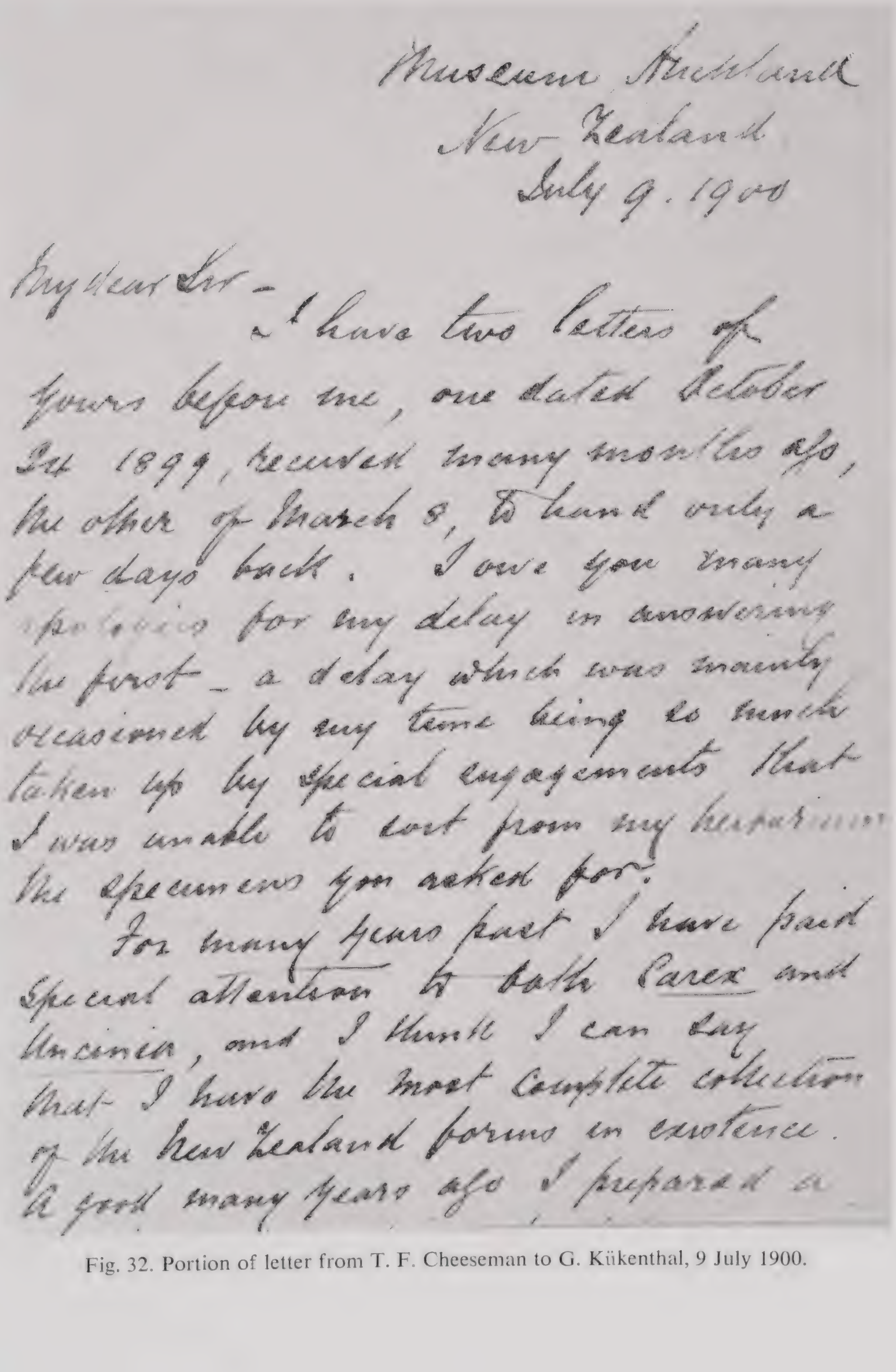
I am engaged with a little study of the New Zealand alpine vegetation. I take the liberty of inquiring, if it would be possible for you to send me your alpine et. plants entmerated in the following list, which are not represented in the Berlin Royal Herbarium. One specimen of each species will me sufficient.

The Berlin Royal Herbarium stands ready to recompense you by a like favor. Withall you will receive the „Index seminum horti Berolinensis" 1895.

Awaiting your reply I remain your obedient servant

L. Diels
Berlin W
Botanisches Museum
Grunewald-Strasse 6/7

Fig. 31. Letter from L. Diels, 26 January 1895.



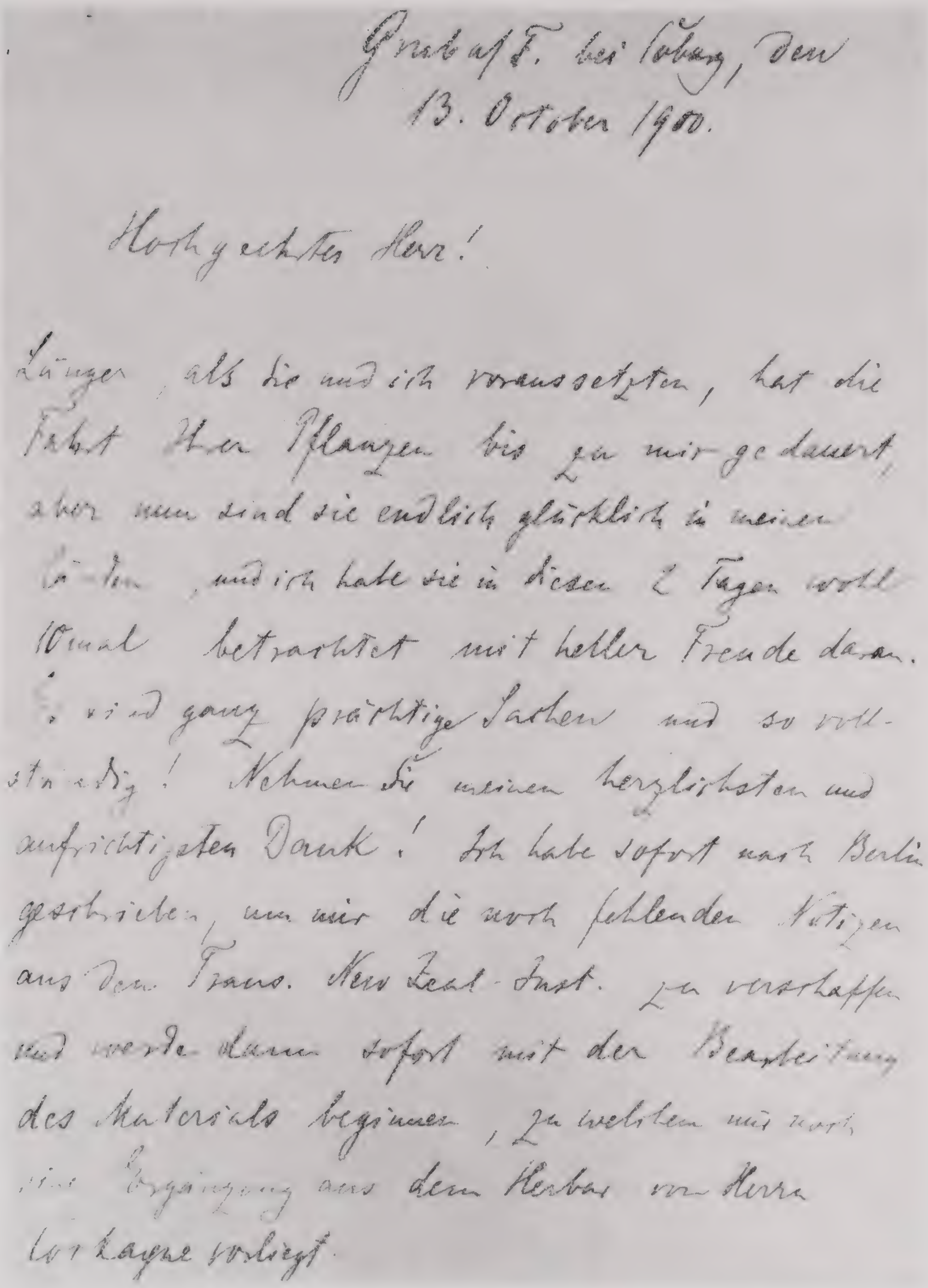
Museum Auckland
New Zealand
July 9. 1900

My dear Sir –

I have two letters of yours before me, one dated October 24 1899, received many months ago, the other of March 8, to hand only a few days back. I owe you many apologies for my delay in answering the first – a delay which was mainly occasioned by my time being so much taken up by special engagements that I was unable to sort from my herbarium the specimens you asked for.

For many years past I have paid special attention to both *Carex* and *Uncinia*, and I think I can say that I have the most complete collection of the New Zealand forms in existence. A good many years ago I prepared a

Fig. 32. Portion of letter from T. F. Cheeseman to G. Kükenthal, 9 July 1900.



Grub a/F. bei Coburg, den
13. October 1900.

Hochgeehrter Herr!

Länger, als Sie und ich voraussetzten, hat die Fahrt Ihrer Pflanzen bis zu mir gedauert, aber nun sind sie endlich glücklich in meinen Händen, und ich habe sie in diesen 2 Tagen wohl 10mal betrachtet mit heller Freude daran. Es sind ganz prächtige Sachen und so vollständig! Nehmen Sie meinen herzlichsten und aufrichtigsten Dank! Ich habe sofort nach Berlin geschrieben, um mir die noch fehlenden Notizen aus dem Trans. New Zeal. Inst. zu verschaffen und werde dann sofort mit der Bearbeitung des Materials beginnen, zu welchem mir noch eine Ergänzung aus dem Herbar von Herrn Cockayne vorliegt.

Fig. 33. Portion of letter from G. Kükenthal, 13 October 1900.

Georg Kükenthal (1864-1955)

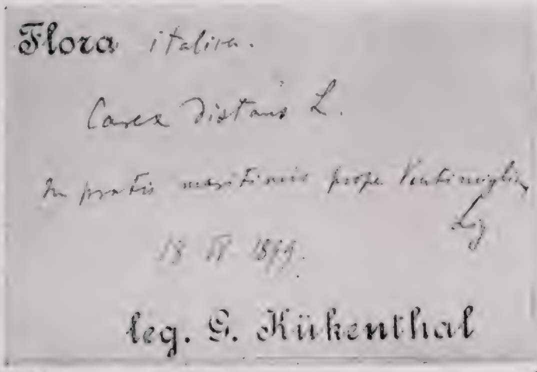
Dr Kükenthal, in preparation for his *Carex* monograph in Engler's *Das Pflanzenreich* (Kükenthal 1909, pp. 67-824), wrote to Cheeseman from Coburg, Germany, in 1899. He sought duplicate specimens from New Zealand of both *Carex* and *Uncinia* and in return offered *Carex* from Europe and America. The following year Cheeseman despatched "sets of 115 varieties" to Kükenthal via Kew, explaining, "As it is somewhat difficult to send a parcel direct from New Zealand to Cobourg (it is too large to go by post), I have included it in a box which I am sending to the Royal Gardens at Kew; thinking that you can easily make arrangements for getting it from there." (Cheeseman to Kükenthal, 9 July 1900) (Fig. 32). A translation of Kükenthal's reply, found with the original letter (in German) (Fig. 33), to Cheeseman dated 13 October, 1900, reads:

> "The transit of your plants took much more time than you and I supposed, but at last they are safely in my hands, and these two last days I has nearly ten times looked at them with greatest pleasure. They are beautiful things, and so complete! Kindly accept my sincerest thanks!"

In January 1901 Kükenthal forwarded a collection of Carices to Cheeseman (Fig. 34). As well as European collections made by Kükenthal there are, in the AK Herbarium, *Carex* specimens from collectors in Japan, Himalaya and Singapore all ex Kükenthal Herbarium.

Other European collectors

European specimens in the Cheeseman Herbarium from collectors cited below are not labelled ex Müller, ex Levier, Flora Exsiccata Austro-Hungarica, ex Richter or ex Kükenthal, though it is possible that some came from these sources.



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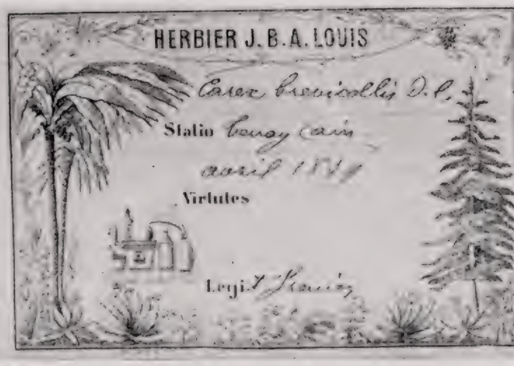

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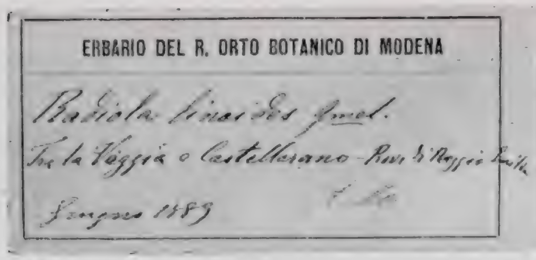

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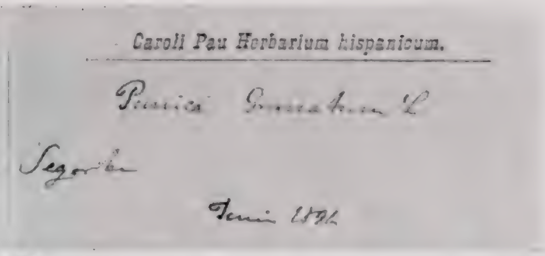

37

Figs. 34-37. Herbarium labels. 34. Label from G. Kükenthal, 18 April 1899 (11 × 8.5 cm). 35. Label ex Herbier J. B. A. Louis, April 1879 (12 × 8.2 cm). 36. Label from A. Mori, 1899 (13 × 7 cm). 37. Label from C. Pau, 1896 (16 × 7 cm).

A. Ausserdorfer, Dr Behrendsen, W. Bernouilli, F. C. E. Börgesen, H. Bourdot, F. Bruyas, H. Carling, P. Chavin, E. Chiovenda, E. Cornaz, F. Cortesi, E. Crespigny, R. Enwald & C. A. Knabe, J. P. Fray, E. Th. & H. Fries, G. Göthlin, W. Granberg, H. Gysperger, E. & A. Haglund, J. Hartz, P. A. Jonson, A. Kaiser, S. Källström, L. Keller, I. Lagercrantz, R. Larsson, J. Lilliesköld, S. O. Lindberg, E. L. Ljungström, J. Lloyd, M. Longa, F. Lönnkvist, M. Lorenzen, J. B. A. Louis (Fig. 35), J. E. Lundequist, O. Möller, A. Mori (Fig. 36), A. E. E. Mouillefarine, C. J. Neuman, E. Nordström, C. Pau (Fig. 37), K. G. Sanio, G. V. Schotte, H. G. Simmons, C. Stenholm, H. Sudre, P. Tillet, G. Treffer, A. Vaccari, G. Vidal, Dr Voeltzkow, L. J. Wahlstedt, E. Warodell, C. G. Westerlund.

Conclusion

Cheeseman collected many duplicates in his long career as a botanist and distributed these freely. In some cases he did not even retain a voucher. Therefore, although the majority of his collections are represented in the Auckland Institute and Museum Herbarium, some will only be found in overseas herbaria. Lanjouw & Stafleu (1954, p. 124) listed Cheeseman collections as being in the following European institutions:

Botanisches Museum, Berlin; Royal Botanic Garden, Edinburgh; Universitatis Florentinae, Istituto Botanico, Firenze; Conservatoire et Jardin botaniques, Geneve; Royal Botanic Gardens, Kew; Botanisches Institut der Universitat, Kiel; Naturhistorisches Museum, Wien.

No attempt has been made here to give a complete list of 20th century collectors represented in the European material acquired as exchange by Cheeseman up to 1900. Rather, a method of selective sampling of many families in the Herbarium has complemented information obtained from the early Cheeseman correspondence in the Auckland Institute and Museum Library's manuscript collection.

Acknowledgements. I am most grateful to Mr E. B. Bangerter (formerly of the British Museum Herbarium) for his help in segregating relevant collections while doing voluntary work on the overseas section of the Auckland Institute and Museum Herbarium. His ready information about British botanists is much appreciated.

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1974 Notes on the Cheeseman Herbarium Part 1. Exchange with U.S.A. herbaria before 1900. *Rec. Auckland Inst. Mus.* 11: 105-117.

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1970 *Index of collectors in the Edinburgh Herbarium.* Her Majesty's Stationery Office, Edinburgh. 147 pp.

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1852-1855 *Flora Novae-Zealandiae.* London, 2 vols.

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1909 Cyperaceae - Caricoideae. *Das Pflanzenreich* 38: 1-824.

LANJOUW, J. and F. A. STAFLEU

1954 Index Herbariorum Part 2. Collectors A-D. *Regnum vegetabile* 2: 1-174.

LASEGUE, A.

1845 *Musée Botanique de M. Benjamin Delessert.* Fortin, Masson, Paris. 588 pp.

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1904 The department of botany. *The history of the collections contained in the natural history departments of the British Museum* 1: 79-193.

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1929 Arthur Bennett. *J. Bot., London* 47: 217-221.

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1970 Benjamin Delessert and Antoine Lasègue. *Taxon* 19: 920-936.

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THE TAXONOMY OF SOME WEST AMERICAN AND ATLANTIC NASSARIIDAE BASED ON THEIR TYPE - SPECIMENS

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Abstract. The type-specimens of 57 species of Nassariidae are discussed and illustrated. Species originally described from the Indo-Pacific, i.e. *Nassarius gwatkinianus* (Melvill), *N. corrugatus* (A. Adams), *N. lautus* (Marrat) and *N. nevillianus* (Preston), are synonyms of previously described West American Nassariidae. *N. hanleyanus* (Marrat) and *N. decoratus* (Marrat) described from unknown locality, are West American nassariid synonyms while *N. moestus* (Hinds), originally described from West America, is an Indo-Pacific species and not conspecific with *N. brunneostomus* (Stearns), which is the taxon applicable to the West American species. *N. scabriusculus* (Powys) appears to be an earlier name for *N. collarius* (C. B. Adams) and the *N. scabriusculus auctt.* is the species *N. stimpsonianus* (C. B. Adams). *N. antillarum* (d'Orbigny), often synonymised with *N. albus* (Say) is *N. vibex* (Say). *N. pumilio* (E. A. Smith) is an earlier name for the West African *N. madseni* (Knudsen). *Cyllene owenii* Gray in Griffith & Pidgeon, is considered to be a prior taxon for *C. senegalensis* Petit de la Saussaye from West Africa and *Demoulia obtusata* (Link) is the earliest name applicable for the West African species currently known as *D. pinguis* A. Adams. *Nassarius vaucheri* (Pallary) from Morocco is not a *Nassarius* but probably belongs to *Chauvetia* Monterosato. *N. planocostatus* (A. Adams) described from Peru is a synonym of the Indian Ocean *N. foveolatus* (Dunker). The new name *Cyllene desnoyersi lamarcki* is proposed for the homonymous West African *C. lyratum* (Lamarck, 1822).

This is the first of a series of papers in preparation for a monograph of Indo-Pacific Nassariidae. Its purpose is to re-assign species originally described from the Indo-Pacific to other faunal regions where they actually belong, and to elucidate the identity of certain non-Indo-Pacific species described from unknown locality. The specific and supraspecific taxonomy of the Nassariidae, particularly those of the Indo-Pacific, is still in a state of chaos and even the validity of the family-name Nassariidae is being questioned and its acceptance or rejection is currently under review by the International Commission on Zoological Nomenclature. For this reason, and until all generic names have been evaluated, the single genus *Nassarius s. lato* has been adopted.

The three dimensions given throughout this paper represent in sequential order the length × width × height of aperture expressed in mm. The following institutional abbreviations are used in this paper:

B.M.N.H. = British Museum (Natural History), London

MCML = Merseyside County Museums, Liverpool

MCZ = Museum of Comparative Zoology, Harvard

USNM = National Museum of Natural History, Washington

Order **NEOGASTROPODA**

Superfamily BUCCINACEA

Family NASSARIIDAE Iredale, 1916

(A decision on the validity of the family-group name is pending by the I.C.Z.N., No. Z.N. (S.) 1887).

Genus **Nassarius** Duméril, 1806

Nassarius Duméril, 1806, Zool. Analyt. p. 166. Type-species by SM (Froriep, 1806) *Buccinum arcularia* L. = *B. arcularia* Linnaeus, 1758. Recent, Indo-Pacific.

Nassarius s. lato

Figs. 1-6. *Nassarius perpinguis* (Hinds). 1, 2. Holotype BMNH No. 1844.9.23.5.; length 21.0 mm. 3, 4 Holotype of *N gwatkinianus* (Melvill), BMNH No 1921.1.28.4.; length 18.0 mm. 5, 6. Holotype of *N. corrugatus* (A. Adams), BMNH No. 193225; length 33.9 mm.

Nassarius perpinguis (Hinds, 1844) (Figs. 1-6)

1844. *Nassa perpinguis* Hinds, Zool. Voy. H.M.S. "Sulphur", Moll. Pt. 2: 36, pl. 9, figs. 12, 13; 1852 A. Adams, Proc. Zool. Soc. Lond. for 1851, Pt. 19: 109; 1859 Chenu, Man. Conchyly. 1: 162, textfig. 773.

1852. *Nassa corrugata* A. Adams, Proc. Zool. Soc. Lond. for 1851, Pt. 19: 110 (*non Buccinum corrugatum* Brocchi, 1814 = *Nassarius*).

1855. *Nassa intastriata* Conrad, U.S. House Rep. Docum. No. 129: 17.

1856. *Nassa interstriata* Conrad, U.S. Pacif. Railr. Surv. 5: 327 (emend. spelling).

1877. *Nassa undata* Marrat, Prop. new forms gen. *Nassa,* p. 9 (Hab: ?) [*fide* Tomlin, 1940].

1908. *Nassa perpinguis* var. *bifasciata* Berry, Nautilus, 22: 39.

1917. *Alectrion perpinguis* (Hinds), Dall, Proc. U.S. Nat. Mus. 51: 576; 1927 Oldroyd, Mar. shells W. coast N. America 2 (1): 266, pl. 26, fig. 11.

1918. *Alectryon (Hima) gwatkinianus* Melvill, Ann. Mag. Nat. Hist. (9) 1: 139, pl. 4, fig. 4.

1931. *Nassarius (Schizopyga) perpinguis* (Hinds), Grant & Gale, Mem. San Diego Soc. Nat. Hist. 1: 673, pl. 26, figs. 51, 52.

1942. *Zeuxis corrugata* (A. Adams), Yen, Proc. Malac. Soc. Lond. 24: 233, pl. 23, fig. 167 (figd. holotype).

1952. *Nassarius perpinguis* (Hinds), Demond, Pacif. Science 6 (4): 305, pl. 2, figs. 4, 5.

1954. *Nassarius (Hinia) perpinguis* (Hinds), Americ. Seashells p. 239, textfig. 53e.

1965. *Nassarius (Caesia) perpinguis* (Hinds), Addicott, U.S. Geol. Surv. Prof. Pap. 503-B: B6, pl. 3, figs. 29, 32.

DISTRIBUTION. Puget Sound, Washington to Magdalena Bay, L. California, Mexico.

TYPE SPECIMENS AND TYPE LOCALITIES

N. perpinguis. Holotype in B.M.N.H. No. 1844.9.23.5.; 21.0 × 12.0 × 10.0 mm. Fawn in colour, 6 nodulose spiral cords on the penultimate and 13 primary cords on the body whorl. Magdalena Bay, California [Mexico].

N. corrugata. Holotype in B.M.N.H. No. 193225; 33.9 × 17.6 × 15.0 mm. Cream in colour, 5 primary nodulose spiral cords on penultimate and 17 on the body whorl. Eastern Seas = error.

A. (H.) gwatkinianus. Holotype in B.M.N.H. No. 1921.1.28.4.; 18.0 × 10.7 mm. Creamy-yellow in colour, 6 primary nodulose cords on penultimate and 12 on the body whorl. Persian Gulf = error.

According to Oldroyd (1927), Grant & Gale (1931) and Demond (1952), the type specimen of *Nassarius perpinguis* is said to be in the Zoological Museum, Copenhagen. Hind's type of *N. perpinguis,* as most of his types from the "Sulphur" voyage, are in the British Museum (Nat. Hist.), London.

The holotype of *N corrugatus* is a very large and more slender individual of *N. perpinguis.* According to Grant & Gale (*op. cit.*), *N. perpinguis* is usually an evenly ventricose species with generally a narrow shelf at the sutures, but the authors point out that both tall and short forms have been collected. Adams' *N. corrugatus* is the tall form with the narrow sutural shelf, and also has the secondary spiral threads on the upper part of the body whorl, mentioned by Addicott (1965). A similar slender example has been illustrated by Grant & Gale (1931, pl. 26, figs. 51, 52). *Nassa corrugata* A. Adams is a secondary homonym of *Buccinum corrugatum* Brocchi, 1814, a *Nassarius (Hinia)* species from the Italian Pliocene.

The holotype of *N. gwatkinianus* (Melvill) is the more usual, ventricose form of *N. perpinguis*. Melvill (1918) received the specimen from Prof. Gwatkin, who supposedly received it from Townsend. Gwatkin's rather frequent errors in identifications and localisation of radulae extracted from specimens, would explain Melvill's citation of "Persian Gulf" for this West American species. No species similar to *N. perpinguis* lives in either the Persian Gulf or the Indo-Pacific.

Authors have usually compared or sometimes confused *N. perpinguis* with *N. californianus* (Conrad, 1856) from Pliocene deposits of California. Despite their close resemblance on a specific level, Addicott (1965) placed *N. californianus* in the subgenus *Demondia* Addicott, 1965 (substitute name for *Schizopyga* Conrad, 1856 — *non* Gravenhorst, 1829) and *N. perpinguis* in *Caesia* H. & A. Adams, 1853, of which it is the type species. *N. fossatus* (Gould), the type species of *Zaphon* H. & A. Adams, 1853, which is morphologically quite different from *N. perpinguis,* has been amalgamated with *Caesia* by Addicott (*op. cit.*). Apart from the coarser sculpture of *N. californianus,* other morphological differences on a subgeneric basis between this species and *N. perpinguis* are negligible, and *Demondia* Addicott is considered a synonym of *Caesia* H. & A. Adams.

Nassarius fossatus (Gould, 1850)

To the synonymy given by Grant & Gale (*op. cit.*) and Demond (*op. cit.*), should be added *Nassa morleti* Crosse, 1867, described from unknown locality. The illustrated type is somewhat immature but is clearly conspecific with *N. fossatus.*

Nassarius mendicus (Gould, 1850) (Figs. 7-11)

1850. *Nassa mendica* Gould, Proc. Boston Soc. Nat. Hist. 3: 155; 1852 Gould, U.S. Expl. Exped. 12: 263, pl. 19, figs. 331, 331a.

1852. *Nassa woodwardi* Forbes, Proc. Zool. Soc. Lond. for 1850, Pt. 18: 273, pl. 11, figs. 3, 3*.

1852. *Nassa cooperi* Forbes, Proc. Zool. Soc. Lond. for 1850, Pt. 18: 273, pl. 11, figs. 4, 4*.

1859. *Nassa gibbsii* Cooper, U.S. Pacif. Railr. Repts. Suppl. 1 (3): 371 (Port Townsend, Puget Sound).

1877. *Nassa acutangula* Marrat, Prop. new forms gen. Nassa, p. 9 (*fide* Tomlin, 1940 = immature specimen of the form *cooperi*).

1927. *Alectrion mendicus* (Gould), Oldroyd, Mar. shells W. coast N. America, 2 (1): 265, pl. 26, fig. 6, 14.

1927. *Alectrion cooperi* (Forbes), Oldroyd, Mar. shells W. coast N. America, 2 (1): 265, pl. 26, fig. 8.

1927. *Alectrion mendicus indisputabilis* Oldroyd, Mar. shells W. coast N. America, 2 (1): expl. to pl. 26, fig. 4.

1931. *Nassarius (Schizopyga) mendicus* (Gould), Grant & Gale, Mem. San. Diego Soc. Nat. Hist. 1: 674, pl. 26, fig. 54.

1931. *Nassarius (Schizopyga) mendicus* var. *cooperi* (Forbes), Grant & Gale, Mem. San. Diego Soc. Nat. Hist. 1: 674, pl. 26, figs. 40, 50.

1952. *Nassarius mendicus* (Gould), Demond, Pacif. Science 6 (4): 308, pl. 1, fig. 3.

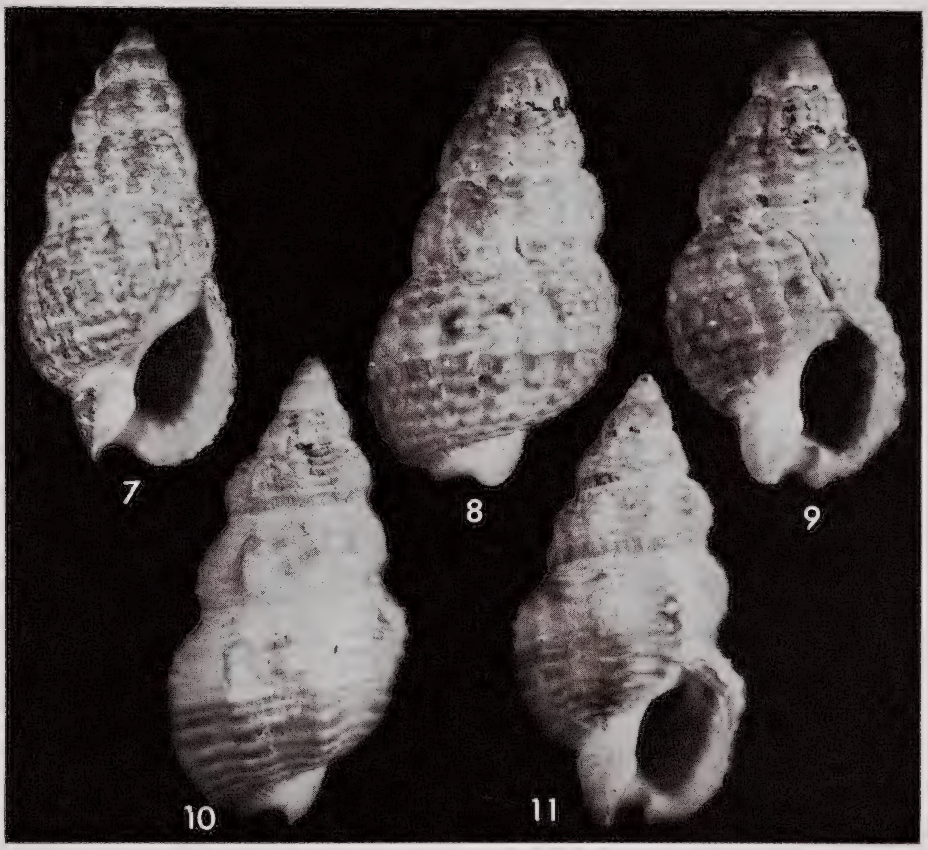
1952. *Nassarius mendicus cooperi* (Forbes), Demond, Pacif. Science, 6 (4): 309, pl. 1, fig. 1.

1954. *Nassarius (Hinia) mendicus* (Gould), Abbott, Americ. Seashells, p. 240, textfig. 53d.

1965. *Nassarius (Demondia) mendicus* (Gould), Addicott, U.S. Geol. Surv. Prof. Pap. 503-B: B3, pl. 1, figs. 14, 16.

1965. *Nassarius (Demondia) mendicus* forma *cooperi* (Forbes), Addicott, U.S. Geol. Surv. Prof. Pap. 503-B: B3, pl. 1, figs. 17-19.

1965. *Nassarius (Demondia) mendicus* forma *indisputabilis* (Oldroyd), Addicott, U.S. Geol. Surv. Prof. Pap. 503-B: B3, pl. 1, figs. 11-13.



Figs. 7-11. *Nassarius mendicus* (Gould). 7. Holotype USNM No. 5727; length 20.4 mm. 8, 9. Holotype of *N. woodwardi* (Forbes), BMNH; length 11.4 mm. 10, 11. Syntype of *N. cooperi* (Forbes), BMNH No. 1855.4.5.13.; length 16.7 mm.

DISTRIBUTION. Alaska to Magdalena Bay, L. California, Mexico.

TYPE SPECIMENS AND TYPE LOCALITIES

N. mendica. Holotype in USNM No. 5727; 20.4 × 10.0 × 9.4 mm. Brown in colour, with 12 axial ribs on the penultimate and 12 ribs on the body whorl, penult whorl with 6 spiral cords. On label is "Straits of Fuca, W. coast Nth. America" (= Strait of Juan de Fuca, Washington State).

N. cooperi. Two syntypes in B.M.N.H. No. 1855.4.5.13.; illustrated syntype 16.7 × 8.3 × 7.6 mm. Nine axial ribs on penultimate and 8 ribs on the body whorl, penult whorl with 5 spiral cords. Sandwich Islands [= Hawaiian Is) = error. Probably on the coast between San Diego and Magdalena Bay, where most of the material of the "Herald" and "Pandora" was collected.

N. woodwardi. Holotype in B.M.N.H.; 11.4 × 6.2 × 5.2 mm. This is the same form as the typical *N. mendicus.* Sandwich Islands [= Hawaiian Is] = error. Probably on coast between San Diego and Magdalena Bay.

The publication date for *N. mendicus* is variously given as either 1851 (Grant & Gale, 1931) or 1849 (Demond, 1952), but the correct date is 1850 (Johnson, 1964). Grant & Gale (*op. cit.*) and Demond (*op. cit.*) cite 1850 as the publication date of *N. cooperi,* whereas the correct date is 1852 (Duncan, 1937).

The ecophenotypic variant *N. cooperi* is usually considered as a subspecies, variety or form of *N. mendicus.* The form *cooperi* has fewer, more angulate and wider spaced axial ribs, more shouldered whorls and consequently an angulate outer lip, and spiral cords on the lower half of the body whorl which are not nodulose. Both forms are sympatric and according to Demond (*op. cit.*) occur together at many points along the Pacific coast between Washington State and San Diego, and according to Grant & Gale (*op. cit.*), integrades are frequent. In some Indo-Pacific species the range of variation is often greater than in *N. mendicus,* and sometimes as many as 5 distinct forms can be recognised on the basis of form, sculpture and colour.

Nassarius catallus (Dall, 1908) (Figs. 12-19)

1880. *Nassa hanleyana* Marrat, Var. shells gen. Nassa, pp. 75, 83; 1940 Tomlin, Proc. Malac. Soc. Lond. 24 (1): 36 (non *Buccinum hanleyanum* Dunker, 1847 = *Nassarius*).

1908. *Alectrion (Hima) catallus* Dall, Bull. Mus. Comp. Zool. Harvard 43 (6): 307, pl. 11, fig. 11.

1917. *Alectrion catallus* Dall, Proc. U.S. Nat. Mus. 51: 576.

1917. *Alectrion polistes* Dall, Proc. U.S. Nat. Mus. 51: 577.

1945. *Nassarius catallus* (Dall), Strong in Burch, Min. Conch. Club Sth. Calif. No. 51: 4; 1952 Demond, Pacif. Science 6 (4): 312, pl. 1, fig. 8; 1958 Keen, Sea shells trop. W. America p. 408, fig. 569; 1965 Addicott, U.S. Geol. Surv. Prof. Pap. 503-B: B11; 1971 Keen, Sea shells trop. W. America, ed. 2: 606, fig. 1292.

1958. *Nassarius polistes* (Dall), Keen, Sea shells trop. W. America, p. 411, fig. 584.

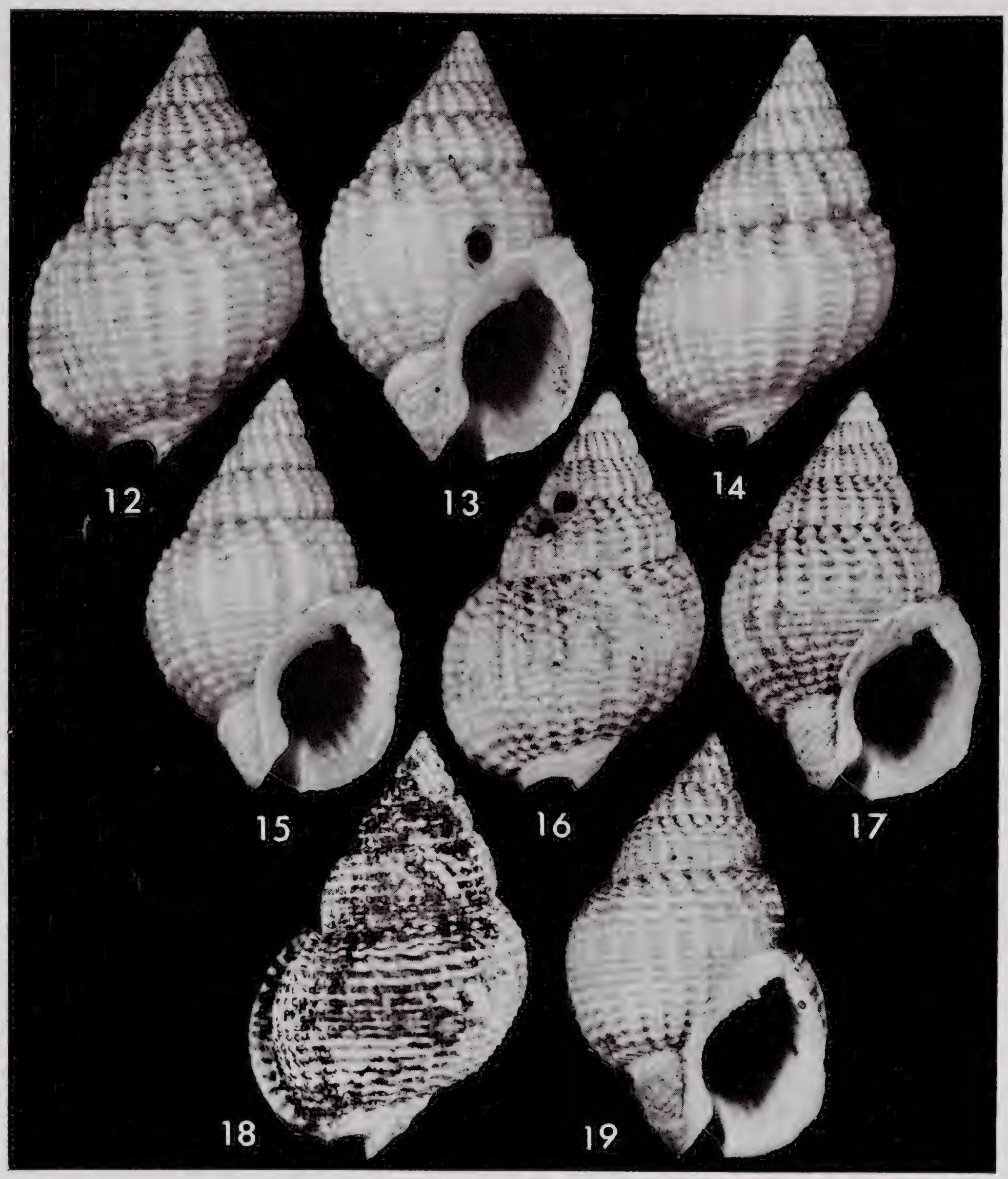
DISTRIBUTION. Baja California to Peru and the Galápagos Is.

TYPE SPECIMENS AND TYPE LOCALITIES

N. hanleyana. Two syntypes in MCML; larger syntype 14.4 × 9.0 × 7.8 mm, smaller syntype 13.6 × 8.4 × 7.0 mm. Faded straw-yellow or cream in colour, penultimate whorl with 19-20 axial ribs and 6-7 spiral cords, body whorl with 17 ribs and 14 spiral cords, columella minutely denticulate, outer lip with 12-13 plicate denticles. Locality unknown.

A. catallus. Holotype in USNM No. 123013; 13.6 × 8.6 × 7.2 mm. Straw-yellow in colour, penultimate whorl with 19 axial ribs and 6 spiral cords, body whorl with 18 ribs and 14 spiral cords, columella minutely denticulate, outer lip plicate. Gulf of Panama, 182 fathoms (333 m), mud, 54.1°F (12.0°C).

A. polistes. Lectotype in USNM No. 96642; 23.0 × 14.4 × 12.0 mm. Straw-yellow in colour, penultimate whorl with 5-7 spiral cords and body whorl with 16, last two whorls with *c.* 20 axial ribs which are weak and undefined on the dorsal side, outer lip with 15 plicate denticles.



Figs. 12-19. *Nassarius catallus* (Dall) 12-15. Syntypes of *N. hanleyanus* (Marrat), MCML. 12, 13. Length 14.4 mm. 14, 15. Length 13.6 mm. 16, 17. Holotype of *N. catallus* (Dall), USNM No. 123013; length 13.6 mm. 18, 19. Lectotype of *N polistes* (Dall), USNM No. 96642; length 23.0 mm.

Tomlin (1940) erroneously synonymised *N. hanleyanus* (Marrat) with *N. sordidus* (A. Adams, 1852), an Indo-Pacific species of appreciably different appearance. No single specific diagnostic character can be found which would differentiate *N. hanleyanus* from either *N. catallus* or *N. polistes*. Being a secondary homonym of *Buccinum hanleyanum* Dunker, 1847, *Nassarius hanleyanus* (Marrat) is relegated to the synonymy of *N. catallus*.

Nassarius nodicinctus (A. Adams, 1852) Figs. 20-24)

1852. *Nassa nodicincta* A. Adams, Proc. Zool. Soc. Lond. for 1851, Pt. 19: 110; 1864 Carpenter, Rept. Brit. Assoc. Adv. Sci. for 1863, pp. 539, 667.

1917. *Alectrion nodicinctus* (A. Adams), Dall, Proc. U.S. Nat. Mus. 51: 576; 1927 Oldroyd, Mar. shells W. coast N. America, p. 268.

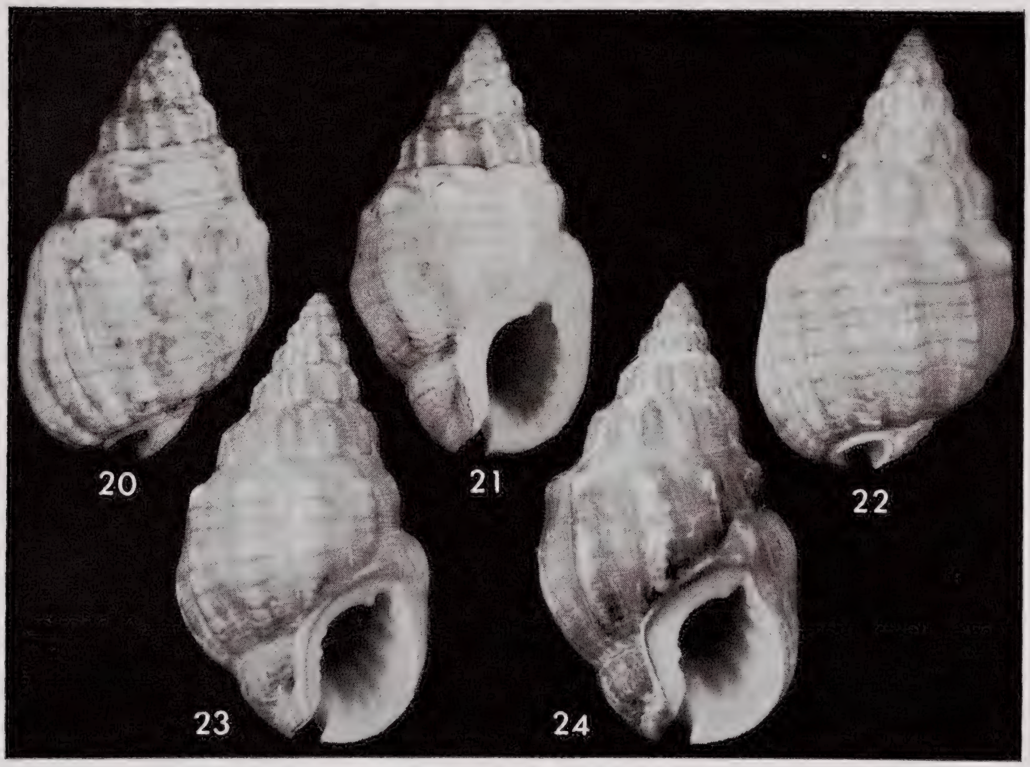
1921. *Zeuxis nodicinctus* (Adams), Dall, U.S. Nat. Mus. Bull. 112: 103.

1927. *Nassarius nodicinctus* (A. Adams), Tomlin, J. Conch. 18: 160 (Coiba I, W. Bay of Panama; Gorgona I, off Colombia, 3°N Lat.; Indefatigable and James Is, Galápagos Is); 1945 Strong in Burch, Min. Conch. Club Sth. Calif. No. 51: 6; 1952 Demond, Pacif. Science, 6 (4): 315; 1955 Hertlein & Strong, Ess. Nat. Sci. hon. Capt. Hancock, Univ. Sth. Calif. p. 129, pl. A, fig. 9; 1971 Keen, Sea shells trop. W. America, ed. 2: 607, fig. 1307.

1932. *Nassa angulicostis* Pilsbry & Lowe, Proc. Acad. Nat. Sci. Philad. 84: 69, pl. 6, fig. 2 (Guaymas; Nicaragua; Panama).

1932. *Nassa angulicostata* Pilsbry & Lowe, Proc. Acad. Nat. Sci. Philad. 84: 115 (invalid emend.).

1971. *Nassarius angulicostis* (Pilsbry & Lowe), Keen, Sea shells trop. W. America, ed. 2: 604, fig. 1291.



Figs. 20-24. *Nassarius nodicinctus* (A. Adams). 20, 21. Syntype BMNH, length 16.1 mm. 22, 23. Specimens from Taboga, Panama, 9 m. 22, 23. Length 14.5 mm. 24. Length 15.0 mm.

DISTRIBUTION. Gulf of California to Colombia and the Galápagos Is.

TYPE SPECIMENS AND TYPE LOCALITIES

N. nodicincta. Two syntypes in B.M.N.H.; illustrated syntype 16.1 × 9.0 × 9.0 mm. Whitish with orange-brown spiral lines, penultimate whorl with 12 axial ribs and 10 spiral threads, body whorl with 9 axial ribs, 2 spiral threads near the sutures, central area smooth, base with 5 spiral cords. Galápagos Is, 7 fathoms (13 m).
N. angulicostis. Holotype in ANSP No. 155331, from San Juan del Sur, Nicaragua, 20 fathoms (37 m).

When Pilsbry & Lowe (1932) described *N. angulicostis,* they cited the following differentiating characters: the weaker grooving or smoothness of the median area of the body whorl in *N. angulicostis* (the syntype of *N. nodicinctus* is equally as smooth), the more numerous spirals on the penultimate whorl, i.e. 10 (the same number is found in the syntype of *N. nodicinctus*), and the deeper siphonal notch (which is the same depth in *N. nodicinctus*). Recent specimens examined from Taboga, Panama, 9 metres (*leg*. T. Mortensen, 1915 — Zool. Mus. Copenhagen) were either broad and squat or slender and elongate, and some individuals closely matched the syntypes of *N. nodicinctus*. The illustrated syntype of *N. nodicinctus* (Fig. 20) is no more angulate in outline nor has it more indented or tabulate sutures than the type of *N. angulicostis* or specimens from Panama (Fig. 23).

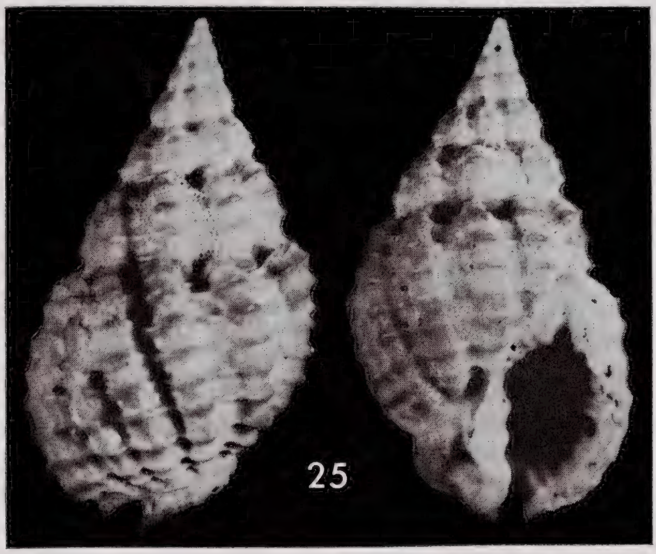


Fig. 25. Holotype of *Nassarius myristicatus* (Hinds), BMNH No. 1844.9.23.11.; length 27.2 mm.

Nassarius myristicatus (Hinds, 1844) (Fig. 25)

1844. *Nassa myristicata* Hinds, Zool. Voy. H.M.S. "Sulphur", Moll. Pt. 2: 36, pl. 9, figs. 10, 11; 1852 A. Adams, Proc. Zool. Soc. Lond. for 1851, Pt. 19: 109; 1932 Pilsbry & Lowe, Proc. Acad. Nat. Sci. Philad. 84: 68, pl. 6, fig. 1.

1853. *Nassa myristica (sic)* Hinds, Reeve, Conch. Icon. 8: pl. 18, fig. 119; 1882 Tryon, Man. Conch. 4: 45, pl. 14, figs. 231, 232 (invalid emend.).

1928. *Nassarius myristicatus* (Hinds), Tomlin, Ann. Sth. Afric. Mus. 25 (2): 322 (not South African = Panamanian); 1958 Keen, Sea shells trop. W. America, p. 410, fig. 580.

1964. *Pallacera myristicata* (Hinds), Woodring, U.S. Geol. Surv. Prof. Pap. 306-C: 269.

1971. *Nassarius (Pallacera) myristicatus* (Hinds), Keen, Sea shells trop. W. America, ed. 2: 610, fig. 1322.

DISTRIBUTION. Nicaragua to Panama.

TYPE SPECIMEN AND TYPE LOCALITY

N. myristicata. Holotype in B.M.N.H. No. 1844.9.23.11.; 27.2 × 15.5 × 13.8 mm. Greyish-brown, interstices at sutures blackish-brown, penultimate whorl with 9 strong axial ribs and 3 wavy spiral cords, body whorl with 11 ribs and 8 spiral cords, 7 plicae distributed over the whole length of the columella, aperture with 9 prominent lirae. Cape of Good Hope = error.

Tomlin (1928) was the first writer to correctly localise *N. myristicatus* from Panama on the basis of Cuming specimens in the British Museum (Nat. Hist.), while Pilsbry & Lowe (1932) illustrated a specimen from Montijo Bay. Montijo Bay, Panama, is here designated as the type locality of *N. myristicatus* (Hinds).

N. myristicatus is the type-species of *Pallacera* Woodring, 1964. The West African *N. tritoniformis* (Kiener, 1841) and *N. cinctellus* (A. Adams, 1852 [non Gould, 1850] from St. Helena are similar to *N. myristicatus* and belong to the same subgenus. The fossil species *Potamides maracaibensis* Weisbord, 1929, and *Phos urumacoensis* Hodson in Hodson & Hodson, 1931, from the Venezuelan Miocene, were placed in *Pallacera* and assigned together with *Antillophos* Woodring, to the Nassariidae by Jung (1965). These two species and the genus *Antillophos* belong to the subfamily Photinae, in the Buccinidae.

Nassarius versicolor (C. B. Adams, 1852) (Figs. 26, 27)

1852. *Nassa versicolor* C. B. Adams, Ann. Lyc. Nat. Hist. New York, 5: 290 (publ. June 1852); 1956 Turner, Occ. Pap. Moll. Harvard, 2 (20): 97, pl. 6, fig. 8 (figd. lectotype).

1852. *Nassa rufocincta* A. Adams, Proc. Zool. Soc. Lond. for 1851, Pt. 19: 106 (publ. 7th December 1852); 1932 Tomlin, Proc. Malac. Soc. Lond. 20 (1): 43.

1853. *Nassa albipunctata* Reeve, Conch. Icon. 8: pl. 21, sp. 144; 1932 Tomlin, Proc. Malac. Soc. Lond. 20 (2): 95.

1880. *Nassa picturata* Marrat, Var. shells gen. *Nassa*, pp. 57, 58 (*fide* Tomlin, 1940).

1927. *Nassarius versicolor* (C. B. Adams), Tomlin, J. Conch. 18: 609 (Taboga, Panama; James I, Galápagos Is, 6 m); 1971 Keen, Sea shells trop. W. America, ed. 2: 609, fig. 1314.

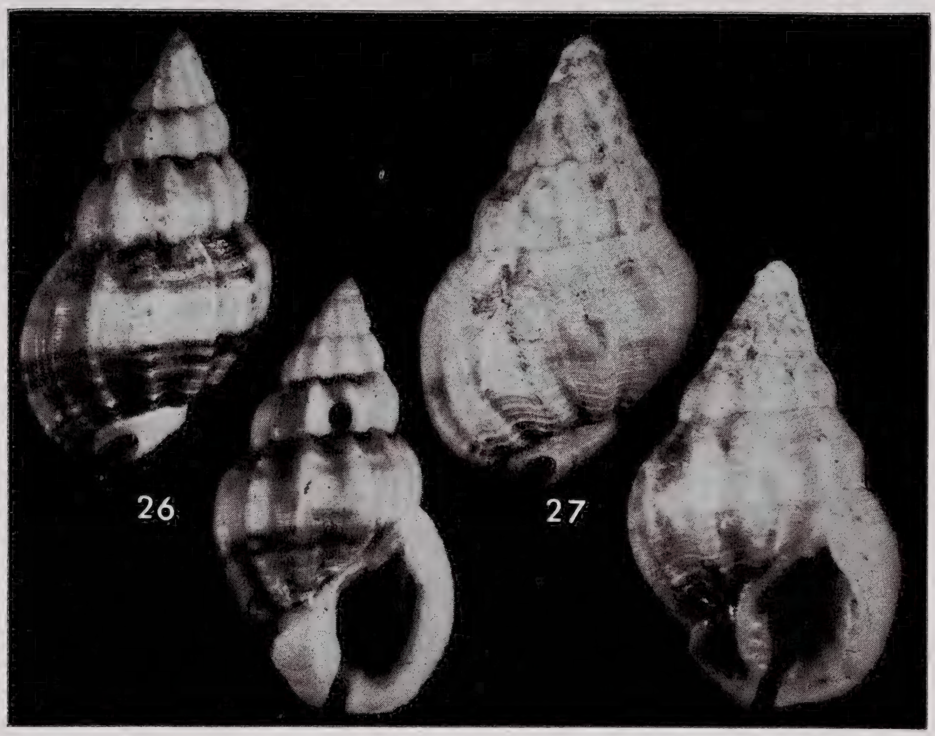
DISTRIBUTION. Lower California to Peru and the Galápagos Is.

TYPE SPECIMENS AND TYPE LOCALITIES

N. rufocincta. Holotype in B.M.N.H.; 14.1 × 7.7 × 6.4 mm. Creamy-white, banded with brown, with 9 axial ribs on the penultimate and 11 ribs on the body whorl. Honduras.

N. albipunctata. Holotype in B.M.N.H. No. 197311; 12.0 × 7.1 × 5.7 mm. Whitish with faint brown bands, with 10 axial ribs on the penultimate and 12 on the body whorl.

A detailed synonymy for this species may be found in Keen (1971).



Figs. 26, 27. *Nassarius versicolor* (C. B. Adams). 26. Holotype of *N. rufocinctus* (A. Adams), BMNH; length 14.1 mm. 27. Holotype of *N. albipunctatus* (Reeve), BMNH No. 197311; length 12.0 mm.

Nassarius dentifer (Powys, 1835) (Fig. 28)

1835. *Nassa dentifera* Powys, Proc. Zool. Soc. Lond. Pt. 3: 95; 1852 A. Adams, Proc. Zool. Soc. Lond. for 1851, Pt. 119: 111; 1853 Reeve, Conch. Icon. 8: pl. 19, fig. 130.

1841. *Buccinum dentiferum* d'Orbigny, Voy. l'Amer. mérid. 5: 432 and 9: pl. 61, figs. 22, 23.

1852. *Nassa tschudii* Troschel, Arch. f. Naturg. 18 (1): 173, pl. 5, figs. 4a-c (Peru); 1915 Preston, J. Conch. 14 (11): 350.

1858. *Buccinum unidentatum* "Powis", Küster, Syst. Conch.-Cab. Mart. Chemn. 3 (1A): pl. 5 (error for pl. 6), figs. 4-6 (Chile).

1909. *Alectrion (Hima) dentiferus* (Powys), Dall, Proc. U.S. Nat. Mus. 37: 214.

1909. *Alectrion (Tritia) tschudii* (Troschel), Dall, Proc. U.S. Nat. Mus. 37: 215.

1945. *Nassarius dentiferus* (Powys), Strong in Burch, Min. Conch. Club Sth. Calif. No. 51: 5; 1952 Demond, Pacif. Science, 6 (4): 315.

1945. *Nassa teschudii (sic)* (Troschel), Strong in Burch, Min. Conch. Club Sth. Calif. No. 51: 5.

1971. *Nassarius dentifer* (Powys), Keen, Sea shells trop. W. America, ed. 2: 906; 1973 Marincovich, Nat. Hist. Mus. Los. Angeles Cty. Sci. Bull. 16: 37, fig. 79.

DISTRIBUTION. Peru to Chile.

TYPE SPECIMENS AND TYPE LOCALITIES

N. dentifera. Three syntypes in the B.M.N.H.; illustrated syntype 22.8 × 11.6 × 11.6 mm. Specimen not fully mature, pale chocolate-brown in colour with a white band on each whorl, penultimate whorl with 14 axial ribs and 5 spiral rows of nodules, body whorl with 12 ribs and 9 rows of nodules, columella with 5-6 plicae, aperture with 8 denticles. Bay of Arica, South America [= Chile], 10 fathoms (18 m), muddy bottom.

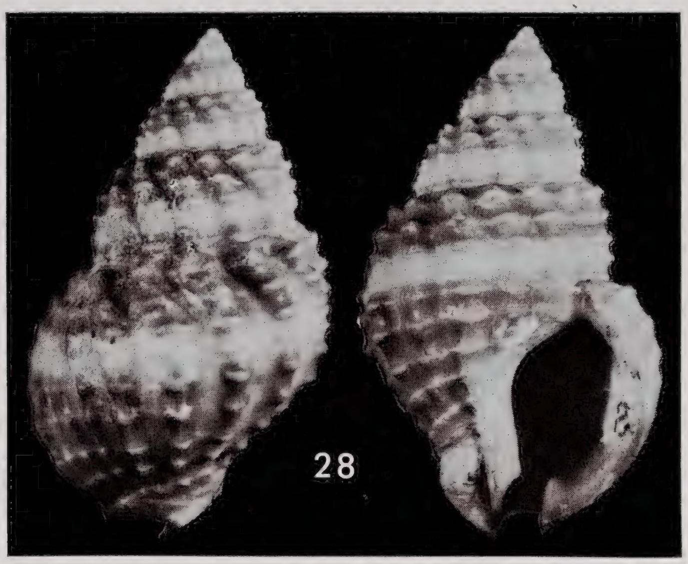


Fig. 28. Syntype of *Nassarius dentifer* (Powys), BMNH; length 22.8 mm.

The species *Nassa angulifera* A. Adams, is not conspecific with *Nassarius dentifer* as tentatively suggested by Keen (1971). For discussions on this species see under *N. anguliferus*.

Nassarius anguliferus (A. Adams, 1852) (Fig. 29)

1852. *Nassa angulifera* A. Adams, Proc. Zool. Soc. Lond. for 1851, Pt. 19: 109; 1853 Reeve, Conch. Icon. 8: pl. 6, fig. 34; 1882 Tryon, Man. Conch. 4: 45, pl. 14, fig. 228; 1932 Tomlin, Proc. Malac. Soc. Lond. 20 (1): 41.

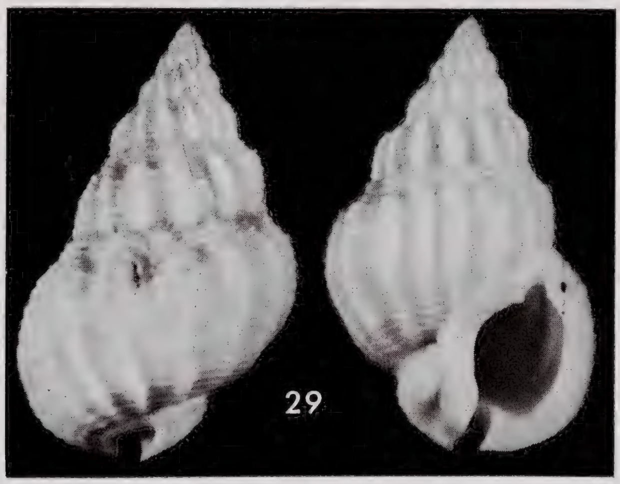


Fig. 29. Syntype of *Nassarius anguliferus* (A. Adams), BMNH No. 197312; length 17.4 mm.

TYPE SPECIMEN AND TYPE LOCALITY

N. angulifera. Three syntypes in the B.M.N.H. No. 197312; illustrated syntype 17.4 × 10.4 × 8.7 mm. Creamy-white in colour with traces of brown bands near the suture and base, penultimate whorl with 14 axial ribs and 9 overriding spiral threads, body whorl with 14 ribs and 19 spiral threads, columella finely plicate along its entire length. Galápagos Is, 10 fathoms (18 m).

There appears to be some confusion as to the identity of the species. Tomlin (1932) considered *N. anguliferus* to be a synonym of the Mediterranean-West African *N. miga* (Bruguière, 1789), while Keen (1971) tentatively placed the species in the synonymy of *N. dentifer* (Powys). *N. anguliferus* does not resemble *N. dentifer* while *N. miga* has evenly convex whorls and oblique axial ribs and lacks the adpressed sutures, concave platform anteriorly to the sutures, the angulate pre-sutural ramp and fine plicae on the columella of *N. anguliferus*. However, small individuals of *N. pagodus* (Reeve, 1844) from the west coast of America closely resemble the types of *N. anguliferus*. Larger series of specimens of *N. pagodus*, not at the writer's disposal, are required to confirm the supposition that *N. anguliferus* may fall within the variational range of *N. pagodus*.

Nassarius scabriusculus (Powys, 1835) (Figs. 30, 31)

1835. *Nassa scabriuscula* Powys, Proc. Zool. Soc. Lond. Pt. 3: 96; 1852 A. Adams, Proc. Zool. Soc. Lond. for 1851, Pt. 19: 111; 1854 Reeve, Conch Icon. 8: pl. 26, figs. 174a, b; 1882 Tryon, Man. Conch. 4: 46, pl. 14, fig. 233.

1852. *Nassa collaria* C. B. Adams, Ann. Lyc. Nat. Hist. New York, 5: 283; 1956 Turner, Occ. Pap. Moll. Harvard Univ. 2 (20): 39, pl. 5, fig. 4 (figd. lectotype).

1971. *Nassarius collarius* (C. B. Adams), Keen, Sea shells trop. W. America, ed. 2: 606, fig. 1294.

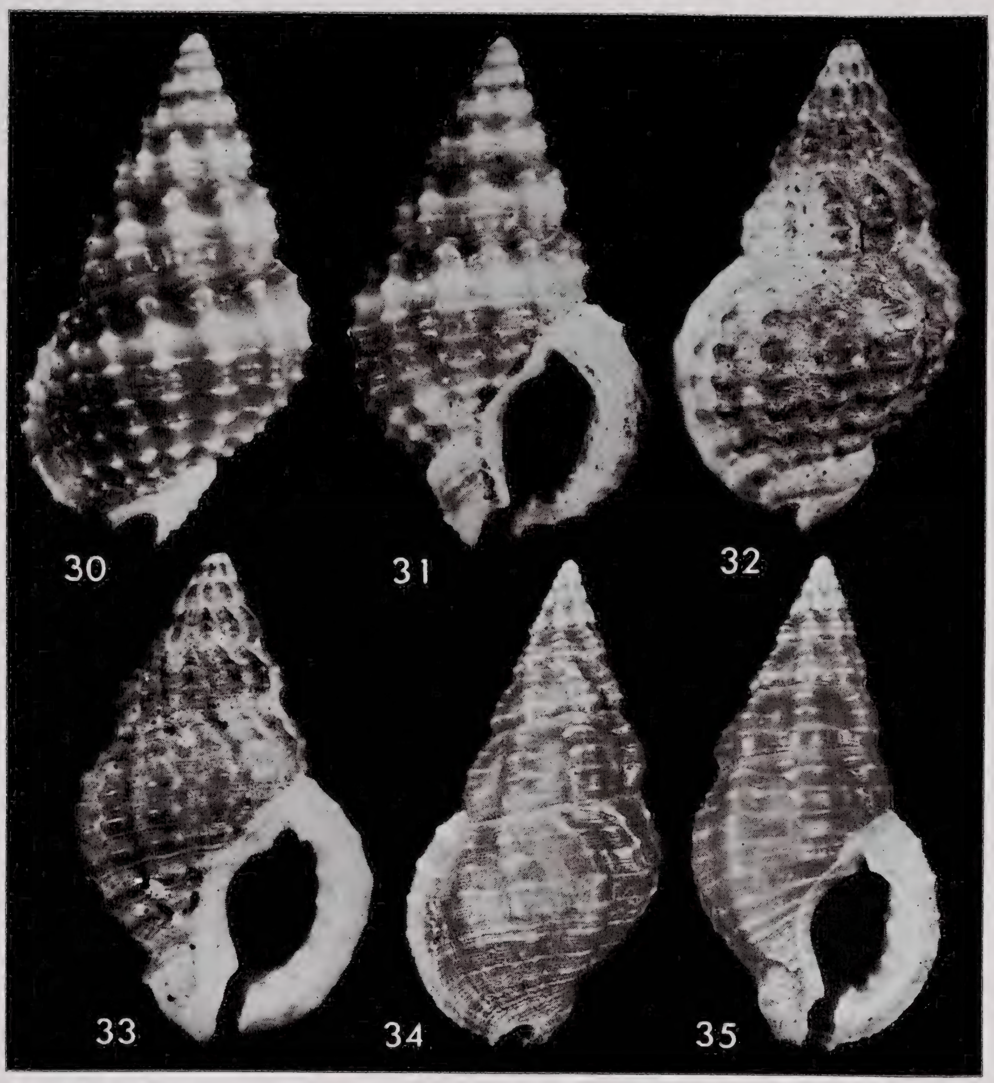
DISTRIBUTION. Guatemala to Panama.

TYPE SPECIMENS AND TYPE LOCALITIES

N. scabriuscula. Three syntypes in the B.M.N.H.; illustrated syntype 11.0 × 6.5 × 5.3 mm. Creamy-white in colour, ornamented with 2 orange-brown bands at the sutures of each whorl, lower central band on body whorl broad or narrow, penultimate with 10 axial ribs and 5 spiral cords, body whorl with 12 ribs and 8 spiral cords, spirals override axial ribs and produce prominent, angulate nodules, columella with 1 basal fold and a parietal fold and weak denticles, outer lip with 4-5 denticles. Bay of Montijo [Panama], Central America, in sandy mud, 12 fathoms (22 m).

N. collaria. Lectotype in MCZ No. 186354; 9.7 × 5.3 mm. Panama.

Keen (1971) described and illustrated *N. collarius* (C. B. Adams) and *N. scabriusculus* (Powys) as valid west American nassarid species. However, the syntypes of *N. scabriusculus* (Powys) appear to be the same species as the lectotype of *N. collarius* (C. B. Adams), and differ from the lectotype of *N. stimpsonianus* (C. B. Adams) which was illustrated by Keen (*op. cit.*) as "*N. scabrisculus*". Both *N. scabriusculus* and *N. collarius* are considerably smaller than *N. stimpsonianus*, have a decidedly heavy nodulose sculpture, closer-set axial ribs and lack the intermediate fine spiral threads between the main spiral cords which is a typical feature of *N. stimpsonianus*. For further discussion see under *N. stimpsonianus*.



Figs. 30-35. 30, 31. Syntype of *Nassarius scabriusculus* (Powys), BMNH; length 11.0 mm. 32-35. *N. stimpsonianus* (C. B. Adams). 32, 33. Holotype of *N. fuscatus* (A. Adams), BMNH No. 197337; length 21.4 mm. 34, 35. Syntype of *N. lautus* (Marrat), MCML; length 16.5 mm.

Nassarius stimpsonianus (C. B. Adams, 1852) (Figs. 32-35)

1852. *Buccinum stimpsonianum* C. B. Adams, Ann. Lyc. Nat. Hist. New York, 5: 296; 1956 Turner, Occ. Pap. Moll. Harvard Univ. 2 (20): 88, pl. 7, fig. 1 (figd. lectotype).

1852. *Nassa fuscata* A. Adams, Proc. Zool. Soc. Lond. for 1851, Pt. 19: 112; 1853 Reeve, Conch. Icon. 8: pl. 19, figs. 127a, b; 1932 Tomlin, Proc. Malac. Soc. Lond. 20 (1): 42.

1880. *Nassa lauta* Marrat, Var. shells gen. Nassa, p. 82.

1971. *Nassarius scabriusculus* (Powys), Keen, Sea shells trop. W. America, ed. 2: 609, fig. 1311 (non *Nassa scabriuscula* Powys, 1835).

DISTRIBUTION. Guatemala to Panama.

TYPE SPECIMENS AND TYPE LOCALITIES

B. stimpsonianum. Lectotype in MCZ No. 186378; 18.3 × 8.1 mm. Panama.

N. fuscata. Holotype in the B.M.N.H. No. 197337; 21.4 × 12.2 × 11.4 mm. Uniformly brown in colour, aperture cream-coloured, with 4 spiral rows of risen threads upon the axial ribs on the penultimate and 8 rows on the body whorl, interspaces of main spiral cords with very fine spiral striae, columella with 8 weak denticles and a parietal fold, outer lip with 7 denticles. Locality unknown.

N. lauta. Three syntypes in MCML; illustrated syntype 16.5 × 8.3 × 8.2 mm. Violet-brown in colour, spiral cords pale, sculptured with 7 axial ribs and 3 main spiral cords on the penultimate and 8 ribs and 9 spiral cords on the body whorl, interspaces of main spiral cords with 5-6 very fine spiral striae, columella with 6 plicae, outer lip with 5 denticles. Malacca = error.

Tomlin (1932) considered *N. fuscatus* to be a synonym of *N. myristicatus* (Hinds), but the two species are very dissimilar. The holotype of *N. fuscatus* is somewhat broader and has slightly more axial ribs but has the same typical sculpture of fine intermediate spiral striae as *N. stimpsonianus* and *N. lautus*. *N. stimpsonianus* (C. B. Adams) is a larger (16-22 mm) and more solid species than *N. scabriusculus* (Powys) (9-12 mm) and is usually, but not always, more conically-ovate and has wider spaced axial ribs and very fine, crowded intermediate spiral striae between the main spiral cords. The spiral cords produce interrupted, paler and heavier threads upon the axial ribs, but are weak or obsolete in between the ribs.

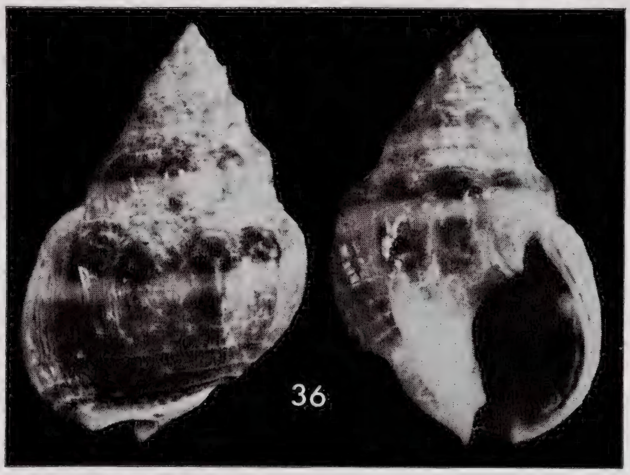


Fig. 36. Syntype of *Nassarius tegula* (Reeve), BMNH; length 14.4 mm.

Nassarius tiarula (Kiener, 1841) (Fig. 36)

1841. *Buccinum tiarula* Kiener, Spéc. gén. icon. coq. viv. 9: 111, pl. 30, fig. 4 (Indian Ocean and Madagascar = error).

1853. *Nassa tiarula* Kiener, Reeve, Conch. Icon. 8: pl. 14, figs. 92a, b; 1859 Chenu, Man. Conchyl. 1: 163, textfig. 766; 1882 Tryon, Man. Conch. 4: 41, pl. 12, figs. 174, 175; 1932 Pilsbry & Lowe, Proc. Acad. Nat. Sci. Philad. 84: 115.

1853. *Nassa tegula* Reeve, Conch. Icon. 8: pl. 15, fig. 98; 1857 Carpenter, Cat. Mazat. shells Brit. Mus. p. 496; 1882 Tryon, Man. Conch. 4: 39, pl. 12, figs. 166, 167; 1894 Stearns, Proc. U.S. Nat. Mus. 17. 180 (with *tiarula* in synonymy)

1894. *Nassa complanata* var. *major* Stearns, Proc. U.S. Nat. Mus. 17: 81 (Los Animas Bay, Gulf of California) [*non* Grateloup, 1847].

1917. *Arcularia tiarula* Kiener, Dall, Proc. U.S. Nat. Mus. 51: 577.

1917. *Arcularia tegula* Reeve, Dall, Proc. U.S. Nat. Mus. 51: 577.

1921. *Zeuxis tegula* Reeve, Dall, U.S. Nat. Mus. Bull. 112: 103.

1927. *Alectrion tegulus* Reeve, Oldroyd, Mar. shells, W. coast N. America, 2 (1): 267, pl. 26, fig. 10.

1931. *Nassarius (Nassarius) tegula* (Reeve), Grant & Gale, Mem. San Diego Soc. Nat. Hist. 1: 671, pl. 26, fig. 43.

1952. *Nassarius tegula* (Reeve), Demond, Pacif. Science, 6 (4): 307, pl. 2, fig. 8; 1969 McLean, Los Angeles Cty. Mus. Nat. Hist. Sci. ser. (24), Zool. No. 11: 48, fig. 26/4.

1952. *Nassarius tegula tiarula* (Kiener), Demond, Pacif. Science, 6 (4): 307, pl. 1, fig. 4.

1954. *Nassarius tegulus* Reeve, Abbott, Americ. Seashells, p. 238, pl. 20, fig. n.

1971. *Nassarius (Arcularia) tiarula* (Kiener), Keen, Sea shells trop. W. America, ed. 2: 610, fig. 1321 and pl. 18, fig. 3.

DISTRIBUTION. Gulf of California, Mexico to Panama (*N. tiarula*); San Francisco, California to the Gulf of California, Mexico (form *tegula*).

TYPE SPECIMEN AND TYPE LOCALITY

N. tegula. Three syntypes in B.M.N.H.; illustrated syntype 14.4 × 9.6 × 9.0 mm. Locality unknown.

Stearns (1894) erroneously placed the senior *N. tiarula* (Kiener, 1841) in the synonymy of the junior *N. tegula* (Reeve, 1853). Subsequent authors either synonymised *N. tiarula* with *N. tegula,* considered them distinct species, subspecies, or separated them into a northern and southern form. Kiener's *N. tiarula* has 12 years' chronological priority over *N. tegula* (Reeve) and Demond's (1952) subspecific combination cannot stand. Demond *(op. cit.)* did point out, however, that variations from the typical form of each are often seen, particularly where their geographical ranges overlap.

Keen (1971) placed *N. tiarula* in the subgenus *Arcularia* Link, 1807, but Mörch's designation (1863) of *Arcularia coronata* Link, 1807 (non Bruguière, 1789 [= *Buccinum arcularia* Linnaeus, 1758] as the type-species of *Arcularia,* makes the latter an objective synonym of *Nassarius* Dumèril, 1806 (see Cernohorsky, 1972). *Nassarius tiarula* (Kiener) is the type-species of *Phrontis* H. & A. Adams.

Nassarius luteostomus (Broderip & Sowerby, 1829)

1829. *Nassa luteostoma* Broderip & Sowerby, Zool. J. 4: 376 (W. coast of America).

1839. *Nassa xanthostoma* Gray, Zool. Capt. Beechey's Voy. p. 127, pl. 36, fig. 3 (Hab?).

1841. *Nassa luteostoma* Kiener, Spéc. gén. icon. coq. viv. 9: 110, pl. 30, fig. 1 (Coast of Senegal = error).

1857. *Nassa ? tegula* var. *nodulifera* Phil., Carpenter, Cat. Mazat. shells Brit. Mus. p. 496 (Mazatlan) [non *Buccinum noduliferum* Philippi, 1848 = *Nassarius*].

Nassa xanthostoma Gray, from unknown locality, is synonymous with *Nassarius luteostomus. Buccinum noduliferum* Philippi, 1848, from Northern China, is quite distinct from Carpenter's *Nassa tegula* var. *nodulifera.*

Nassarius complanatus (Powys, 1835) (Fig. 37)

1835. *Nassa complanata* Powys, Proc. Zool. Soc. Lond. Pt. 3: 96; 1852 A. Adams, Proc. Zool. Soc. Lond. for 1851, Pt. 19: 104; 1853 Reeve, Conch. Icon. 8: pl. 17, figs. 11a, b; 1932 Pilsbry & Lowe, Proc. Acad. Nat. Sci. Philad. 84: 115.

1849. *Buccinum gemma* Philippi, Abb. Beschr. Conchyl. 3: 44, pl. 1, fig. 5 (Hab: ?).

1882. *Nassa (Zeuxis) complanata* Powis, Tryon, Man. Conch. 4: 33, pl. 10, figs. 105, 107.

1909. *Alectrion (Hima) complanatus* Powys, Dall, Proc. U.S. Nat. Mus. 37: 214.

1917. *Arcularia complanata* Powys, Dall, Proc. U.S. Nat. Mus. 51: 577.

1917. ? *Arcularia iodes* Dall, Proc. U.S. Nat. Mus. 51: 577 (Gulf of California).

1931. *Nassarius (Nassarius) complanatus* (Powys), Grant & Gale, Mem. San Diego Soc. Nat. Hist. 1: 671.

1971. *Nassarius (Arcularia) complanatus* (Powys), Keen, Sea shells trop. W. America, ed. 2: 609, fig. 1317.

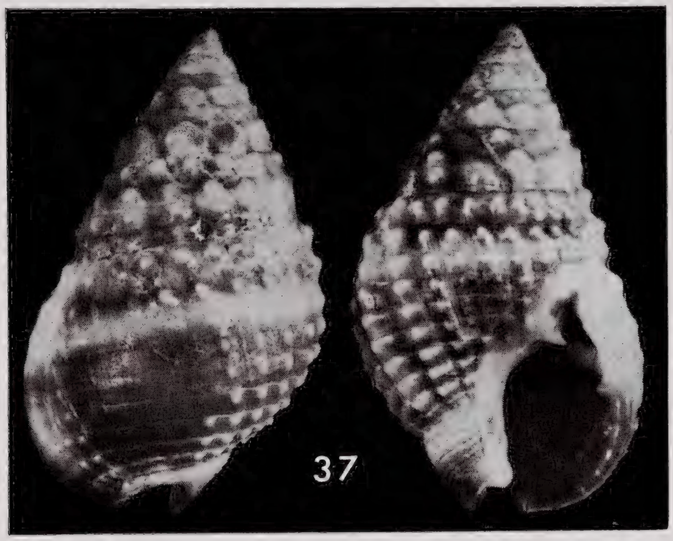


Fig. 37. Syntype of *Nassarius complanatus* (Powys), BMNH; length 11.0 mm.

DISTRIBUTION. Salvador to Northern Chile.

TYPE SPECIMEN AND TYPE LOCALITY

N. complanata. Three syntypes in the B.M.N.H.; illustrated syntype 11.0 × 6.3 × 5.4 mm. Violet-brown in colour, with a white transverse band and remnants of a dark violet-brown median band on the body whorl, penultimate whorl with 14 axial ribs and 3 spiral rows of nodules, body whorl with 12 ribs and 9 rows of nodules, sculpture becoming absent on the dorsal surface towards the outer lip, edge of columella with 8-9 small denticles, outer lip with 5-6 denticles. Atacamas, Western Columbia [= Atacames, Northern Ecuador].

Nassarius iodes (Dall), does not seem to differ from *N. complanatus* in any great degree judging from both Dall's (1917) and Keen's (1971) diagnoses. Dall's type specimen of *N. iodes* is only a fraction smaller (8.0 mm) than the illustrated syntype of *N. complanatus* (11.0 mm), both have a basically violet-brown colouring, similar sculpture which becomes feeble or obsolete on the dorsum of the body whorl, and in most specimens of *N. complanatus* the violet-brown central band is always visible, if only sometimes as a dark violet-brown patch in line with the parietal denticle. In Keen's figure (1971, fig. 1318) of *N. iodes* the callus near the siphonal fasciole is more splayed out than in the syntype of *N. complanatus*, but in Indo-Pacific Nassariidae, the size, shape and degree of spread of the columellar callus are exceedingly variable, and unreliable for specific determination.

Nassarius exilis (Powys, 1835) (Fig. 38)

1835. *Nassa exilis* Powys, Proc. Zool. Soc. Lond. pt. 3: 95; 1852 A. Adams, Proc. Zool. Soc. Lond. for 1851, Pt. 19: 106; 1853 Reeve, Conch Icon. 8: pl. 15, figs. 101a, b; 1932 Pilsbry & Lowe, Proc. Acad. Nat. Sci. Philad. 84: 115.

1852. *Nassa panamensis* C. B. Adams, Ann. Lyc. Nat. Hist. New York, 5: 288; 1956 Turner, Occ. Pap. Moll. Harvard, 2 (20): 71, pl. 5, fig. 9 (figd. lectotype) [*non Buccinum panamense* Philippi, 1851 = *Nassarius*].

1882. *Nassa (Zeuxis) exilis* Powis, Tryon, Man. Conch. 4: 32, pl. 10, fig. 100.

1909. *Alectrion (Hima) exilis* Powys, Dall, Proc. U.S. Nat. Mus. 37: 215.

1917. *Arcularia exilis* Powys, Dall, Proc. U.S. Nat. Mus. 51: 578.

1945. *Nassarius exilis* (Powys), Strong in Burch, Min. Conch. Club Sth. Calif. 51: 5; 1971 Keen, Sea shells trop. W. America, ed. 2: 606, fig. 1296.

1951. *Arcularia exilis* (Powis), Carcelles & Williamson, Rev. Inst. Nac. Inv. Cienc. Nat. 2 (5): 300.

Fig. 38. Syntype of *Nassarius exilis* (Powys), BMNH; length 15.7 mm.

DISTRIBUTION. Panama to Chile.

TYPE SPECIMENS AND TYPE LOCALITY

N. exilis. Three syntypes in B.M.N.H.; illustrated syntype 15.7 × 7.2 × 7.4 mm. Purplish-brown in colour, banded with white, penultimate whorl with 16 axial ribs and 13-14 fine spiral striae, body whorl with 12 ribs, 16 fine spiral striae and 2 nodulose cords, area adjoining back of outer lip smooth, columella smooth, outer lip with 4 denticles. Payta, Peru [= Paita, Peru].

N. panamensis. Lectotype in MCZ No. 186283. Panama.

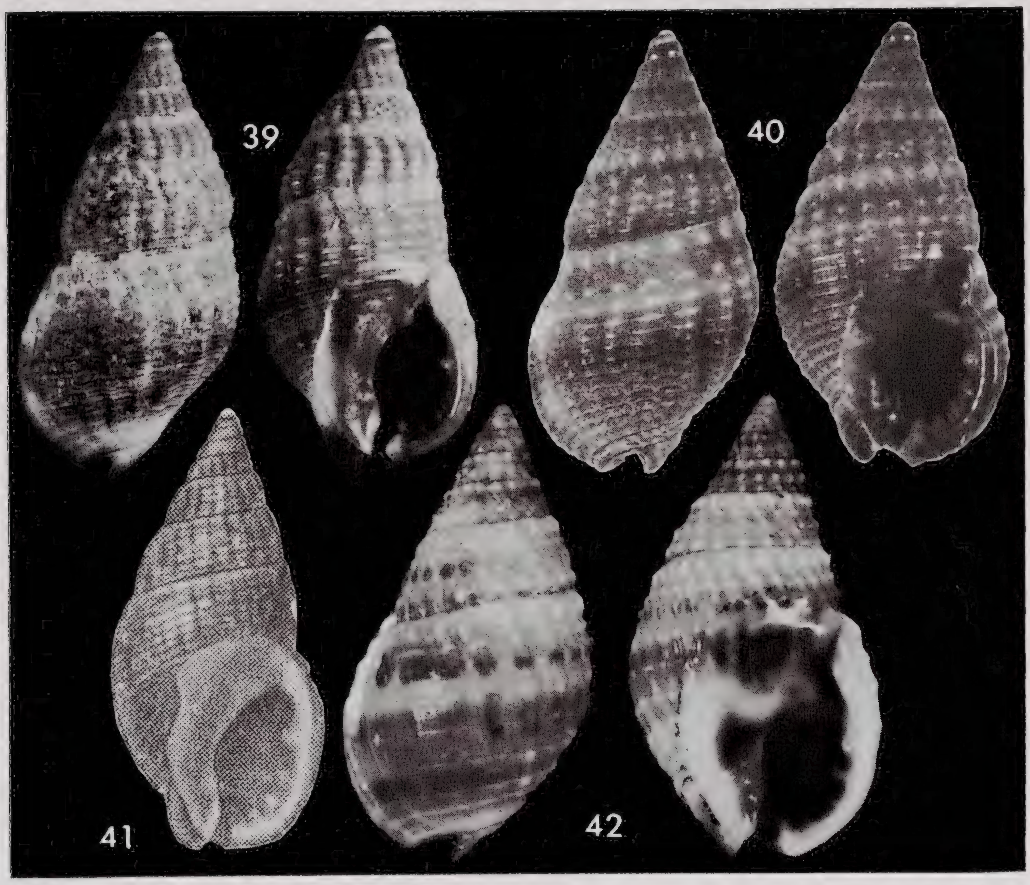
Nassarius moestus (Hinds, 1844) (Figs. 39-41)

1844. *Nassa moesta* Hinds, Zool. Voy. H.M.S. "Sulphur", Moll. Pt. 2: 36, pl. 9, figs. 18, 19; 1876 E. A. Smith, J. Linn. Soc. Lond. 12: 546 (San Christoval, Solomon Is).

1882. *Nassa (Zeuxis) moesta* Hinds, Tryon, Man. Conch. 4: 33, pl. 10, fig. 101 (in synonymy of *N. exilis* Powys, 1835).

1908. *Nassa tristis* Preston, Rec. Ind. Mus. Calcutta, 2 (2): 194, pl. 14, fig. 9

— [*non Nassarius moestus auct.*].



Figs. 39-42. 39-41. *Nassarius moestus* (Hinds). 39. Syntype BMNH No. 1844.9.23.3-4.; length 9.5 mm. 40. Specimen from Rabaul, New Britain; length 8.2 mm. 41. Type-figure of *N. tristis* (Preston); length 10.0 mm. 42. *N. brunneostomus* (Stearns), from Almejas Bay, L. California, Mexico; length 15.7 mm.

DISTRIBUTION. Tropical Indo-West Pacific.

TYPE SPECIMENS AND TYPE LOCALITIES

N. moesta. Two syntypes in the B.M.N.H. No. 1844.9.23.3-4.; illustrated syntype 9.5 × 4.7 × 4.3 mm. Shell with 3 golden-brown nuclear whorls with a dark brown streak, mature whorls violet-grey in colour, sutures pale, body whorl with a pale, narrow subsutural band, aperture and callus chocolate-brown, penultimate whorl with 16 axial ribs and body whorl with 16 ribs, sculptured with thin, overriding spiral striae, columella with 2 basal folds and a parietal denticle, outer lip with 5 prominent denticles. Gulf of Papagayo, W. coast of central America = error.

N. tristis. Type specimen in the Indian Museum, Calcutta; 10.0 × 4.25 mm. Andaman Is.

Dimensions of illustrated specimen of *N. moestus* from Rabaul, New Britain: 8.2 × 4.2 × 3.8 mm.

Hinds (1844) described *N. moestus* from the west coast of central America on the authority of the notoriously unreliable Capt. Belcher. E. A. Smith (1876) was the first author to cast doubt on the reliability of the west American locality when he stated: "There is another remarkable instance of wide geographical distribution, supposing both the above localities [Gulf of Papagayo and San Christoval, Solomon Is] to be correct. Of the identity of this specimen from the Solomon Islands with examples from central America there is not a shadow of doubt. It has been compared with typical examples of *moesta* received from Sir Edward Belcher and labelled in Hinds's handwriting, and in no respect differs from them." This is followed by a detailed description of the true *N. moestus.* Tryon (1882) erroneously synonymised *N. moestus* with *N. exilis,* and gave the localities of Fiji Is and Solomon Is on the authority of A. Garrett and J. Brazier, who personally collected the species (*N. moestus*) at these places.

Subsequent authors acknowledged *N. moestus* as of west American origin, but applied the taxon to a species of quite different appearance. It has been confused with the west American species subsequently described as *Nassa brunneostoma* Stearns, 1893, from the Gulf of California, and *N. leucops* Pilsbry & Lowe, 1932, from Kino Bay, Sonora, Mexico. Keen (1971) stated that the species is similar to *Nassarius complanatus* (Powys), but that it is proportionately wider, the last whorl is smooth near the aperture and the spreading callus varies from white to brown. The real *N. moestus* (Hinds), however, is a small, fusiform species (clearly indicated in Hinds's type figures, 1844, pl. 9, figs. 18, 19), with convex whorls, adpressed sutures and a quite distinct protoconch. The nuclear whorls consist of *c.* 3 golden-brown, glassy smooth whorls with a dark brown streak usually confined to the last nuclear whorl. The sculpture of *N. moestus* differs appreciably from that of *N. brunneostomus,* and consists of axial riblets which are bisected into laterally oriented nodules by very thin spiral threads; the interspaces of these threads have additional fine spiral hair-lines. On the body whorl, the nodules extend only to the start of the columellar callus while the fine spiral threads continue to the base. The coffee-brown callus is not spreading as in *N. brunneostomus* (Fig. 42), but is well-defined and distinctly bordered, and is frequently concavely indented on the left side as shown in the type-figure of *N. tristis* Preston (Fig. 41). The columella has only 1-2 basal folds and a parietal denticle and the outer lip 5 strong denticles. In colour the species varies from bluish-grey to violet-grey, the sutures are paler and a pale subsutural band frequently appears on the body whorl. *N. moestus* ranges in size from 6.0 to 10.0 mm, and never attains the size of *N. brunneostomus.*

The Indo-Pacific origin of *N. moestus* (Hinds) will necessitate the substitution of the "*N. moestus*" of authors by *N. brunneostomus* (Stearns, 1893), which is the next available taxon.

Nassarius gemmulosus (C. B. Adams, 1852) (Fig. 43)

1852. *Nassa gemmulosa* C. B. Adams, Ann. Lyc. Nat. Hist. New York, 5: 285; 1956 Turner, Occ. Pap. Moll. Harvard, 2 (20): 51, pl. 5, fig. 5 (figd. holotype).

1880. *Nassa decorata* Marrat, Var. shells gen. *Nassa,* p. 81; 1940 Tomlin, Proc. Malac. Soc. Lond. 24 (1): 36.

1941. *Nassa cara* Pilsbry & Olsson, Proc. Acad. Nat. Sci. Philad. 93: 30, pl. 6, figs. 1, 2 (Punta Blanca, Canoa form., Pliocene of W. Ecuador).

1958. *Nassarius gemmulosus* (C. B. Adams), Keen, Sea shells trop. W. America, p. 140, fig. 575; 1971 Keen, *ibid.* ed. 2: 606, fig. 1300.

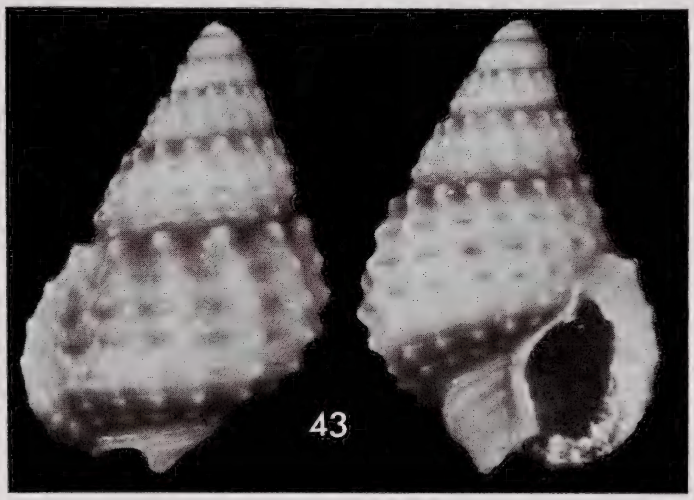


Fig. 43. *Nassarius gemmulosus* (C. B. Adams). Syntype of *N. decoratus* (Marrat), MCML; length 5.9 mm.

DISTRIBUTION. Mexico to Panama.

TYPE SPECIMENS AND TYPE LOCALITIES

N. gemmulosa. Holotype in MCZ No. 186392; 6.0 × 4.0 mm. Panama.

N. decorata. Two syntypes in MCML; illustrated syntype 5.9 × 4.0 × 3.0 mm. Shell with 3½ mature whorls and 3 smooth nuclear whorls, off-white in colour, body whorl with a brown band at the suture and another towards the base, centre of body whorl with 3-4 spiral rows of short brown lines, penultimate whorl with 15 avial ribs and 3 spiral rows of spinose nodules, body whorl with 15 ribs and 7 rows of nodules, base of columella with 2-3 small denticles, outer lip with 5 denticles. Locality unknown.

Tomlin (1940) tentatively considered Marrat's minute syntypes of *N. decorata* to be diseased young specimens of the Indo-Pacific *Nassarius horridus* (Dunker). The syntypes of *N. decorata* are clearly not related to *Nassarius horridus* but are the West American *N. gemmulosus* (C. B. Adams).

Nassarius gayii (Kiener, 1834) (Figs. 44-49)

1834. *Buccinum gayii* Kiener, Spéc. gén. icon. coq. viv. 9: 71, pl. 21, fig. 79 (coast of Chile).

1841. *Nassa gayi* d'Orbigny, Voy. l'Amer. mérid. 5: 432; 1853 Reeve, Conch. Icon. 8: pl. 13, figs. 87a, b.

1850. *Nassa rubricata* Gould, Proc. Bost. Soc. Nat. Hist. 3: 155; 1852 Gould, U.S. Expl. Exp. 12: 265, pl. 19, figs. 332, 332a; 1964 Johnson, U.S. Nat. Mus. Bull. 239: 143.

1852. *Nassa (Tritia) gayii* Kiener, A. Adams, Proc. Zool. Soc. Lond. for 1851, Pt. 19: 112 (St. Helena = error).

1854. *Buccinum gayi* Kiener, Hupé in Gay, Hist. fis. & polit. Chile, Zool. 8: 205; 1858 Küster, Syst. Conch.-Cab. Mart. Chemn., ed. 2: 3 (1A): 27, pl. 6, figs. 16-18.

1881. *Nassa (?) taeniolata* Philippi, E. A. Smith, Proc. Zool. Soc. Lond. p. 30, pl. 4, fig. 8 (*spec. juv.*) [? *non Buccinum taeniolatum* Philippi, 1845]

1882. *Nassa (Tritia) gayi* Kiener, Tryon, Man. Conch. 4: 56, pl. 17, figs. 324, 325.

1906. *Nassa nevilliana* Preston, Proc. Malac. Soc. Lond. 7: 34, textfig.

1909. *Alectrion (Hima) gayii* Kiener, Dall, Proc. U.S. Nat. Mus. 37: 215.

1909. *Nassa flammulata* Preston, Ann. Mag. Nat. Hist. (8) 3: 512, pl. 10, fig. 13; 1915 Preston, J. Conch. 14 (11): 350.

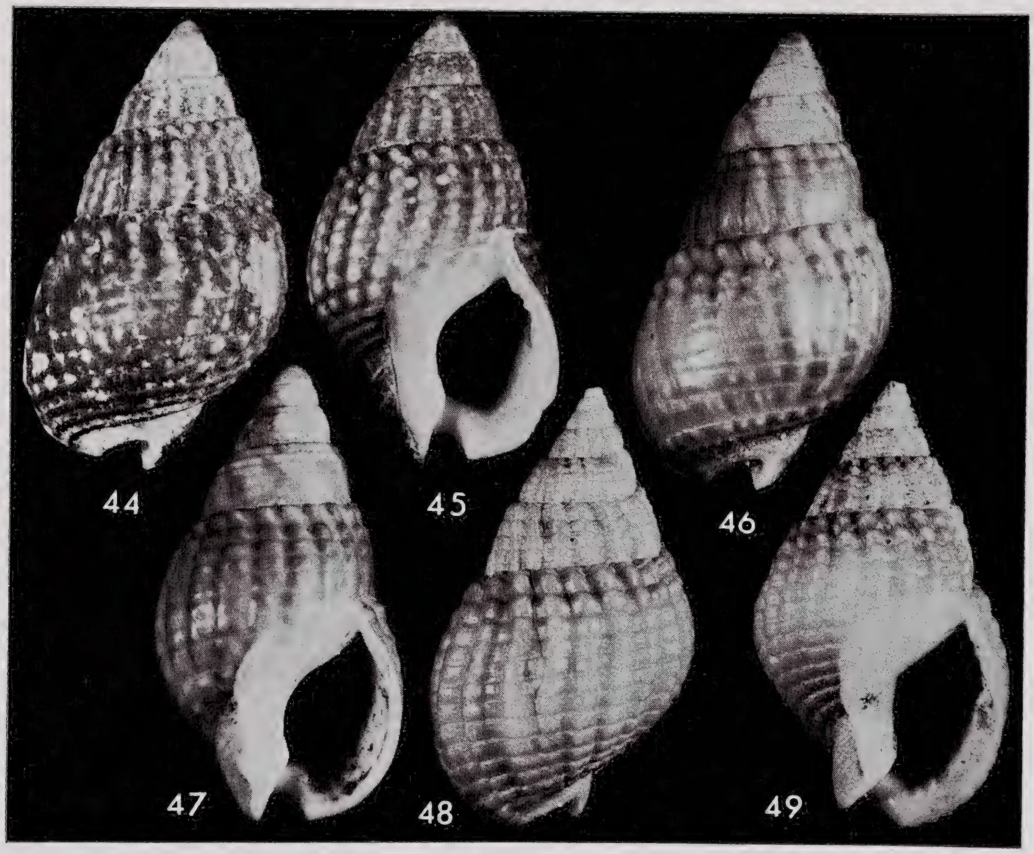
1917. *Alectrion rubricatus* Gould, Dall, Proc. U.S. Nat. Mus. 51: 576.

1917. *Alectrion gayii* Kiener, Dall, Proc. U.S. Nat. Mus. 51: 576.

1945. *Nassarius gayii* (Kiener), Strong in Burch, Min. Conch. Club Sth. Calif. No. 51: 5.

1951. *Alectryon (Hima) gayi* (Kiener), Carcelles & Williamson, Rev. Inst. Nac. Inv. Cienc. Nat. 2 (5): 300.

1969. *Nassarius gayi* (Kiener), Herm, Zitteliana, 2: 141, pl. 14, figs. 5-9; 1973 Marincovich, Nat. Hist. Mus. Los Angeles Cty. Sci. Bull. 16: 37, textfigs. 80, 81.



Figs 44-49. *Nassarius gayii* (Kiener). 44, 45. Holotype of *N. rubricatus* (Gould), USNM No. 5728; length 16.0 mm. 46, 47. Holotype of *N. flammulatus* (Preston), BMNH No. 1915.1.6.55.; length 13.3 mm. 48, 49. Holotype of *N. nevillianus* (Preston), BMNH No. 1906.4.17.2.; length 16.7 mm.

DISTRIBUTION. Peru to the west side of the Strait of Magellan, Sth. Chile.

TYPE SPECIMENS AND TYPE LOCALITIES

N. rubricata. Holotype in USNM No. 5728; 16.0 × 8.4 × 8.3 mm. Uniformly brown in colour, aperture white, penultimate whorl with 23 axial ribs and 5 spiral rows of nodules, body whorl with 22 ribs, 7 rows of nodules and 3 strong cords, base of columella with 3 folds, aperture denticulate. Pacific shore.

N. nevilliana. Holotype in B.M.N.H. No. 1906.4.17.2.; 16.7 × 9.0 × 9.0 mm. Uniformly tan in colour, slightly darker near sutures, penultimate whorl with 21 axial ribs and 4 spiral rows of nodules, base of columella with 2 folds, aperture denticulate. Ceylon ? = error.

N. flammulata. Holotype in B.M.N.H. No. 1915.1.6.55.; 13.3 × 7.0 × 6.6 mm. Uniformly brown in colour, aperture white, penultimate whorl with 15 axial ribs and 5 spiral rows of nodules, body whorl with 18 ribs and 10 spiral rows of nodules, axial sculpture absent on earlier whorls and obsolete on the body whorl towards the outer lip, base of columella with 4 folds, aperture denticulate. S. Peru.

When Preston (1906) described new species based on unlocalised specimens from Hugh Nevill's collection, he hazarded a guess that they originated from Ceylon. His *Bullia cinerea* is a juvenile specimen of the Australian *Nassarius dorsatus* (Röding), and *N. nevilianus* is not an Indo-Pacific species but is conspecific with *N. gayii* from the west coast of South America.

It seems very unlikely that the small (6.5 mm) *Buccinum nucleolus* Philippi, 1846, from Mazatlan, is a synonym of the considerably larger (16.5 mm) *Buccinum taeniolatum* Philippi, 1845, from Chonos I, Chile, as suggested by Keen (1971). The former species is always minute, white with a narrow reddish-brown band at the sutures and occasionally at the base of the body whorl, whereas *Nassarius taeniolatus* is considerably larger, brown in colour and regularly nodulose. The latter species closely resembles *N. gayii* and may prove to be a synonym.

Nassarius coppingeri (E. A. Smith, 1881) (Fig. 50)

1881. *Nassa (Tritia) coppingeri* E. A. Smith, Proc. Zool. Soc. Lond. p. 30, pl. 4, fig. 7; 1882 Tryon, Man. Conch. 4: 56, pl. 18, figs. 372; 1951 Carcelles & Williamson, Rev. Inst. Nac. Inv. Cienc. Nat. 2 (5): 299.

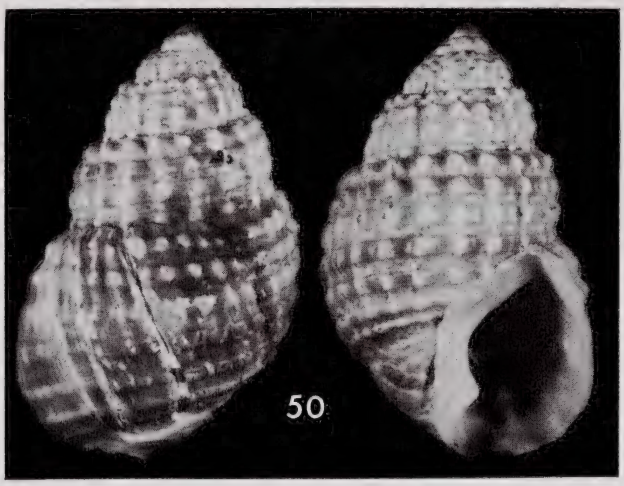


Fig. 50. Holotype of *Nassarius coppingeri* (E. A. Smith), BMNH No. 1879.10.15.17.; length 13.0 mm.

DISTRIBUTION. Southern Chile, Sth. America.

TYPE SPECIMEN AND TYPE LOCALITY

N. coppingeri. Holotype in B.M.N.H. No. 1879.10.15.17.; 13.0 × 8.1 × 7.0 mm. Creamy-fawn in colour, ornamented with ill-defined purplish-brown bands, some nodules occasionally white, penultimate whorl with 19 axial ribs and 4 spiral rows of flattish cords, body whorl with 25 ribs and 7 rows of cords, nodules almost quadrate, columella smooth, outer lip with 6 denticles. Tom Bay, in the neighbourhood of the island of Madre de Dios, west of Southern Patagonia, 1-30 fathoms (2-55 m) [= Tom Bay, near Madre de Dios Archipelago, Southern Chile].

The "*Nassarius coppingeri* E. A. Smith" of Forti (1969, pl. 8, fig. 9) and of Rios (1970, pl. 26, figure upper left) are not *N. coppingeri* as defined by the extant holotype. Rios' species from Brazil appears to be *N. scissuratus* (Dall, 1889) and Forti's species from the Holocene of Rio Grande do Sul is presumably the same. The Panamanian deep water species *Nassarius miser* (Dall, 1908) is so similar to *N. coppingeri* that a re-examination of Dall's holotype and comparison with *N. coppingeri* would be advisable.

Nassarius foveolatus (Dunker, 1847) (Figs. 51, 51a)

1847. *Buccinum foveolatum* Dunker, Zeit. f. Malakozool. 4: 63 (Oriental India); 1858 Kuester, Syst. Conch. Cab. Martini & Chemnitz, 3 (1A): 23, pl. 6, figs. 1-3.
1852. *Nassa planocostata* A. Adams, Proc. Zool. Soc. Lond. for 1851, Pt. 19: 108; 1932 Tomlin, Proc. Malac. Soc. Lond. 20 (2): 96.
1853. *Nassa planicostata (sic)* A. Adams, Reeve, Conch. Icon. 8: pl. 12, figs. 76a, b.
1853. *Nassa foveolata* "Dunker MS", Reeve, Conch. Icon. 8: pl. 13, figs. 83a, b (Hab: ?); 1932 Tomlin, Proc. Malac. Soc. Lond. 20 (2): 96.
1854. *Nassa labida* Reeve, Conch. Icon. 8: pl. 27, fig. 179 (Hab: ?); 1932 Tomlin, Proc. Malac. Soc. Lond. 20 (2): 96.
1887. *Nassa foveolata* (Dunker), v. Martens, J. Linn. Soc. Lond. 21: 182 (King I, Mergui Archip.).
1928. *Nassarius (Zeuxis) foveolatus* (Dunker), Melvill, Proc. Malac. Soc. Lond. 18: 106 (Bombay, India).

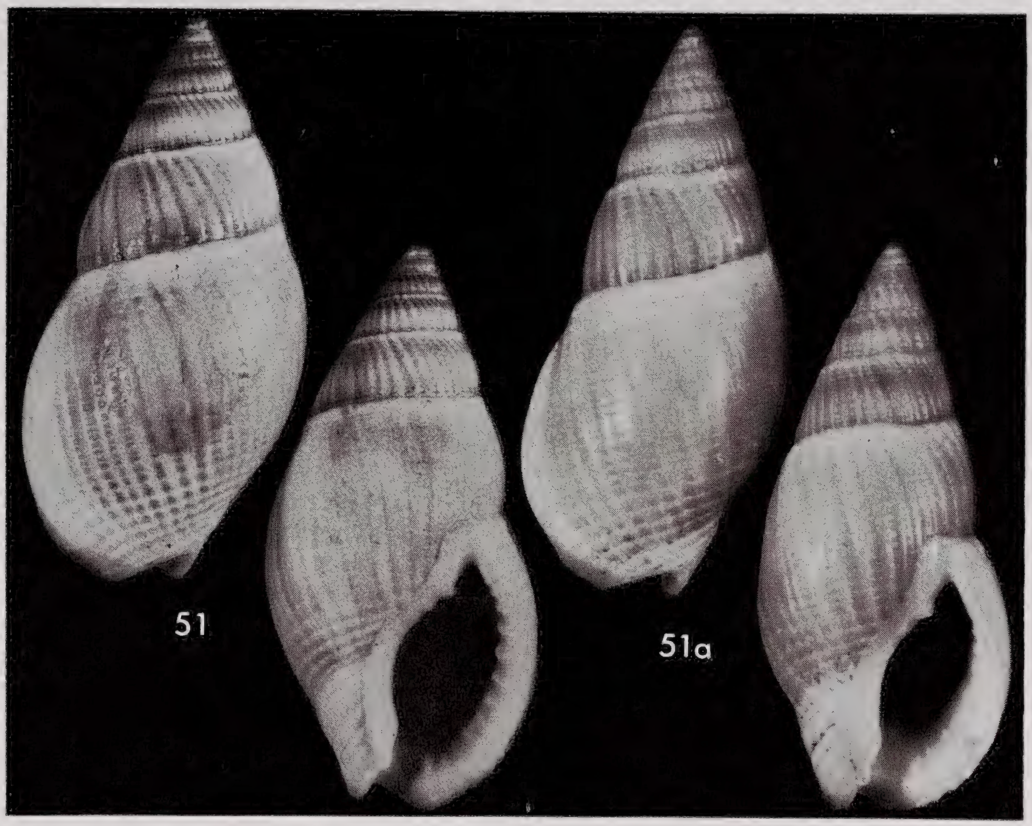
DISTRIBUTION. Indian Ocean.

TYPE SPECIMEN AND TYPE LOCALITY

N. planocostata. Three syntypes in B.M.N.H.; illustrated syntype 17.0 × 8.1 × 9.0 mm. Lead-grey in colour, spire whorls with a brownish sutural band, penultimate whorl with 32 axial ribs and body whorl with 31, very closely spirally striate, interstices of ribs appearing pitted, base of body whorl with 12 spiral cords, columella finely denticulate along its entire length, outer lip with 12 denticles. Payta, Peru [= Paita, Peru, = error].

The species has been erroneously reported from Peru and has been accepted as of Peruvian origin by all subsequent American authors. Tomlin (1932) cast some doubt on the species South American origin when he correctly synonymised *Nassa foveolata* Reeve with *Buccium foveolatum* Dunker, commented on the close similarity of *Nassa planocostata* A. Adams to *Buccinum foveolatum* and considered the type-figure of

Nassa labida to possibly represent *N. planocostata*. The syntypes of *N. planocostata* which are accompanied by a MS label "Karachi - Townsend", are undoubtedly conspecific with *Nassarius foveolatus* (Dunker) from the Indian Ocean. Recent examination of specimens of *N. foveolatus* from Madras, India (Zool. Survey India) enabled the writer to select a specimen which closely corresponds to Adams' syntype of *N. planocostatus* (Fig. 51A).



Figs. 51, 51a. *Nassarius foveolatus* (Dunker). 51. Syntype of *N. planocostatus* (A. Adams), BMNH; length 17.0 mm. 51a. Specimen from Madras, India; Zool. Surv. India No. M-18489/3, 15.8 × 7.0 × 8.0 mm.

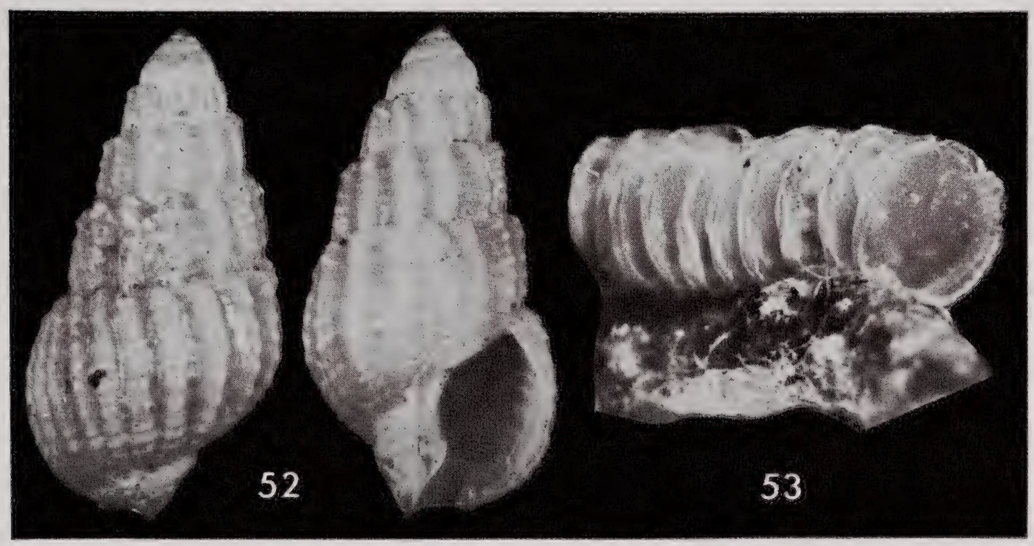
The species is leaden-grey in colour with a single brownish sutural band on the spire whorls and 1-2 rather faint bands on the body whorl. The spire whorls have a sutural row of small nodules, the penultimate whorl is sculptured with 27-35 slender and usually oblique axial ribs and 8-12 fine, close-set spiral striae and the body whorl with 26-36 axial ribs and 23-27 striae; the last 3-4 striae are usually granulose and the siphonal fasciole has 6-12 cords. The axial ribs and spiral striae produce small pits in the interstices at the point of intersection. The columella has 8-9 denticles, the outer lip 10-12 denticles, and the back of the outer lip is prominently variced. The "Peruvian" species illustrated by Keen (1971) as "*Nassarius planocostatus*" originated from the Lea collection (Nat. Mus. Nat. Hist., Washington), and bears a label with the erroneous locality of "West coast of S. America" (Dr. H. A. Rehder, *in litt.*)

Nassarius exsarcus (Dall, 1908) (Figs. 52, 53)

1908. *Alectrion (Tritia) exsarcus* Dall, Bull. Mus. Comp. Zool. Harvard, 42 (6): 308, pl. 11, fig. 12.

1917. *Alectrion exsarcus* Dall, Proc. U.S. Nat. Mus. 51: 576.

1945. *Nassarius exsarcus* (Dall), Strong in Burch, Min. Conch. Club. Sth. Calif. No. 51: 5; 1971 Keen, Sea shells trop. W. America, ed. 2: 606, textfig. 1297.



Figs. 52, 53. *Nassarius exsarcus* (Dall). 52. Holotype USNM No. 110565; length 9.0 mm. 53. Egg-capsules of *N. exsarcus* on gorgonian coral; height *c.* 1.6 mm.

DISTRIBUTION. Galápagos Is.

TYPE SPECIMEN AND TYPE LOCALITY

N. exsarcus. Holotype in USNM No. 110565; 9.0 × 4.7 mm. Brownish in colour, some axial ribs occasionally paler, penultimate whorl with 12 angulate axial ribs and body whorl with 16 ribs, spiral sculpture of overriding spiral threads, columella with 1 anterior fold, aperture plicate. "Albatross" Stat. 4642, near the Galápagos Is [= 5 miles (8 km) from S.E. end of Hood I] in 300 fathoms (549 m) at 48.6°F (9.2°C).

The type specimen is accompanied by a piece of gorgonian coral to which egg-capsules are attached. These egg-capsules were dredged together with the holotype of *N. exsarcus* and probably belong to this species (Dall, 1908) [Fig. 53].

Dall (1908, p. 308) recorded the species from 200 fathoms (366 m), but the label shows the depth to be 300 fathoms (549 m); this depth is confirmed by the data given for station 4642 (1908, p. 456).

Nassarius townsendi (Dall, 1890) (Fig. 54)

1890. *Nassa townsendi* Dall, Proc. U.S. Nat. Mus. 12: 326, pl. 12, fig. 9.

1917. *Alectrion townsendi* Dall, Proc. U.S. Nat. Mus. 51: 576.

1945. *Nassarius townsendi* Dall, Strong in Burch, Min. Conch. Club Sth. Calif. No. 51: 5; 1971 Keen, Sea shells trop. W. America, ed. 2: 609, textfig. 1313a.

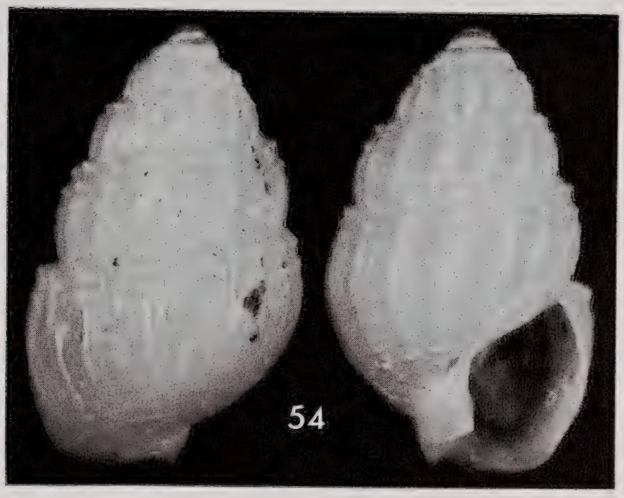


Fig. 54. Holotype of *Nassarius townsendi* (Dall), USNM No. 96473; length 10.2 mm.

DISTRIBUTION. Galápagos Is.

TYPE SPECIMEN AND TYPE LOCALITY

N. townsendi. Holotype in USNM No. 96473; 10.2 × 6.3 × 4.5 mm. Shining white in colour, penultimate and body whorl with 15 angulate axial ribs each, spire whorls with 2 spiral rows of slightly coronate nodules anterior to the sutures, interstices obsoletely striate, lower third of body whorl with spiral threads, columella and aperture smooth. Operculum yellowish-brown, smooth at the margin. Station 2807, near the Galápagos Is, 812 fathoms (1486 m), at 34.8°F 3.6°C).

N. townsendi is morphologically very similar to the Indo-Pacific deep-water species *N. babylonicus* (Watson, 1882), the type-species of the subgenus *Profundinassa* Thiele, 1929. Both species have a similar form, sculpture, colourless white shell, a depressed protoconch and an operculum with smooth margins.

Nassarius vibex (Say, 1822) (Figs. 55, 56)

1822. *Nassa vibex* Say, J. Acad. Nat. Sci. Philad. (1), 2: 231 (Shores of New Jersey); 1852 A. Adams, Proc. Zool. Soc. Lond. for 1851, Pt. 19: 101; 1890 Dall, Trans. Wagner Free Inst. Sci. 3 (1): 132.

1822. *Buccinum polygonatum* Lamarck, Hist. nat. anim. s. vert. 7: 278 (Hab: ?); 1834 Kiener, Spéc. gén. icon. coq. viv. 9: 92, pl. 29, fig. 119.

1843. *Nassa antillarum* d'Orbigny in Sagra, Hist. phys. polit. nat. l'ile Cuba, Moll. 2: 141, pl. 23, figs. 1-3.

1848. *Buccinum sturmii* Philippi, Zeit. f. Malakozool. 5: 135; 1849 Philippi, Abb. Beschr. Conchyl. 3: 41, pl. 1, fig. 1.

1848. *Buccinum antillarum* Philippi, Zeit. f. Malakozool. 5: 139; 1849 Philippi, Abb. Beschr. Conchyl. 3: 42, pl. 1, fig. 2 (described as a new species — *non* d'Orbigny in Sagra, 1843).

1853. *Nassa ciniscultus* Reeve, Conch. Icon. 8: pl. 22, figs. 146a, b; 1932 Tomlin, Proc. Malac. Soc. Lond. 20 (2): 95.

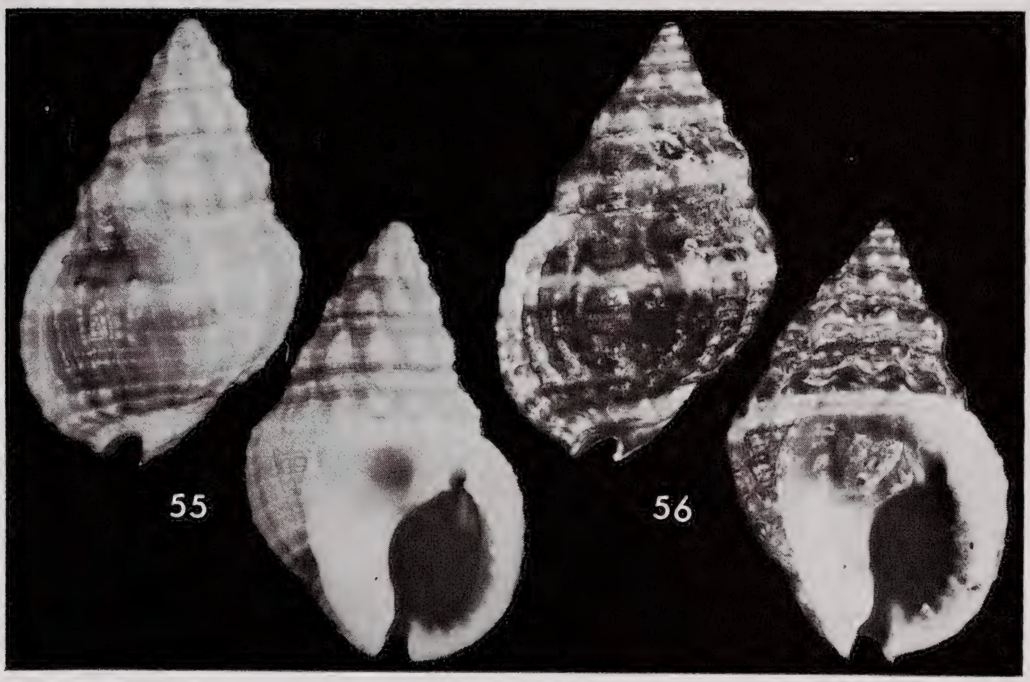
1882. *Nassa (Phrontis) vibex* (Say), Tryon, Man. Conch. 4: 42, pl. 13, figs. 199-202, 205-207.

1869. *Nassa fretensis* Perkins, Proc. Bost. Soc. Nat. Hist. p. 117 (*fide* Dall, 1890 [Newhaven].

1948. *Uzita vibex* (Say), Gardner, U.S. Geol. Surv. Prof. Pap. 199-B: 253, pl. 30, fig. 23.

1953. *Nassarius (Phrontis) vibex* (Say), Olsson & Harbison, Acad. Nat. Sci. Philad. Mon. No. 8: 220, pl. 33, figs. 1, 1a.

1954. *Nassarius vibex* Say, Abbott, Americ. Seashells, p. 237, pl. 23, fig. Q; 1959 Nowell-Usticke, Check-list mar. shells St. Croix, p. 70; 1961 Warmke & Abbott, Caribbean Seashells, p. 118, pl. 21, fig. P; 1970 Vilas & Vilas, Florida mar. shells, ed. 2: 81, pl. 10, fig. 11; 1970 Rios, Coast. Brazil. Seashells, p. 94.



Figs. 55, 56. *Nassarius vibex* (Say). 55. Syntype of *N. antillarum* (d'Orbigny), BMNH No. 1854.10.4.36718; length 15.8 mm. 56. Syntype of *N. ciniscculus* (Reeve), BMNH No. 19711; length 13.6 mm.

DISTRIBUTION. Boston, Massachusetts to Florida, the Caribbean and Brazil.

TYPE SPECIMENS AND TYPE LOCALITIES

N. antillarum d'Orbigny. Nine syntypes in the B.M.N.H. No. 1854.10.4.36718; illustrated syntype 15.8 × 9.8 × 9.0 mm. Off-white in colour, maculated with brown, 11 axial ribs on the penultimate and 13 on the body whorl, a nodulose sutural girdle, 2 rows of large nodules on whorls and additional spiral threads, columella with 8 irregular plicae, aperture with 11 denticles. Cuba, St. Lucia, Florida and St. Thomas. *N. cinisculus*. Three syntypes in B.M.N.H. No. 19711; illustrated syntype 13.6 × 8.6 × 9.0 mm; with 10 axial ribs on the penultimate and 11 on the body whorl, spiral cords coarse and nodulose, dark greenish-brown, banded with white. Island of St. Thomas [= Virgin Is, Caribbean].

Most authors have assigned *N. antillarum* d'Orbigny to the synonymy of *N. albus* (Say), however, Abbott (1958) queried whether *N. antillarum* is a form of *N. vibex* or *N. albus*. The "*Nassarius antillarum* (d'Orbigny)" of Olsson & Harbison (1953) is, however, *N. albus* (Say). The syntypes of *N. antillarum* are clearly conspecific with *N. vibex* (Say).

Nassarius capillaris (Watson, 1882) (Fig. 57)

1882. *Nassa (Hima) capillaris* Watson, J. Linn. Soc. Lond. 16: 369; 1886 Watson, Rept. Sci. Res. Voy. H.M.S. "Challenger", 15: 186, pl 11, fig. 7.

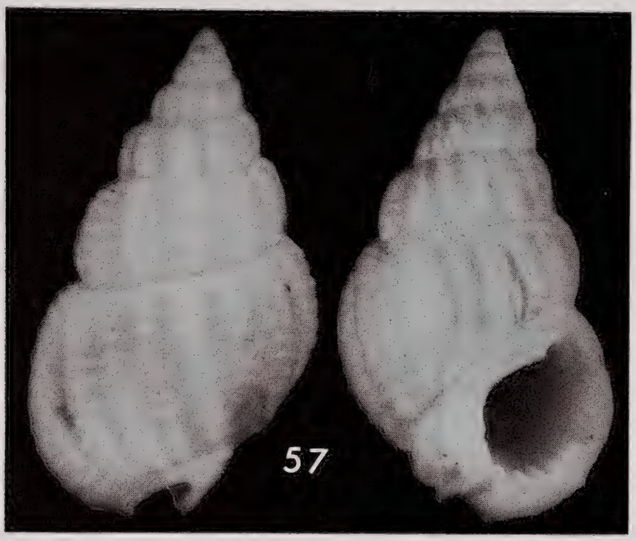


Fig. 57. Syntype of *Nassarius capillaris* (Watson), BMNH No. 1887.2.9.661-5; dorsal view 9.9 mm, ventral view 12.0 mm.

DISTRIBUTION. Recorded from Fernando de Noronha I, Brazil.

TYPE SPECIMEN AND TYPE LOCALITY

N. capillaris. Five syntypes in the B.M.N.H. No. 1887.2.9.661-5.; dorsal view of illustrated syntype 9.9 × 5.5 × 4.7 mm, ventral view of illustrated syntype 12.0 × 6.3 × 5.1 mm. White in colour, some specimens occasionally stained with orange-brown between axial ribs, penultimate whorl with *c.* 10 axial ribs and 7 spiral threads, body whorl with 14 ribs and 14 spiral threads, columella plicate, aperture lirate. Anchorage at Fernando Noronha I, Brazil, 3° 47′S and 32° 24′ 30″W, 25 fathoms (46 m).

This species undoubtedly belongs to the *albus-consensus* group of species, and according to Matthews in Rios (1970), is a synonym of *N. albus* (Say, 1826). *N. capillaris,* however, bears a very close resemblance to the *albus*-group of species from the Florida Pliocene, particularly *N. locklini* and *N. fargoi* Olsson & Harbison, 1953.

Nassarius simplex (E. A. Smith, 1880) (Fig. 58)

1880. *Nassa (Caesia) simplex* E. A. Smith, Ann. & Mag. Nat. Hist. (5), 6: 319; 1882 Tryon, Man. Conch. 4: 63 (undetermined species) [*non* S. V. Wood, 1872; *nec* Seguenza, 1880].

DISTRIBUTION. Recorded from Uruguay, Sth. America.

TYPE SPECIMEN AND TYPE LOCALITY

N. simplex. Three syntypes in the B.M.N.H. No. 1879.10.15.190-2.; illustrated syntype 12.4 × 7.5 × 5.3 mm. Light cream in colour, penultimate whorl with 16 axial ribs and 5 spiral rows of nodulose cords, body whorl with 16 ribs, 3 spiral rows of nodulose cords at the shoulder followed by 14 spiral cords, columella with 4 small plicae anteriorly and a parietal fold, aperture lirate. Off the mouth of the Rio de la Plata, Uruguay, 36° 47′ S and 55° 17′ W, in 28 fathoms (51 m).

Fig. 58. Syntype of *Nassarius simplex* (E. A. Smith), BMNH No. 1879.10.15.190-2; length 12.4 mm.

Two of the syntypes are immature specimens while the third syntype has been painted with a gold colour. *Nassa simplex* E. A. Smith, 1880, is a primary homonym of *Nassa reticosa* var. *simplex* S. V. Wood, 1872, from the Red Crag of Butley, Pliocene of England, and of *Nassa cuvieri* var. *simplex* Seguenza, 1880, a fossil from the Pliocene of Calabria. No substitute name is here proposed for *N. simplex* (Smith) since the species requires comparison with immature specimens of *N. miga* (Bruguière, 1789).

Nassarius sanctaehelenae (A. Adams, 1852) (Fig. 59)

1852. *Nassa sanctaehelenae* A. Adams, Proc. Zool. Soc. Lond. for 1851, Pt. 19: 110; 1854 Reeve, Conch. Icon. 8: pl. 28, figs. 188a, b; 1890 E. A. Smith, Proc. Zool. Soc. Lond. p. 263.

DISTRIBUTION. St. Helena I, Atlantic Ocean.

TYPE SPECIMEN AND TYPE LOCALITY

N. sanctaehelenae. Holotype in the B.M.N.H. No. 19714; 10.0 × 5.8 × 5.0 mm. Dirty white in colour, ornamented with a faint, brown sutural band on the spire whorls and an interrupted central and basal band on the body whorl, 12 coarse axial ribs on the penultimate and 8 ribs on the body whorl, spiral cords at sutures and base produce flat nodules upon the ribs, columella with 6 plicae and a parietal fold, aperture plicate. St. Helena, 20 fathoms (37 m).

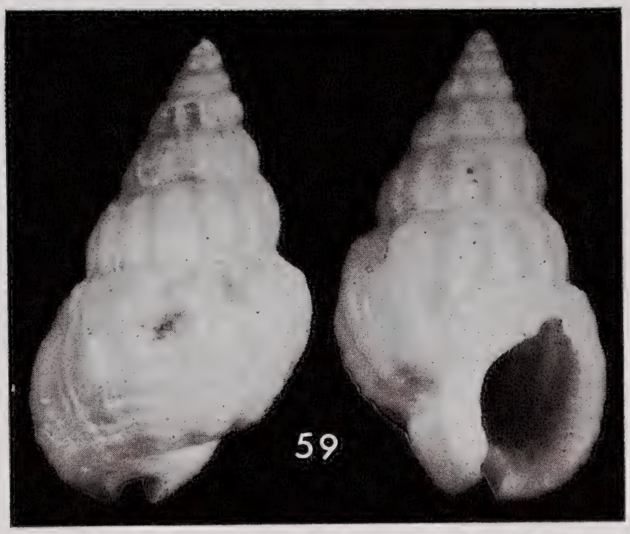


Fig. 59. Holotype of *Nassarius sanctaehelenae* (A. Adams), BMNH No. 19714; length 10.0 mm.

E. A. Smith (1890) provided a detailed description based on about 40 specimens from St. Helena. He remarked that the form and sculpture in this species are very variable, and disagreed with Jeffreys who associated the St. Helena species with *N. incrassatus* (Ström). Not only does *N. sanctaehelenae* lack the blackish-purple stain on the canal of *N. incrassatus*, but the columellar callus is quite distinct from *N. incrassatus*, being more expanded, distinctly orbicular above the parietal wall and well defined and bordered.

Nassarius cinctellus (A. Adams, 1852) (Fig. 60)

1852. *Nassa cinctella* A. Adams, Proc. Zool. Soc. Lond. for 1851, Pt. 19: 110; 1854 Reeve, Conch. Icon. 8: pl. 26, fig. 176; 1890 E. A. Smith, Proc. Zool. Soc. Lond. p. 263 (*non* Gould, 1850).

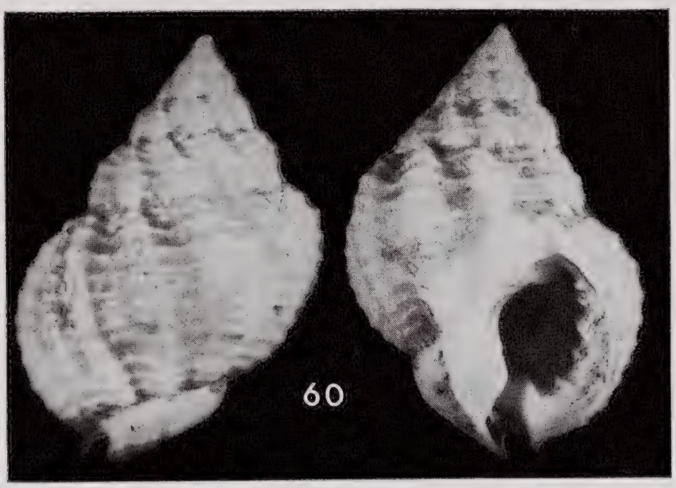


Fig. 60. Syntype of *Nassarius cinctellus* (A. Adams), BMNH No. 1972112; length 13.0 mm.

DISTRIBUTION. Reported from St. Helena, Atlantic Ocean.

TYPE SPECIMEN AND TYPE LOCALITY

N. cinctella A. Adams. Two syntypes in the B.M.N.H. No. 1972112; illustrated syntype 13.0 × 9.0 × 7.5 mm. Pale fawn in colour, callus white, penultimate whorl with 10 coarse axial ribs and 5 overriding spiral cords, body whorl with 8 ribs and 11 spiral cords, columella with 2 strong plicae anteriorly and a parietal fold, callus not sharply bordered, outer lip with 7 denticles. St. Helena, 20 fathoms (37 m).

E. A. Smith (1890) commented that the existing 2 syntypes were the only specimens known, and also considered the species to be similar to the Caribbean *N. ambiguus* (= *N. albus* Say). In appearance, however, the species seems to share features of form, conical spire, outer lip varix and sculpture with the West African *N. tritoniformis* (Kiener, 1841), except that the St. Helena species has broader axial ribs. *Nassa cinctella* A. Adams, 1852, is a primary homonym of the Indo-Pacific *Nassa cinctella* Gould, 1850. Further research on the identity and distribution of the St. Helena species is clearly indicated before a substitute name is proposed.

Nassarius pumilio (E. A. Smith, 1872) (Figs. 61-66)

1872. *Nassa pumilio* E. A. Smith, Proc. Zool. Soc. Lond. for 1871, p. 732, pl. 75, fig. 11.

1877. *Nassa minor* Marrat, Prop. new forms gen. *Nassa*, p. 14 (Kabenda = Cabinda, West Africa) [*non Buccinum asperulum* var. *minor* Grateloup, 1847 = *Nassarius*].

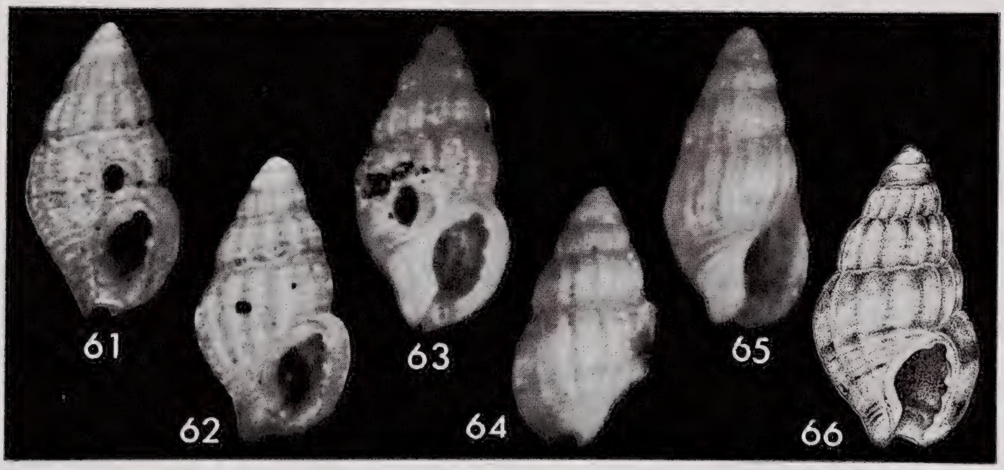
1882. *Nassa (Tritia) pumilio* E. A. Smith, Tryon, Man. Conch. 4: 57, pl. 17, fig. 333.

1882. *Nassa weyersi* Craven, Ann. Soc. Malac. Belg. 17: 16, pl. 2, fig.2.

1923. *Nassa (Hima) polignaci* Lamy, Congr. Soc. Sav. Paris for 1922, p. 33, textfig. (Portuguese Guinea, W. Africa).

1956. *Nassa madseni* Knudsen, Atlantide Rept. No. 4: 51, pl. 1, fig. 6 (Lagos, Nigeria).

DISTRIBUTION. Portuguese Guinea to Angola, West Africa.



Figs. 61-66. *Nassarius pumilio* (E. A. Smith). 61, 62. Syntypes BMNH No. 1870.1.12.34.; length 3.5 mm and 3.3 mm respectively. 63-65. Syntypes of *N. weyersi* (Craven), BMNH No. 1891.3.7.53-56; length 3.8 mm, 3.4 mm and 3.7 mm respectively. 66. Type-figure of *N. madseni* (Knudsen); length 3.9 mm.

TYPE SPECIMENS AND TYPE LOCALITIES

N. pumilio. Six syntypes in the B.M.N.H. No. 1870.1.12.34.; illustrated syntypes 3.5 × 2.1 mm and 3.3 × 2.0 mm. White, corneous and shining, faintly banded with brown, base of shell brownish, 11-12 axial ribs on the body whorl and 4-5 spiral threads on the penultimate whorl, columella with 2 basal folds, outer lip denticulate. Whydah, W. Africa [= Ouidah, Dahomey, W. Africa].

N. weyersi. Four syntypes in the B.M.N.H. No. 1891.3.7.53-6.; illustrated syntypes 3.8 × 1.9 mm, 3.7 × 1.8 mm and 3.4 × 1.7 mm.

This minute West African species is one of the smallest known species of *Nassarius.* The protoconch appears smooth in worn specimens but in well preserved individuals a faint keel close to the suture of the last nuclear whorl is visible under magnification. Although E. A. Smith (1872) described the species as three-banded, the bands are now very faint in the syntypes. The original type-figure of *N. pumilio* has not been very well executed and the nodules appear too prominent. In the 10 syntypes available for study, the spiral cords were either prominent, crossing the ribs and forming minute nodules, or weak and confined to the interspaces of the ribs. The brown banding is better preserved in *N. weyersi* than in *N. pumilio.* In the unique holotype of *N. madseni* (Knudsen), the spiral sculpture is weak and confined to the interspaces of the axial ribs. *N. pumilio* and *N. weyersi* appear to have been completely overlooked since they have received no mention in West African faunal lists.

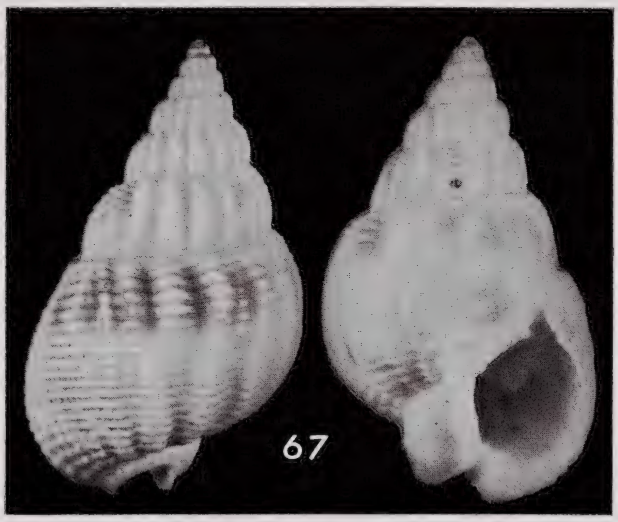
Nassarius denticulatus (A. Adams, 1852) (Fig. 67)

1852. *Nassa denticulata* A. Adams, Proc. Zool. Soc. Lond. for 1851, Pt. 19: 110; 1853 Reeve, Conch. Icon. 8: pl. 9, fig. 55; 1881 Monterosato, Bull. Soc. Malac. Ital. 6: 258; 1887 Kobelt, Icon. europ. Meeresconchyl. 1: 144, pl. 25, figs. 8, 9 and pl. 26, figs. 1-4; 1956 Knudsen, Bull. l'Inst. Franc. d'Afrique Noire, 18 (2): 517, pl. 2, figs. 5, 6; 1956 Knudsen, Atlantide Rept. No. 4: 48, pl. 2, fig. 2.

1876. *Nassa limata* var. *conferta* v. Martens, Jahrb. Deut. Malak. Gesell. 3: 239, pl. 9, fig. 3 (near Cape Verde Is, 23° 04′ W & 16° 40′ N, 47 fathoms (86 m); 1881 v. Martens, Conch. Mittheil. 2: 113, pl. 22, figs. 14-16.

1882. *Nassa (Hima) denticulata* A. Adams, Tryon, Man. Conch. 4: 47, pl. 15, fig. 254.

1968. *Hinia (Uzita) denticulata* (A. Adams), Nordsieck, Europ. Meeres-Gehäusesch. 1: 142, pl. 23, fig. 81.30.



67

Fig 67. Syntype of *Nassarius denticulatus* (A. Adams), BMNH No. 197314; length 21.0 mm.

DISTRIBUTION. Morocco to the Canary Is, Madeira, Cape Verde Is and Angola; rarely in the Mediterranean.

TYPE SPECIMEN AND TYPE LOCALITY

N. denticulata. Two syntypes in the B.M.N.H. No. 197314; illustrated syntype 21.0 × 12.0 × 10.4 mm. Cream in colour with a brown interrupted band near the sutural area, sculptured with 13 axial ribs on the penultimate and 14 on the body whorl, and deeply incised spiral grooves which produce 9 narrow and slightly flattened spiral threads on the penultimate whorl, columella with 5 plicae anteriorly, aperture lirate. Locality unknown.

Nassarius vinctus (Marrat, 1877) (Figs. 68-73)

1853. *Nassa (Tritia) trifasciata* A. Adams, Proc. Zool. Soc. Lond. for 1851, Pt. 19: 113 (*non Buccinum trifasciatum* Gmelin, 1791 = *Nassarius*).

1877. *Nassa vincta* Marrat, Prop. new forms gen. *Nassa,* p. 12; 1938 Tomlin, J. Conch. 21 (3): 83; 1940 Tomlin, Proc. Malac. Soc. Lond. 24 (1): 38.

1903. *Nassa analogica* Sowerby, Marine Inv. Sth. Africa, 2 (3): 219, pl. 4, fig. 3 (8th July 1903); 1906 E. A. Smith, Ann. Natal Govt. Mus. 1 (1): 36; 1959 Barnard, Ann. Sth. Afric. Mus. 45: 99, fig. 22a (radula).

1903. *Nassa trifasciata* A. Adams, Sowerby, Marine Inv. Sth. Africa, 2 (3): 228, pl. 4, fig. 2.

1903. *Nassa (Amycla) circumtexta* v. Martens, Wiss. Ergeb. deut. Tief.-Exp. "Valdivia", 7: 27, pl. 3, fig. 18 (Francis Bay, 80-100 m; Algoa Bay; Agulhas Bank, 116-117 m; Simons Bay, 70 m [18th December 1903].

1906. *Nassa circumtexta* Martens, E. A. Smith, Ann. Natal Govt. Mus. 1 (1): 36.

1928. *Nassarius circumtextus* (Martens) Tomlin, Ann. Sth. Afric. Mus. 25: 316.

1932. *Nassa aenigmatica* Turton, Mar. shells Pt. Alfred, p. 58, pl. 13, fig. 431 (Pt. Alfred, Sth. Africa).

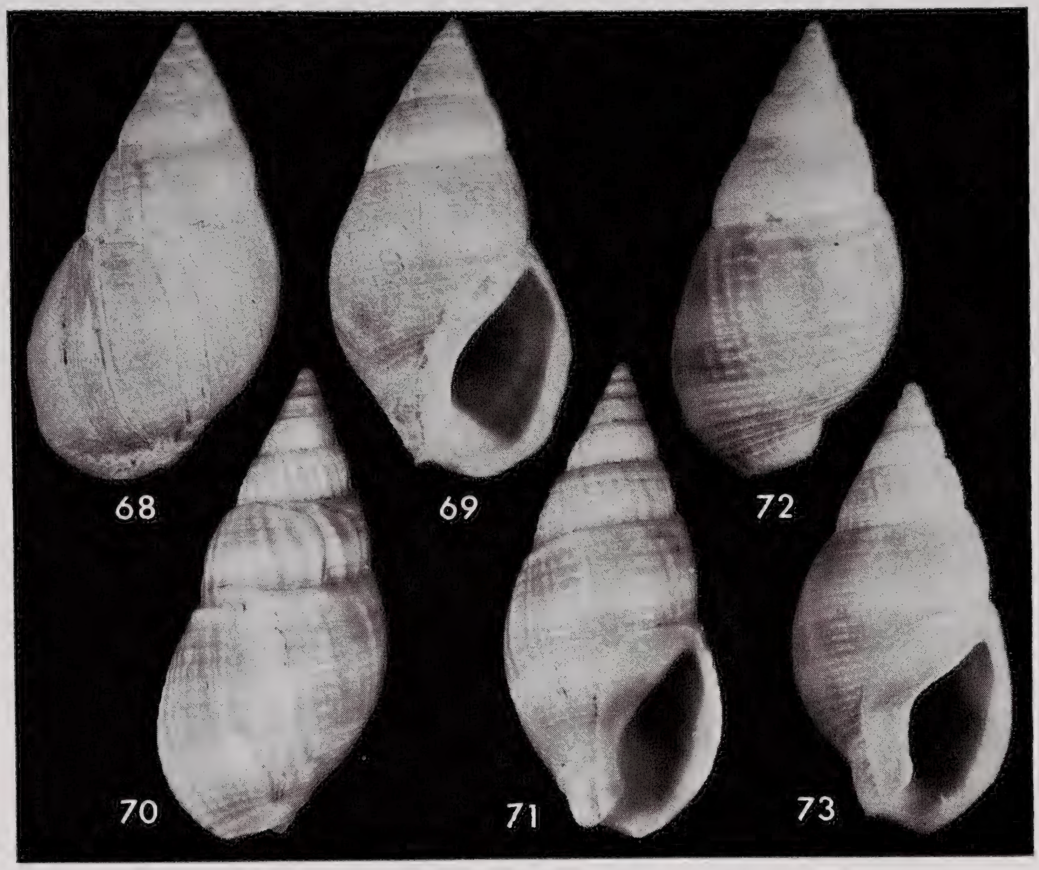
DISTRIBUTION. East London to Saldanha Bay, South Africa; also reported from West Africa.

TYPE SPECIMENS AND TYPE LOCALITIES

N. trifasciata. Three syntypes in the B.M.N.H.; illustrated syntype 18.3 × 9.0 × 9.8 mm. White in colour, with an orange-brown band on the penultimate and 3 bands on the body whorl, obsoletely axially ribbed, penultimate whorl with 7 flattish spiral cords and body whorl with 19 cords, anterior of columella with 1-2 folds, outer lip with 15 plicae. Vigo Bay [= Spain] = error.

N. vincta. Five syntypes in MCML; illustrated specimen (marked "lectotype", MS Dr. W. Adam), 16.8 × 8.0 × 8.3 mm. Whitish in colour, with 3 brown bands on the body whorl, obsoletely axially ribbed, 5 flattish cords on the penultimate and 16 on the body whorl, columella smooth, outer lip with 11 weak plicae. Locality unknown.
N. analogica. Three syntypes in the B.M.N.H. No. 1903.7.27.77-79.; illustrated syntype 18.8 × 9.7 × 10.0 mm. Light orange-brown in colour with a faint white band and axial streaks, 6 flattish cords on the penultimate and 17 on the body whorl, columella with a basal denticle, outer lip smooth. Off Cape Infanta, Sth. Africa, 40 fathoms (73 m).

Tomlin (1928, 1932) and E. A. Smith (1906) correctly pointed out that Adams' locality "Vigo Bay" in Spain was an obvious error and that the type of *N. trifasciatus* (A. Adams) are the same species as *N. analogicus* (Sowerby) and *N. circumtextus* (v. Martens). When Tomlin (1938, 1940) examined the Marrat collection of Nassariidae in the Liverpool Museum (now the Merseyside County Museums, Liverpool), he discovered that the type-specimens of *N. vinctus* (Marrat) were conspecific with *N. trifasciatus, N. analogicus* and *N. circumtextus.*



Figs. 68-73. *Nassarius vinctus* (Marrat). 68, 69. Syntype of *N. analogicus* (Sowerby), BMNH No. 1903.7.27.77-79; length 18.8 mm. 70, 71. Syntype of *N. vinctus* (Marrat), MCML; length 16.8 mm. 72, 73. Syntype of *N. trifasciatus* (A Adams), BMNH; length 18.3 mm.

Dautzenberg (1913), Nickles (1950) and Buchanan (1954), however, applied the name *N. trifasciatus* (A. Adams) to the West African species *N. semistriatus* (Brocchi, 1814), while Knudsen (1956) placed *N. trifasciatus* in the synonymy of *N. semistriatus*. Examination of the syntypes of all species involved confirms their conspecifity and South African origin, and because of secondary homonymy of *N. trifasciatus* (A. Adams), *N. vinctus* (Marrat, 1877) is the appropriate name for the South African species.

Nassarius incrassatus (Ström, 1768) (Figs. 74, 75)

1768. *Buccinum incrassatum* Ström, K. Korske Vid. Selsk. Skrift. 4: 369.

1853. *Nassa delicata* Reeve, Conch. Icon. 8: pl. 24, fig. 163; 1932 Tomlin, Proc. Malac. Soc. Lond. 20 (2): 95 (*non* A. Adams, 1852).

1854. *Nassa tenella* Reeve, Conch. Icon. 8: Errata at end of Index (*nom. subst. pro N. delicata* Reeve, 1853).

1854. *Nassa rosacea* Reeve, Conch. Icon. 8: pl. 27, fig. 183; 1932 Tomlin, Proc. Malac. Soc. Lond. 20 (2): 97 (non *Planaxis rosacea* Risso, 1826 = *Buccinum incrassatum* Ström).

Figs. 74, 75. *Nassarius incrassatus* (Ström). 74. Syntype of *N. tenellus* (Reeve) and *N. delicatus* (Reeve), BMNH; length 12.2 mm. 75. Syntype of *N. rosaceus* (Reeve), BMNH; length 11.4 mm.

DISTRIBUTION. From Northern Norway to Madeira and the Mediterranean.

TYPE SPECIMENS AND TYPE LOCALITIES

N. tenellus. Two syntypes in the B.M.N.H.; illustrated syntype 12.2 × 6.3 × 5.1 mm. Casces Bay = [? Cascaes Bay, Portugal].

N. rosaceus. Three syntypes in the B.M.N.H.; illustrated syntype 11.4 × 6.4 mm.

Both of Reeve's species are the slender and the broad, pinkish forms of *N. incrassatus* and both have the typical dark purple stain on the back of the siphonal canal. *Nassa rosacea* Reeve, 1854, is a secondary homonym of *Planaxis rosacea* Risso, 1826, which also happens to be the pinkish form of *N. incrassatus*.

The genus-group name *Tritonella* A. Adams, 1852, is persistently used in recent literature despite its homonymy of *Tritonella* Swainson, 1839, in Amphibia. The correct subgeneric group for *N. incrassatus* (Ström) is *Hima* Leach in Gray, 1852, with its type-species *Buccinum minutum* Pennant, 1777 = *B. incrassatum* Ström, 1768, by the first valid subsequent designation by Marwick (1931). In the writer's opinion, *Hinia* Gray, 1847, is not consubgeneric with *Hima* Leach in Gray, 1852.

Nassarius antiquatus (Watson, 1897) (Fig. 76)

1897. *Nassa antiquata* Watson, J. Linn. Soc. Lond. 26: 241, pl. 19, fig. 10 (*non* Gabb, 1864).
1968. *Alectrion (Zeuxis) antiquatus* (Watson), Nordsieck, Europ. Meeres-Gehäusesch. 1: 144, pl. 23, fig. 81.63.

TYPE SPECIMEN AND TYPE LOCALITY

N. antiquata. Holotype in the B.M.N.H. No. 1911.7.17.4.; 13.0 × 6.0 × 5.4 mm. Whitish in colour, ornamented with orange spots and axial streaks, first 3 post-nuclear whorls clathrate, 4th and penultimate whorl moderately smooth, body whorl with 12 flattish cords, all whorls with a deeply incised presutural groove which gives rise to a sutural girdle, columella with 2 folds anteriorly and a few small denticles, outer lip with 6 denticles. Funchal and Cabo Girao, Madeira.

Fig. 76. Holotype of *Nassarius antiquatus* (Watson), BMNH No. 1911.7.17.4.; length 13.0 mm.

Nordsieck (1968) considered *N. antiquatus* a valid biospecies, but in the present author's opinion it is conspecific with *N. semistriatus* (Brocchi, 1814), which is known living from the East Atlantic and West Africa. *Nassa antiquata* Watson, 1897, is in any case taxonomically not available, being a primary homonym of *Nassa antiquata* Gabb, 1864, from the California Eocene.

Nassarius brychia (Watson, 1882) (Fig. 77)

1880. *Nassa brychia* Watson, Marrat, Var. shells gen. *Nassa,* p. 52 (*nomen nudum*).
1882. *Nassa brychia* Watson, J. Linn. Soc. Lond. 16: 365.
1886. *Nassa (Tritia) brychia* Watson, Rept. Sci. Res. Voy. H.M.S. "Challenger", Zool. 15: 198, pl. 11, fig. 5.

TYPE SPECIMEN AND TYPE LOCALITY

N. brychia. Holotype in the B.M.N.H. No. 1887.2.9.671.; 16.6 × 9.2 × 8.3 mm. Dirty white in colour, some nodules appearing darker, sculptured with 17 axial ribs and 3 broad grooves on the penultimate and 20 ribs and 10 cords on the body whorl, columella smooth apart from a single basal fold, outer lip with 9 plicae. Off Gomera, Canary Is, 28° 03′ 15″N and 17° 27′W, 620 fathoms (1135 m).

The species has not been mentioned in East Atlantic faunal lists and does not appear to have been recognised since its description. It is superficially similar to *N. reticulatus* (Linnaeus), but the columellar callus in *N. brychia* is not spreading above the parietal wall but is small and well-defined.

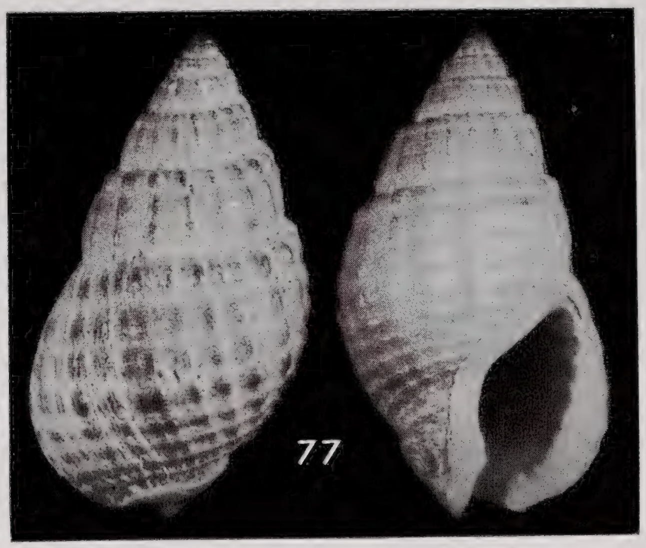


Fig. 77. Holotype of *Nassarius brychia* (Watson), BMNH No. 1887.2.9.671.; length 16.6 mm.

Nassarius cuvierii (Payraudeau, 1826) (Fig. 78)

— *Nassarius costulatus auct* (*non Buccinum costulatum* Brocchi, 1814).
1826. *Buccinum ferussaci* Payraudeau, Cat. Moll. Corse p. 162, pl. 8, figs. 15, 16.
1826. *Buccinum cuvierii* Payraudeau, Cat. Moll. Corse, p. 163, pl. 8, figs. 17, 18.
1836. *Buccinum variabile* Philippi, Enum. Moll. Siciliae 1: 221.
1852. *Nassa variabilis* Philippi, A. Adams, Proc. Zool. Soc. Lond. for 1851, Pt. 19: 103; 1853 Reeve, Conch. Icon. 8: pl. 19, figs. 129a, b.
1854. *Nassa maderensis* Reeve, Conch. Icon. 8: pl. 27, figs. 182a, b.
1882. *Nassa (Zeuxis) cuvieri* Payraudeau, Tryon, Man. Conch. 4: 32, pl. 10, figs. 92-97.
1890. *Nassa cuvieri* Payraudeau, Hidalgo, Mem. R. Acad. Cienc. Madrid 15 (2): 99; 1913 Melvill & Standen, Trans. R. Soc. Edinburgh 48 (18): 341.
1910. *Nassa ferussaci* Payraudeau, Dautzenberg, Act. Soc. Linn. Bordeaux 64: 54; 1947 Nicklés, Inst. Franc. d'Afrique Noire, p. 10.
1929. *Nassa (Telsca) cuvieri* Payraudeau, Thiele, Handb. syst. Weicht. 1: 325.
1943. *Hinia (Telasco) cuvieri* (Peyradeau) *(sic)*, Wenz, Handb. Palaeoz. 6 (6): 1236, fig. 3525.
1963. *Hinia (Telasco) ferussaci* Payraudeau, Glibert, Inst. R. Sci. Nat. Belg. Mém. 74: 114.

DISTRIBUTION. Mediterranean to the Cape Verde Is and N.W. Africa.

TYPE SPECIMEN AND TYPE LOCALITY

N. maderensis. Five syntypes in the B.M.N.H.; illustrated syntype 9.0 × 5.0 × 5.0 mm. Cream in colour, ornamented with small white spots and orange-brown spiral lines, early whorls with *c.* 10 angulate axial ribs, last 1½ whorls only with spiral striae, columella with 2-3 folds anteriorly, outer lip with 8 denticles. Madeira.

Nassarius maderensis (Reeve) is the moderately smooth form of *N. cuvierii* (Payraudeau), which is the species frequently listed as "*Nassarius costulatus* (Renier, 1804)" in recent literature (Knudsen, 1956; Nordsieck, 1968). Renier's names, however, are taxonomically unavailable since his work "Tavola alfabetica delle Conchiglie Adriatiche, 1804" has been rejected for nomenclatorial purposes in Opinion 316 of the

I.C.Z.N. as from the 17th December 1954 (Hemming, 1958). Several authors have adopted the name *N. ferussaci* (Payraudeau, 1826) in preference to the conspecific *N. cuvierii* (Payraudeau, 1826) on the basis of page precedence. Page precedence, however, has been superseded by the first reviser rule (Art. 24 (a) of I.C.Z.N.), and Tryon (1882) appears to have been the first reviser who cited both taxa and selected *N. cuvierii* in preference to *N. ferussaci*. Although several authors have suggested that the fossil *N. costulatus* (Brocchi, 1814) is an earlier name for *N. cuvierii* (Payraudeau), Prof. W. Adam *(in litt.)* is of the opinion that *N. costulatus* (Brocchi) is a different species and conspecific with the subsequently named *N. italicus* (Mayer, 1876).

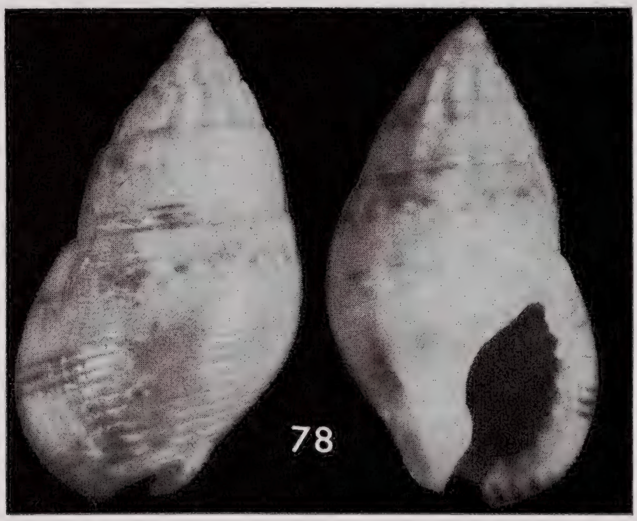


Fig. 78. *Nassarius cuvierii* (Payraudeau). 78. Syntype of *N. maderensis* (Reeve), BMNH; length 9.0 mm.

Nassarius tingitanus (Pallary, 1901) (Fig. 79)

1901. *Nassa tingitana* Pallary, J. Conchyl. 49 (3): 226; 1902 Pallary, J. Conchyl. 50 (1): 10, pl. 1, figs. 3, 4.

1943. *Hannonia tingitana* Pallary, Wenz, Handb. Paläozool. 6 (3): 1233, textfig. 3513; 1968 Nordsieck, Europ. Meeres-Gehäusesch. 1: 140, pl. 23, fig. 80.50.

DISTRIBUTION. East Atlantic to Spain and Morocco.

TYPE SPECIMEN AND TYPE LOCALITY

N. tingitana. One syntype in the B.M.N.H. No. 1906.4.17.18.; 10.0 × 3.8 × 2.9 mm. Light tan in colour, fusiform, aperture very short, sculptured with angulate axial ribs, penultimate whorl with 5 fine spiral grooves and body whorl with 7 grooves and 5 basal cords, columella smooth, outer lip denticulate. Tangier, Morocco, 12-21 metres.

N. tingitanus (Pallary) is the type-species of *Hannonia* Pallary, 1914, which, however, is a primary homonym of *Hannonia* Hoek, 1881, in Pantopoda. No substitute name is proposed as in our opinion *N. tingitanus* would be appropriately placed in the subgenus *Aciculina* A. Adams, 1853.

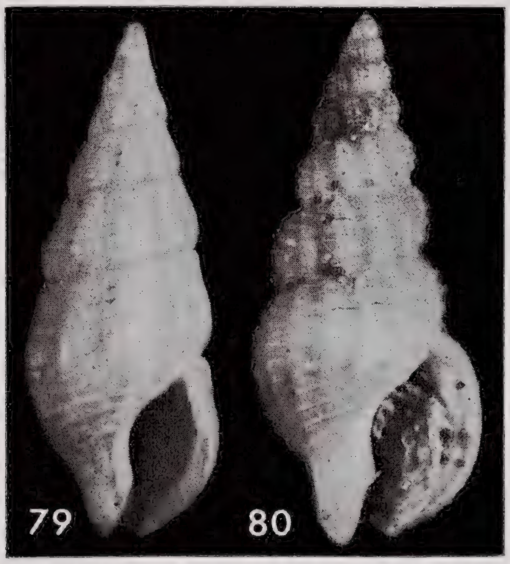
[Nassarius] vaucheri (Pallary, 1914) (Fig. 80)

1914. *Nassa (Hima) vaucheri* Pallary, Expl. Sci. Maroc, Miss. zool., Malac. 2: 35.

TYPE SPECIMEN AND TYPE LOCALITY

N. vaucheri. One syntype in the B.M.N.H. No. 1906.4.17.14.; 9.8 × 4.2 × 4.0 mm. Creamy-fawn in colour with a broad brown band on the lower half of the body whorl, spire brownish, sculptured with axial ribs and overriding spiral threads. Rabat, Morocco.

The writer has seen no mention of this species in nassariid literature, and suspects that *N. vaucheri* probably belongs to *Chauvetia* Monterosato, in the family Buccinidae.



Figs. 79, 80. 79. Syntype of *Nassarius tingitanus* (Pallary), BMNH No. 1906.4.17.18.; length 10.0 mm. 80. Syntype of [*Nassarius*] *vaucheri* (Pallary), BMNH No. 1906.4.17.14.; length 9.8 mm.

Nassarius clathratus (Born, 1778) (Fig. 81)

1778. *Buccinum clathratum* Born, Ind. rer. nat. mus. Caes. Vindob. Pt. 1: 225 (Hab: ?); 1880 Born, Test. Mus. Caes. Vindob. p. 261, pl. 9, figs. 17, 18.

1852. *Nassa turrita* A. Adams, Proc. Zool. Soc. Lond. for 1851, Pt. 19: 110; 1932 Tomlin, Proc. Malac. Soc. Lond. 20 (1): 44 (*non* Borson, 1820).

DISTRIBUTION. Pliocene fossil in Europe; rarely living in the East Atlantic.

TYPE SPECIMEN AND TYPE LOCALITY

N. turrita. Three syntypes in the B.M.N.H.; illustrated syntype 30.3 × 17.8 × 13.4 mm. Uniformly cream in colour, apparently fossil, sculptured with 23 axial ribs and 8 spiral cords on ribs on the penultimate and 20 ribs and 16 cords on the body whorl, sutures with a flat ramp, shell thin for its size, columella with 2 basal folds and a parietal fold, outer lip with 14 plicae. Locality unknown.

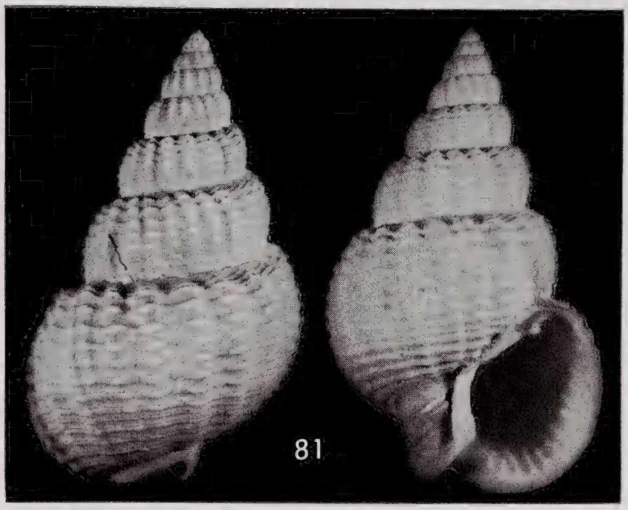


Fig. 81. *Nassarius clathratus* (Born). Syntype of *N. turritus* (A. Adams), BMNH; length 30.3 mm.

Recent authors have applied the taxon "*Nassa limata* Chemnitz" to a species similar to *Nassarius clathratus* (Born). Chemnitz's taxon is non-binomial and his work has been suppressed by the I.C.Z.N. for nomenclatorial purposes. The taxon *Nassa limata* has not been validated until 1844 by Deshayes (in Deshayes & Edwards, 1844), but *Buccinum lima* Dillwyn, 1817, has been proposed for the species illustrated in Chemnitz (1795, pl. 188, figs. 1808, 1809). The shell depicted by Chemnitz (*op. cit.*) came from the East Indies and according to that author's description is white, thin and transparent with pale brown bands and a somewhat expanded callus above the parietal wall. These features, combined with the locality "East Indies" and the doubtful occurrence of living specimens during the 19th century, would exclude *N. clathratus* (Born) or "*N. limatus auct.*" from consideration. Lamarck (1822) actually considered Chemnitz's species to be a variety of *Phos senticosus* (Linnaeus).

Nassa turrita A. Adams, 1852, apart from being a synonym of *Nassarius clathratus* (Born), is also a primary homonym of *Nassa turrita* Borson, 1820, from the Italian Pliocene.

Nassarius plicatellus (A. Adams, 1852) (Figs. 82, 83)

1852. *Nassa nivea* A. Adams, Proc. Zool. Soc. Lond. for 1851, Pt. 19: 110; 1853 Reeve, Conch. Icon. 8: pl. 18, figs. 122a, b; 1932 Tomlin, Proc. Malac. Soc. Lond. 20 (1): 43.

1852. *Nassa plicatella* A. Adams, Proc. Zool. Soc. Lond. for 1851, Pt. 19: 111; 1853 Reeve, Conch. Icon. 8: pl. 9, figs. 56a, b; 1932 Tomlin, Proc. Malac. Soc. Lond. 20 (1): 43; 1959 Barnard, Ann. Sth. Afric. Mus. 45: 114.

1884. *Nassa (Tritia) nivea* A. Adams, Tryon, Man. Conch. 4: 57, pl. 17, fig. 326.

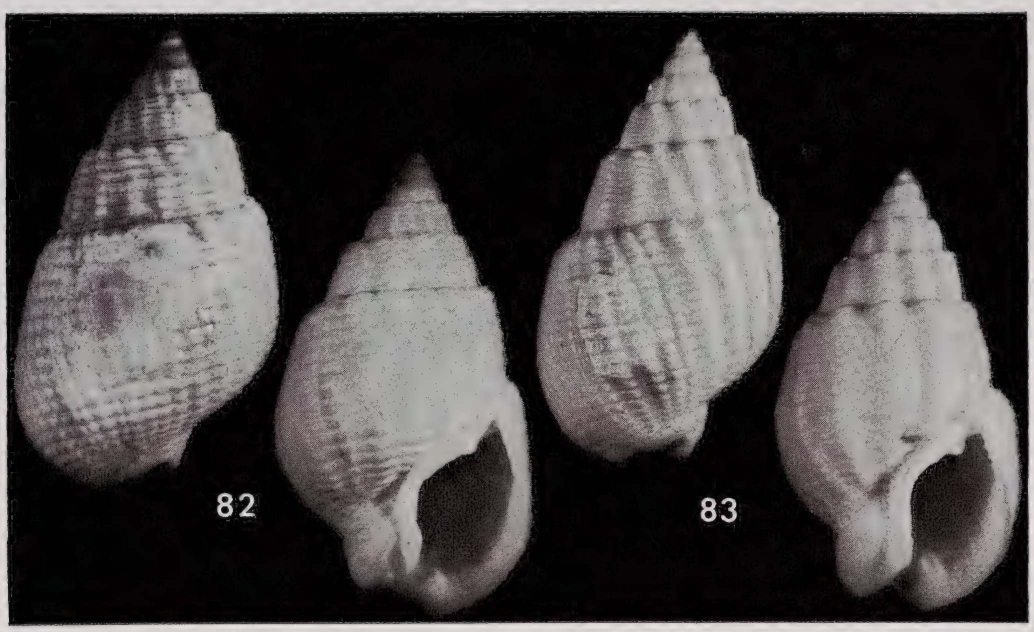
1884. *Nassa (Tritia) plicatella* A. Adams, Tryon, Man. Conch. 4: 58, pl. 17, fig. 335; 1913 Dautzenberg, Ann. l'Inst. Océanog. Monaco, 5: 32.

1903. *Nassa (Caesia) plicatella* A. Ad., v. Martens, Wiss. Erg. deut. Tief.-Exp. "Valdivia", 7: 9.

1923. ? *Nassa angolensis* Odhner, Goteb. K. Vet. Handl. 26: 14, pl. 1, figs. 6, 7 (Port Alexander, Angola, 16 fathoms (29 m)).

1928. *Nassarius plicatellus* (A. Adams), Tomlin, Ann. Sth. Afric. Mus. 25 (2): 323.

1928. *Nassa scopularcus* Barnard, Ann. Sth. Afric. Mus. 45: 120, fig. 24a (Sth. of Bogenfels, late Tertiary of S.W. Africa) [worn juvenile].



Figs. 82, 83. *Nassarius plicatellus* (A. Adams). 82. Syntype BMNH, length 24.4 mm. 83. Syntype of *N. niveus* (A. Adams), BMNH; length 23.3 mm.

DISTRIBUTION. Mossamedes, Angola, to Saldanha Bay, Sth. Africa.

TYPE SPECIMENS AND TYPE LOCALITIES

N. nivea. Three syntypes in the B.M.N.H.; illustrated syntype 23.3 × 12.9 × 11.5 mm. White in colour, sculptured with 13 axial ribs and 10 spiral cords on the penultimate and 18 ribs and 20 cords on the body whorl, columella with 2-3 plicae anteriorly and a parietal fold with 2 adjoining denticles, outer lip with 15 plicae. Batangas, island of Luzon, Philippines, 21 fathoms (38 m) = error.

N. plicatella. Two syntypes in the B.M.N.H.; illustrated syntype 24.4 × 13.7 × 11.8 mm. Creamy-white in colour, early whorls brownish, sculptured with 14 axial ribs and 8 overriding spiral cords on the penultimate and 11 ribs and 20 cords on the body whorl, axial ribs indistinct on back of dorsum, columella with a basal and a parietal fold with 2 adjoining denticles, outer lip with 13 plicae. Wallwich Bay, Africa [= Walvis Bay, S.W. Africa].

Tomlin (1932) correctly pointed out that the Philippine locality for *N. nivea* A. Adams, 1852, was erroneous and that the species was conspecific with *N. plicatella* A. Adams, 1852. Both these taxa were published simultaneously in the same publication by A. Adams (1852), but Tomlin failed to act as a first reviser by not selecting a valid name in preference to the other (Art. 24 (a) of the Code of I.C.Z.N.). In view of the sustained usage and correct locality indication, *Nassarius plicatellus* (A. Adams, 1852) is here adopted as the valid taxon, provided it is not a primary homonym. Sherborn (1929, p. 5042) listed a prior "*Nassa plicatella* G. v. Muenster, 1835, N. Jahrb. f. Min., p. 450", but Sherborn (1933) in his Index of trivial names under genera listed a "*Nassa plicatula*" which is not contained in his Main Index, and omitted any mention of *N. plicatella.* Muenster's work is not available to the writer and it cannot be therefore ascertained by him whether Muenster described a *Nassa plicatella* or *Nassa plicatula.*

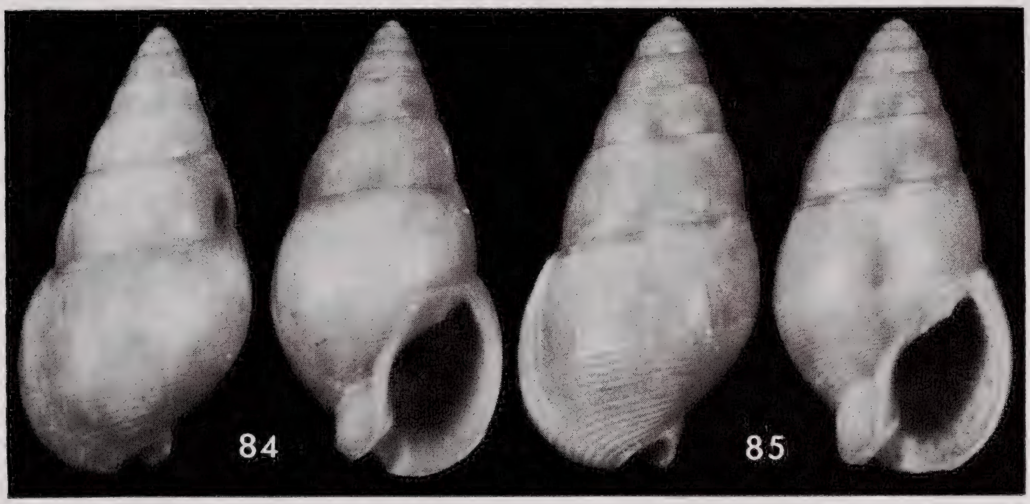
Nassarius sesarma (Marrat, 1877) (Figs. 84, 85)

1877. *Nassa sesarma* Marrat, Prop. new forms gen. *Nassa,* p. 13, pl. 1, fig. 14.

TYPE SPECIMEN AND TYPE LOCALITY

N. sesarma. Two syntypes in the MCML; illustrated larger syntype 13.0. × 6.7 × 6.0 mm, smaller syntype 10.0 × 5.5 × 5.0 mm. Pale grey in colour with brownish spots especially at the sutures and a few white spots on the body whorl, columella stained brown, shell with 4 mature and 3 nuclear whorls, first post-nuclear whorl with 7 spiral rows of minute pits, next 2 whorls with 2-3 sutural threads, body whorl with *c.* 29 close-set, fine spiral striae, columella with a basal fold and adjoining denticle, outer lip with 14-15 fine denticles. Whydah [= Ouidah, Dahomey, W. Africa].

N. sesarma is not at all conspecific with *N. marratii* (E. A. Smith, 1876) [= *N. gaudiosus* Hinds, 1844] from the Solomon Islands as suggested by Tomlin (1940). Marrat's West African locality is correct and *N. sesarma* is considered to be a valid species (Prof. W. Adam, *in litt.*).



Figs. 84, 85. Syntypes of *Nassarius sesarma* (Marrat); length 13.0 mm and 10.0 mm respectively.

Genus **Demoulia** Gray, 1838

Demoulia Gray, 1838, Ann. Mag. Nat. Hist. (1), 1: 29. Type species by SD (Herrmannsen, 1847) *Buccinum retusum* Lamarck, 1822 = *Nassa ventricosa* Lamarck, 1816. Recent, Sth. Africa.

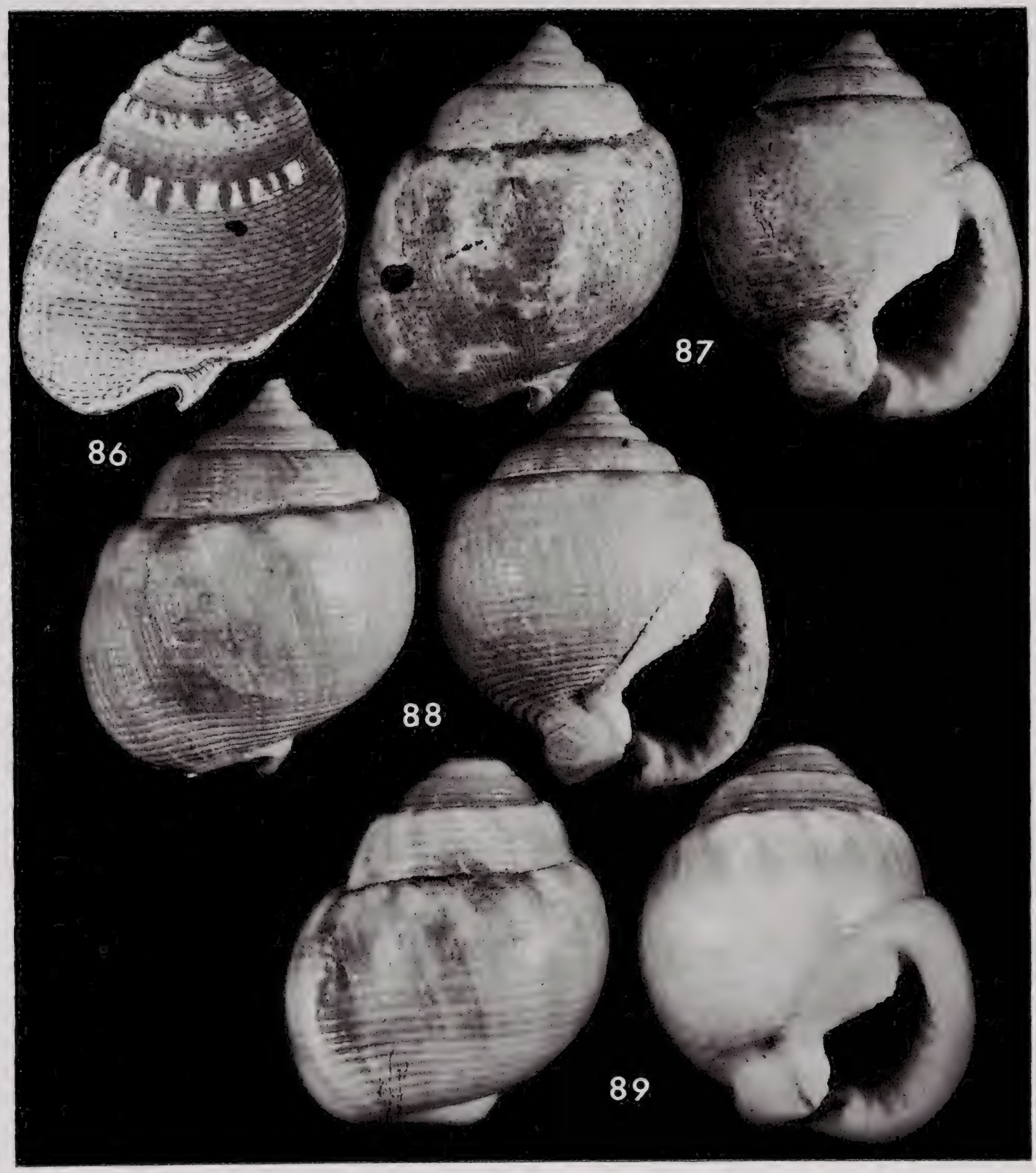
1847. *Desmoulea* Gray, Proc. Zool. Soc. Lond. p. 140 (invalid emend.).

1851. *Desmoulinsia* Woodward, Man. Moll. p. 112 (invalid emend.).

1856. *Streptorhega* Bronn, Lethaea Geognostica, 3 (6): 563 (*nom. subst. pro Demoulea* or *Desmoulea* Gray, 1847).

1874. *Moulinsia* Tournouer, J. Conchyl. 22: 295 (*nom. subst. pro Desmoulea* Gray, 1847) [*non* Grateloup, 1840].

DISTRIBUTION. Species of *Demoulia* do not live in the tropical Indo-Pacific or Japan and are confined to West and South Africa.



Figs. 86-89. *Demoulia obtusata* (Link). 86. Type-figure from Chemnitz, 1788, vol. 10, pl. 153, fig. 1466. 87. Holotype of *D. pulchra* Gray, BMNH; length 19.3 mm. 88. Syntype of *D. pinguis* (A. Adams), BMNH; length 22.0 mm. 89. Holotype of *D. crassa* (A. Adams) and *D. ponderosa* (Reeve), BMNH No. 197328; length 22.4 mm.

Demoulia obtusata (Link, 1807) (Figs. 86-89)

1788. "*Buccinum cassideum abbreviatum varietates*" Chemnitz, Syst. Conch.-Cab. 10: 194, 195, pl. 153, fig. 1466 (West Indian Seas = error) [*non binom.*].

1807. *Buccinum obtusatum* Link, Beschr. Nat.-Samml. Univ. Rostock, 3rd Abth.: 126 (refers to Chemnitz, *op. cit.*, fig. 1466); 1936 Tomlin & Winkworth, Proc. Malac. Soc. Lond. 22 (1): 40.

1838. *Demoulia pulchra* Gray, Ann. Mag. Nat. Hist. (1), 1: 29; 1891 E. A. Smith, Ann. Mag. Nat. Hist. (6), 8: 322.

1853 *Desmoulea pinguis* A. Adams, Proc. Zool. Soc. Lond. for 1851, Pt. 19: 113; 1858 H. & A. Adams, Gen. rec. Moll. 3: pl. 12, figs. 6, 6a; 1882 Kobelt, Jahrb. deut. Malak. Gesell. 9 (1): 29; 1884 Tryon, Man. Conch. 4: 65, pl. 18, figs. 362-364.

1853. *Desmoulea crassa* A. Adams, Proc. Zool. Soc. Lond. for 1851, Pt. 19: 113; 1882 Kobelt, Jahrb. deut. Malak. Gesell. 9 (1): 29.

1854. *Nassa pinguis* A. Adams, Reeve, Conch. Icon. 8: pl. 29, figs. 193a, b; 1956 Knudsen, Atlantide Rept. No. 4: 55.

1854. *Nassa ponderosa* Reeve, Conch. Icon. 8: pl. 29, fig. 196 (*nom. subst. pro Desmoulea crassa* A. Adams, 1853); 1932 Tomlin, Proc. Malac. Soc. Lond. 20 (2): 96.

1882. *Desmoulea pulchra* Gray, Kobelt, Jahrb. deut. Malak. Gesell. 9 (1): 29.

1913. *Desmoulinsia pinguis* (A. Adams), Dautzenberg, Ann. l'Inst. Océanog. Monaco, 5: 33.

1929. *Nassa (Desmoulea) pinguis* A. Adams, Thiele, Handb. syst. Weicht. 1: 323, textfig. 366 (radula); 1932 Tomlin, Proc. Malac. Soc. Lond. 20 (1): 43; 1950 Nicklés, Man. Ouest-Afric. 2: 105, fig. 183.

DISTRIBUTION. Morocco to Gold Coast, West Africa.

TYPE SPECIMENS AND TYPE LOCALITIES

D. pulchra. Holotype in the B.M.N.H.; 19.3 × 15.4 × 12.9 mm. Sierra Leone, W. Africa.

D. pinguis. Three syntypes in the B.M.N.H. (2 of these juvenile); illustrated adult syntype 22.0 × 18.0 × 14.7 mm. Senegal [= W. Africa].
D. crassa and *D. ponderosa.* Holotype in the B.M.N.H. No. 197328; 22.4 × 18.0 × 14.5 mm. Japan = error.

E. A. Smith (1891) who had the opportunity to compare the type-specimens of *D. pulchra, D. pinguis, D. crassa* and *D. ponderosa,* arrived at the conclusion that all these "species" were conspecific and that the species should be known as *D. pulchra* Gray, 1838. Tomlin (1932), who also worked with the actual types, also pronounced *D. pinguis* as conspecific with *D. pulchra.* Despite Gray's (1838) good locality and description, his taxon has been ignored after 1932, and the species is listed as *D. pinguis* A. Adams, in West African faunal lists.

Similarly *Buccinum obtusatum* Link, 1807, based on a good figure and excellent description in Chemnitz (1788), has been overlooked as a prior name for the species under discussion. Chemnitz *(op. cit.)* described all the then known species of *Demoulia,* i.e. *D. abbreviata* (Gmelin, 1791), *D. ventricosa* (Lamarck, 1816) and the species represented in his fig. 1466 which is the *D. obtusata* (Link, 1807). When Chemnitz (*op. cit.*) compared the species illustrated in fig. 1466 (= *obtusata*) with fig. 1465 (= *ventricosa*), he appended the following description of *D. obtusata*:

> "It is smaller yet fresher, prettier and rarer than the preceding species [*abbreviata* and *ventricosa*]. It is also encircled by spiral striae, but these are so delicate and fine that they can be hardly seen with the naked eye. The surface is therefore almost smooth and shining. The base colour of the body whorl is white, but is mostly covered by a large yellowish blotch, like by a cloud. The upper, rounded, step-like decreasing 6 whorls have a darker greyish-yellow colour and terminate in a blue point. A colourful white, yellow-spotted band encircles the sutures of the whorls. The outer thickened lip is inside full of teeth. The inner white lip has at the upper part a swollen pad, the purpose and benefit of which is unknown to me, but is present in one and all members of the genus. The interior walls are white. This snail, like the preceding, lives in the West Indian Seas." [Free translation].

The species *D. obtusata* is easily recognised by its solid globular shape, swollen and plicate parietal wall and the recurved base of the columella. The shell is cream in colour and ornamented with clouded brown zones and axial flames and usually with a whitish, yellowish-brown spotted band at the sutures. The sculpture consists of numerous spiral threads and axial growth-lines, and the periostracum is brown. The holotype of *D. crassa* is a worn and more coarsely sculpture variant of *D. obtusata.*

Chemnitz's description does not match any of the other 2 living species and 1 subspecies of *Demoulia* in either sculpture, shape or colouring. *D. abbreviata* from South Africa is so distinct that it does not require further comparison, while the South African *D. ventricosa ventricosa* (Lamarck, 1816) and its subspecies *D. ventricosa nataliae* Kilburn, 1972, differ prominently in shape and lack the spotted sutural girdle which was not omitted from Chemnitz's description. *Buccinum obtusatum* Link, does not qualify as a *nomen oblitum* since it has been discussed in literature by Tomlin & Winkworth (1936), who erroneously questioned its synonymy with *Nassarius mutabilis* (Linnaeus).

Genus **Cyllene** Gray in Griffith & Pidgeon, 1834

Cyllene Gray in Griffith & Pidgeon, 1834, Anim. Kingd. Cuvier, Moll. Rad. 12: 597. Type species by monotypy *C. owenii* Gray in Griffith & Pidgeon, 1834.

1924. *Radulphus* Iredale, Proc. Linn. Soc. N.S.W. 49 (3): 270. Type species by monotypy *R. royanus* Iredale, 1924.

Species of *Cyllene* live only in the tropical Indo-West Pacific and West Africa. They are easily separated from the superficially similar buccinid genera *Phos* and *Cominella* by the presence of a sutural groove above the outer lip as in the Olividae, and the prominent columellar callus which bears oblique plications.

Cyllene owenii (Gray in Griffith & Pidgeon, 1834 (Figs. 90, 91)

1834. *Cyllene owenii* Gray in Griffith & Pidgeon, Anim. Kingd. Cuvier, Moll. Rad. 12: 597, pl. 41, fig. 2; 1851 A. Adams, Proc. Zool. Soc. Lond. for 1850, Pt. 18: 205; 1853 Petit de la Saussaye, J. Conchyl. 4: 146; 1872 E. A. Smith, Proc. Zool. Soc. Lond. for 1871, p. 732.

1853. *Cyllene senegalensis* Petit de la Saussaye, J. Conchyl. 3: 145, pl. 5, fig. 5 (west coast of Africa); 1875 P. Fischer, J. Conchyl. 23: 278; 1913 Dautzenberg, Ann. l'Inst. Océanog. Monaco, 5: 29; 1927 Dautzenberg, Faune Colon. Franc. 1: 489; 1947 Nicklés, Inst. Franc. d'Afric. Noire, 1: 11; 1956 Knudsen, Atlantide Rept. No. 4: 59, pl. 3, fig. 8.

1859. *Cyllene oweni* Gray, Sowerby, Thes. Conchyl. 3: 78, pl. 217, figs. 19, 20; 1875 P. Fischer, J. Conchyl. 23: 278; 1877 Kobelt, Jahrb. deut. Malak. Gesell. 4: 298; 1881 Tryon, Man. Conch. 3: 224, pl. 84, figs. 564, 566.

DISTRIBUTION. Senegal to the Congo, West Africa.

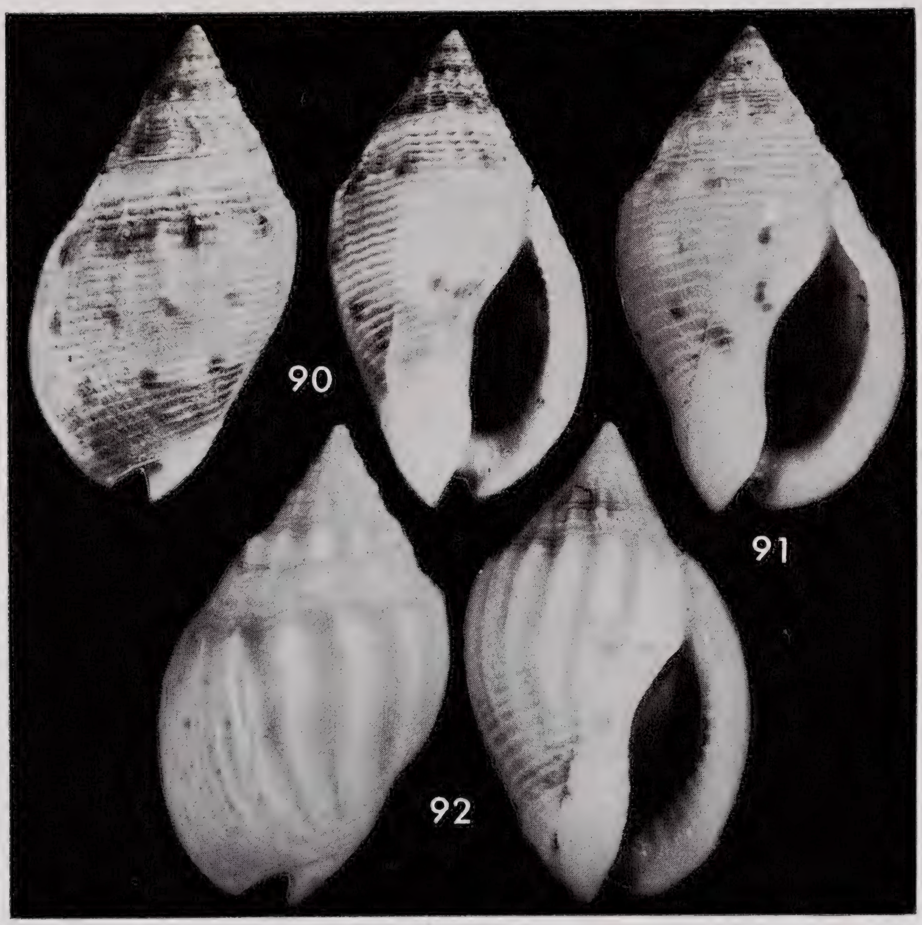
TYPE SPECIMEN AND TYPE LOCALITY

C. owenii. Specimen of *C. owenii* (a questionable type) in the B.M.N.H.; 16.4 × 9.0 × 11.0 mm. Locality unknown.

Gray in Griffith & Pidgeon (1834) briefly described *Cyllene owenii* from unknown locality in the Index of the work, and supplied a ventral view figure on plate 41. This illustration does show the close-set spiral threads extending from the siphonal fasciole to the presutural ramp where the axial ribs gain prominence. Although the usual brown streaks are present in the figure, the spiral cords have been drawn in bluish-violet and the brown patch on the columella of *C. owenii* has been exaggerated. It is highly doubtful that the specimen illustrated by Gray in Griffith & Pidgeon (*op. cit.*) is the same specimen as the one in the British Museum (Nat. Hist.) and illustrated here.

Gray's labels with specimens of *C. owenii* in the British Museum (Nat. Hist.) enabled Sowerby (1859) to give presentable illustrations of the species, and E. A. Smith (1872) to localise the species from Whydah (= Ouidah, Dahomey, W. Africa). Fischer (1875) subsequently also reported the species from the west coast of Africa, but usually Continental authors preferred to adopt the name *C. senegalensis* for the species.

Cyllene owenii has a rough sculpture of close-set, flattened narrow spiral cords which are bisected by narrow axial ribs in the vicinity of the weak presutural ramp; the sutures are adpressed and form a broad sutural thread which is occasionally granulose. The shell is creamy-white or fawn and ornamented with reddish-brown bands, spots or streaks, usually arranged in 3 spiral rows on the body whorl. The brown colouring tends to spill over on to the columella in a greater or lesser degree, and this feature is clearly indicated in Petit de la Sausaye's (1853) figure of *C. senegalensis* and exaggerated in Gray's figure of *C. owenii.*



Figs. 90-92. 90, 91. *Cyllene owenii* Gray in Griffith & Pidgeon. 90. Specimen from BMNH (questionable type), length 16.4 mm. 91. Specimen from Joal, Senegal, W. Africa; length 15.6 mm. 92. *Cyllene desnoyersi lamarcki* Cernohorsky; Dakar, Senegal, W. Africa; length 20.0 mm.

Cyllene desnoyersi lamarcki nom. n. (Fig. 92)

1822. *Buccinum lyratum* Lamarck, Hist. nat. anim. s. vert. 7: 272 (Seas of Senegal); 1834 Kiener, Spéc. gén. icon. coq. viv. 9: 38, pl. 22, fig. 88; 1844 Deshayes & Edwards, Hist. Nat. anim. s. vert. ed. 2, 10: 170 (non *B. lyratum* Gmelin, 1791).

1851. *Cyllene lyrata* (Lamarck), A. Adams, Proc. Zool. Soc. Lond. for 1850, Pt. 18: 205; 1853 Petit de la Saussaye, J. Conchyl. 4: 145; 1858 H. & A. Adams, Gen. Rec. Moll. 3: pl. 13, fig. 2; 1877, Kobelt. Jahrb. Deut. Malak. Gesell. 4: 298; 1881 Tryon, Man. Conch. 3: 223, pl. 84, figs. 555-557; 1929 Thiele, Handb. syst. Weicht. 1: 326, fig. 373 (radula), fig. 374 (shell); 1956 Knudsen, Atlantide Rept. No. 4: 59; 1968 Nordsieck, Europ. Meeres-Gehäusesch. 1: 144, pl. 23, fig. 81.80.

1859. *Cyllene lyratum* Lamarck, Chenu, Man. Conchyl. 1: 161, fig. 757.

1875. *Cyllene lirata (sic),* Lam., Tournouer, J. Conchyl. 23: 335, pl. 15, fig. 5 (shell), figs. 5a, b (operculum).

1943. *Cyllene (Cyllene) lyrata* (Lamarck), Wenz, Hand. Palaeoz. 6 (6): 1239, fig. 3582.

DISTRIBUTION. Mauritania to Congo, W. Africa.

The substitute name *lamarcki* is here proposed in a subspecific sense for *Buccinum lyratum* Lamarck, 1822, which is a primary homonym of *B. lyratum* Gmelin, 1791, a species in the Turridae. Deshayes & Edwards (1844) and Hörnes (1856) synonymised the Miocene *Cyllene desnoyersi* (Basterot, 1825) with the living *C. lyrata* (Lamarck), but Tournouer (1875) in his review of the two species, kept them separate. The differences in morphological characters between the older Aquitanian *C. desnoyersi* and the younger Tortonian *C. desnoyersi turonica* Peyrot, 1903, are more pronounced than between the latter species and the living *C. desnoyersi lamarcki.* The Aquitanian *C. desnoyersi* has a larger, more ponderous shell, the spire is more elongate, the depression at the suture of the body whorl deeper, the axial ribs are larger, fewer and wider spaced, and the spiral striae cover the whole surface as in *C. owenii* (Gray in Griffith & Pidgeon). The subspecies of *C. desnoyersi* from Upper Miocene deposits of Pontlevoy, Touraine, St. Jean-de-Marsac (Tournouer, 1875, pl. 15, figs. 4, 4a) and the Vienna Basin (Hörnes, 1856, pl. 12, figs. 19a, b) resemble the living West African *C. desnoyersi lamarcki* more closely. The spire has become more depressed, spiral striae are less prominent and the "stromboid notch" on the outer lip has weakened. The proposed division of *C. desnoyersi* into subspecies is as follows:

C. desnoyersi desnoyersi (Basterot, 1825). Aquitanian to Burdigalian, L. Miocene of Europe.

C. desnoyersi turonica Peyrot, 1903. Helvetian to Tortonian, U. Miocene of Europe and tentatively from the Plaisancian, L. Pliocene of Italy.

C. desnoyersi lamarcki nom. n. Recent, West Africa.

ADDITIONAL WEST AMERICAN RECORD

Nassarius corpulentus (C. B. Adams, 1852) (Fig. 93)

1852. *Nassa corpulenta* C. B. Adams, Ann. Lyc. Nat. Hist. New York 5: 284; 1956 Turner, Occ. Papers Moll. Harv. Univ. 2 (20): 44, pl. 5, fig. 3 (figd. lectotype).

1853. *Nassa polygonata* Reeve, Conch. Icon. 8: pl. 18, fig. 123 (*non Buccinum polygonatum* Lamarck, 1882 = *Nassarius*).

1880. *Nassa rufolineata* Marrat, Var. shells gen. *Nassa,* p. 31 (*nom. subst. pro N. polygonata* Reeve, 1853, pl. 18, fig. 123); 1940 Tomlin, Proc. Malac. Soc. Lond. 24: 38.

1971. *Nassarius corpulentus* (C. B. Adams), Keen, Sea shells trop. W. America, ed. 2: 606, fig. 1295.

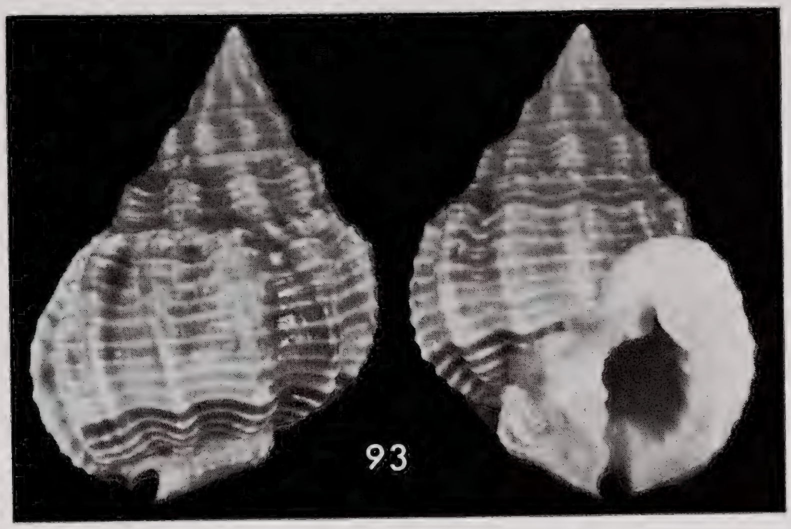


Fig. 93. *Nassarius corpulentus* (C. B. Adams). Syntype of *N. polygonatus* (Reeve) and *N. rufolineatus* (Marrat), BMNH; length 21.7 mm.

DISTRIBUTION. Mexico to Ecuador.

TYPE SPECIMENS AND TYPE LOCALITIES

N. polygonata and *N. rufolineata*. Three syntypes in the B.M.N.H.; illustrated syntype 21.7 × 15.9 × 12.8 mm. Shell light brown in colour with a broad whitish band on body whorl, some axial ribs white, basal band on body whorl composed of brown lines between spiral cords. Sculptured with 9 axial ribs and 7 spiral cords on the penultimate and 9 ribs and 15 cords on the body whorl, fossa deep, siphonal fasciole with 6 oblique cords, outer lip with 7 denticles, columella with 2 basal folds and smaller nodules posteriorly. One other syntype has a very weak, almost obsolete spiral sculpture on the body whorl and closely resembles *Nassarius shaskyi* McLean, 1970. Isle of Camiguing, Philippines, sandy mud, 30 fathoms (55 m) = error.

N. corpulenta. Lectotype in MCZ No. 186352. Panama.

Acknowledgements. I would like to record my appreciation to the Curators and Museum staff who permitted access to type-collections in their respective care or facilitated the loan of type material of Nassariidae pertaining to this paper. My thanks are due to Dr J. Taylor, Mr J. Peake, Mr P. Nuttall and Ms K. Way, British Museum (Nat. Hist.), London; Dr J. R. A. Gray and Ms N. McMillan, Merseyside County Museums, Liverpool; Dr R. Kilias, Zoological Museum, Humboldt University, Berlin; Dr H. A. Rehder, Smithsonian Institution, National Museum of Natural History, Washington; and Mr B. F. Kensley, South African Museum, Cape Town. I am grateful to Prof. Dr W. Adam, Institut Royal des Sciences Naturelles de Belgique, Brussels and Dr M. Keen, Stanford University, California, for their invaluable comments and discussions regarding the synonymy of West African and West American Nassariidae respectively. A monetary grant towards the cost of illustrations received from members of the San Diego Shell Club, California, is gratefully acknowledged. I would like to thank the following members: Ms W. Ames; Mr and Mrs W. Barber; Mr and Mrs H. Bradner; Mr and Mrs F. Bratcher; Mr and Mrs D. Dillworth; Ms M. Dippel; Mr B. Draper; Ms B. Good; Mr and Mrs E. Haigh; Drs G. and L. Lindegren and Mr and Mrs B. Purdy.

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SUPPLEMENTARY NOTES ON THE TAXONOMY OF BUCCINID SPECIES OF THE SUBFAMILY PISANIINAE (MOLLUSCA : GASTROPODA)

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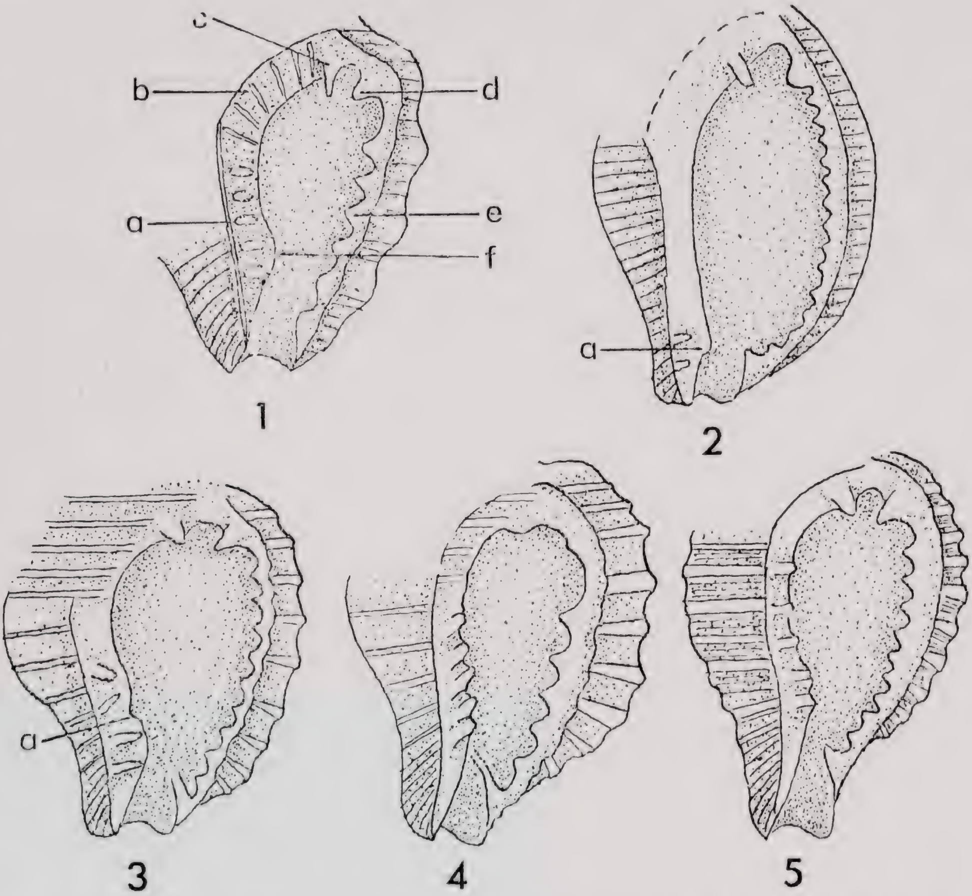
Abstract. The systematics of species of the genus-groups *Engina, Pisania, Jeannea, Caducifer, Monostiolum, Pollia, Prodotia, Enginella, Zeapollia* and *Clivipollia* are discussed. *Cantharus (Prodotia) iostomus* (Gray in Griffith & Pidgeon, 1834), is considered to be the earliest name applicable to the species previously known under the homonymous names *Buccinum marmoratum* Reeve, 1846, and *B. gracile* Reeve, 1846. The West American species *Engina fusiformis* Stearns, 1894, is found to be a primary homonym of *E. fusiformis* Pease, 1865, and will have to be replaced by its junior synonym *E. solida* Dall, 1917. *Ricinula siderea* Reeve, 1846, the type-species of the muricid genus *Drupella* Thiele, is shown to be a buccinid *Engina* species. *Triton tessellatus* Reeve, 1844, described from the Philippines, appears to be a finely sculptured variant of the Caribbean *Caducifer (Monostiolum) swifti* (Tryon, 1881), while 3 species usually placed in the buccinid genus *Engina* actually belong to the muricid genus *Morula* Schumacher. The identity of the majority of species discussed, is elucidated on the basis of their type-specimens.

Recent papers dealing with species of Pisaniinae are those by Cernohorsky (1971), Ponder (1972) and Cernohorsky (1974 — synonymy of *Engina contracta* Reeve). From studies of the radulae of Buccinidae it has become evident that due to its high variability in features of length and numbers of cusps on the lateral teeth, not only within species of a subfamily or genus but within individual specimens of a species, the radula is not particularly suited as a diagnostic tool below the family level. The denticulate cutting edge of the inward facing cusp of the lateral tooth was thought to be a feature peculiar to *Cantharus, Pollia* and *Clivipollia*. This denticulate cutting edge has made its appearance in a Queensland specimen of *Pisania ignea* (Gmelin) examined by Ponder (1972, fig. 2) and has also been found to occur in *Engina australis* (Pease) (Hedley, 1917, pl. 50, fig. 30). Specimens of *Pisania ignea* from Fiji (Cernohorsky, 1971, fig. 20) and from Japan (Habe & Kosuge, 1967, p. 79, bottom figure) have a radula with a smooth cutting edge and the lateral tooth is decidedly *Engina*-like. *Cantharus (Pollia) proteus* (Reeve, an unquestionable *Pollia* species, also lacks the cantharid-like denticles on the cutting edge of the lateral tooth (Habe & Kosuge, *op. cit.*, p. 79, top figure). *Caducifer truncatus* (Hinds) has a *Pisania*-like radula (Cernohorsky, *op. cit.*, fig. 27), that of *Engina resta* (Iredale) has a long outer cusp of the lateral as in *Engina* but a denticulate inner cusp as in *Cantharus* (Ponder, *op. cit.*, fig. 11). The radula of *Cantharus (Prodotia) iostomus* (Gray in Griffith & Pidgeon) from Papua New Guinea (Ponder, *op. cit.*, fig. 5 — as *marmorata* Reeve) is *Engina*-like while a specimen from Fiji (Cernohorsky, *op. cit.*, fig. 21) is of the *Pisania* type. It is clear that radulae of buccinid species not only vary within populations and individuals, but some of the radular variation may also be due to sexual dimorphism similarly to that of *Pisania luctuosa* (Tapparone-Canefri) (Cernohorsky, *op. cit.*).

Within the *Pisania* group, a generic and subgeneric allocation will therefore largely depend on shell-morphology, particularly features of the aperture, i.e. the formation of the columella callus and denticulation.

In the Pisaniinae, 3 basic types of apertural features are found:

1. *Engina* (Fig. 1). Columella with 1 parietal denticle, a spreading callus near the parietal area in adult individuals which is sculptured with 4-7 radially placed, raised lirae (Fig. 1-b), lower half of columella with 3-7 denticles which are more or less positioned horizontally. Outer lip with an anal denticle and 5-8 additional denticles; in more rotund species of *Engina*, the posterior 1-2 denticles are sometimes larger and fused. The interior ledge of the columella (Fig. 1-f) is prominently or moderately swollen and projecting and is either smooth or centrally grooved as in some Columbellidae. The anal canal is distinct and excavated into the callus. The radially oriented lirae are found only in species of *Engina*.



Figs. 1-5. Apertural features. 1. *Engina* (a. Lower columellar denticles. b. Radial lirae on parietal callus. c. Parietal denticle. d. Anal denticle. e. Outer lip denticles. f. Swelling on interior ledge of columella). 2. *Pisania* (a. Columellar terminal denticle or projection). 3. *Pollia* (a. Groove posterior to columellar projection). 4. *Clivipollia*. 5. *Prodotia*.

2. *Pisania* (Fig. 2). Columella regularly concave, parietal wall smooth and with a denticle near the anal canal, lower half of columella either completely smooth or with half a dozen denticles as in *P. striata* (Gmelin) or *P. pusio* (Linnaeus). Adult specimens with a raised, almost vertical calloused columella ledge which terminates on reaching the smooth, thinly glazed or weakly calloused parietal wall. The interior ledge of the columella lacks the swelling of *Engina* and the protrusion of *Cantharus* and is replaced by only a slightly projecting terminal denticle (Fig. 2-a). Outer lip with small, distinct and numerous denticles which become lirate within the aperture, anal notch distinct. In the subgenus *Jeannea* and the species *Pisania ignea* (Gmelin), the denticles on the outer lip are rather feeble. The apertural features of *Pisania* are shared by *Jeannea* Iredale, *Caducifer* Dall and *Monostiolum* Dall.

3. *Cantharus* (Fig. 3). Columella concave but projecting anteriorly, calloused, callus usually thinned on the parietal wall where the intruding spiral sculpture of the body whorl is usually visible, columella sculptured with a few or more numerous denticles. Anal canal distinct and flanked by a parietal and anal denticle, outer lip with 7-15 denticles which usually extend partly into the aperture. The anterior inner ledge of the columella is convex and projecting and is preceded by a prominent or shallow oblique groove (Fig. 3-a). *Cantharus* and *Pollia* share the same apertural features, but *Pollia* species lack the angulate, shouldered whorls of *Cantharus*.

a. *Clivipollia* (Fig. 4). Essentially similar to *Pollia*, but the apertural opening is constricted due to the development of larger but fewer denticles. The outer lip has only 5-6 rather large denticles, with the last anterior denticle usually prominent and angulate and extending deep into the aperture thus rendering the siphonal canal deeply excavated. The interior ledge of the columella has the preceding anterior groove broader and deeper than in *Cantharus* or *Pollia* and the anal canal is shallower.

b. *Prodotia* (Fig. 5). The apertural features are similar to *Cantharus-Pollia* but due to the more fusiform shape of the shell the aperture is narrower and the parietal callus is entire and smooth in adult individuals and effectively covers the underlying horizontal sculpture seen in *Cantharus, Pollia* and *Clivipollia*. The columella has up to half a dozen denticles, the anal canal is bordered by a parietal and anal denticle and the outer lip has 8-11 denticles some of which extend as lirae into the aperture. The groove preceding the projection on the interior ledge of the columella is also present but is shallower than in *Cantharus*.

In the New Zealand Miocene *Zeapollia* Finlay, the apertural features are similar to those of *Cantharus-Pollia*, with 2-3 cords of the spiral sculpture of the body whorl intruding onto the parietal wall, and the outer lip has only 5-6 denticles. In the Caribbean Miocene *Trachypollia* Woodring, the columella callus is entire as in *Prodotia*, the anterior columellar projection is present and the outer lip has only 5 denticles. *Trachypollia sclera* Woodring, 1928, from the Jamaican Miocene and *T. aneureta* Woodring, 1964, from the Gatun formation of Panama, lack the sculpture of radially oriented raised lirae on the parietal wall and cannot therefore be admitted as members of *Engina* as suggested by Ponder (1972).

Family BUCCINIDAE Rafinesque, 1815

Subfamily PISANIINAE Gray, 1857

1857. Pisaniana Gray, Guide Syst. Distr. Moll. Brit. Mus. Pt. 1: 13.

The subfamily name has been credited to Tryon, 1881 (Cernohorsky, 1971 and Abbott, 1974) but Gray (1857) was actually the first author to utilise the subfamily taxon Pisaniinae (*ex*-Pisaniana). Cominellinae (*ex*-Cominellina) and Photinae (*ex*-Phosina) were also already established by Gray (*op. cit.*) in the same publication, and since both are considered synonyms, Photinae Gray, 1857, is here selected as the subfamily name in preference to Cominellinae Gray, 1957, under the "first reviser" rule (Art. 24 (a) of I.C.Z.N.).

Genus **Engina** Gray, 1839

Engina Gray, 1839, Zool. Capt. Beechey's Voy. "Blossom", p. 112. Type species by SD (Gray, 1847) *E. zonata* Gray, 1839 = *Purpura turbinella* Kiener, 1836. Recent, Caribbean.

1847. *Enzina* Gray, Proc. Zool. Soc. Lond. p. 133 *(nom. null.)*

1940. *Enzinopsis* Iredale, Aust. Zoologist 9: 434. Type species by OD *E. gannita* Hedley, 1915 = *Ricinula contracta* Reeve, 1846. Recent, Indo-Pacific.

Ovate, biconic species of *Engina* appear at first glance readily separable from the more slender, fusiform species with a more produced siphonal canal such as *E. contracta* (Reeve) and *E. obliquicostata* (Reeve). However, the whole series of *Engina* species gradually merge into representative species of both forms and stout, ovate forms and taller, fusiform forms occur within a single species (see Keen, 1971, fig. 1124, as *E. fusiformis* = *E. solida*). *Enzinopsis* has been synonymised with *Engina* by Ponder (1972) who also remarked on the artificial separation of the two genus-groups.

Engina species are sculptured with axial and spiral cords and always have a secondary spiral sculpture of fine intermediate striae. The apertural form and sculpture (Fig .1) of radially oriented lirae is unique to *Engina*. *Engina* species live in the Caribbean, the west coast of America and the Indo-Pacific (including S.E. Australia and Sth. Africa).

Engina lineata (Reeve, 1846) (Fig. 6)

1846. *Ricinula lineata* Reeve, Conch. Icon. 3: pl. 6, fig. 51.

1869. *Ricinula lineata* var. *maculata* Pease, Amer. J. Conch. 5: 76, pl. 8, fig. 12 (Apaian I = Abaiang I, Gilbert Is).

1971. *Engina lineata* (Reeve), Cernohorsky, Rec. Auckl. Inst. Mus. 8: 159, fig. 78.

TYPE LOCALITY. Island of Ticao, Philippines.

The 3 syntypes of *Ricinula lineata* Reeve are in the B.M.N.H. No. 1968463, dimensions of illustrated syntype length 13.0 mm, width 7.4 mm. The species is easily separated from *Engina zonalis* (Lamarck) by its narrower spiral bands, presence of a few additional round or crescent-shaped black spots and the colouring of the aperture, which is always white in *E. lineata* but is purplish-brown in *E. zonalis*.

Engina alveolata (Kiener, 1836) (Fig. 10)

1836. *Purpura alveolata* Kiener, Spéc. gén. icon. coq. viv. 8: 42, pl. 9, fig. 23.

1846. *Ricinula lauta* Reeve, Conch. Icon. 3: pl. 4, fig. 24 (Hab: ?).

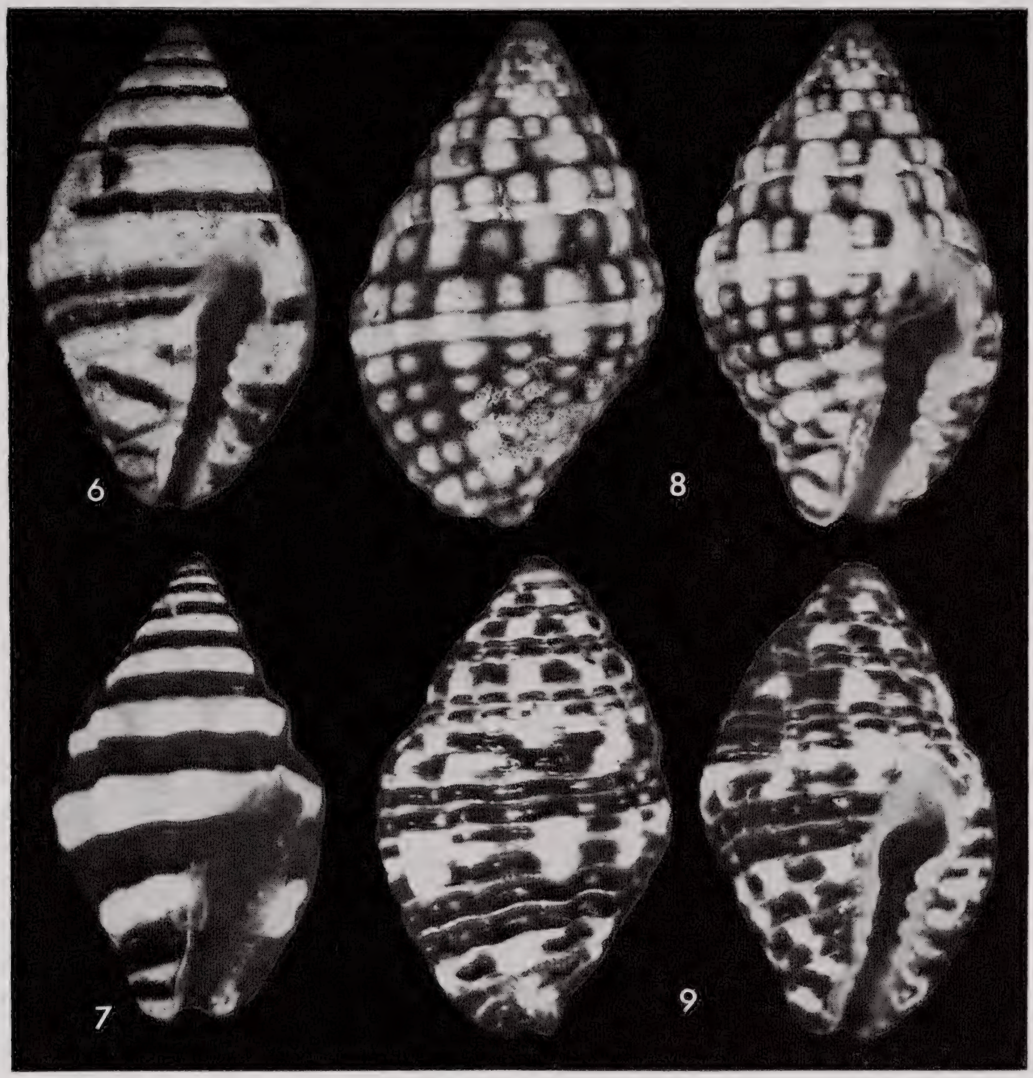
1846. *Ricinula histrio* Reeve, Conch. Icon. 3: pl. 5, fig. 36.

1865. *Engina fusiformis* Pease, Proc. Zool. Soc. Lond. p. 513 (Central Pacific); 1868 Pease, Amer. J. Conch. 3: 273, pl. 23, fig. 5 (Howland I); 1965 Kay, Bull. Brit. Mus. (Nat. Hist.) Zool. Suppl. 1: 81, pl 13, figs 15, 16 (figd. lectotype).

1883. *Engina reevei* Tryon, Man. Conch. 5: 191, pl. 62, fig. 29 (Panama to L. California = error; Australia).

1895. *Engina mundula* Melvill & Standen, J. Conch. 8: 105, pl. 2, fig. 6 (Lifu, Loyalty Is).

1971. *Engina alveolata* (Kiener), Cernohorsky, Rec. Auckl. Inst. Mus. 8: 158, fig. 39 (protoconch), fig. 65 (radula). figs. 76, 77 (shell).



Figs. 6-9. 6. *Engina lineata* (Reeve); syntype BMNH No. 1968463, 13.0 × 7.4 mm. 7. *E. zonalis* (Lamarck). Syntype of *Ricinula trifasciata* Reeve, BMNH No. 1968470, 14.5 × 7.7 mm. 8. *E .phasinola* (Duclos); specimen from the New Hebrides, 11.0 × 6.7 mm. 9. *E. zatricium* Melville; topotype from Lifu, Loyalty Is, 14.2 × 8.8 mm.

TYPE LOCALITY. None (Island of Ticao, Philippines — for *histrio* Reeve).

The 3 syntypes of *Ricinula lauta* Reeve, B.M.N.H. No. 1968478 and 4 syntypes of *R. histrio* Reeve, B.M.N.H. No. 1968467, are conspecific with *Engina alveolata* (Kiener). The lectotype of *E. fusiformis* Pease, B.M.N.H. No. 1964309, length 15.3 mm, width 8.0 mm, is also synonymous with *E. alveolata* (Fig. 10). The 3 syntypes of *Ricinula trifasciata* Reeve, 1846, from Bohol I, Philippines, B.M.N.H. No. 1968470, are not the species *E. alveolata* as suggested by Adam & Leloup (1938), but are a colour-form of *E. zonalis* (Lamarck, 1822). In *R. trifasciata* the rhomboidal spots have fused into blackish, continuous bands (Fig. 7).

The currently used taxon *Engina fusiformis* Stearns, 1894 (described as *E. carbonaria* var. *fusiformis*) from the Gulf of California and Mexico, is a primary homonym of *E. fusiformis* Pease, 1865, and must be replaced with its next available junior synonym *E. solida* Dall, 1917.

Engina phasinola (Duclos, 1840) (Fig. 8)

1840. *Columbella phasinola* Duclos, Hist. nat. coq. univ. pl. 8, figs. 13-16.
1902. *Engina phasinola* Duclos, Pace, Proc. Malac. Soc. Lond. 5: 121.
1961. *Engina phasianola (sic)* (Duclos), Habe, Col. Ill. Shells Japan 2: 61, pl. 31, fig. 2.

TYPE LOCALITY. None.

The recent collection of specimens which conform with the depicted type-figure of *Columbella phasinola,* necessitate a separation of the similar and sympatric *Engina zatricium* Melvill, 1893. *E. phasinola* has the axial ribs studded with regular round nodules, the shell is white with chocolate-brown between the nodules which themselves are white and pale orange and the aperture is reddish-brown or purplish-brown.

Engina zatricium Melvill, 1893 (Fig. 9)

1893. *Engina zatricium* Melvill, Proc. Malac. Soc. Lond. 1: 51, textfig.; 1895 Melvill & Standen, J. Conch. 8: 106, pl. 2, fig. 4.
1971. *Engina phasinola* (Duclos), Cernohorsky, Rec. Auckl. Inst. Mus. 8: 159, fig. 79; 1972 Cernohorsky, Mar. shells Pacific 2: 144, pl. 39, fig. 5 (*non Columbella phasinola* Duclos, 1840).

TYPE LOCALITY. Lifu, Loyalty Islands.

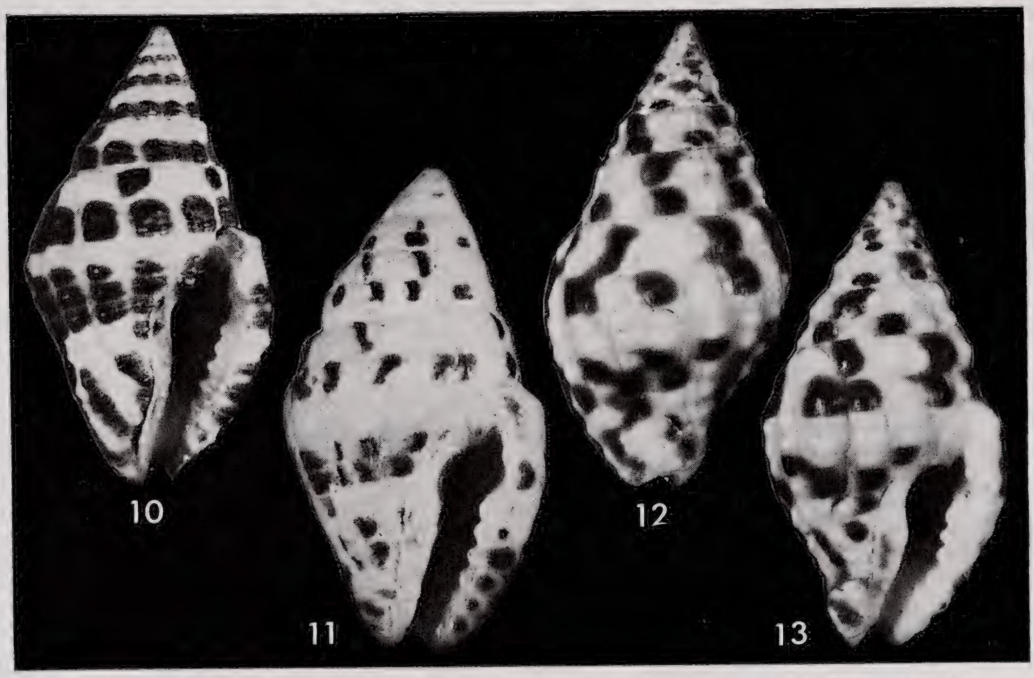
This species differs from *E. phasinola* (Duclos) in not having distinct nodules but coarse axial ribs which are overridden by nodulose spiral cords. The colour is blackish-brown with irregular, scattered white spots and the aperture is purplish-brown in fresh specimens.

Engina siderea (Reeve, 1846) (Figs. 11-14)

1846. *Ricinula siderea* Reeve, Conch. Icon. 3: pl. 3, fig. 14; 1902 Pace, Proc. Malac. Soc. Lond. 5: 135; 1970 Cernohorsky, Bull. zool. Nomencl. 26: 233.
1880. *Ricinula (Sistrum) siderea* Reeve, Tryon, Man. Conch. 2: 190, pl. 59, fig. 276.
1933. *Engina siderea* Reeve, Dautzenberg & Bouge, J. Conchyl. 77 (2): 210.

TYPE LOCALITY. Islands of Burias and Masbate, Philippines.

The taxonomy of *Ricinula siderea* (Reeve) has remained confused since the time of its description. Originally described as a *Ricinula,* a synonymous genus in the Muricidae, it has been transferred to the Columbellidae by Tryon (1880) and has been retained in that family by Cernohorsky (1970). In 1925 Thiele (1925) established the genus *Drupella* for a group of tropical Indo-Pacific *Morula*-like species, which included the species *Purpura elata* Blainville, 1832, *Ricinula spectrum* Reeve, 1846, *Sistrum ochrostoma* (Blainville, 1832) and "*Ricinula siderea* Reeve, 1846". He also illustrated the radula of the misidentified *R. siderea* which shows it to be the radula of the muricid *Drupa cornus* Roeding, 1798, but not of the real *R. siderea* Reeve. Thiele (*op. cit.*) did not designate a type-species for *Drupella* in his original publication but v. Ihering and Haas (1927) subsequently selected the misidentified "*Ricinula siderea* Reeve" as the type-species of *Drupella*. Examination of recently collected specimens of *Ricinula siderea* show that the species is actually an *Engina* and has a buccinid radula (Fig. 14). If the designation by v. Ihering and Haas (*op. cit.*) is allowed to stand then *Drupella* Thiele, 1925, would become a synonym of *Engina* Gray. A petition for the suppression of v. Ihering and Hass' type designation of "*Ricinula siderea* Reeve" has been lodged with the International Commission on Zoological Nomenclature (Cernohorsky, 1970).



Figs. 10-13. 10. *Engina alveolata* (Kiener); lectotype of *E. fusiformis* Pease, BMNH No. 1964309, 15.3 × 8.0 mm. 11-13. *E. siderea* (Reeve). 11. Syntype BMNH No. 1968474, 14.0 × 7.8 mm. 12, 13. Specimen from Nukuhiva, Marquesas Is, 13.2 × 7.0 mm.

The 3 syntypes of *Ricinula siderea* Reeve are in the B.M.N.H. No. 1968474, dimensions of illustrated syntype length 14.0 mm, width 7.8 mm. The syntypes are worn shells, but fresh specimens are creamy-white with some of the nodules brown, the penultimate whorl has 2 spiral rows of moderately large nodules and the body whorl *c.* 10, and the spaces between the nodules cary numerous, very fine spiral striae. The interior ledge of the columella is swollen and grooved, the anterior half of the columella has 5-6 denticles, the parietal wall 6 radially oriented lirae, the anal canal is bordered by a parietal and anal denticle and the outer lip has 5 prominent denticles. The aperture is porcellaneous-white. We have seen specimens from the Marquesas, Howland I, Cook Is and the Fiji Is.

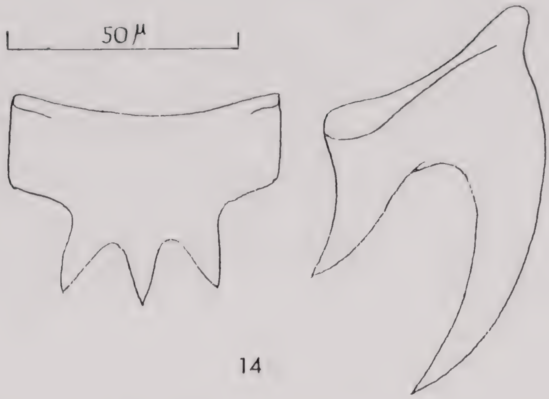


Fig. 14. Half-row of radula of *Engina siderea* (Reeve); Nukuhiva, Marquesas Is.

Engina pulchra (Reeve, 1846) (Fig. 15)

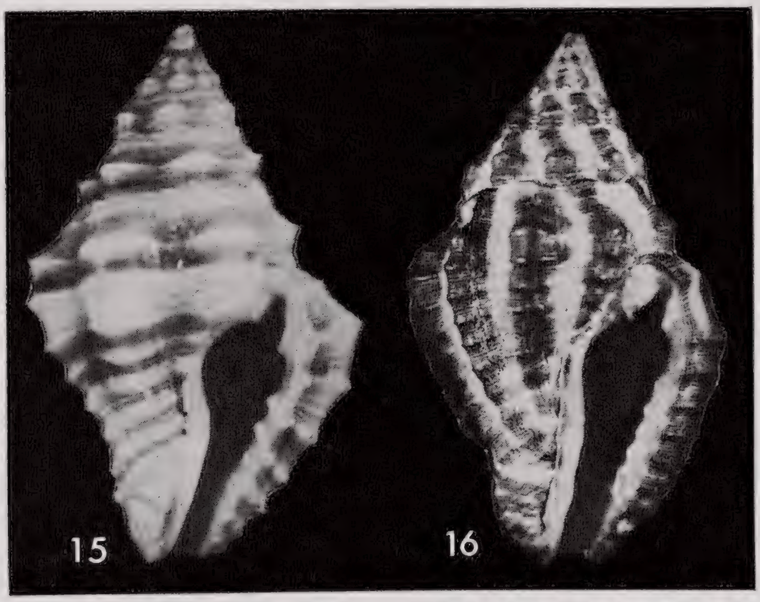
1846. *Buccinum pulchrum* Reeve, Conch. Icon. 3: pl. 11, fig. 80.

1852. *Ricinula reeviana* C. B. Adams, Ann. Lyc. Nat. Hist. New York 5: 326 (*nom. subst. pro Buccinum pulchrum* Reeve, 1846).

1883. *Engina pulchra* (Reeve), Tryon, Man. Conch. 5: 191, pl. 62, fig. 33; 1971 Keen, Sea shells trop. W. America, ed. 2: 565, textfig. 1128.

TYPE LOCALITY. Galápagos Is.

The 4 syntypes of *Buccinum pulchrum* Reeve are in the B.M.N.H. No. 1966608, dimensions of illustrated syntype length 18.0 mm, width 11.0 mm.



Figs. 15, 16. 15. *Engina pulchra* (Reeve); syntype BMNH No. 1966608, 18.0 × 11.0 mm. 16. *E. pyrostoma* (Sowerby); syntype of *Ricinula forticostata* Reeve, BMNH No. 1968479, 19.5 × 10.7 mm.

Engina pyrostoma (Sowerby, 1832) (Fig. 16)

1832. *Columbella pyrostoma* Sowerby, Proc. Zool. Soc. Lond. Pt. 2: 116.

1846. *Ricinula crocostoma* Reeve, Conch. Icon. 3: pl. 5, fig. 40 (Capul I, Philippines = error).

1846. *Ricinula forticostata* Reeve, Conch. Icon. 3: pl. 4, fig. 29 (Hab: ?).

1883. *Engina pyrostoma* (Sowerby), Tryon, Man. Conch. 5: 195; 1971 Keen, Sea shells trop. W. America ed. 2: 565, textfig. 1129.

TYPE LOCALITY. Panama and Galápagos Is.

The 3 syntypes of *Ricinula forticostata* Reeve are in the B.M.N.H. No. 1968479, dimensions of illustrated syntype length 19.5 mm, width 10.7 mm. The syntype lacks the angular outline of *Engina pyrostoma* and in shape and colour pattern resembles *E. tabogaensis* Bartsch, 1931.

Engina incarnata (Deshayes in Laborde & Linant, 1834) (Fig. 17)

1834. *Peristernia incarnata* Deshayes in Laborde & Linant, Voy. L'Arabie & Pétrée, figs. 20, 21.

1846. *Ricinula astricta* Reeve, Conch. Icon. 3: pl. 4, sp. 30 (Hab: ?).

1879. *Peristernia paulucciae:* Tapparone-Canefri, J. Conchyl. 27: 325 (Mauritius); 1880 Tapparone-Canefri, Ann. Soc. Malac. Belg. 15 (1): 71, pl. 2, figs. 14, 15 (Mauritius and Aden).

1880. *Peristernia kobeltiana* Tapparone-Canefri, Ann. Soc. Malac. Belg. 15 (1): 72, pl. 3, figs. 17, 18 (Mauritius) (*non. P. kobeltiana* T.-C., 1879).

1907. *Engina astricta* (Reeve), Schepman, Samml. geol. Reichs-Mus. Leiden (1), 8: 173 (Post-Tertiary of Celebes).

1971. *Engina incarnata* (Deshayes in L. & L.), Cernohorsky, Rec. Auckl. Inst. Mus. 8: 161, figs. 80, 81.

TYPE LOCALITY. Red Sea.

The 3 syntypes of *Ricinula astricta* Reeve are in the B.M.N.H. No. 1968480, dimensions of illustrated syntype length 16.6 mm, width 8.4 mm. For a detailed discussion on *E. incarnata* see Cernohorsky (1971).

Engina fuscolineata E. A. Smith, 1913 (Figs. 18, 19)

1913. *Engina fuscolineata* E. A. Smith, Ann. Mag. Nat. Hist. (8) 12: 413, pl. 9, fig. 1.

TYPE LOCALITY. Henderson I (= Pitcairn I group, Polynesia).

The holotype is in the B.M.N.H. No. 1913.7.28.107., length 8.9 mm, width 4.3 mm. This small species is sculptured with 15 axial ribs on the penultimate and 15 ribs on the body whorl, the axial ribs are constricted below the suture by a shallow groove and spiral sculpture consists of grooves and striae. The outer lip, apart from the bordering anal denticle, has 5 prominent denticles, the columella has 4 denticles, some radial lirae on the parietal wall and a grooved swelling on the interior ledge of the columella. It is white in colour, ornamented with brown axial streaks between axial ribs.

The species is similar to *E. siderea* (Reeve) and has the same sculpture of centrally constricted whorls which produce 2 rows of nodules on the spire whorls. The sculpture in *E. fuscolineata* is finer, the spiral striae more distinct and the blackish-brown blotches upon the nodules in *E. siderea* are replaced by blackish-brown streaks between the nodules in *E. fuscolineata*.

Engina layardi Melvill, 1895 (Fig. 20)

1895. *Engina layardi* Melvill, Proc. Malac. Soc. Lond. 1: 227, pl. 14, fig. 15.

TYPE LOCALITY. Ceylon.

The 3 syntypes are in the B.M.N.H., dimension of illustrated syntype length 10.4 mm, width 4.5 mm. The species is very similar to *E. anakisia* (Duclos, 1840), has obsolete axial ribs, 3 spiral cords on the penultimate and 16 on the body whorl, the outer lip is plicate on the edge and denticulate and the columella is lirate on the parietal wall. It is white in colour, some nodules are brown, interspaces between the outer lip plicae brown.

Engina menkeana (Dunker, 1860) (Fig. 21)

1860. *Cantharus (Pollia) menkeana* Dunker, Malakozool. Blaetter 6: 222.
1861. *Cantharus menkeanus* Dunker, Moll. Japon. p. 7, pl. 1, fig. 7.
1882. *Pollia menkeana* Dunker, Ind. Moll. Mar. Japon. p. 18.
1895. *Tritonidea (Cantharus) menkeana* Dkr., Pilsbry, Cat. Mar. Moll. Jap. p. 33.
1901. *Tritonidea submenkeana* Pilsbry, Proc. Acad. Nat. Sci. Philad. 53: 387, pl. 21, fig. 24 (Hirado, Hizen, W. Kiusiu, Japan).
1943. *Engina menkeana* (Dunker), Habe, Jap. J. Malac. 13: 70, pl. 4, fig. 6 (radula).
1961. *Enzinopsis menkeana* (Dunker), Habe, Col. Ill. shells Japan 2: 61, pl. 31, fig. 3; 1971 Kuroda & Habe, Sea shells Sagami Bay, p. 166, pl. 44, fig. 7.

TYPE LOCALITY. Decima (= Dejima, Nagasaki City, Kyushu, Japan).

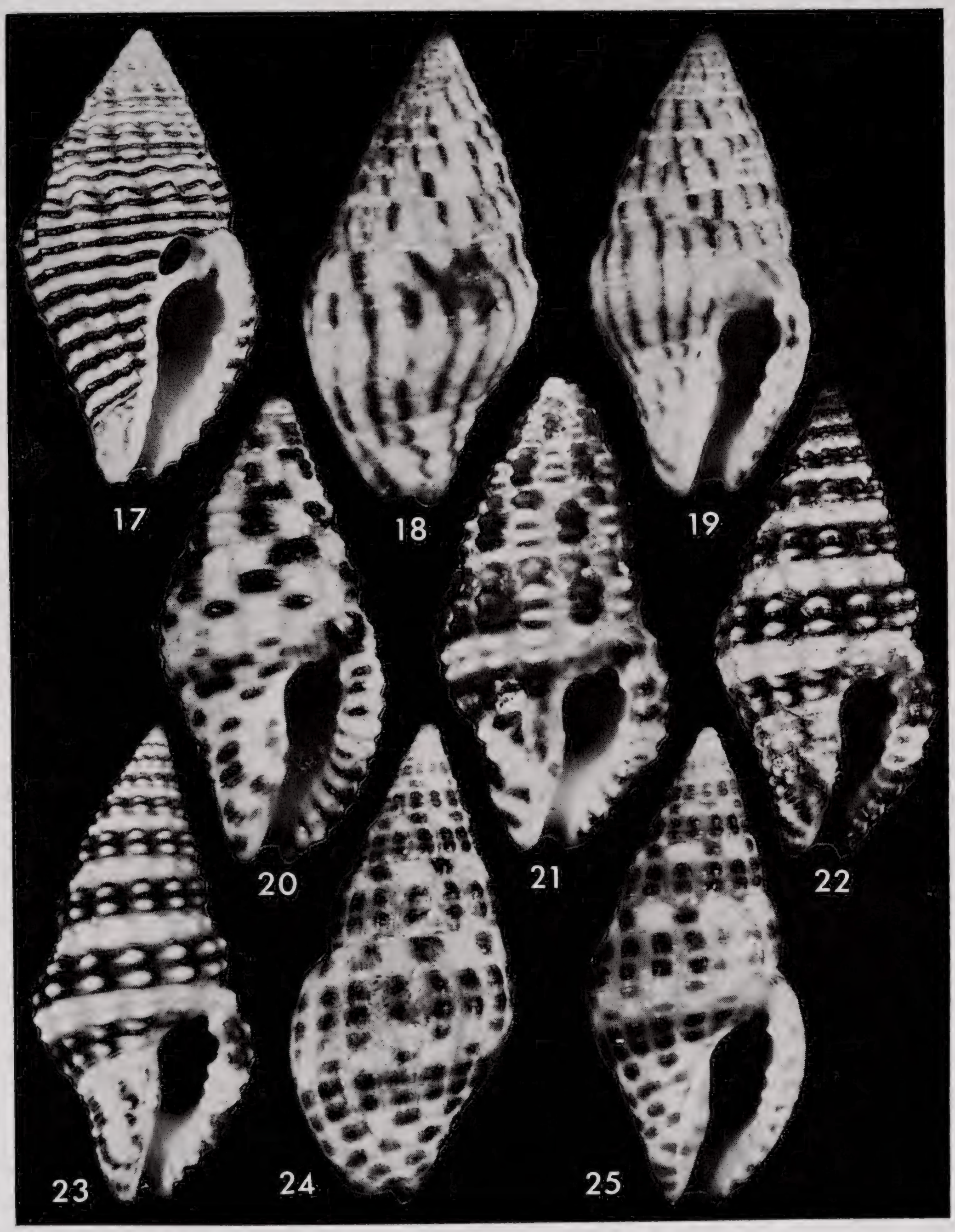
The species has a sculpture of coarse, nodulose axial ribs, 3-4 spiral rows of nodules on the penultimate and 10-11 on the body whorl, interspaces with fine spiral striae, 1 anal and 6 denticles on the outer lip, 3 denticles on the anterior of the columella, 4-6 radially placed lirae and a denticle on the parietal wall. It is white in colour, some nodules are brown, the anal canal and interspaces of denticles on the outer lip are stained with brown.

Engina concinna (Reeve, 1846) Figs. 22, 23)

1846. *Ricinula concinna* Reeve, Conch. Icon. 3: pl. 5, fig. 35.
1883. *Engina concinna* Reeve, Tryon, Man. Conch. 5: 194, pl. 63, fig. 54.

TYPE LOCALITY. Cagayan, Mindanao I, Philippines.

The 3 syntypes are in the B.M.N.H. No. 1968466, dimensions of illustrated syntype length 15.0 mm, width 6.4 mm. The species is sculptured with regular axial ribs, 4 spiral rows of laterally elongated nodules on the penultimate and 10-12 rows on the body whorl and very fine intermediate spiral striae. The outer lip has 6 prominent denticles, the columella 3-5 denticles, the parietal wall 6 radial lirae, the interior ledge a protruded swelling, and the anal canal is bordered by a parietal and anal denticle. It is white in colour, ornamented with dark brown bands which contain 2 spiral rows of white odules. The specimen illustrated from Broome, West Australia (Fig. 23) has a tilted spire due to an injury on the fifth post-embryonic whorl.



Figs. 17-25. 17. *Engina incarnata* (Deshayes in L. & L.); syntype of *Ricinula astricta* Reeve, BMNH No. 1968480, 16.6 × 8.4 mm. 18, 19. *E. fuscolineata* E. A. Smith; holotype BMNH No. 1913.7.28.107., 8.9 × 4.3 mm. 20. *E. layardi* Melvill; syntype BMNH, 10.4 × 4.5 mm. 21. *E. menkeana* (Dunker); specimen from Fukura, Japan, 11.0 × 5.2 mm. 22, 23. *E. concinna* (Reeve). 22. Syntype BMNH No. 1968466, 15.0 × 6.4 mm. 23. Specimen from Broome, W. Australia, 16.0 × 7.3 mm. 24, 25. *E. natalensis* Melvill; syntype BMNH, 11.6 x 5.3 mm.

Engina natalensis Melvill, 1895 (Figs. 24, 25)

1858. *Buccinum perlatum* Küster, Syst. Conch.-Cab. Mart. Chemnitz ed. 2, 3 (14): 61, pl. 12, figs. 5, 6 (*non* Conrad, 1833).

1895. *Engina natalensis* Melvill, Proc. Malac. Soc. Lond. 1: 226, pl. 14, fig. 12.

1903. *Engina perlata* (Küster), E. A. Smith, Proc. Malac. Soc. Lond. 5: 372; 1959 Barnard, Ann. Sth. Afric. Mus. 45 (1): 149; 1973 Kensley, Sea-shells Sth Africa p. 154, textfig. 568 (figure 560 given in error).

TYPE LOCALITY. Natal, South Africa.

The 4 syntypes of *E. natalensis* are in the B.M.N.H., dimensions of illustrated syntype (marked with an "X") length 11.6 mm, width 5.3 mm. The shell is white with reddish-brown nodules. The species is known in current South African literature as *Engina perlata,* but *Buccinum perlatum* Küster, 1858, being a primary homonym of the American fossil *B. perlatum* Conrad, 1833, will have to be substituted with *Engina natalensis* Melvill.

Engina armillata (Reeve, 1846) (Figs. 26, 27)

1846. *Ricinula armillata* Reeve, Conch. Icon. 3: pl. 6, fig. 47.

1883. *Engina armillata* Reeve, Tryon, Man. Conch. 5: 194, pl. 63, fig. 59.

1972. *Engina (Engina) armillata* (Reeve), Ponder, J. Malac. Soc. Aust. 2 (3): 256, textfig. 9 (radula).

TYPE LOCALITY. Island of Ticao, Philippines.

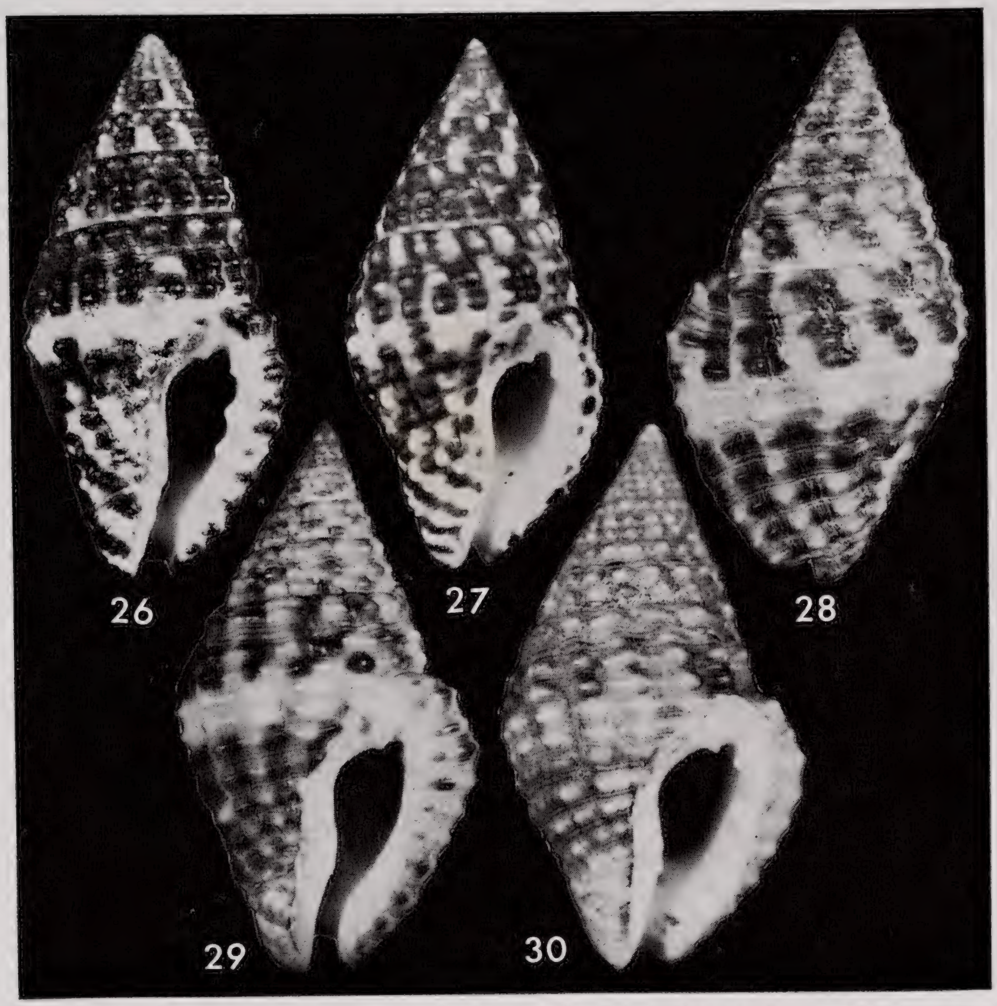
The 4 syntypes are in the B.M.N.H. No. 1968459, dimensions of illustrated syntype length 13.2 mm, width 6.5 mm. The species is dark brown in colour with a white median band on the body whorl, whitish interspaces and nodules coloured white or pale brown. Sculpture consists of 3 spiral rows of nodules on the penultimate and *c.* 12 rows on the body whorl. The interior ledge of the columella is protruding and smooth, the columella has *c.* 5 prominent denticles, 5-6 radial lirae on the parietal wall, the anal canal is bordered by a parietal and anal denticle and the outer lip is denticulate. The aperture is white.

Engina zea Melvill, 1893 (Figs. 28-30)

1893. *Engina zea* Melvill, Mem. Proc. Manch. Lit. Soc. 7: 55, fig.; 1901 Melvill & Standen, Proc. Zool. Soc. Lond. p. 416 (Karachi; Bombay; Ceylon; Aden; Persian Gulf).

TYPE LOCALITY. Bombay, India.

The holotype of *E. zea* is in the B.M.N.H. No. 1893.2.16.5., length 16.6 mm, width 9.2 mm. The species is similar in sculpture and ornamentation to *E. armillata* (Reeve), especially the pale colour-forms, but is broader and has a more solid, slightly angulate outer lip. As in *E. armillata, E. zea* has 3 spiral rows of nodules on the penultimate and 10-11 on the body whorl and the interspaces are sculptured with very fine spiral striae.



Figs. 26-30. 26, 27. *Engina armillata* (Reeve). 26. Syntype BMNH No. 1968459, 13.2 × 6.5 mm. 27. Specimen from Keppell Bay, Qld., Australia, 15.0 × 7.2 mm. 28-30. *E. zea* Melvill. 28, 29. Holotype BMNH No. 1893.2.16.5., 16.6 × 9.2 mm. 30. Specimen from Bombay, India, USNM, 16.1 × 9.0 mm.

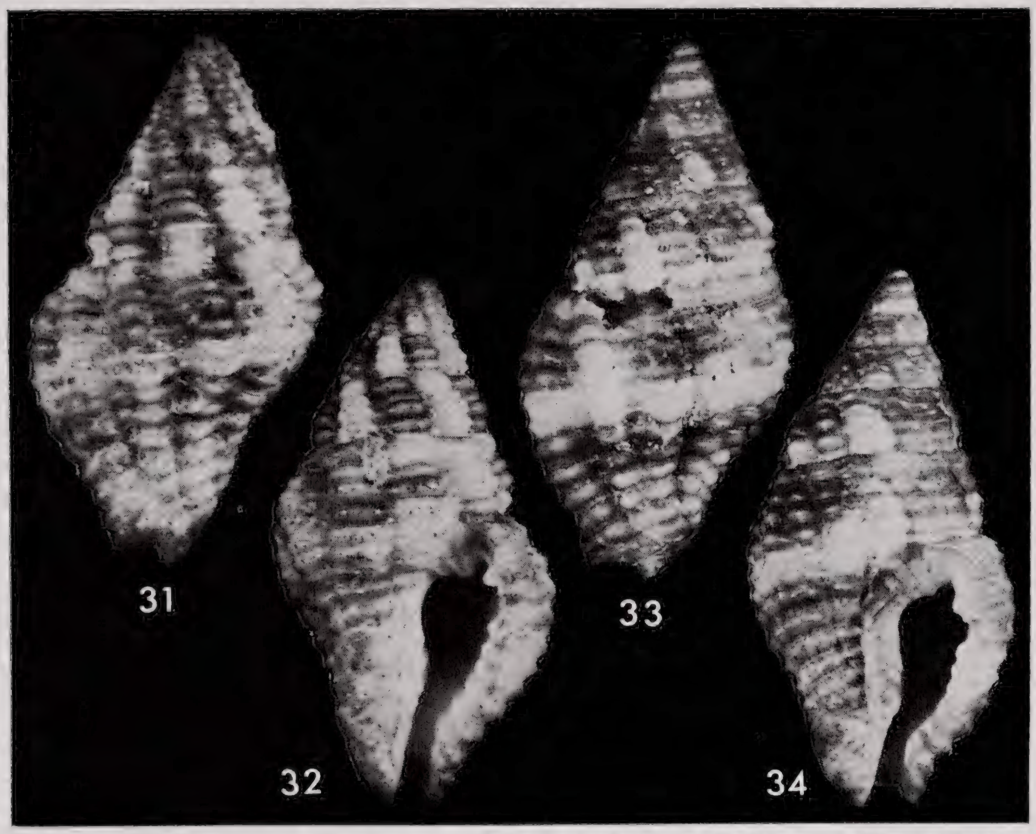
Engina curtisiana (E. A. Smith, 1884) (Figs. 31-34)

1884. *Tritonidea curtisiana* E. A. Smith, Rept. Zool. Coll. voy. H.M.S. "Alert", p. 47, pl. 5, fig E.

1895. *Engina sinensis* Melvill, Proc. Malac. Soc. Lond. 1: 227, pl. 14, fig. 14 (China Seas); 1895 Melvill & Standen, J. Conch. 8: 106, pl. 3, fig. 27 (Lifu, Loyalty Is); 1911 Schepman, Siboga-Exped. 49d: 307 (Indonesia, 9-45 m); 1942 Yen, Proc. Malac. Soc. Lond. 24: 229, pl. 23, fig. 159 (figd. syntype).

TYPE LOCALITY. Port Curtis, Queensland, Australia, 1-11 fathoms (2-20 m).

The holotype of *Tritonidea curtisiana* E. A. Smith is in the B.M.N.H. No. 1881.11.10.136., length 13.7 mm, width 7.3 mm. The 2 syntypes of *Engina sinensis* Melvill, B.M.N.H., dimensions of illustrated syntype length 11.0 mm, width 5.4 mm, are the same specis as *E. curtisiana*. The species is sculptured with coarse axial ribs which number from 9-13 on the penultimate and from 8-10 on the body whorl; spiral cords, which produce laterally elongated nodules, encircle the shell and number 4 on the penultimate and 13-15 on the body whorl. The outer lip has 6 distinct denticles, the columella has 4-5 denticles and *c.* 6 radial lirae on the parietal wall and the anal canal is bordered by a parietal and anal denticle. It is reddish-brown in colour, ornamented with a white median band on the body whorl, with the occasional axial ribs also white.



Figs. 31-34. *Engina curtisiana* (E. A. Smith). 31, 32. Holotype BMNH No. 1881.11.10.136., 13.7 ×7 .3 mm. 33, 34. Syntype of *E. sinensis* Melvill, BMNH, 11.0 × 5.4 mm.

Engina lanceolata (Kuroda & Habe, 1971) from Japan is rather similar to *E. curtisiana* in sculpture, form and colour-pattern.

Engina obliquicostata (Reeve, 1846) (Figs. 35-38)

1846. *Buccinum obliquicostatum* Reeve, Conch. Icon. 3: pl. 12, fig. 91.

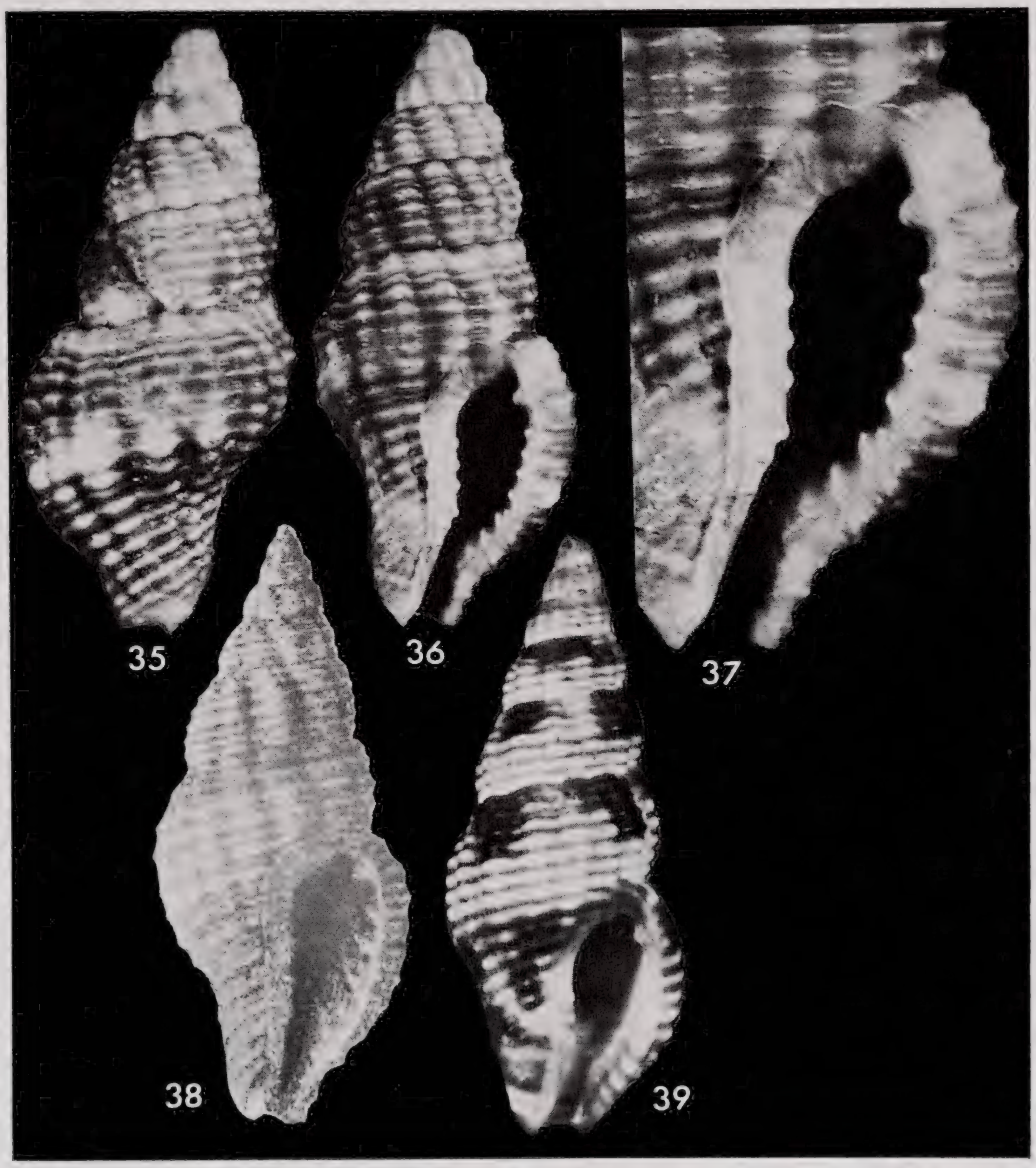
1880. *Tritonidea obliquecostata (sic)* Reeve, Tapparone-Canefri, Ann. Soc. Malac. Belg. 15 (1): 64.

1880. ? *Tritonidea proxima* Tapparone-Canefri, Ann. Soc. Malac. Belg. 15 (1): 64, pl. 3, figs. 9, 10 (Mauritius).

1881. *Cantharus obliquecostatus (sic)* Reeve, Tryon, Man. Conch. 3: 161, pl. 74, figs. 277, 278.

TYPE LOCALITY. Island of Ticao, Philippines.

The holotype of *B. obliquicostatum* is in the B.M.N.H., length 14.6 mm, width 6.2 mm. The species is sculptured with moderately broad, oblique axial ribs which number 13 on the penultimate and 10 on the body whorl and prominent nodulose spiral cords which number from 6-7 on the penultimate and *c*. 20 on the body whorl. The outer lip is thickened and has 7 distinct denticles and a larger anal denticle, columella is calloused, anteriorly with 4-6 denticles and 6 radial lirae on the parietal wall. It is reddish-brown in colour with a white median band on the body whorl and whitish sutures and nodules.



Figs. 35-39. 35-38. *Engina obliquicostata* (Reeve). 35, 36. Holotype BMNH, 14.6 × 6.2 mm. 37. Aperture enlarged. 38. Type-figure of *Tritonidea proxima* Tapparone-Canefri, 13.0 mm (from T.-C. 1880, pl. 3, fig. 9). 39. *Engina australis* (Pease); specimen from Sydney, N.S.W., Australia, 14.4 × 5.3 mm.

The species is a typical fusiform *Engina* with a distinctly lirate parietal callus. The species *Pisania (Prodotia) obliquicostata* Ponder, 1972, is the species *Cantharus (Prodotia) iostomus* (Gray in Griffith & Pidgeon).

Engina australis (Pease, 1871) (Fig. 39)

1867. *Cantharus (Tritonidea) assimilis* Angas, Proc. Zool. Soc. Lond. p. 187 (*non Buccinum assimile* Reeve, 1846 = *Cantharus (Pollia)*).

1871. *Tritonidea australis* Pease, Amer. J. Conch. 7 (1): 21 (*nom. subst. pro Cantharus (Tritonidea) assimilis* Angas, 1867).

1881. *Cantharus australis* Pease, Tryon, Man. Conch. 3: 161, pl. 73, fig. 269.

1882. *Pollia australis* Pease, Kobelt, Jahrb. deut. Malak. Gesell. 9 (1): 21.

1917. *Maculotriton australis* Pease, Hedley, Proc. Linn. Soc. N.S.W. 41 (4): 711, pl. 50, figs. 28-30 (animal. operculum and radula); 1962 Macpherson & Gabriel, Mar. Moll. Victoria p. 176, fig. 211.

1972. *Engina (Engina) australis* (Pease), Ponder, J. Malac. Soc. Aust. 2 (3): 250, pl. 24, figs. 1, 2, textfig. 12 (radula), figs. 15, 16, 24 (protoconch and operculum).

TYPE LOCALITY. Watson Bay, New South Wales, Australia.

A description of the species has been given by Ponder (1972). Hedley's (1917) illustration of the radula shows an *Engina*-like lateral with a long, slender outer cusp, but the cutting edge of the inward-facing inner cusp is denticulate as in *Cantharus*.

Couturier (1907) and Dautzenberg & Bouge (1933) report the species from the Gambier Is, Polynesia. A misidentification is suspected since *E. australis* occurs only in S.E. Australia.

Engina farinosa (Gould, 1850) (Figs. 40-42)

1850. *Buccinum (Pollia) farinosum* Gould, Proc. Bost. Soc. Nat. Hist. 3: 152; 1852 Gould. U.S. Expl. Exped. 12: 255, pl. 19, figs. 323, 323a; 1964 Johnson, U.S. Nat. Mus. Bull. 239: 75.

1860. *Hindsia angicostata* Pease, Proc. Zool. Soc. Lond. p. 142 (Sandwich Is = Hawaiian Is); 1965 Kay, Bull. Brit. Mus. (Nat. Hist.) Zool. Suppl 1: 16, pl 1, figs. 15, 16 (figd. lectotype).

1868. *Nassaria farinosa* Gould, Pease, Amer. J. Conch. 4 (3): 109 (*Hindsia angicostata* placed in synonymy).

1883. *Engina farinosa* Gould, Tryon, Man. Conch. 5: 192, pl. 62, fig. 40.

TYPE LOCALITY. Kauai, Sandwich Is = Hawaiian Is.

The holotype of *B. farinosum* Gould is in the National Museum of Natural History, Washington, No. USNM 5719, length 15.0 mm, width 8.0 mm. The species is cream or very light brown in colour, ornamented with brown in the interspaces of the spiral threads upon the axial ribs. The sculpture consists of broad axial ribs, sharp and thin spiral cords and fine striae in the interspaces. The outer lip has 5 denticles in addition to the anal denticle, the anterior half of the columella is noduled and the expanding parietal callus is plicate.

Engina egregia (Reeve, 1844) (Fig. 43)

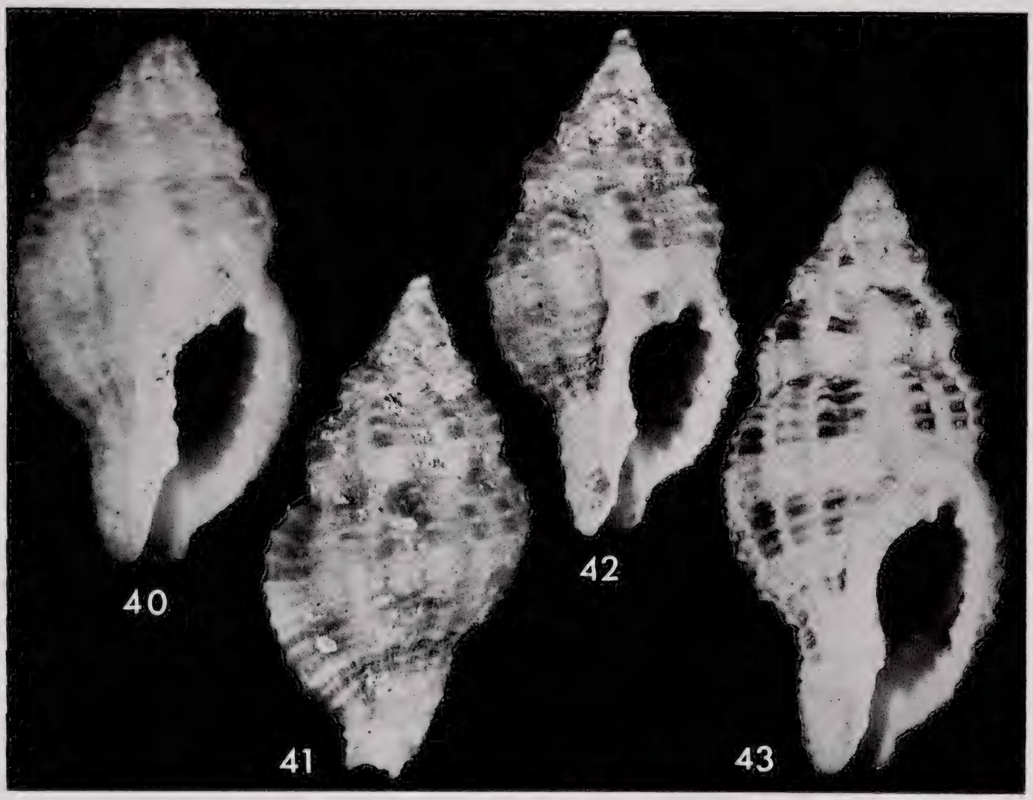
1844. *Triton egregius* Reeve, Conch. Icon. 2: pl. 18, fig. 78.

1881. *Nassaria egregia* Tryon, Man. Conch. 3: 222, pl. 84, fig. 553.

1907. *Tritonidea egregia* Reeve, Schepman, Samml. geol. Reichs-Mus. Leiden (1), 8: 173 (Post-Tertiary of Celebes).

1950. *Phos amoenus* Schwengel, Nautilus, 63 (3): 81, pl. 5, fig. 4 (Mbega I = Beqa I, Fiji Is).

TYPE LOCALITY. Island of Masbate, Philippines.



Figs. 40-43. 40-42. *Engina farinosa* (Gould). 40. Holotype USNM No. 5719, 15.0 × 8.0 mm. 41, 42. Specimen from the Hawaiian Is, USNM, 14.7 × 7.4 mm. 43. *Engina egregia* (Reeve); syntype BMNH No. 1967643, 17.2 × 8.0 mm.

The 3 syntypes are in the B.M.N.H. No. 1967643, dimensions of illustrated syntype length 17.2 mm, width 8.0 mm. The shell is sculptured with 12 axial ribs and 8 sharp cords on the penultimate and 11 ribs and 16 cords on the body whorl. The columella has 10 plicae and 12 denticles are on the outer lip. It is creamy-white in colour, ornamented with reddish-brown lines on and between the ribs.

Engina farinosa and *E. egregia* show a marked departure in shell-form from typical *Engina* but the apertural features conform to those of *Engina*. The West American *Buccinum cinis* Reeve, 1846, may possibly belong in the same group as *E. farinosa* and *E. egregia*.

Genus **Pisania** Bivona, 1832

Pisania Bivona, 1832, Effem. Sci. Lett. Sicil. Palermo 2: 8. Type species (Opinion 740 of I.C.Z.N.) *P. striatula* Bivona, 1832 = *Voluta striata* Gmelin, 1791. Recent, Mediterranean.

1832. *Proboscidea* Schmidt in Moeller, Isis, col. 131. Type species by M *P. ignea* = *Buccinum igneum* Gmelin, 1791 (non Bruguière, 1791; nec Spix, 1824). Recent, Indo-Pacific.

1848. *Ecmanis* Gistl, Nat. Thierr. Schulen, p. 10. Type species (art. 67 (i) of I.C.Z.N.) *Buccinum igneum* Gmelin, 1791 (*nom. subst. pro Proboscidea* Schmidt in Moeller, 1832).

1850. *Polliana* E. M. Gray, Figs. Moll. Anim. 5: 67 (equated with *Pisania* Bivona).

1904. *Taeniola* Dall, Smiths. Misc. coll. 47: 137. Type species by OD *Triton decollatus* Sowerby, 1833 (*non* Pallas, 1760). Recent, Pacific.

1929. *Appisania* Thiele, Handb. syst. Weicht. p. 314. Type species by M *Metula (Appisania) montrouzieri* Crosse, 1862 = *Buccinum facsiculatum* Reeve, 1846. Recent, Indo-Pacific.

1966. *Sukunaia* Cernohorsky, Veliger, (9) (2): 229. Type species by OD *S. jenningsi* Cernohorsky, 1966. Recent, Pacific.

The thin, more fragile shell, wider aperture and obsolete denticles on the outer lip are in themselves of insufficient diagnostic value to retain the monotypic genus *Ecmanis* Gistl as a valid subgeneric group, and in agreement with Ponder (1972) *Ecmanis* is synonymised with *Pisania* Bivona. Ponder (*op. cit.*) suggested that *Taeniola* Dall, 1904, could hold subgeneric rank, but all the differentiating characters listed by Ponder (*op. cit.*) are also present in species of *Pisania*. *Taeniola* Dall is unavailable, being a primary homonym of *Taeniola* Pallas, 1760.

Pisania (Pisania) fasciculata (Reeve, 1846) (Fig. 44)

1846. *Buccinum fasciculatum* Reeve, Conch. Icon. 3: pl. 10, fig. 76.

1855. *Pisania crenilabrum* A. Adams, Proc. Zool. Soc. Lond. for 1854, Pt. 22: 138 (West Indies = error); 1971 Cernohorsky, Rec. Auckl. Inst. Mus. 8: 138, figs. 3-9, 18, 30 (figd. lectotype).

1862. *Pisania montrouzieri* Crosse, J. Conchyl. 10: 251, pl. 10, fig. 5 (New Caledonia).

1901. *Pisania delicatula* Sowerby, J. Malac. 8: 101, pl. 9, fig. 2 (Bird I, Pacific).

1968. *Appisania sugimotoi* Habe, Jap. J. Malac. 27 (3): 85, textfig. 1 (Okinoshima, near Cape Ashizuri, Shikoku, Japan).

1972. *Pisania (Pisania) fasciculata* (Reeve), Ponder, J. Malac. Soc. Aust. 2 (3): 261, pl. 25, fig. 2, textfigs. 4, 20, 21.

TYPE LOCALITY. Island of Mindanao, Philippines.

It was pointed out (Cernohorsky, 1971) that intergrading specimens connecting *P. fasciculata* with *P. crenilabrum* have been observed from Tonga, Fiji and N.E. Australia. Ponder (1972) observed the same variation and also suggested that *P. delicatula* Sowerby, 1901, from Bird I, Pacific, is synonymous with *P. fasciculata*. Examination of the holotype of *P. delicatula*, B.M.N.H. No. 1902.5.28.20, length 16.4 mm, width 6.3 mm, shows the species to be a worn, faded and immature specimen of *P. fasciculata*. The label accompanying the holotype reads "Bird I, Coral Sea".

Pisania (Pisania) hermannseni A. Adams, 1855 (Figs. 45, 46)

1855. *Pisania (Pisania) hermannseni* A. Adams, Proc. Zool. Soc. Lond. for 1854, Pt. 22: 138, pl. 28, fig. 7; 1881 Tryon, Man. Conch. 3: 146, pl. 71, fig. 199; 1942 Yen, Proc. Malac. Soc. Lond. 24: 230, pl. 23, fig. 161 (figd holotype).

TYPE LOCALITY. China.

The holotype is in the B.M.N.H. No. 1967930, dimensions length 38.6 mm, width 15.5 mm. The shell is worn smooth apart from 12 spiral cords on the lower third of the body whorl, the columella is smooth and the outer lip is prominently denticulate. The shell has obviously faded since the original illustration was published and is now yellowish-white with traces of a brown pattern. The present author has seen no report of recently collected specimens of this species.

Pisania (Pisania) lirocincta Sowerby, 1910 (Fig. 47)

1910. *Pisania lirocincta* Sowerby, Proc. Malac. Soc. Lond. 9: 65, textfig.

TYPE LOCALITY. None.

The holotype is in the B.M.N.H. No. 1910.9.30.10., length 33.7 mm, width 15.2 mm. The early whorls are clathrate, penultimate whorl with 6 strong cords, body whorl with 17 cords, columella smooth apart from a parietal and a terminal denticle, outer lip denticulate and lirate. It is creamy-yellow in colour, streaked and blotched with brown.

The species is similar in form to *Pisania ignea* (Gmelin, 1791) and *P. tritonoides* (Reeve, 1846), but differs from both in features of strong spiral cords. No recent shells of the species have been seen and the species apparently remains unlocalised.

Subgenus **Jeannea** Iredale, 1912

Jeannea Iredale, 1912, Proc. Malac. Soc. Lond. 10: 220. Type species by OD *J. hedleyi* Iredale, 1912. Recent, S.W. Pacific.

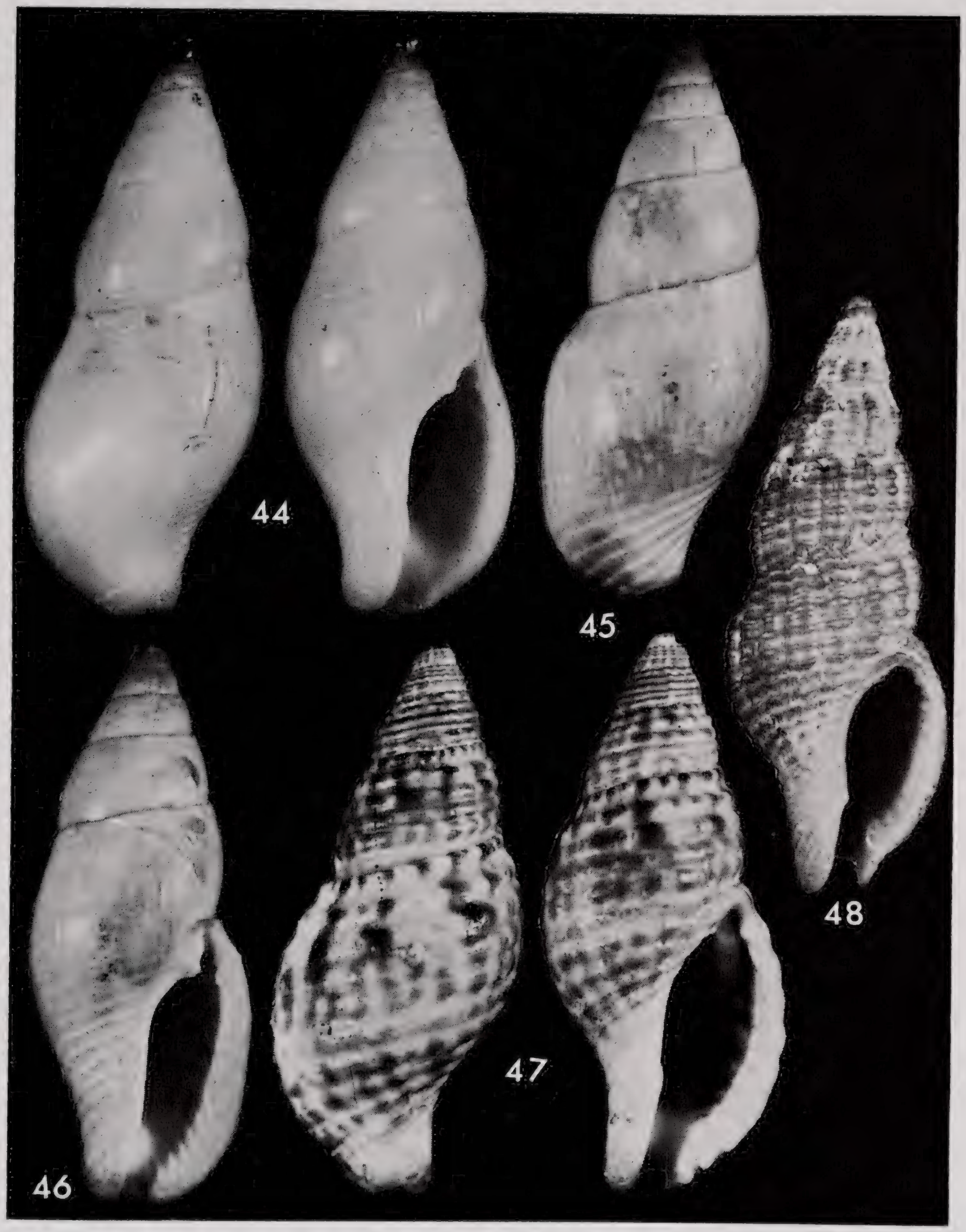
Pisania (Jeannea) gracilis (Sowerby, 1859) (Fig. 48)

1859. *Phos gracilis* Sowerby, Thes. Conchyl. 3: 91, pl. 222, fig. 33.
1915. *Maculotriton gracilis* (Sowerby), Hedley, Proc. Linn. Soc. N.S.W. 39: 733, pl. 84, fig. 79.
1972. *Engina ? gracilis* (Sowerby), Ponder, J. Malac. Soc. Aust. 2 (3): 254, pl. 24, fig. 3.

TYPE LOCALITY. Sydney, New South Wales, Australia.

The holotype of *P. gracilis* is in the B.M.N.H., length 14.5 mm, width 5.4 mm. The type is brown in colour, the penultimate whorl has 16 axial ribs and 8 spiral cords, body whorl 12 axial ribs. The columella appears smooth, but under magnification a very shallow groove cuts across the anterior of the concave columella a short distance above the anterior terminal denticle. It may have been this feature which prompted the describer to place *gracilis* in *Phos*.

Pisania (Jeannea) gracilis is similar in shell features to *Jeannea*, and does not bear any traces of radially oriented raised lirae on the parietal wall as do species of *Engina*. *Pisania (Jeannea) unicolor* (Angas, 1867) is usually separated from *P. (J.) gracilis* on the basis of 1 more spiral cord (7-8 in *gracilis* and 9-11 in *unicolor*) and the stouter, slightly broader shell, weaker axial ribs and less convex whorls in *P. (J.) unicolor*. Further study into the relationship of the two species is clearly indicated, since these minor differentiating characters are greatly exceeded by the range of individual variation in the Buccinidae.



Figs. 44-48. 44. *Pisania fasciculata* (Reeve); holotype of *P. delicatula* Sowerby, BMNH No. 1902.5.28.20., 16.4 × 6.3 mm. 45, 46. *P. hermannseni* A. Adams; holotype BMNH No. 1967930, 38.6 × 15.5 mm. 47. *P. lirocincta* Sowerby; holotype BMNH No. 1910.9.30.10., 33.7 × 15.2 mm. 48. *P. gracilis* (Sowerby); holotype BMNH, 14.5 × 5.4 mm.

Genus **Caducifer** Dall, 1904

Caducifer Dall, 1904, Smiths. Misc. coll. 47: 136. Type species by OD *Triton truncatus* Hinds, 1844. Recent, Indo-Pacific.

Authors hold different opinions on the inter-relationship of *Caducifer* and *Monostolium* with other buccinid genera. Cernohorsky (1971) assigned *Caducifer* as a subgenus of *Pisania,* Keen (1971) considered *Caducifer* as a full genus with *Monostiolum* as a subgenus, Ponder (1972) placed *Caducifer* as a subgenus in the genus *Monostiolum* and Abbott (1974) assigned *Monostiolum* as a subgenus of the genus *Colubraria.* The writer agrees with Keen (*op. cit.*) and Ponder (*op. cit.*) that *Caducifer* and *Monostiolum* are closely allied, *Caducifer* differing in the terebriform shape and decollate spire from *Monostiolum.* Both groups, however, are closely related to *Pisania* and differ from the Indo-Pacific group of *Pisania* species only in their more fusiform shape and shorter aperture. The genera *Caducifer* and *Monostiolum* were published simultaneously and their relative priority has been effectively determined by the action of the first reviser, i.e. Keen *(op. cit.)*.

Caducifer (Caducifer) concinnus (Reeve, 1844) (Fig. 49)

1844. *Triton concinnus* Reeve, Conch. Icon. 2: pl. 19, fig. 87.
1878. *Triton (Epidromis) concinnus* Reeve, Kobelt, Jahrb. deut. Malak. Gesell. 5: 367.
1881. *Triton (Epidromus) concinnus* Reeve, Tryon, Man. Conch. 3: 29, pl. 15, fig. 144.
1928. *Nyctilochus concinnus* Reeve, Faustino, Summ. Philipp. mar. fresh-wat. Moll. p. 228.

TYPE LOCALITY. Philippine Is.

The holotype is in the B.M.N.H. No. 1967646, length 10.7 mm, width 4.0 mm. The penultimate whorl has 21 slender axial riblets and 14 fine spiral threads, and the body whorl 21 riblets and *c.* 23 spiral threads. The aperture is angulate, the columella smooth, and the outer lip finely denticulate. It is white in colour, ornamented with orange axial streaks and small spots.

The species is similar to *Caducifer truncatus,* especially the finely sculptured form *decapitatus* Reeve. Tryon (1881) erroneously confounded the species with *C. (Monostiolum) tessellatus* (Reeve).

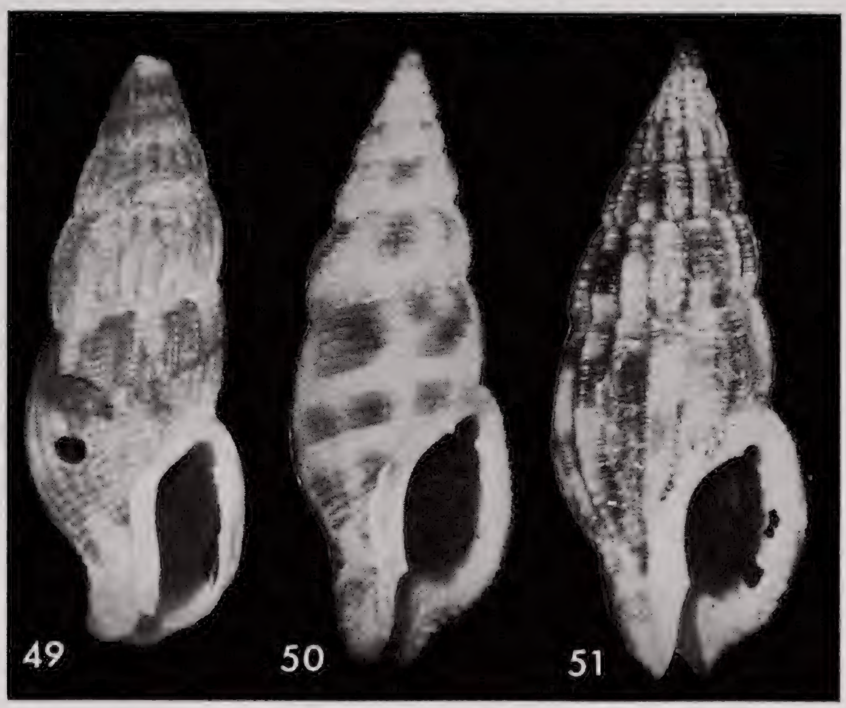
Subgenus **Monostiolum** Dall, 1904

Monostiolum Dall, 1904, Smiths. Misc. coll. 47: 136. Type species by OD *Triton (Epidromus) swifti* Tryon, 1881. Recent, Caribbean.

Caducifer (Monostiolum) tessellatus (Reeve, 1844) (Fig. 50)

1844. *Triton tessellatus* Reeve, Conch. Icon. 2: pl. 19, fig. 91; 1911 Peile, Proc. Malac. Soc. Lond. 9 (4): 227, textfig. (radula).
1845. *Pleurotoma igniflua* Reeve, Conch. Icon. 1: pl. 24, fig. 214 (Hab: ?); 1936 Fulton, Proc. Malac. Soc. Lond. 22 (1): 7.

TYPE LOCALITY. Island of Burias, Philippines = probably an error.



Figs. 49-51. 49. *Caducifer (Caducifer) concinnus* (Reeve); holotype BMNH No. 1967646, 10.7 × 4.0 mm. 50. *C. (Monostiolum) tessellatus* (Reeve); syntype BMNH No. 1967647, 16.8 × 6.0 mm. 51. *C. (M.) pictus* (Reeve); syntype BMNH No. 1966646, 16.7 × 6.8 mm.

The 4 syntypes of *Triton tessellatus* are in the B.M.N.H. No. 1967647, dimensions of illustrated syntype length 16.8 mm, width 6.0 mm. The penultimate whorl has 25 weak axial riblets and 17 spiral threads, the body whorl 40 spiral threads but no well-formed axial ribs, the columella has a parietal and an anterior terminal denticle but is otherwise smooth, the outer lip has an anal denticle and 7 smaller denticles. It is white, ornamented with brown blotches of varying size.

Peile (1911) pointed out that Tryon (1881) incorrectly synonymised *Triton tessellatus* Reeve with *T. concinnus* Reeve. He further stated that the Philippine locality for *T. tessellatus* has never been confirmed and that it is probably incorrect since he collected a specimen in Bermuda. Peile's (*op. cit.*) assumptions appear to be correct and *Triton tessellatus* very closely resembles *Caducifer (Monostiolum) swifti* (Tryon, 1881) from the Caribbean except that the spiral sculpture is finer than is generally seen in specimens of *C. (M.) swifti*.

Another earlier name for the species which has been overlooked in recent literature is *Pleurotoma igniflua* Reeve, 1845, described from unknown locality. Fulton (1936) placed the specis in *Pisania (Monostiolum)*, reported it from Bermuda and considered it very close if not conspecific with *Triton swifti* Tryon. The type-figure of *Pleurotoma igniflua* is the same form as has been illustrated by Ponder (1972) and is clearly recognisable as the Caribbean *swifti*. Fulton's (*op. cit.*) elucidation of *Pleurotoma igniflua* clearly prevents a retention of *Triton swifti* in malacological literature under the 50 year rule applicable to unused senior synonyms.

Caducifer (Monostiolum) pictus (Reeve, 1844) (Fig. 51)

1844. *Triton pictus* Reeve, Conch. Icon. 2: pl. 20, fig. 99.

1878. *Triton (Epidromis) pictus* Reeve, Kobelt, Jahrb. deut. Malak. Gesell. 5: 368.

1881. *Triton (Epidromus) pictus* Reeve, Tryon, Man. Conch. 3: 30, pl. 15, fig. 154.

1928. *Colubraria pervaricosa* Dall & Ochsner, Proc. Calif. Acad. Sci. (4), 17: 107, pl. 6, fig. 11 (N.E. of Vilamil, Albemarle I, Galapagos Is, Pleistocene).

1971. *Caducifer (Monostiolum) pictus* (Reeve), Keen, Sea shells trop. W. America ed. 2: 558, fig. 1103.

TYPE LOCALITY. Galápagos Is.

The 3 syntypes of *Triton pictus* are in the B.M.N.H. No. 1966646, dimensions of illustrated syntype length 16.7 mm, width 6.8 mm. The penultimate whorl has 15 axial ribs and 11 thin sharp spiral threads, the body whorl 11 ribs and 25 spiral threads, the columella has a parietal and an anterior terminal denticle but is otherwise smooth, the outer lip has an anal denticle and 8 only slightly smaller denticles. It is white in colour, mottled and streaked with brown.

Genus **Cantharus** Röding, 1798

Cantharus Röding, 1798, Mus. Bolten. p. 132. Type species by SD (Cossmann, 1901) *Buccinum tranquebaricum* Gmelin, 1791. Recent, Indian Ocean.

1807. *Nassaria* Link, Beschr. Nat. Samml. Univ. Rostock 3 Abth., p. 123. Type species by SD (Dell, 1967) *N. tranquebarica* Link = *Buccinum tranquebaricum* Gmelin, 1791.

1826. *Anna* Risso, Hist. Nat. L'Europe merid. 4: 214. Type species by M *A. massena* Risso, 1826. Recent, Mediterranean.

1971. *Muricantharus* Olsson, Stud. trop. Amer. Moll. Miami, p. 61. Type species by OD *Pseudoneptunea panamica* Hertlein & Strong, 1951. Recent, W. coast of America.

The generic group *Anna* Risso, 1826, has recently been re-introduced into buccinid literature by Wenz (1941), who questionably assigned *Anna* Risso under *Pollia* Gray, and by Nordsieck (1968) who placed *Anna* as a subgenus of *Cantharus* and cited the type species as "*pictus* Scacchi". *Purpura picta* Scacchi, 1836, is a primary homonym of *P. picta* Turton 1825, and *Anna massena* Risso, 1826, is in any case a prior name for *Purpura picta* Scacchi. Abbott (1974) listed the species as *Cantharus massena* and reported its occurrence in the Caribbean. In shell-form *A. massena* is closer to *Pollia* than *Cantharus*, but if regarded as a synonym of *Pollia* then *Anna* Risso would gain priority over *Pollia*, which is taxonomically undesirable.

Muricantharus panamicus (Hertlein & Strong) does not differ in either radular or shell-features from *Cantharus*. Abbott's (1974) placement of *Solenosteira* Dall, 1890, as a subgenus of *Cantharus* appears to be a more natural grouping than the full generic status accorded to *Solenosteira* by Keen (1971).

Subgenus **Pollia** Gray in Sowerby, 1834

Pollia Gray in Sowerby, 1834, Gen. Rec. foss. shells 2: footnote to *Purpura*, pl. 237, fig. 12. Type species by M *Triton undosus* Lamarck = *Buccinum undosum* Linnaeus, 1758. Recent, Indo-Pacific.

1834. *Pusio* Gray in Griffith & Pidgeon, Anim. Kingd. Bar. Cuvier, Moll. Rad. 12: 600, pl. 25, fig. 2. Type species by SD (Gray, 1847) *P. elegans* = *Triton (Pusio) elegans* Gray in Griffith & Pidgeon, 1834. Recent, W. coast of America.

1840. *Tritonidea* Swainson, Treat. Malac. p. 302. Type species by SD (Gray, 1847) *T. undosus* = *Buccinum undosum* Linnaeus, 1758.

1953. *Gemophos* Olsson & Harbison, Acad. Nat. Sci. Philad. Mon. No. 8: 225. Type species by OD *Buccinum gemmatum* Reeve, 1846. Recent, W. coast of America.

Robertson (1957) placed *Gemophos* Olsson & Harbison in the synonymy of *Pollia* and in this he is followed by Abbott (1974). Keen (1971), however, placed *Gemophos* as a valid subgenus under *Cantharus*, together with the related species *Triton (Pusio) elegans* Gray in Griffith & Pidgeon. Even if a finer subdivision of the *Cantharus-Pollia* group would be required for the West American species placed by Keen (*op. cit.*) in *Gemophos*, then the generic group *Pusio* Gray in Griffith & Pidgeon, 1834, would have clear priority over *Gemophos*, a fact mentioned by Robertson already in 1957.

Cantharus (Pollia) fuscopictus (Sowerby, 1905) (Figs. 52, 53)

1905. *Tritonidea (Cantharus) fuscopicta* Sowerby, Ann. Mag. Nat. Hist. (7) 16: 191.

TYPE LOCALITY. Ceylon.

The holotype is in the B.M.N.H. No. 1905.10.23.13., length 13.8 mm, width 7.1 mm. The penultimate whorl has 4 main spiral cords, the body whorl 11 cords and finer intermediate spiral striae in interspaces, the columella has 3 weak denticles anteriorly, the anal canal is bordered by a parietal and anal denticle, and the outer lip has 7 small denticles. It is white in colour, ornamented with dark brown, oblique streaks at the body whorl suture, the spiral cords are maculated with brown, and the aperture is white.

Sowerby (1905) described some new species based on specimens contained in H. Nevill's collection, and according to the author the majority of specimens were unlabelled and bore no locality indications. It appears that Sowerby's (*op. cit.*) locality indication of "Ceylon" must have been based on his knowledge of Nevill's shell-collecting activities in that area. The present author has examined specimens of *C. (P.) fuscopictus* from Rarotonga, Cook Is (Fig. 53).

Cantharus (Pollia) rawsoni (Melvill, 1897) (Fig. 55)

1897. *Sistrum rawsoni* Melvill, Mem. Proc. Manch. Lit. Phil. Soc. 41 (3): 5, pl. 6, fig. 3.

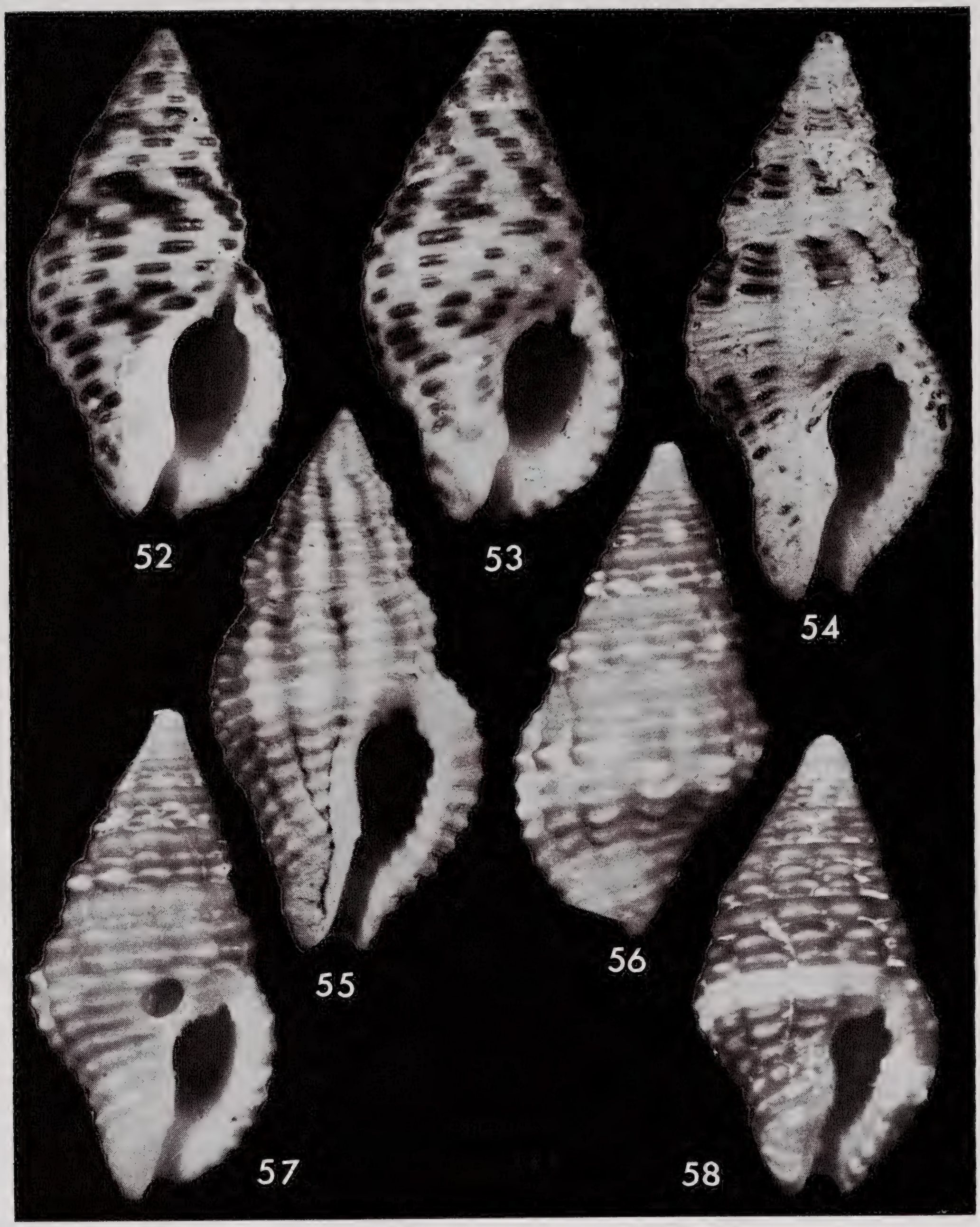
TYPE LOCALITY. Persian Gulf.

Four syntypes are in the B.M.N.H. No. 1903.6.23.15., dimensions of illustrated syntype length 14.0 mm, width 7.0 mm. The penultimate whorl has prominent axial ribs and 6 main spiral cords, and the body whorl 15 cords with finer intermediate spiral threads in the interspaces. The columella is projecting anteriorly and has 7 plicae which are more or less extensions of the spiral sculpture, the anal canal is bordered by a parietal and anal denticle, and the outer lip has 8 denticles. It is fawn in colour, ornamented with an indistinct paler median band on the body whorl, with some axial ribs occasionally lighter.

Cantharus (Pollia) eximius (Reeve, 1846) (Fig. 54)

1846. *Ricinula eximia* Reeve, Conch. Iconica, 3: pl. 6, fig. 45.
1883. *Engina eximia* Reeve, Tryon, Man. Conch. 5: 193, pl. 62, fig. 43.

TYPE LOCALITY. Corregidor, Manila Bay, Philippines.



Figs. 52-58. 52, 53. *Cantharus (Pollia) fuscopictus* (Sowerby). 52. Holotype BMNH No. 1905.10.23.13., 13.8 × 7.1 mm. 53. Specimen from Rarotonga, Cook Is, 12.3 × 6.6 mm. 54. *C. (P.) eximius* (Reeve); syntype BMNH No. 1968473, 9.8 × 4.5 mm. 55. *C. (P.) rawsoni* (Melvill); syntype BMNH No. 1903.6.23.15., 14.0 × 7.0 mm. 56-58. *C. (Enginella) spica* (Melvill & Standen); topotypes from Lifu, Loyalty Is. 56, 57. Specimen with echinate nodules, 9.6 × 4.8 mm. 58. Specimen with smooth nodules, 6.0 × 3.0 mm.

Four syntypes are in the B.M.N.H. No. 1968473, dimensions of illustrated syntype length 9.8 mm, width 4.5 mm. The penultimate whorl has angulate axial ribs and 6 main spiral cords, and the body whorl *c.* 15 main spiral cords and 1-2 irregular-sized, weaker cords in interspaces. The columella has a projecting anterior shelf which bears at this point 2-3 plicae, the canal is bordered by a parietal and anal denticle, and the outer lip has 6-7 low denticles and plicae. It is creamy-white in colour, the spiral cords are ornamented with dark brown upon the right-hand slope of the axial ribs, and a few scattered brown spots are present.

Subgenus **Enginella** Monterosato, 1917

Enginella Monterosato, 1917, Boll. Soc. zool. Ital. (3) 4: 22 (in separate). Type species by OD *Pollia bicolor* Cant. = *Murex bicolor* Cantraine, 1835 (*non* Risso, 1826; *nec* Valenciennes, 1832) = *Buccinum leucozonum* Philippi, 1844. Recent, Mediterranean.

The type species is usually cited as *Engina (Enginella) bicolor* (Cantraine) (Wenz 1941; Nordsieck 1968), but *Enginella* does not belong in *Engina* since it lacks the typically radially oriented lirae on the parietal callus. It is a convenient subgenus group for the small *Engina*-shaped *Cantharus* species which have a thin parietal callus without the *Engina*-like lirae. The taxon *Murex bicolor* Cantraine, 1835, is twice pre-occupied and *Cantharus (Enginella) leucozonus* (Philippi, 1844) would be the appropriate name for the small Mediterranean species.

Cantharus (Enginella) spica (Melvill & Standen, 1895) (Figs. 56-58)

1895. *Engina spica* Melvill & Standen, J. Conch. 8: 105, pl. 2, fig. 12.

TYPE LOCALITY. Lifu, Loyalty Is.

Topotypes from Lifu show that the species is not an *Engina*. The sutural cords are more prominent than the spiral cords and are either smooth and undivided or separated in elongated rectangles. One or two cords posteriorly to the sutures of the spire whorls and the third, fourth and fifth cord on the body whorl are occasionally sculptured with spikey nodules. The columella is projecting anteriorly and has 2-4 small denticles, the anal canal is bordered by a parietal denticle and an anal denticle, the parietal wall lacks radial plicae and the outer lip has 6 small denticles. It is variable in colour, either white with reddish-brown streaks or reddish-brown, sometimes with a white median band and some white nodules. The size-range is 6.0 - 12.0 mm.

Subgenus **Prodotia** Dall, 1924

Prodotia Dall, 1924, Proc. Biol. Soc. Washington 37: 89. Type species by OD *Pisania billeheusti* Souverbie (= Petit de la Saussaye) = *Triton iostoma* Gray in Griffith & Pidgeon, 1834. Recent, Indo-Pacific.

Cantharus (Prodotia) iostomus (Gray in Griffiths & Pidgen, 1834) (Figs. 59-62)

1834. *Triton iostoma* Gray in Griffith & Pidgeon, Anim. Kingd. Bar. Cuvier, Moll. Rad. 12: 600, pl. 23, fig. 4.

1846. *Buccinum marmoratum* Reeve, Conch. Icon. 3: pl. 12, fig. 95 (*non* Link, 1807; *nec* Anton, 1839).

1846. *Buccinum gracile* Reeve, Conch. Icon. 3: pl. 12, fig. 96 (Masbate I, Philippines) [*non* da Costa, 1778].

1846. ? *Buccinum crocatum* Reeve, Conch. Icon. 3: pl. 12, fig. 97 (Capul I, Philippines).

1853. *Phos billeheusti* Petit de la Saussaye, J. Conchyl. 4 (3): 244, pl. 8, fig. 5 (Nukuhiva, Marquesas Is).

1864. *Pisania billeheusti* var. C, *P. artensis* Souverbie & Montrouzier, J. Conchyl. 12: 266 (Art 1, New Caledonia).

1864. ? *Fusus (Pisania) desmoulinsi* Montrouzier in Souverbie & Montrouzier, J. Conchyl. 12: 268, pl. 10, fig. 3 (Art I, New Caledonia).

1865. *Fusus crosseanus* Souverbie, J. Conchyl. 13: 160, pl. 5, fig. 6 (immature) (Art I, New Caledonia).

1880. *Tritonidea marmorata* Reeve, Tapparone-Canefri, Ann. Soc. Malac. Belg. 15 (1): 63.

1880. *Tritonidea gracilis* Reeve, Tapparone-Canefri, Ann. Soc. Malac. Belg. 15 (1): 63.

1913. *Tritonidea difficilis* E. A. Smith, Ann. Mag. Nat. Hist. (8) 12: 414, pl. 9, fig. 2 (Henderson I, Pitcairn I group, Polynesia).

1938. *Pisania (Prodotia) marmorata* (Reeve), Adam & Leloup, Mem. Mus. Roy. d'Hist. Nat. Belg. 2 (19): 179.

1950. *Phos lannumi* Schwengel, Nautilus, 63 (3): 80, pl. 5, fig. 3 (Guam I, Marianas Is).

1958. *Engina billeheusti* (Petit), Tinker, Pacific Sea Shells ed. 2: 130, plate facing page, figs. lower row.

1967. *Pisania marmorata* (Reeve), Orr-Maes, Proc. Acad. Nat. Sci. Philad. 119 (4): 135, pl. 13, fig. B.

1971. *Pisania gracilis* (Reeve), Cernohorsky, Rec. Auckl. Inst. Mus. 8: 143, figs. 21, 32, 41-44 (figd. lectotype of *Buccinum marmoratum* Reeve).

1972. *Engina (Prodotia) obliquicostata* (Reeve), Ponder, J. Malac. Soc. Aust. 2 (3): 256, pl. 25, figs. 3, 4, textfigs. 6, 17 (*non Buccinum obliquicostatum* Reeve, 1846).

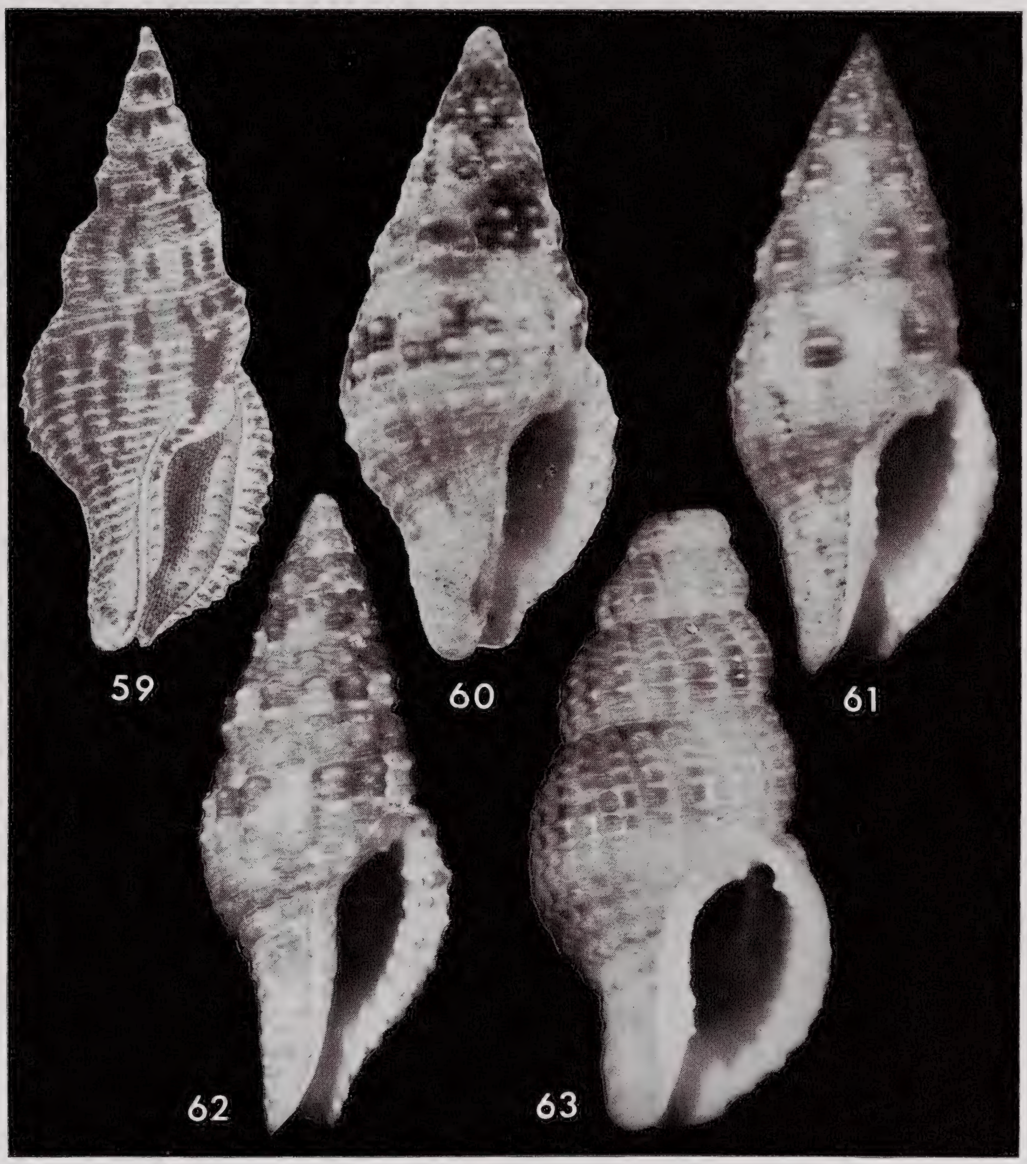
1972. *Engina (Prodotia) marmorata* (Reeve), Ponder, J. Malac Soc. Aust. 2 (3): 256, pl. 25, fig. 5, textfigs. 5, 18.

TYPE LOCALITY. None. (Capul I, Philippines — for *marmoratum* Reeve).

The species is extremely variable in shape, length of siphonal canal and number of mature and embryonic whorls. In Hawaii and the Fiji Islands where the species is moderately common, broad and slender specimens occur frequently intermingled in populations (see Tinker, 1952, plate facing p. 78). The width-ratio ranges from 37%-46% of shell-length. The number of mature whorls ranges from 7-9 and embryonic whorls from 1¾-3¼. In general, specimens from 15-20 fathoms (27-37 m) have fewer embryonic whorls than individuals collected in shallow water of the intertidal zone.

The sculpture is variable, consisting of prominent or weak and irregular axial ribs which number from 11-24 on the body whorl and from 13-21 on the penultimate whorl. The spiral cords vary in intensity and it is often difficult to differentiate between primary and secondary sculpture, but in general there are 3-7 primary spirals on the penultimate and 15-22 on the body whorl. One feature which is common to all the named variants of *C. (P.) iostomus*, is the arrangement of the spiral cords: on the antepenultimate and penultimate whorls 2, rarely 3, of the spiral cords are more prominent, with larger nodules, and the fourth and fifth spiral cord anterior to the suture of the body whorl is equally more prominent. If these spiral cords are very prominent, the whorls appear subangulate and if subdued, they appear convex. This strengthening of the presutural ramp cords can also be seen in the type-figure of *C. (P.) iostomus* (Fig. 59). In fresh specimens finer spiral and axial striae are visible in the interspaces of the spiral cords. The outer lip has 8-11 denticles in adult individuals and the columella, which has either a narrow or broader elevated callus, has 5-7 denticles or plicae, the parietal area is smooth and the anal canal is bordered by a parietal denticle. The shell is white or creamy-white, marbled, spotted or streaked with brown or reddish-brown and some individuals show a pinkish-violet cast at least on the spire whorls or protoconch and sometimes even in the aperture.

The radula is as variable as the shell, rachidians have 5-8 cusps, which are either regular or serrated (Ponder, 1972, figs. 5, 6) or stunted (Cernohorsky, 1971, fig. 21); laterals are either *Pisania*-like, tri-cuspid, with the outer cusp only moderately long, or bi-cuspid with the outer cusp as long as in *Engina*. Some of the radular differences may be due to sexual dimorphism, similarly to *Pisania luctuosa* Tapparone-Canefri (Cernohorsky, *op. cit.*).



Figs. 59-63. 59-62. *Cantharus (Prodotia) iostomus* (Gray in G. & P.). 59. Type-figure from Griffith & Pidgeon, 1834, pl. 23, fig. 4. 60-62. Specimens from Rat Tail Passage, Suva, Fiji Is. 60. Broad specimen, 19.3 × 8.7 mm. 61. Intermediate specimen, 17.3 × 7.2 mm. 62. Slender specimen, 14.6 × 5.6 mm. 63. *C. (P.) shepstonensis* (Tomlin); holotype BMNH No. 1926.12.6.6., 23.3 × 11.3 mm.

The majority of authors have appplied the name *Buccinum marmoratum* Reeve, to the broad individuals and *B. gracile* Reeve, to slender examples of the species, and *Phos billeheusti* Petit de la Saussaye has, with few exceptions, been synonymised with either *B. marmoratum* or *B. gracile*. Both *B. marmoratum* and *B. gracile* are primary homonyms and unavailable for usage (see synonymy). At this stage there is no taxon applicable to the species which can be considered to have been in general current use and the unused senior synonym *Triton iostoma* Gray in Griffith & Pidgeon, 1834, is here re-introduced into literature. Tapparone-Canefri (1880) was the first author to recognise the identity of *Triton iostoma* which he synonymised with the later *Buccinum marmoratum* Reeve. The type-figure of *Triton iostoma* has been so well executed that there can be little doubt that it is the species under discussion (Fig. 59, from Griffith & Pidgeon 1834).

The holotype of *Tritonidea difficilis* E. A. Smith, 1913, B.M.N.H. No. 1913.7.28.108., from Henderson I, Pitcairn group, Polynesia, is a very worn and faded individual of *C. (P.) iostomus*. The species range extends from Polynesia to East Africa.

Since its description, *Triton iostoma* has been placed in the genera *Triton, Buccinum, Phos, Fusus, Tritonidea* (= *Cantharus*), *Engina* and *Pisania*. In features of prominent spiral sculpture and form of aperture the species is closer to *Pollia* than to *Pisania*. The more slender species of *Pollia* approach *Prodotia* in form, and the subgenus *Prodotia* is therefore utilised as a subgeneric group containing the fusiform species of *Cantharus*.

Cantharus (Prodotia) shepstonensis (Tomlin, 1926) (Fig. 63)

1926. *Pollia shepstonensis* Tomlin, Ann. Natal Mus. 5 (3): 291, pl. 16, fig. 4.

TYPE LOCALITY. Beach end near Port Shepstone [Natal], Sth. Africa.

The holotype is in the B.M.N.H. No. 1926.12.6.6., length 23.3 mm, width 11.3 mm. It is a worn shell with the apical whorls missing, 18 axial ribs and 7 main spiral cords on the penultimate and 15 ribs and 13 cords on the body whorl, with additional fine spiral striae situated between the main cords. The columella has 9 small plicae and the outer lip is denticulate. The colour is a faded orange-brown with a darker brown staining on ribs and in the interspaces.

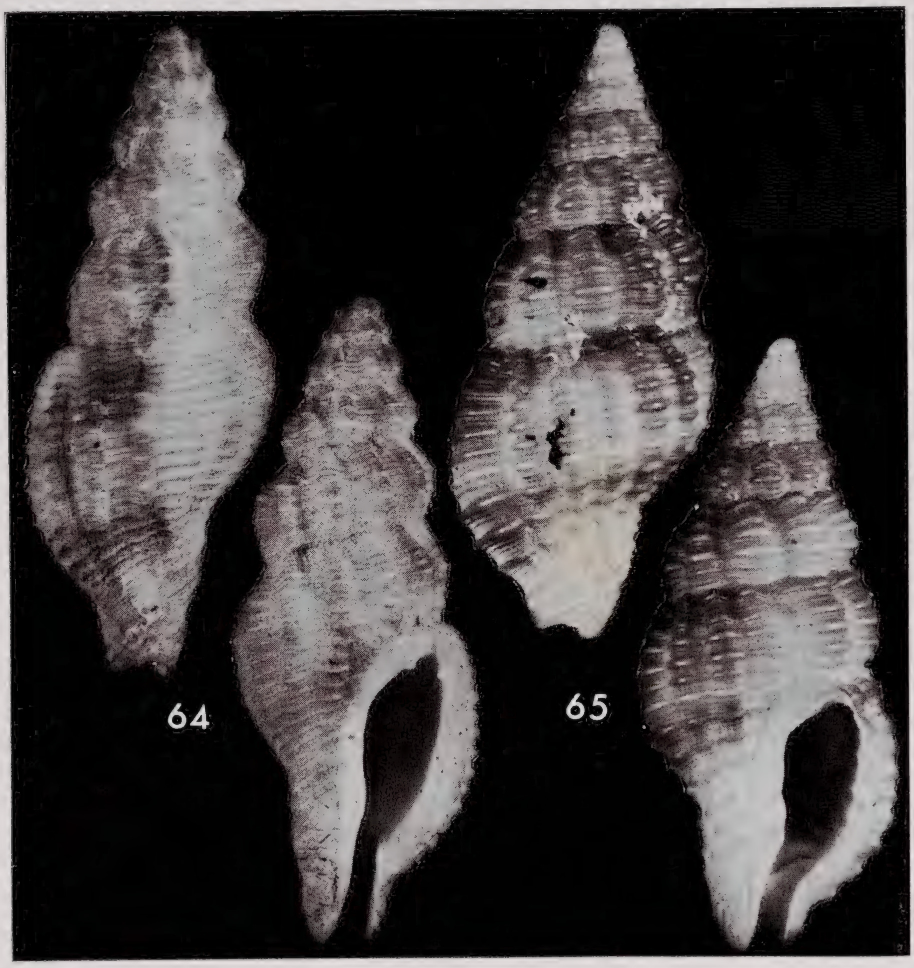
On the label accompanying the holotype of *P. shepstonensis* is written "same as *difficilis* Smith". Tomlin (1926) did compare his species to *Buccinum marmoratum* Reeve (= *iostomus* Gray in G. & P.), a species which lives on the Natal coast, and the possibility that *Pollia shepstonensis* is a very worn *C. (P.) iostomus* cannot be excluded. *Pollia shepstonensis* has remained unlisted in South African faunal lists.

Cantharus (Prodotia) townsendi (Melvill, 1918) (Fig. 64)

1918. *Pisania townsendi* Melvill, Ann. Mag. Nat. Hist. (9) 1: 140, pl. 4, fig. 5.

TYPE LOCALITY. Karachi.

The holotype is in the B.M.N.H. No. 1921.1.28.5., length 21.6 mm, width 8.0 mm. The shell is fusiform with a produced siphonal canal, angulate whorls, 11 axial ribs on each of the last two whorls, 11 main spiral threads and 3 intersticial spiral striae on the penultimate and 24 main spiral threads and 3-4 intersticial spirals on the body whorl. The columella has 2 anterior denticles, the parietal wall is smooth, the anal canal is bordered by a parietal and an anal denticle, and the outer lip has 10-11 small denticles. The holotype is light brown in colour and the aperture is yellowish.



Figs. 64, 65. 64. *Cantharus (Prodotia) townsendi* (Melvill); holotype BMNH No. 1921.1.28.5., 21.6 × 8.0 mm. 65. *C. (P) castaneus* (Melvill); holotype BMNH No. 1912.9.17.7., 13.8 × 5.8 mm.

Cantharus (Prodotia) castaneus (Melvill, 1912) (Fig. 65)

1912. *Tritonidea castanea* Melvill, Proc. Malac. Soc. Lond. 10 (3): 249, pl. 12, fig. 16.

TYPE LOCALITY. Mussandam, Persian Gulf, 55 fathoms (101 m).

The holotype is in the B.M.N.H. No. 1912.9.17.7, length 13.8 mm, width 5.8 mm. The holotype is not fully mature, has 10 thick axial ribs on each of the last two whorls, penultimate whorl with 6 main undulate spiral cords, body whorl with 11, and with additional finer intermediate spiral striae. The columella has 4 plicae and a smooth parietal wall, the outer lip is denticulate and plicate, and the shell is cream in colour with brown spiral cords.

Subgenus **Zeapollia** Finlay, 1927

Zeapollia Finlay, 1927, Trans. Proc. N.Z. Inst. 57: 418. Type species by OD *Tritonidea acuticingulata* Suter, 1917. L. Miocene of New Zealand.

The genus is monotypic and closely resembles other subgenera of *Cantharus*. The type-species *Cantharus (Zeapollia) acuticingulata* has 2 smooth embryonic and 4 mature whorls and the sculpture consists of axial ribs, overriding main spiral cords and finer intermediate spiral striae. The columella has a projecting anterior ledge and at this point carries 2 low denticles, the anal canal is bordered by a parietal and an anal denticle and the outer lip has 5-6 about equally sized denticles. (Fig. 66).

Subgenus **Clivipollia** Iredale, 1929

Clivipollia Iredale, 1929, Aust. Zoologist 5 (4): 347. Type species by M *C. imperita* Iredale, 1929 = ? *Ricinula pulchra* Reeve, 1846. Recent, Indo-Pacific.

The radula of *Ricinula pulchra* Reeve (Ponder, 1972, fig. 13) is typical of the *Cantharus-Pollia* group of species (Robertson, 1957, figs. 14-19; Cernohorsky, 1971, fig. 62 and 1974, fig. 13). In shell-morphology *Clivipollia* resembles *Pollia* except that species of *Clivipollia* are stouter and more biconic, the aperture is restricted and narrow and the denticles on the outer lip are more prominent with the first 2-3 posterior denticles usually larger and intruding into the aperture. The columella is more bulging and coarsely denticulate and the anal notch is shallower and more squarish.

The morphological differences in *Clivipollia* are by no means sharply defined and the transition from *Pollia* to *Clivipollia* is gradual rather than abrupt. In a world-wide survey of buccinid genera the finer subdivisions of *Pollia* and *Cantharus* may be found to be superfluous. The following examined species would qualify for inclusion in *Clivipollia: Voluta fragaria* Wood, 1828 (= *Turbinella carolinae* Kiener, 1840 = *Ricinula bella* Reeve, 1846), *Turbinella wagneri* Anton, 1839, *Ricinula pulchra* Reeve, 1846, *R. recurva* Reeve, 1846, *Engina costata* Pease, 1860, *E. albocincta* Pease, 1860, and *E. cumingiana* Melvill, 1895.

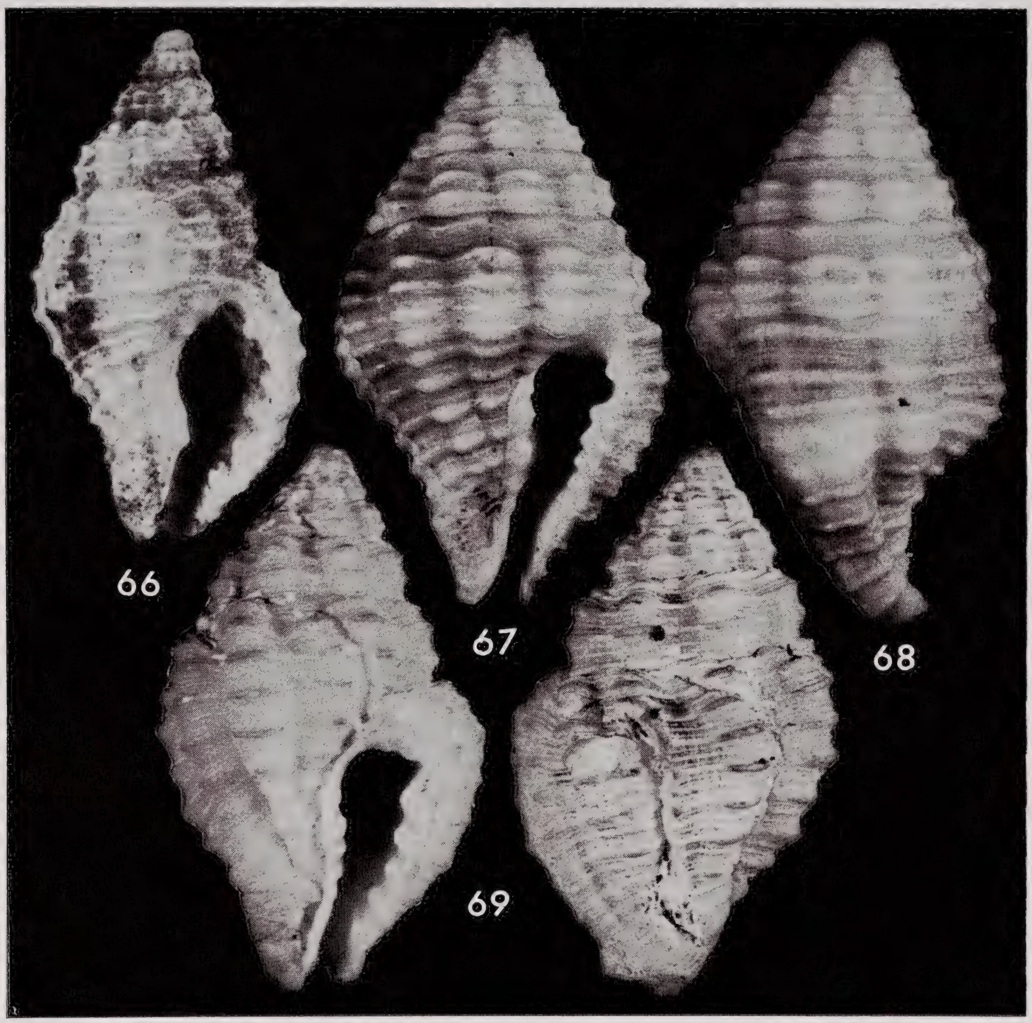
Cantharus (Clivipollia) recurva (Reeve, 1846) (Figs. 67, 68)

1846. *Ricinula recurva* Reeve, Conch. Icon. 3: pl. 6, fig. 53.

1907. *Engina recurva* Reeve, Schepman, Samml. geol. Reichs-Mus. Leiden (1), 8: 173 (Post-Tertiary of Celebes); 1933 Dautzenberg & Bouge, J. Conchyl. 77 (2): 210.

TYPE LOCALITY. Lord Hood's I [= S. Marutea I, S.E. end of the Tuamotu Archipelago].

Two syntypes are in the B.M.N.H. No. 1968465, dimensions of illustrated syntype length 11.0 mm, width 6.0 mm. The shell is sculptured with broad, roundly angulate ribs, 3 strong main spiral cords on the penultimate and 11 on the body whorl, the cords are nodulose on the summits of the ribs, and the interspaces have finer spiral threads. The ventral side of the body whorl recedes backwards towards the dorsum, the siphonal canal is recurved, the columella is swollen and has 5 prominent denticles, the anal canal is bordered by a parietal and an anal denticle, and the outer lip has 5 strong denticles. It is yellowish-brown in colour, ornamented with a white band posteriorly to the sutures on spire whorls and a median band on the body whorl.



Figs. 66-69. 66. *Cantharus (Zeapollia) acuticingulata* (Suter); specimen from Target Gully, Oamaru, L. Miocene of New Zealand, 9.6 × 5.0 mm. 67, 68. *C. (Clivipollia) recurva* (Reeve); syntype BMNH No. 1968465, 11.0 × 6.0 mm. 68. Lateral view. 69. *C. (C.) costatus* (Pease); holotype BMNH No. 1961163, 16.5 × 10.0 mm.

Cantharus (Clivipollia) costatus (Pease, 1860) (Fig. 69)

1860. *Engina costata* Pease, Proc. Zool. Soc. Lond. p. 142; 1965 Kay, Bull. Brit. Mus. (Nat. Hist.) Zool. Suppl 1: 14, pl 1, figs 17, 18 (figd. holotype).

1918. *Peristernia thaanumi* Pilsbry & Brian, Nautilus 31 (3): 101, pl. 9, figs. 6, 7 (off Waikiki, 35-50 fathoms (64-92 m) and Honolulu Harbour, Hawaiian Is).

TYPE LOCALITY. Hawaiian Is.

The holotype of *Engina costata* is in the B.M.N.H. No. 1961163, length 16.5 mm, width 10.0 mm. The penultimate whorl has 8 broad, angulate axial ribs and 3 strong main spiral cords, the body whorl 7 ribs and 9 main spirals, the interspacial sculpture is variable but usually has 1 median intermediate cord and 1-2 finer spiral threads on either side of the median. The outer lip is thickened, the columella has a flat parietal denticle and 5 denticles on the somewhat swollen centre pillar, the outer lip has a flattish anal denticle and 5 strong denticles. It is yellowish-brown in colour, and the aperture is white.

Cantharus (Clivipollia) albocinctus (Pease, 1860) (Fig. 70)

1860. *Engina albocincta* Pease, Proc. Zool. Soc. Lond. p. 142; 1965 Kay, Bull. Brit. Mus. (Nat. Hist.) Zool. Suppl. 1: 16, pl. 2, figs. 9, 10 (figd. lectotype).

TYPE LOCALITY. Hawaiian Is.

The lectotype is in the B.M.N.H. No. 1961454, length 7.4 mm, width 4.0 mm. This minute species is orange-brown in colour with a median white band on the body whorl and is sculptured with coarse axial ribs and spiral cords; the sutures are sculptured with slightly more elongated nodules which are slightly separated from the subsequent rows of coarse nodules, and the interspaces have finer spiral striae. The columella has 3-4 small denticles anteriorly, the parietal wall lacks the radial lirae of *Engina*, the anal canal is bordered by a parietal and an anal denticle, and the outer lip has 6 small denticles.

Cantharus (Clivipollia) cumingianus (Melvill, 1895) (Fig. 71)

1895. *Engina cumingiana* Melvill, Proc. Malac. Soc. Lond. 1: 226.

TYPE LOCALITY. St. Thoms [Virgin Is, Caribbean = error ?].

The holotype is in the B.M.N.H., length 11.6 mm, width 6.3 mm. The penultimate whorl has 7 strong, broad and nodulose axial ribs and 4 main spiral cords, the body whorl 6 ribs and 12 main cords, and the interspaces finer intermediate spiral threads. The columella is projecting anteriorly and is sculptured with 5 weak central denticles, the anal canal is bordered by a parietal and an anal denticle, and the outer lip has 5 strong denticles. It is yellowish-brown in colour, the spaces between the axial ribs are darker, and the aperture and median band on the body whorl are white.

Melvill (1895) described *E. cumingiana* from a single shell in the Cuming collection in the British Museum (Nat. Hist.), and gave the locality as "St. Thomas" which is presumably St. Thomas in the Virgin Islands. The holotype, which compares in length within one-tenth of a mm with Melvill's given dimensions and is undoubtedly the Cumingian holotype, bears a label with no known locality. It is unknown on whose authority Melvill cited the "St. Thomas" locality, but no similar species has been reported from the Caribbean and the species remains unlocalised.

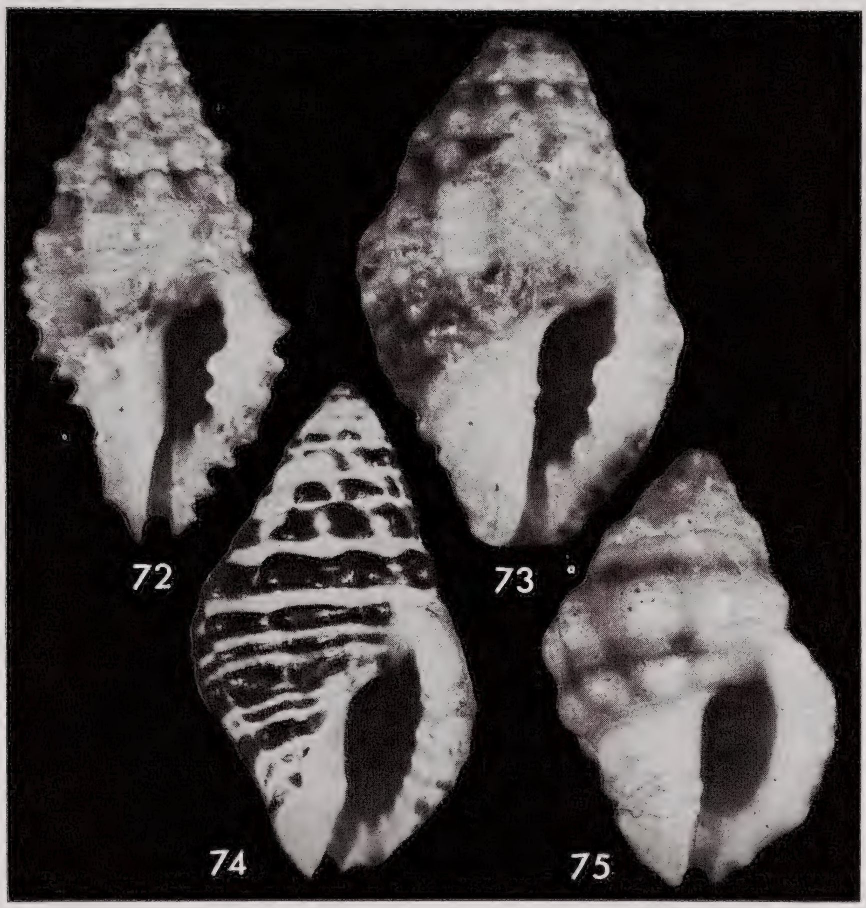
REMARKS ON NON-BUCCINID SPECIES

Engina monilifera Pease, 1860. The lectotype in the B.M.N.H. No. 1961454, length 7.4 mm, width 4.0 mm, is a very worn *Morula* Schumacher, from the Hawaiian Is (Fig. 73). The species is conspecific with the holotype of *Ricinula echinata* Reeve, 1846, B.M.N.H. No. 1968456, length 9.3 mm, width 4.5 mm, from unknown locality (Fig. 72). The species has been reported as *Morula parva* (Reeve, 1846) by Cernohorsky (1969) from the Fiji Is, and has been erroneously synonymised with *M. echinata* (Reeve). Melvill & Standen (1895) reported the species from the Loyalty Is as *Engina iodosia*

(Duclos, 1840), which they considered a prior name for *Ricinula echinata* Reeve, and *Engina monilifera* Pease. The type-figure of *Columbella iodosia* shows a shell with a prominently constricted outer lip and a sculpture of round nodules, features which do not correspond with those of *Morula echinata*.

Figs. 70, 71. 70. *Cantharus (Clivipollia) albocinctus* (Pease); lectotype BMNH No. 1961454, 7.4 × 4.0 mm. 71. *C. (C.) cumingianus* (Melvill); holotype BMNH, 11.6 × 6.3 mm.

Ricinula funiculata Reeve, 1846. Three syntypes from unknown locality are in the B.M.N.H. No. 1968475, dimensions of illustrated syntype length 17.0 mm, width 10.0 mm (Fig. 74). Tryon (1883) reported the species as an *Engina* and illustrated a species which bears no resemblance to Reeve's *funiculata*. The real *Ricinula funiculata* is a worn *Morula* with a white base colour, blackish-brown nodes and ridges, a violet aperture, 3 plicae on the anterior of the columella and denticles on the outer lip. The species *Engina siderea* (Reeve) is often found mislabelled "*E. funiculata*" in Museum collections.



Figs. 72-75. 72, 73. *Morula echinata* (Reeve). 72. Holotype BMNH No. 1968456, 9.3 × 4.5 mm. 73. Lectotype of *Engina monilifera* Pease, BMNH No. 1961454, 7.4 × 4.0 mm. 74. *Morula funiculata* (Reeve); syntype BMNH No. 1968475, 17.0 × 10.0 mm. 75. *M. purpureocincta* (Preston); holotype BMNH No 1915.1.6.28., 8.9 × 5.8 mm.

Engina purpureocincta Preston, 1909. The holotype from Ceylon is in the B.M.N.H. No. 1915.1.6.28., length 8.9 mm, width 5.8 mm (Fig. 75). The species is a *Morula* which is conspecific with *Engina nodicostata* Pease, 1868, from the Tuamotus. The species has been recently discussed by Orr-Maes (1967) and Cernohorsky (1969).

Acknowledgements. I would like to record my thanks to Dr J. Taylor, British Museum (Natural History), London, and Dr A. H. Rehder, National Museum of Natural History, Smithsonian Institution, Washington, who kindly granted access to type-collections in their respective care.

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1957 A study on *Cantharus multangulus* (Philippi), with notes on *Cantharus* and *Pseudoneptunea* (Gastropoda: Buccinidae). *Notulae Naturae* No. 300: 1-10; textfigs.

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1925 *Wissenschaftliche Ergebnisse der Deutschen Tiefsee-Expedition auf dem Dampfer 'Valdivia", 1898-1899. Gastropoda. II. Teil.* Jena, 17 (2): 38-382; pl. 13-46.

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1952 *Pacific Sea Shells.* Honolulu, Mercantile Printing Co., 230 pp.; pl.

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1926 On South African Marine Mollusca, with descriptions of new species. *Ann. Nat. Mus.* 5 (3): 283-301; pl. 16.

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1880 *Manual of Conchology.* Philadelphia, G. W. Tryon 2: 1-289; pl. 1-70.

1881 *Manual of Conchology.* Philadelphia, G. W. Tryon 3: 1-310; pl. 1-87.

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THE TAXONOMY OF SOME INDO-PACIFIC MOLLUSCA

Part 3. With descriptions of new taxa and remarks on an Ecuadorian fossil species of Turridae

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Abstract. A new subgenus is proposed for the Austral-Neozelanic nassariid species *Nassarius ephamillus* (Watson) and the species synonymy and distribution is discussed. *Eucyclotoma hindsii* (Reeve), *Cymatium armatum* (Sowerby) and *Distorsio pusilla* are defined and recorded from the Pacific while *Pseudoneptunea varicosa* (Roeding) is localised from Thailand. Two new species of *Microvoluta* from East Australia are described. *Venassa* v. Martens, is considered to have been based on a teratological individual of *Nassarius (Zeuxis)* species. The following species are re-assigned: *"Nassa" semitexta* Hedley, from the Nassariidae to the Rissoacea; *Mitrea stadialis* Hedley, from the Mitridae to the Volutomitridae; the Ecuadorian Mio/Pliocene *Mitra (Subcancilla) musa* Olsson, from the Mitridae to the Turridae. The turrid genus *Mitrithara* Hedley, 1922, is considered to be synonymous with *Mitrolumna* Bucquoy, Dautzenberg & Dollfuss, 1883.

For previous publications in this series see Cernohorsky (1972, 1974a).

Family CYMATIIDAE

(The validity of the family name is currently under consideration by the I.C.Z.N.).

Genus **Cymatium** Roeding, 1798

Subgenus **Ranularia** Schumacher, 1817

Ranularia Schumacher, 1817, Essai nouv. syst. p. 253. Type species by SD (Gray, 1847) *M. clavator* = *Ranularia longirostra* Schumacher, 1817 = *Tudicla gutturnium* Roeding, 1798.

The type designation is usually credited to Hermannsen (1848), however, Gray's (1847) designation is 3 months prior.

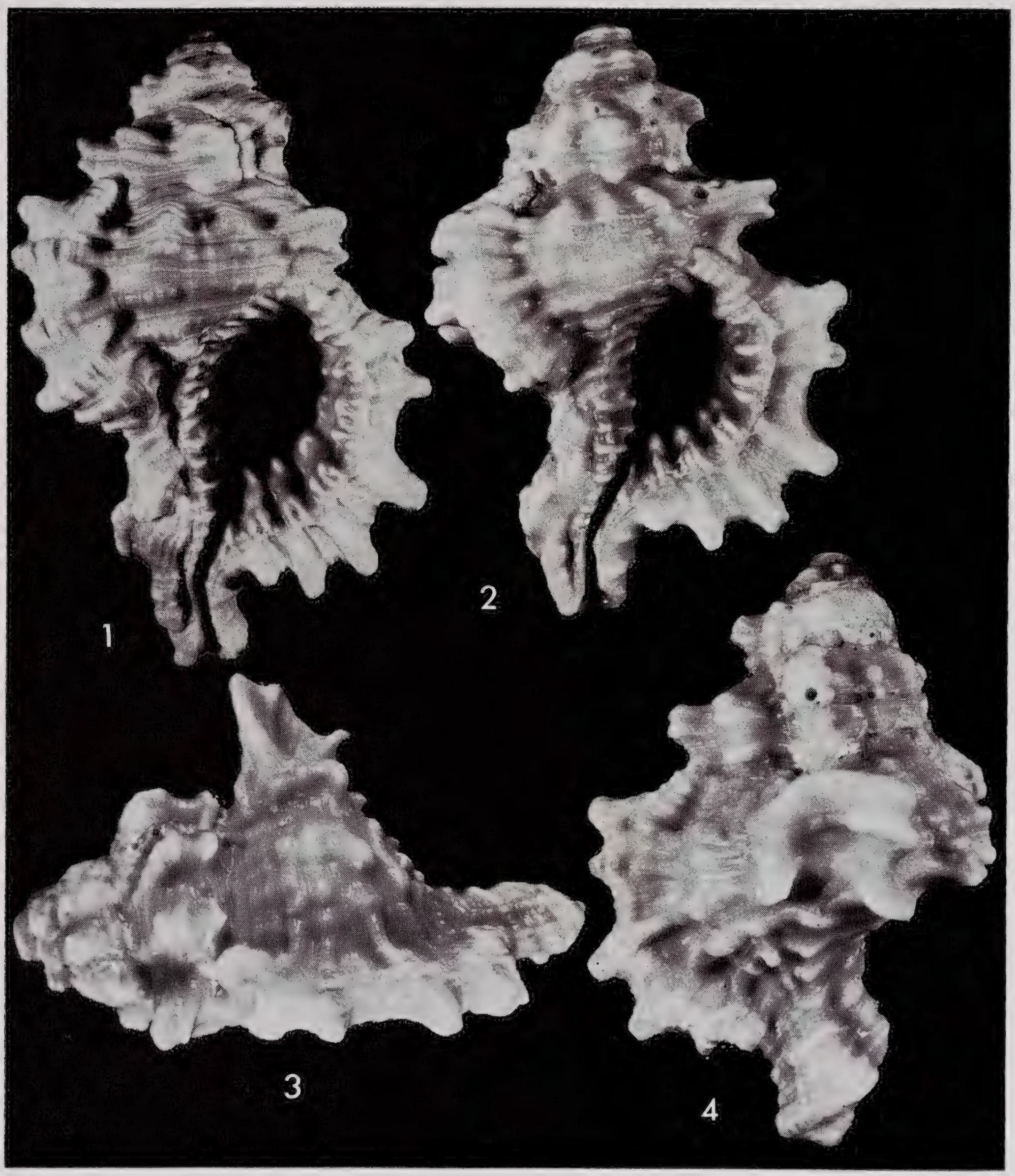
Cymatium (Ranularia) armatum (Sowerby, 1897) (Figs. 1-4)

1897. *Lotorium armatum* Sowerby, Proc. Malac. Soc. Lond. 2: 137, pl. 11, fig. 1.

1933. *Cymatium armatum* (Sowerby), Bayer, Zool. Meded. Rijks Mus. Nat. Hist. 16: 47.

TYPE LOCALITY. Marquesas Is?

The species has not been illustrated nor reported since the date of its description. The recent collection of 2 storm-tossed specimens from Pango Pt., Efate I, New Hebrides (*leg.* H. Dale), confirm the species occurrence in the Pacific. The species exceeds 50 mm in length (holotype 67.5 mm), has 2 strong varices per whorl which are crossed by strong ribs, the dorsum has an erect, three-leaved, shovel-like extension, the siphonal canal is twisted, the columella has 16 plicae, the outer lip 11 and the edge of the outer lip is sculptured with 6 digitations. The colour is tan with paler areas, the aperture is reddish-orange, the columella is streaked with chocolate-brown and the plicae are whitish.



Figs. 1-4. *Cymatium (Ranularia) armatum* (Sowerby). 1. Holotype BMNH No. 1897.4.30.2., length 67.5 mm, width 41.4 mm. 2-4. Specimen from Pango Pt., Efate I, New Hebrides; 57.4 × 40.4 mm.

Cymatium lotorium (Linnaeus) has a similar coarse sculpture and twisted siphonal canal but the columella is differently sculptured and the outer lip lacks the protruding digitations of *C. (R.) armatum*.

Genus **Distorsio** Roeding, 1798

Subgenus **Personella** Conrad, 1865

Distorsio (Personella) Conrad, 1865, Americ. J. Conch. 1: 21. Type species by M *D. septemdentata* Gabb, 1860. Eocene of Texas.

Distorsio *(*? **Personella) pusilla** Pease, 1861 (Figs. 5-9)

1861. *Distorsio pusilla* Pease, Proc. Zool. Soc. Lond. for 1860, Pt. 28: 397; 1881 Tryon, Man. Conch. 3: 35; 1946 Edmondson, Spec. Publ. Bishop Mus. No. 22: 123; 1952 Kuroda & Habe, Chek-list Mar. Moll. Jap. p. 53; 1960 Azuma, Cat. Moll. Okinawa p. 31; 1965 Kay, Bull. Brit. Mus. (Nat. Hist.), Zool. Suppl. 1: 37, pl. 3, figs. 15, 16 (figd. holotype).

1878. *Persona pusilla* Pease, Kuester & Kobelt, Syst. Conch. Cab. Mart. Chemnitz, ed. 2, 3 (2): 273.

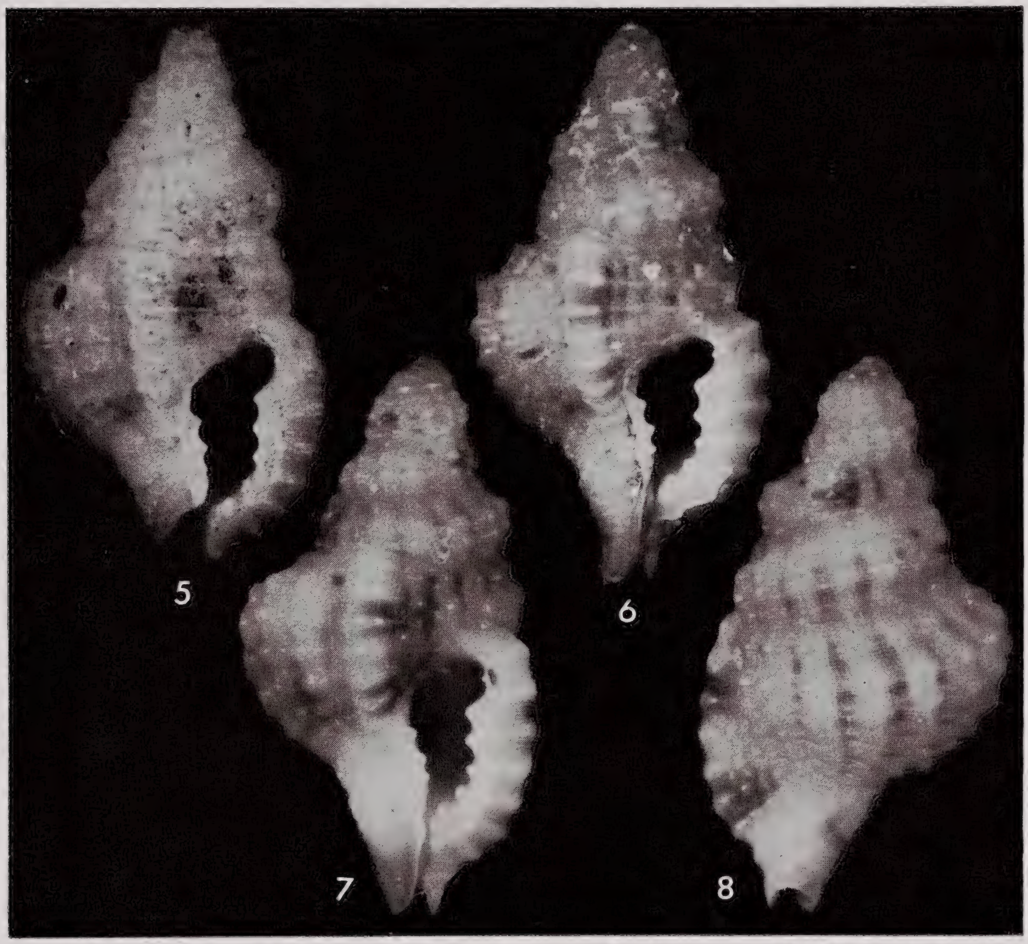
1953. *Distorsio (Personella) pusilla* Pease, Emerson & Puffer, Proc. Biol. Soc. Washington 66: 102.

TYPE LOCALITY. Sandwich Is [= Hawaiian Is].

Shell small, 8-10 mm in length, protoconch consisting of 2½ to 3 smooth, glassy, ember-coloured embryonic whorls, penultimate embryonic whorl with a dark brown band; teleoconch of 4½ whorls with 7 varices, varices very weak on spire whorls and visible only under magnification. Sculptured with *c.* 15 axial ribs and 4 nodulose cords on the penultimate and 12 ribs and 7 spiral cords on the body whorl with an additional 5 cords on the siphonal fasciole; the moderately deep interspaces are finely cancellate. Outer lip with 7 prominent denticles, first adapical denticle minute, second denticle largest, subsequent denticles only fractionally smaller; columella with 4 denticles, columellar callus narrow and confined to the aperture. Golden-fawn in colour, ornamented with a few brown streaks and blotches, outer lip white and with 2 brown streaks on the dorsal side of the varix, siphonal fasciole white.

The comparative rarity of this minute *Distorsio* has been responsible for the obscure identity of the species. Emerson and Puffer (1953) suggested that *D. pusilla* would appear to be a geographical subspecies of *D. reticulata* Roeding, 1798. *D. pusilla* is not only sympatric with *D. reticulata* in the Pacific, but also differs appreciably from *D. reticulata* and other members of the subgenus *Rhysema* Clench & Turner, 1956. The whorls are less distorted, the spreading columellar callosity is lacking, the deep anal and lateral columella excavation and sharply bent, closely denticulate columella are absent and in the *D. reticulata* group of species the third or fourth adapical denticle is accentuated and the outline of the body whorl almost completely merges with the siphonal fasciole. In *D. pusilla* the siphonal canal is straighter and the hairy periostracum is lacking.

D. pusilla is considerably closer in morphological features to the presumably extinct *Personella* Conrad, 1865, from the American Tertiary and closely resembles the New Zealand Eocene *D. (P.) beui* Maxwell, 1968, in apertural features and arrangements of denticles. Wrigley (1932) stressed the importance of the number and arrangement of the denticles on the outer lip and described *Personella* as having 8 denticles and the related *Sassia* Bellardi, 1873, only 7 denticles. *Distorsio pusilla* does have only 7 denticles on the outer lip as in *Sassia,* but species of the latter group have a different protoconch and the denticles are laid in a regular, concave curve. In species of *Rhysema,* the number of denticles on the outer lip fluctuates from 8-10 and in *Personella* and *Sassia* from 7-8.



Figs. 5-8. *Distorsio* (? *Personella*) *pusilla* Pease. 5. Holotype BMNH No. 1961155; 9.9 × 5.3 mm. 6-8. Specimens from Nth. Tipilao Pt., Guam I, Marianas Is. 6, 7.8 × 4.1 mm. 7, 8. 9.9 × 5.0 mm.

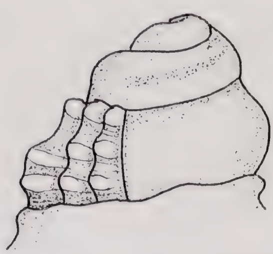


Fig. 9. *Distorsio* (? *Personella*) *pusilla* Pease. Protoconch.

The recent specimens described and illustrated were collected at Nth. Tipilao Pt., Guam I, Marianas Is, in 11 m, under rocks (*leg.* R. Salisbury). The species has been previously reported from Japan and the Hawaiian Is. The holotype of *D. pusilla* (Fig. 5) is in the British Museum (Nat. Hist.) No. 1961155, dimensions length 9.9 mm, width 5.3 mm, and is a worn and faded specimen with part of the protoconch and siphonal canal missing.

Family BUCCINIDAE

Genus **Pseudoneptunea** Kobelt, 1882

Pseudoneptunea Kobelt, 1882, Jahrb. deut. Malak. Gesell. 9: 17. Type species by SD (Cossmann, 1901) *Siphon. varicosa* Kien. = *Neptunea varicosa* Roeding, 1798. Recent, Indo-Malaya.

Pseudoneptunea varicosa (Roeding, 1798) (Figs 10-12)

1788. *"Murex varicosus"* Chemnitz, Syst. Conch. Cab. 70: 256, pl. 162, figs. 1546-47 (Cape of Good Hope = error) [*non binom.*].

1791. *Murex rubecula (pars)* Gmelin, Syst. Nat. ed. 13: 3535 (ref. Chemnitz, *op. cit.*, figs. 1546-47 and 6 other references) [*non* Linnaeus, 1758].

1798. *Neptunea varicosa* Roeding, Mus. Bolten. p. 116 (ref. Chemnitz, *op. cit.*, figs. 1546-47) (Hab: ?).

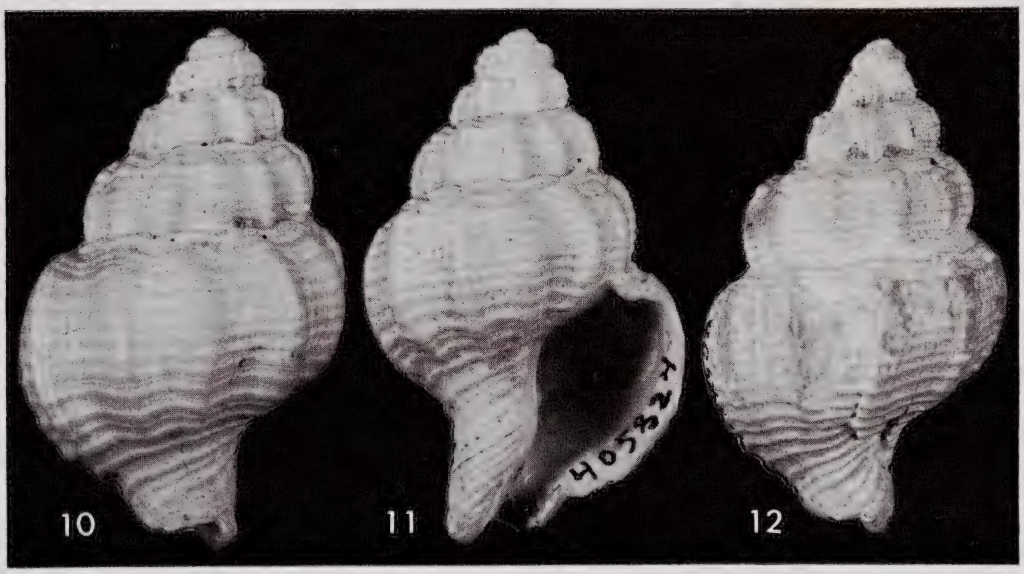
1802. *Murex varicosus* Holten, Enum. syst. Conch. Chemnitzii p. 63 (ref. Chemnitz, *op. cit.*, fig. 1546).

1895. *Siphonalia bantamensis* K. Martin. Samml. geol. Reichs-Mus. Leiden, N.F. 1 (2): 97, pl. 16, fig. 218bis, 218a, b (Tjikeusik, Bantam, Pliocene of Java).

1939. *Siphonalia (Pseudoneptunea) varicosa* (Anton), Oostingh, Ing. Ned.-Indie Mijnb. Geol. 6 (82): 109 (Pangkalpinang, Banka and Mampawah, W. Borneo, Indonesia).

1939. *Siphonalia (Pseudoneptunea) bantamensis* (K. Martin), Oostingh, Ing. Ned.-Indie Mijnb. Geol. 6 (8): 109, pl. 13, fig. 236.

1974. *Siphonalia varicosa* (Roeding), Cernohorsky, Rec. Auckl. Inst. Mus. 11: 179, fig. 53 (figd. syntypes).



Figs. 10-12. *Pseudoneptunea varicosa* (Roeding); Sichol, Nakhon Si Thammarat, E. coast of Gulf of Thailand, USNM No. 405824. 10, 11. 31.0 × 18.8 × 18.0 mm. 12. 39.0 × 23.3 × 20.8 mm.

In a recent revision of Chemnitz's type specimens of Mollusca in the Copenhagen Museum (Cernohorsky, 1974b), the buccinid species *Pseudoneptunea varicosa* (Roeding), variously reported from Peru, Sth. America, Sth. Africa and Indonesia, remained unlocalised. Dr H. Rehder, Smithsonian Institution, Washington, kindly drew my attention to the existence of 2 beach specimens of the species in the collection of the National Museum of Natural History, Washington, USNM No. 405824, collected in 1929 at Sichol, Nakhon Si Thammarat, E. coast of the Gulf of Thailand (Figs. 10-12). These specimens have subangulate whorls and a sculpture of crisp main spirals with an occasional intermediate spiral thread. *Siphonalia bantamensis* K. Martin, 1895, from the Java Pliocene is obviously conspecific with the recent species, and *Pseudoneptunea varicosa* is therefore confirmed from the Indo-Malay region. *Siphonalia (Pseudoneptunea) inflata* Oostingh, 1941, from the Pliocene of Semarang, Java, is another "species" which very closely resembles the syntypes of *Pseudoneptunea varicosa* and has the spiral threads obsolete on the centre of the body whorl.

Family NASSARIIDAE Iredale, 1916

(The validity of the family name is currently under consideration by the I.C.Z.N.).

Genus **Nassarius** Duméril, 1806

Nassarius Duméril, 1806, Zool. anayt. p. 166. Type species by SM (Froriep, 1806) *Buccinum arcularia* Linnaeus, 1758. Recent, Indo-Pacific.

Cryptonassarius subgen. n.

TYPE SPECIES. *Nassa ephamilla* Watson, 1882, here designated. Recent, New Zealand and Australia.

Shell up to 19.0 mm in length, thin, ovate to elongate-ovate, body whorl inflated, protoconch of 3¼-4 smooth, rounded, convex embryonic whorls, first whorl partly immersed, teleoconch in adult specimens with 3¼-4½ (1¼-3 in juvenile and immature specimens) weakly or distinctly angulate convex whorls; sutures with a narrow, impressed fine spiral girdle which is more distinct in immature specimens than in adults. Sculptured with axial ribs and overriding spiral threads which produce a granulose sculpture which usually shows considerable wear on first 1-2 mature whorls; interspaces of axial ribs with longitudinal growth-striae. Aperture slightly shorter than the spire, oval, outer lip thin and sharp, varix lacking, aperture neither denticulate nor plicate, columella concave and calloused in mature specimens but callus small, narrow and not spreading, columella edentulous, distal end of columella usually with a thin, elevated ridge, parietal denticle absent. Siphonal canal very abbreviated, siphonal notch distinct and reverted, fossa very shallow, almost non-existent. White to cream in colour, periostracum thin, translucent straw-yellow to light brown in colour. Operculum elongate-ovate with a broad basal nucleus, margins not serrated but weakly corrugate through overlapping growth rings. Radula typically nassarine, with narrow, concave rachidians which bear *c.* 10 small denticles, laterals bi-cuspid, cutting edge of inward facing cusp with or without minute denticles (see Verco, 1907, pl. 29, fig. 13, and Ponder, 1968, pl. 1, figs. 15, 16).

Among the number of existing and often superfluous generic units in Nassariidae, there is no appropriate subgeneric unit to which *N. ephamillus* could be assigned. The species is usually associated with *Reticunassa* Iredale, 1936 (= *Hima* Leach in Gray, 1852), but it lacks the typically fusiform, solid shape, thick variced outer lip, denticled aperture, parietal fold and produced siphonal canal. It is perhaps closest in morphological features to the West American *Nassarius perpinguis* (Hinds, 1844) the type-species of

Caesia H. & A. Adams, 1853, but it lacks the parietal glaze, the apertural denticulation and the distinct fossa of *N. perpinguis*. In the 40 specimens examined, there was no trace of a parietal denticle in *N. ephamillus*.

Nassarius (Cryptonassarius) ephamillus (Watson, 1822) (Figs. 13-22)

1882. *Nassa ephamilla* Watson, J. Linn. Soc. Lond. 16: 370; 1883 Watson, N.Z. J. Science 1: 442; 1884 Hutton, Trans. Proc. N.Z. Inst 16: 233.

1886. *Nassa dissimilis* Watson, Rept. Sci. Res. Voy. H.M.S. Challenger 15: 175, pl. 17, fig. 6.

1886. *Nassa (Tritia) ephamilla* Watson, Rept Sci. Res. Voy. H.M.S. Challenger 15: 187, pl. 11, figs. 9a-d.

1906. *Nassa jacksonensis* Quoy & Gaimard, Hedley, Rec. Aust. Mus. 6 (3): 214 (*non Buccinum jacksonianum* Quoy & Gaimard, 1833).

1907. *Arcularia dipsacoides* Hedley, Rec. Aust. Mus. 6 (5): 359, pl. 67, fig. 21; 1907 Verco, Trans. Roy. Soc. Sth. Aust. 31: 214, pl. 29, fig. 13 (radula).

1913. *Alectrion dissimilis* Watson, Suter, Man. N.Z. Mol. p. 396; 1915 Suter, Atlas, pl. 19, fig. 1.

1913. *Alectrion ephamilla* Watson, Suter, *ibid.* p. 396; 1915 Suter, Atlas, pl. 19, fig. 2.

1918. *Nassarius dipsacoides* Hedley, J. Proc. R. Soc. N.S.W. 51: M88; 1932 Cotton & Godfrey, Sth. Aust. Nat. 13 (3): 94.

1938. *Reticunassa flindersi* Cotton & Godfrey, Rec. Aust. Mus. 6 (2): 204, pl. 17, fig. 8; 1938 Cotton & Godfrey, Malac. Soc. Sth. Aust. Publ. No. 1: 24; 1955 Cotton, R. Soc. Sth. Aust. Malac. Sect. No. 7, p. 2, fig. 10.

1951. *Nassarius ephamillus* (Watson), Fleming, Trans. Proc. R. Soc. N.Z. 79 (1): 137; 1956 Dell, Dominion Mus. Bul. No. 18: 109, pl. 13, figs. 127, 128; 1961 Powell, Shells New Zealand, ed. 4: 98; 1968 Ponder, Rec. Dominion Mus. 6: 31, pl. 1, figs. 15, 16 (radula and operculum).

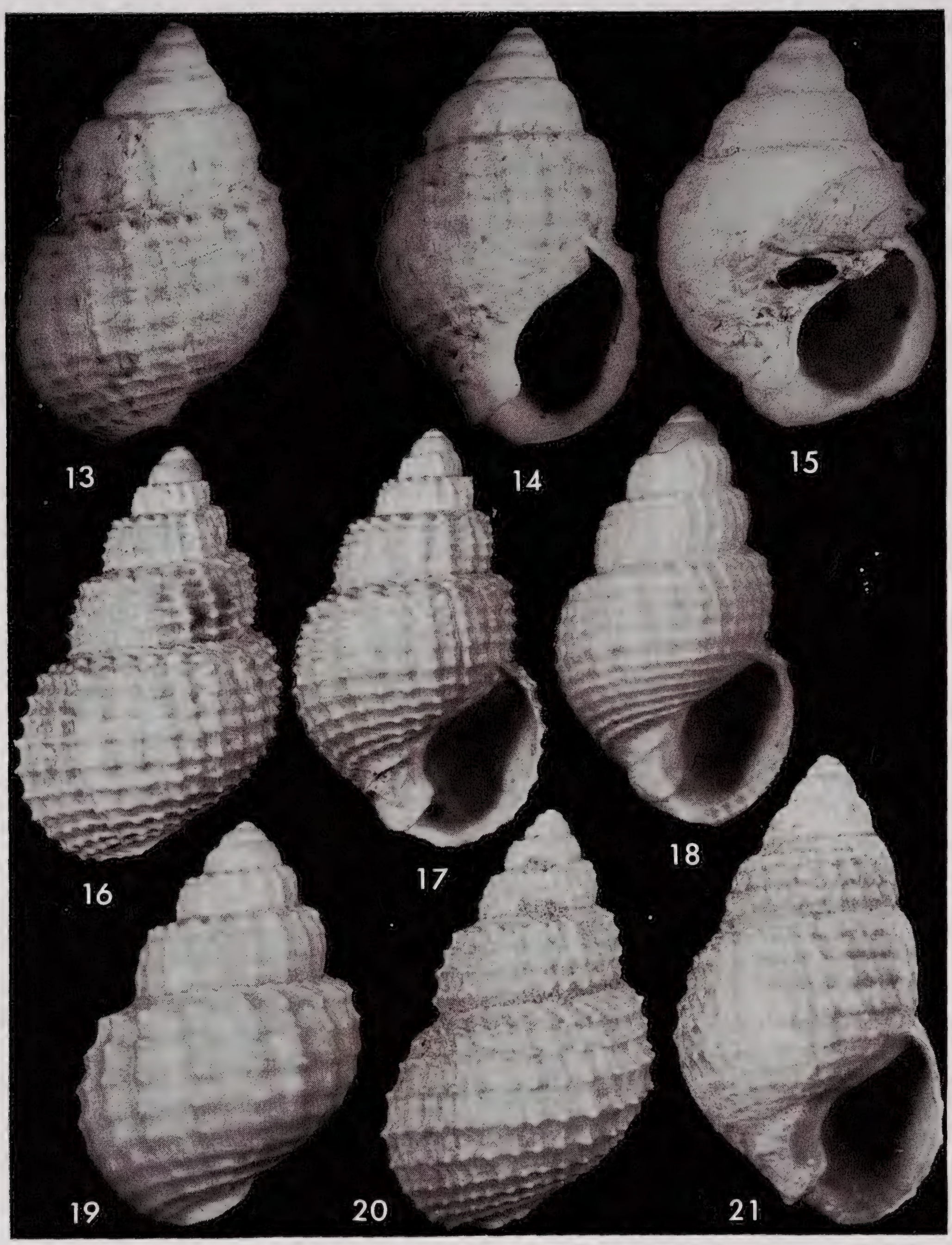
1962. *Reticunassa dipsacoides* (Hedley), Iredale & McMichael, Aust. Mus. Syd. Mem. No. 11: 67.

1962. *Nassarius dissimilis* (Watson), Clarke, Nat. Mus. Canada Bull. No. 181: 26.

TYPE LOCALITY. E. of East Cape, 37° 34′ S & 179° 22′ E, 700 fathoms (1281 m), blue mud, 40°F (4.5°C), New Zealand.

DISTRIBUTION. New Zealand to S.E. and S. Australia, 80 to 1100 fathoms (146-2013 m) (Fig. 22).

Material examined. New Zealand: E. of East Cape, 37° 34′ S & 179° 22′ E, 700 fathoms (1281 m), blue mud (5 syntypes of *N. ephamillus,* B.M.N.H. No. 1887.2.9.666-70); N.E. of Taiaroa Heads, Otago, 45° 45.6′ S & 171° 05′ E, *c.* 300 fathoms (549 m) (Nat. Mus. Wellington & Powell coll.); S.W. of Cape Foulwind, Tasman Sea, 42° 10′ S & 170° 10′ E, 610 m (Powell coll.); E. of Cape Turnagain, 40° 28′ S & 177° 43′ E, 1100 fathoms (2013 m), blue mud, 37.2°F (2.9°C) (holotype of *N. dissimilis,* B.M.N.H. No. 1887.2.9.591.); S.E. of Cape Palliser, Cook Str., 41° 42′ S & 175° 29′ E, 946-951 m (Nat. Mus. Wellington); off Palliser Bay, Cook Str., 550 fathoms (1007 m) (Nat. Mus. Wellington); S.W. of Cape Palliser, Cook Str., 41° 44′ S & 175° 12′ E, *c.* 400 fathoms (732 m) (Nat. Mus. Wellington); Chatham Rise, 43° 40′ S & 179° 28′ E, 220 fathoms (403 m) (Nat. Mus. Wellington); Chatham Rise, 43° 35.5′ S & 177° 59′ E, 320 fathoms (586 m) (Nat. Mus. Wellington); S.E. of Pitt I, 44° 35.5′ S & 176° 04′ W, 330 fathoms (604 m) (Nat. Mus. Wellington). Australia: 35 miles E. of Sydney, N.S.W., 800 fathoms (1464 m) (holotype of *N. dipsacoides,* Aust. Mus. Sydney No. C-26624); off Cape Jaffa, Sth. Australia, 300 fathoms (549 m) (holotype of *N. flindersi,* Sth. Aust. Mus. No. D-13298); Encounter Bay, Sth. Australia, 36° 00′ S & 138° 21′ E, 450 m (Zool.



Figs. 13-21. *Nassarius (Cryptonassarius) ephamillus* (Watson). 13, 14. Syntypes BMNH No. 1887.2.9.666-70.; 12.7 × 7.7 mm and 13.6 × 8.3 mm respectively. 15. Holotype of *Nassa dissimilis* Watson; BMNH No. 1887.2.9.591., 13.5 × 9.5 mm (immature and decorticated). 16, 17. Holotype of *Arcularia dipsacoides* Hedley; Aust. Mus. Sydney, No. C-26624, 11.9 × 7.2 mm (immature). 18. Holotype of *Reticunassa flindersi* Cotton & Godfrey; Sth. Aust. Mus. No. D-13298, 8.8 × 5.1 mm (immature). 19, 20. Specimens from Taiaroa Heads, Otago, New Zealand, 300 fathoms (549 m). 19. 8.5 × 5.5 mm (juvenile). 20. 17.6 × 11.0 mm (adult). 21. Specimen from Chatham Rise, New Zealand, 320 fathoms (586 m); 19.0 × 11.0 (adult).

Mus. Copenhagen). Literature records: off Sydney, 300 fathoms (549 m); 22 miles E. of Narrabeen, N.S.W., 80 fathoms (146 m); off Cape Jaffa, Sth. Australia, 130-300 fathoms (238-549 m); 120 miles W. of Eucla, S.W. Australia, 300 fathoms (549 m).

Fig. 22. Distributional map of *Nassarius (Cryptonassarius) ephamillus* (Watson). Black spots indicate locality records of specimens examined.

Dimensions

8.8 ×	5.1 ×	4.2 mm	—	holotype of *Reticunassa flindersi* Cotton & Godfrey
11.9 ×	7.2 ×	5.8 mm	—	holotype of *Arcularia dipsacoides* Hedley
12.7 ×	7.7 ×	6.6 mm	—	syntype of *Nassa ephamilla* Watson
13.5 ×	9.5 ×	7.5 mm	—	holotype of *Nassa dissimilis* Watson
13.6 ×	8.3 ×	7.0 mm	—	syntype of *Nassa ephamilla* Watson
17.6 ×	11.0 ×	8.8 mm	—	specimen from Taiaroa Head, Otago, New Zealand
19.0 ×	11.0 ×	8.8 mm	—	specimen from Chatham Rise, New Zealand

Variation in sculpture. Axial ribs on penultimate whorl 15-26, on body whorl 17-30; rows of nodules on penultimate whorl 4-5 (rarely 3), on body whorl 8-12.

Variation in the number of whorls with increasing maturity

Length of specimen	No. of mature whorls	No. of embryonic whorls
3.0 - 3.2 mm	$1\frac{1}{4}$ - $1\frac{1}{2}$	4
3.6 mm	$1\frac{1}{2}$	$3\frac{1}{2}$
4.6 mm	2	$3\frac{1}{4}$
5.0 mm	2	$3\frac{1}{2}$
5.2 mm	2	$3\frac{1}{4}$
6.0 mm	$2\frac{1}{2}$	$3\frac{1}{4}$
8.5 mm	3	$3\frac{3}{4}$
8.8 mm	$3\frac{1}{4}$	$3\frac{1}{2}$
11.9 mm	4	$3\frac{1}{4}$
12.7 mm	$3\frac{3}{4}$	$3\frac{1}{2}$
18.6 mm	$4\frac{1}{2}$	$3\frac{3}{4}$

While the number of embryonic whorls remains fairly constant in small juveniles and larger adults, there is a noticeable increase in the number of mature sculptured whorls with increasing size and maturity. Small juveniles and immature specimens are considerably broader than larger more mature specimens which are usually more slender and elongate. This change in shape through the developmental stages of individuals occurs in many other neogastropod families, notably the Mitridae, Vexillidae and Buccinidae.

Watson's type specimens of *Nassarius ephamillus* and *N. dissimilis* have a chalky appearance which is typical of dead-collected specimens. The holotype of *N. dissimilis* is badly decorticated and retains the granulose sculpture only on a small part of the dorsal surface of the body whorl.

Dell (1956) considered *N. ephamillus* to be close to *N. flindersi* (Cotton & Godfrey) and to *N. dipsacoides* (Hedley) from Australia, and expressed his doubts as to the species close relationship to the Indo-Pacific *N. pauperus* (Gould), the type species of *Reticunassa* Iredale (= *Hima* Leach in Gray). Examination of the holotypes of *N. dipsacoides* and *N. flindersi* shows them to be immature individuals of *N. ephamillus* (Watson). The Australian populations can be matched up in all morphological features with the New Zealand populations and cannot be even differentiated subspecifically.

ON THE SUBGENUS VENASSA

Subgenus **Venassa** von Martens, 1881

Venassa v. Martens, 1881, Conch. Mittheil. 2: 109. Type species by M *Nassa (Venassa) pulvinaris* v. Martens, 1881. Recent, Indonesia.

During a study of Indo-Pacific Nassariidae a certain number of malformed specimens have been encountered which in their distorted shape closely resemble the type specimen of *Nassarius pulvinaris* (v. Martens) (Fig. 25). Examination showed that malformed growth was due to teratological damage visible usually on the spire whorls in the form of fissures and repair scars. Growth on whorls subsequent to where damage occurred became accelerated, with sutures dipping more obliquely and the shell assuming a considerably more fusiform shape. The distortion is most pronounced on the body whorl which becomes more elongate and usually roundly angulate in its anterior third. Malformation is apparent in the distortion of the aperture, with the outer lip twisted and oriented obliquely to the axis, a distorted and often exaggerated columellar callus and a twisted siphonal fasciole. The usually distinct parietal denticle is indistinct and the columella also becomes edentulous. *Nassarius stolidus* (A. Adams, 1852) (= *N. nodiferus* Powys, 1835) (Figs. 23, 24) and *N. distortus* (A. Adams, 1852) (formerly *N. monilis* Kiener, 1834) (Figs. 26, 27), have both been based on the same type of malformed individual as "*Venassa*" *pulvinaris* (v. Martens). Malformation also occurs in temperate water Nassariidae like the S.E. Australian *N. pyrrhus* (Menke) (Figs. 28, 29). The subgenus *Venassa* v. Martens, will become a synonym of *Nassarius s. lato,* and may prove consubgeneric with *Zeuxis* A. Adams, 1852. A slightly distorted specimen of *N. olivaceus* (Bruguière, 1789) examined, bore a close resemblance to the malformed type of *Venassa pulvinaris,* but until a matching malformed specimen of a known species is found, the subgeneric synonymy will remain tentative.

Family RISSOIDAE Gray, 1847

Genus **Isselia** Semper in Schmeltz, 1874

Isselia Semper in Schmeltz, Cat. Mus. Godeffroy 5: 104, 110. Type species by OD *Rissoina mirabilis* Dunker in Schmeltz, 1874 (*non* Bourguignat, 1877). Recent, Indo-Pacific.

1881. *Isseliella* "Nevill MS" Weinkauff, Syst. Conch. Cab. ed. 2, 1 (22): 61, 67. Type species art. 67 (i) of I.C.Z.N. *Rissoina mirabilis* Dunker in Schmeltz, 1874 (*nom. subst. pro Isselia* Semper in Schmeltz, 1874).

Isselia Semper in Schmeltz has 3 years priority over *Isselia* Bourguignat, 1877, and the substitute name *Isseliella* Weinkauff, 1881, is superfluous.

Figs. 23-29. 23, 24. *Nassarius nodiferus* (Powys). 23. Syntype BMNH, 31.4 × 19.0 mm. 24. Holotype of *Nassa stolida* A. Adams; BMNH, 31.3 × 19.7 mm (malformed specimen). 25. Holotype of *Nassa (Venassa) pulvinaris* v. Martens from Atapupu, Timor, Indonesia; Zool. Mus. Humb. Univ. Berlin, 23.0 × 14.0 mm (malformed specimen). 26, 27. *Nassarius distortus* (A. Adams). 26. Syntype BMNH No. 197334, 26.0 × 14.2 mm (malformed specimen). 27. Normal specimen from Namotu Is, Fiji Is; 20.0 × 11.0 mm. 28, 29. *Nassarius pyrrhus* (Menke). 28. Normal specimen from Semaphore, Sth. Australia; 19.5 × 10.6 mm. 29. Malformed specimen from Parson's Bay, S.E. Tasmania; Tasm. Mus. & Art Gall. No. E-5317; 20.0 × 10.0 mm.

Isselia semitexta (Hedley, 1899) (Figs. 30-34)

1899. *Nassa semitexta* Hedley, Mem. Aust. Mus. 3 (7): 462, textfig. 37.

1907. *Tritonidea seurati* Couturier, J. Conchyl. 55 (2): 137, pl. 2, figs. 1-3 (Hao, Tuamotu Archip.).

1907. *Arcularia semitexta* (Hedley), Hedley, Proc. Linn. Soc. N.S.W. 32 (3): 509 (Mast Head reef, Capricorn group, Qld., Australia).

1909. *Cantharus semitextus* (Hedley), Hedley, Aust. Assoc. Adv. Sci. No. 138/139: 367.

1922. *Stossichia intertexta* (Hedley), Bavay, Bull. Mus. Nat. d'Hist. Nat. (1), 28: 425.

1922. *Stossichia seurati* (Couturier), Bavay, Bull. Mus. Nat. d'Hist. Nat. (1), 28: 425.

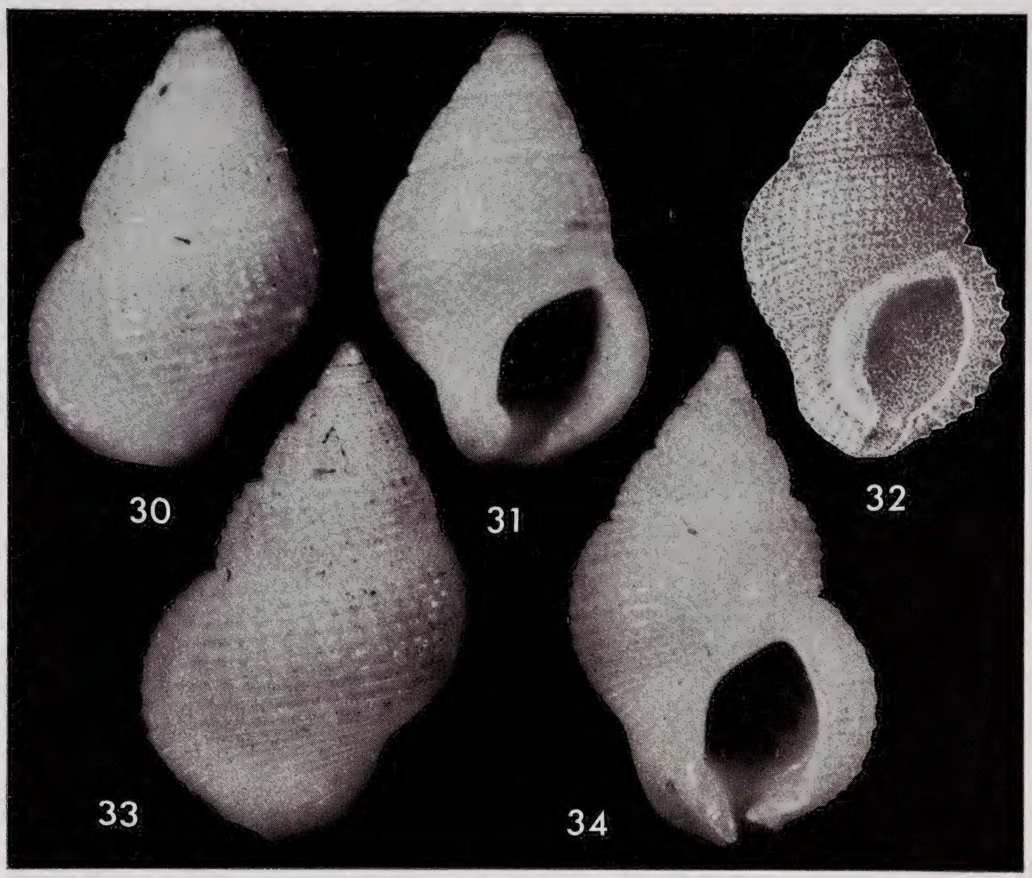
TYPE LOCALITY. Funafuti, Ellice Is.

DISTRIBUTION. Tuamotus to Queensland, Australia.

Shell small, 5.0-7.0 mm in length, ovate, milky-white in colour, mature whorls 5-5½, embryonic whorls partly missing in specimens examined. Spire whorls only weakly convex, sutures deeply incised and "V"-shaped in profile, sculptured with fine, slender axial riblets which number from 23-25 on the penultimate and from 22-26 on the body whorl, axial riblets becoming obsolete on the anterior half of the body whorl. Fine spiral threads override axial riblets and produce a granulose sculpture at the point of intersection; spirals number 6 on the penultimate and from 22-25 on the body whorl and *c.* 16 of the anterior cords are smooth. Outer lip prominently variced, aperture ovate, interior with 12 fine striae; columella calloused and smooth, callus impressed and slightly spreading anteriorly, anterior of columella with a single fold and a distinct kink which causes the siphonal fasciole and anterior of columella to twist toward the aperture, siphonal notch distinct and moderately broad.

Hedley (1899) based his description on two very worn specimens from Funafuti, Ellice Is, and his original figure shows a shell which appears to be in considerably better state of preservation than his actual types in the Australian Museum, No. C-6020, dimensions 5.9 × 3.6 × 3.5 mm and 5.9 × 3.8 × 3.7 mm. Hedley (*op. cit.*) expressed his doubts as to the correct assignment of the species to *Nassa* (= *Nassarius*) and commented on the rissoinid appearance of his new species. Hedley (1907) reported the species from Mast Head reef, Australia. Couturier (1907) unaware of Hedley's prior description, re-described the species as *Tritonidea seurati,* assigning it to the Buccinidae. Couturier's specimen came from Hao, Tuamotus, and measured 6.0 × 4.0 mm (Fig. 32).

Through the courtesy of Dr H. A. Rehder, Smithsonian Institution, Washington, I was able to examine a recently collected specimen from dredged land fill of the Patutoa district of Papeete, Tahiti, dimensions 6.6 × 4.0 × 3.8 mm (Figs. 33, 34). This comparatively little known but widely distributed Pacific species is not a nassarid nor a buccinid but belongs to the genus *Isselia* Semper in Schmeltz, 1874, family Rissoidae. Bavay (1922) correctly placed "*Nassa semitexta*" in the Rissoidae but erroneously associated the species with *Stosicia* Brusina, 1870, whose type is the quite different species *Rissoa planaxoides* Desmoulins in Grateloup, 1838, from the European Miocene. "*Stossichia serrei* Bavay, 1922" from Colón, Panama, is also an *Isselia* which closely resembles the Caribbean *Rissoa aberrans* C. B. Adams, 1850, a species which is usually assigned to *Alvania* Risso, but probably belongs to *Isselia.*



Figs. 30-34. *Isselia semitexta* (Hedley). 30, 31. Syntypes, Aust. Mus. Sydney, No. C-6020; 5.9 × 3.6 mm and 5.9 × 3.8 mm respectively. 32. Type figure of *Tritonidea seurati* Couturier; 6.0 × 4.0 mm (after Couturier 1907). 33, 34. Specimen from Patutoa, Papeete, Tahiti; USNM No. 669585, 6.6 × 4.0 mm.

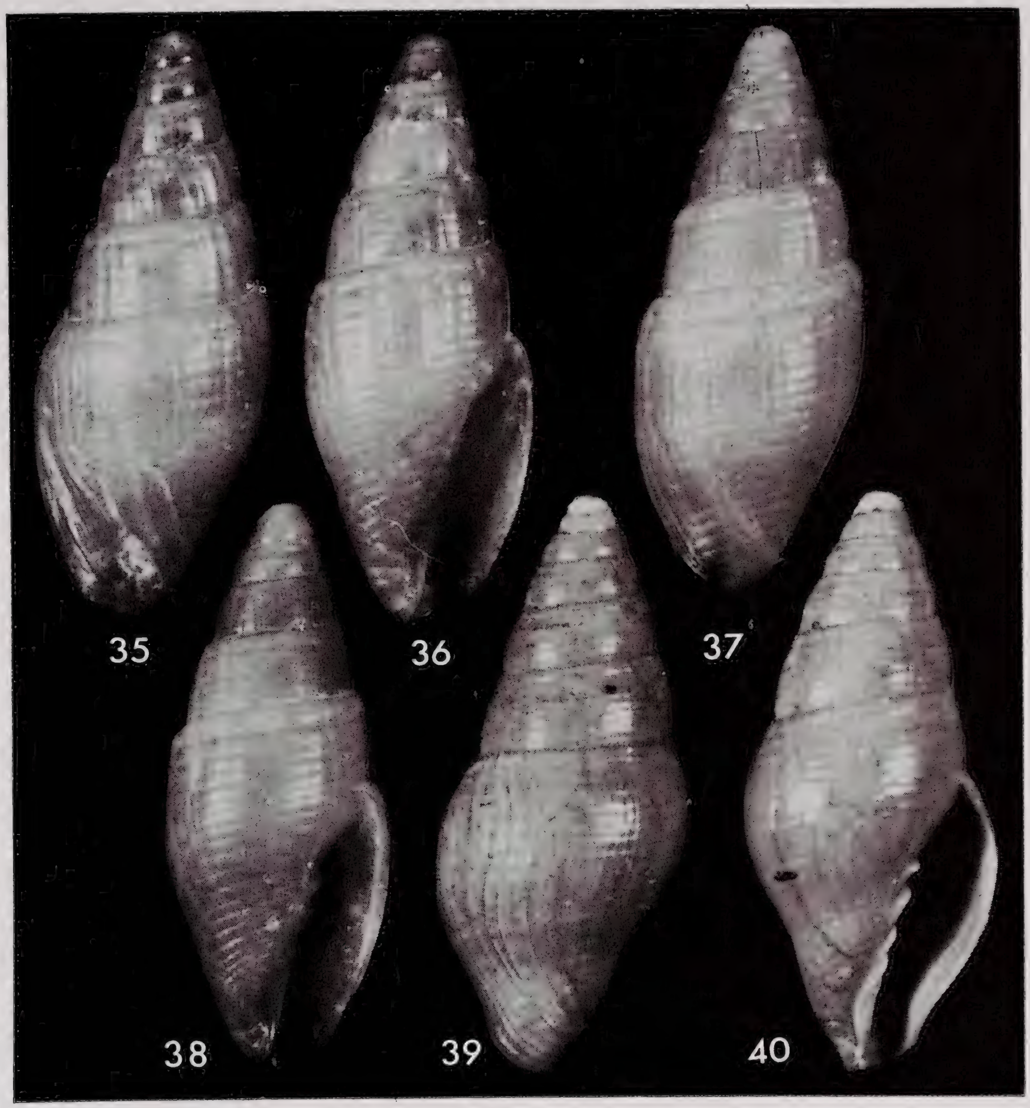
Family VOLUTOMITRIDAE

Genus **Microvoluta** Angas, 1877

Microvoluta Angas, 1877, Proc. Zool. Soc. Lond. p. 34. Type species by M *M. australis* Angas, 1877. Recent, S.E. Australia.

Microvoluta garrardi sp. n. (Figs. 35-38, 41)

Shell very small, 6.0-8.0 mm in length, fusiformly-elongate, width 38%-42% of length. Protoconch of 2-2½ smooth, glassy-white globose nuclear whorls, teleoconch of 4-4½ very weakly convex or almost straight-sided whorls; sculptured with numerous, irregularly sized and spaced narrow axial ribs and finely incised spiral grooves which produce flat spiral cords. Spiral grooves number from 5-6 on the penultimate and from 12-16 on the body whorl in addition to the 6-7 more elevated, oblique cords on the anterior third of the body whorl; a deep presutural spiral groove gives rise to a narrow sutural girdle which is usually irregularly and weakly nodulose through the intrusion of the axial riblets. Aperture only slightly longer than the spire, narrow, smooth within, outer lip thin and simple, only weakly constricted basally, columella concave, slightly calloused anteriorly, sculptured with 4 distinct, distant folds, first posterior fold shorter than subsequent fold. Siphonal canal short, ill-defined and spout-shaped, siphonal notch absent. Light brown or fawn in colour, ornamented on the body whorl with 2 broad, ill-defined darker brown transverse bands on which are superimposed delicate zig-zag axial lines and some small white spots.



Figs. 35-40. 35-38. *Microvoluta garrardi* sp.n., N.E. of Cape Moreton, Qld., Australia, 114-124 m. 35, 36. Holotype Aust. Mus. Sydney, No. C-96235; 7.0 × 2.7 × 3.6 mm. 37, 38. Paratype Auckl. Inst. Mus.; 6.8 × 2.7 × 3.6 mm. 39, 40. *M. pentaploca* Finlay, Mornington, Balcombe Bay, Miocene Victoria, Australia; 7.4 × 3.0 × 4.0 mm.

TYPE LOCALITY. Northeast of Cape Moreton, Queensland, Australia, 114-124 metres.

Holotype. In the Australian Museum, Sydney, No. C-96235; length 7.0 mm, width 2.7 mm, height of aperture 3.6 mm (Figs. 35, 36).

Paratypes. Paratype No. 1, dimensions 6.8 × 2.7 × 3.6 mm, in the Auckland Institute and Museum, Auckland; paratypes Nos. 2-12 in the Australian Museum, Sydney.

Microvoluta australis Angas, 1877, another recent Australian volutomitrid species (Fig. 49) is appreciably broader, smooth or weakly spirally sculptured, lacks the sutural girdle, has a more inflated body whorl and more convex spire whorls. *M. garrardi* is perhaps most similar to the Victorian Miocene *M. pentaploca* Finlay, 1927, but this species is also broader and the sculpture consists of curved axial growth-lines rather than axial riblets and although a sutural girdle is present, the presutural groove is narrower and more shallow, the body whorl is more inflated, the outer lip is prominently constricted anteriorly and all specimens examined were prominently lirate within the aperture (Figs. 39, 40).

M. garrardi has been named for Mr Thomas Garrard, Sydney, for his valuable contributions to Australian malacology.

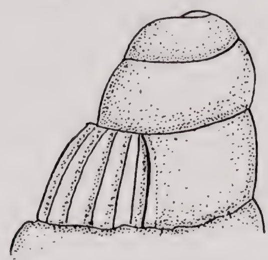


Fig. 41. *Microvoluta garrardi* sp. n. Protoconch.

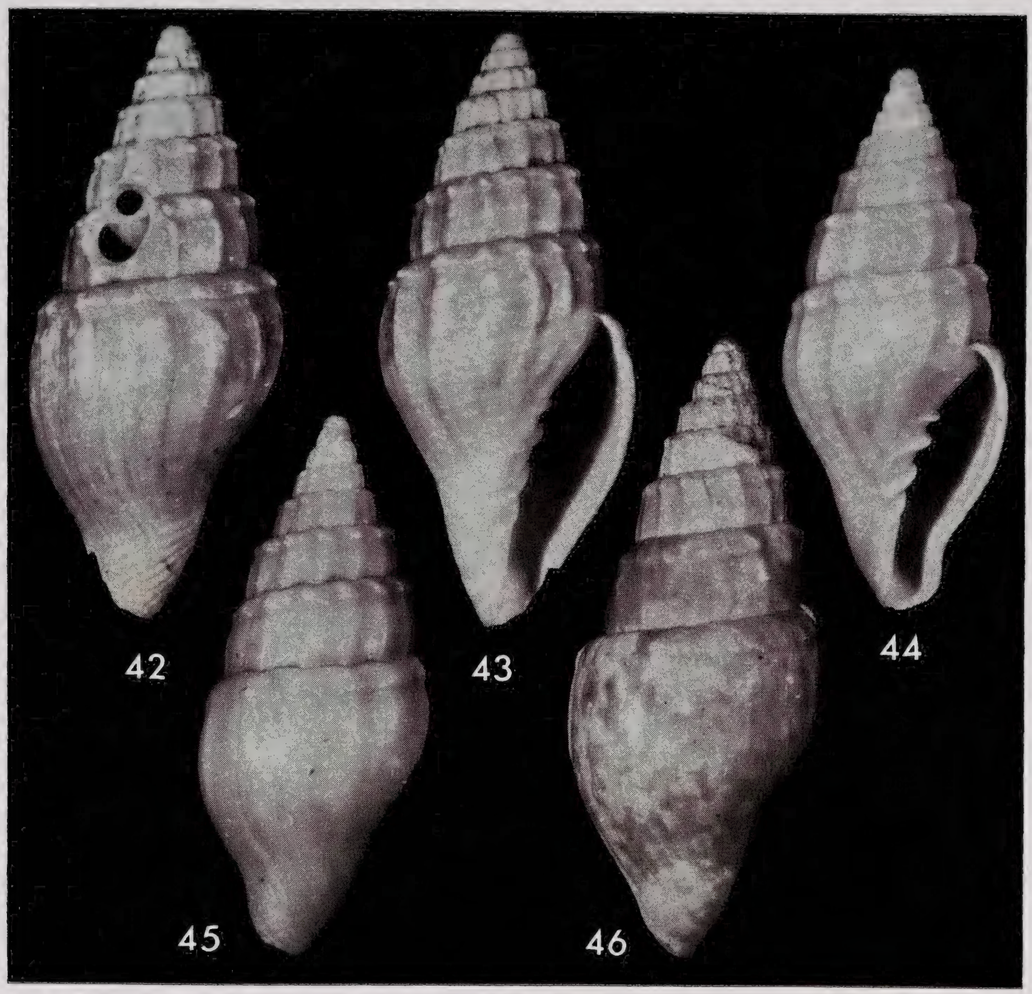
Microvoluta ponderi sp. n. (Figs. 42-46)

Shell small, 8.0-12.0 mm in length, fusiformly-elongate, width 40%-46% of length. Protoconch of 2-2¼ smooth, glassy, globose embryonic whorls, teleoconch of 5-6½ weakly convex whorls which are angulate at the sutures; sculptured with straight or slightly arcuate, angulate axial ribs which number from 12-17 on the penultimate and from 12-15 on the body whorl; a moderately deep presutural groove subdivides axial ribs into bluntly coronate sutural nodes. The axial ribs may become weak or almost obsolete and irregular-sized on the body whorl and sometimes appear like growth-striae which curve in the direction of the siphonal fasciole. Except for the presutural groove and 5-9 fine, oblique and close-set spiral cords on the siphonal fasciole, spiral sculpture is lacking. Aperture about equal in height to the spire, narrow, interior with 2-13 lirae, outer lip thin, convex and constricted anteriorly; columella not calloused except for a small calloused tip on the anterior of the columella which is concave and has 4-5 distant thin folds, first posterior fold shorter than subsequent fold. Siphonal canal somewhat produced and distinctly spout-shaped, siphonal notch lacking. Uniformly white in colour under a straw-yellow, thin and opaque periostracum.

TYPE LOCALITY. East of Port Jackson, New South Wales, Australia, 118 metres (ex-"Challenge").

Holotype. In the Australian Museum, Sydney, No. C-98330; length 11.0 mm, width 4.8 mm, height of aperture 5.7 mm (Figs. 42, 43) [the holotype is holed on the penultimate whorl on the dorsal side].

Paratypes. Paratype No. 1, dimensions 10.0 × 4.0 × 5.2 mm from the type locality in the Auckland Institute and Museum, Auckland; paratype No. 2 from the type locality and paratypes Nos. 3-5 (C-67478) from CSIRO St. G3/201/60, off Sydney, N.S.W., 366 m, in the Australian Museum, Sydney (largest paratype 12.3 × 5.0 × 6.0 mm).



Figs. 42-46. *Microvoluta ponderi* sp. n. 42-45. E. of Port Jackson, N.S.W., Australia, 118 m. 42, 43. Holotype Aust. Mus Sydney, No C-98330; 11.0 × 4.8 × 5.7 mm. 44, 45. Paratype Auckl. Inst. Mus.; 10.0 × 40 × 5.2 mm. 46. Paratype from off Sydney, N.S.W., 366 m; Aust. Mus. Sydney, No. C-67478; 12.3 × 5.0 × 6.0 mm.

Microvoluta ponderi is the only living *Microvoluta* species with a sutural row of bluntly coronate nodules. The closest relative appears to be the New Zealand species *M. marginata* (Hutton, 1885), but in this species, like in some Eocone-Miocene *Proximitra* species, the nodules are situated a considerable distance anteriorly to the sutures, usually on the presutural ramp. In sculpture the species is closest to the New Zealand Miocene *Proximitra fracta* (Marwick, 1926), a species which has only 2¼-2½ mature whorls and has obviously been based on a juvenile specimen. In *P. fracta* the sutural nodules on the penultimate whorl are adjoining each other and are so large that they occupy half the height of the whorl.

M. ponderi has been named for Dr Winston Ponder, Curator of Molluscs, Australian Museum, Sydney, for his contributions to research on New Zealand and Australian Mollusca.

Microvoluta stadialis (Hedley, 1911) (Figs. 47, 48)

1911. *Mitra stadialis* Hedley, Zool. Res. Fish. Exp. "Endeavour", Pt. 1: 112, pl. 20, fig. 37.

1932. *Austromitra stadialis* (Hedley), Cotton & Godfrey, Sth. Aust. Nat. 13 (2): 79; 1957 Cotton, Roy. Soc. Sth. Aust. Malac. Sect. No. 12: 5, fig. 15; 1959 Cotton, Sth. Aust. Moll. in Handb. Flora Fauna Sth Aust, p. 386; 1962 Macpherson & Gabriel, Mar. Moll. Victoria No. 2: 209.

TYPE LOCALITY. 40 miles (64 km) south of Cape Wiles, Sth. Australia, 100 fathoms (183 m).

Figs. 47-49. 47, 48. *Microvoluta stadialis* (Hedley), 40 miles (64 km) Sth. of Cape Wiles, Sth. Australia, 100 fathoms (183 m); paratypes Aust. Mus. Sydney, No. C-31990, 8.0 × 3.7 × 4.4 mm and 7.1 × 2.9 × 3.6 mm respectively. 49. *M. australis* (Angas), off Cronulla, N.S.W., Australia, 40-100 m; 8.5 × 3.7 mm.

The species has been placed in the vexillid genus *Austromitra* Finlay, by Australian authors, but examination of paratypes of *Mitra stadialis,* Australian Museum, Sydney, No. C-31990, prove the species to be a *Microvoluta* with a concave columella, thin wide-spaced columellar folds with the first posterior fold smaller than the subsequent fold, a spout-shaped siphonal canal and a microvolutine protoconch. To the original description can be added that the spiral sculpture consists of 3-4 thin and shallow spiral grooves situated about centrally on the spire whorls and anteriorly to the suture on the body whorl; 2-3 orange-brown spiral lines are usually impressed in the grooves.

Family TURRIDAE

Subfamily RAPHITOMINAE Bellardi, 1875

(= Daphnellinae Casey, 1904 = Pleurotomellinae Nordsieck, 1968)

Genus **Eucyclotoma** Boettger, 1895

Eucyclotoma Boettger, 1895, Nachricht. deut. Malak. Gesell. 27: 55. Type species by SD (Cossman, 1896) *Clathurella bicarinata* "Reeve" = *C. bicarinata* Pease, 1863. Recent, Pacific.

1924. *Turrhyssa* Dall, Proc. Biol. Soc. Washington 37: 88. Type species by OD *Clathurella bicarinata* Pease, 1863.

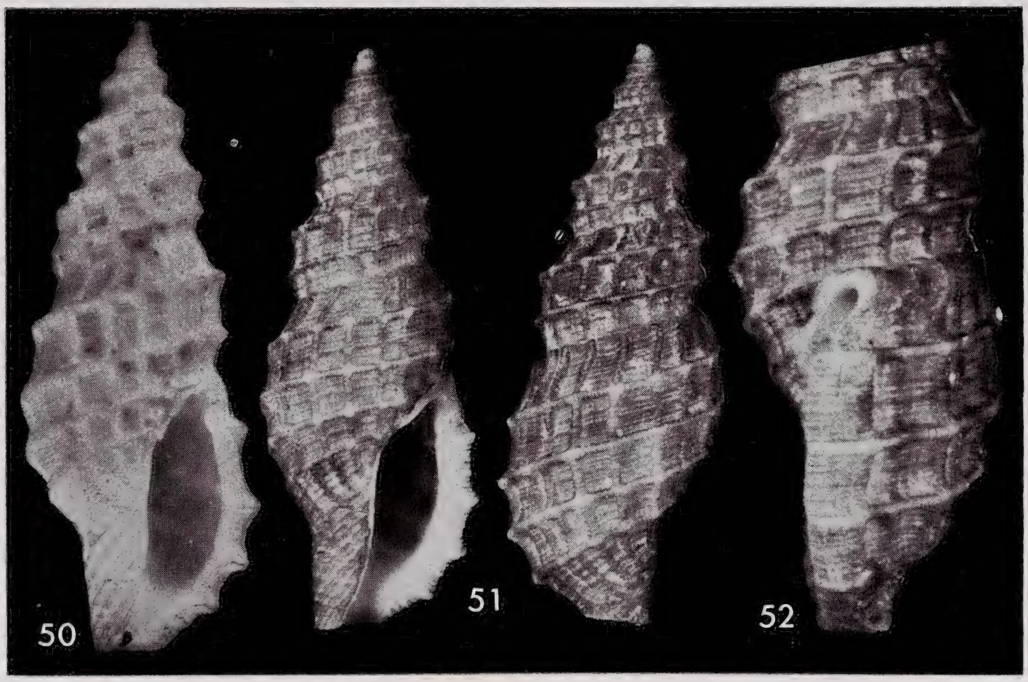
Eucyclotoma hindsii (Reeve, 1843) (Figs. 50-53)

1843. *Pleurotoma hindsii* Reeve, Conch. Icon. 1: pl. 14, fig. 119.
1884. *Clathurella hindsii* Reeve, Tryon, Man. Conch. 6: 289, pl. 17, fig. 12.
1952. *Eucyclotoma hindsii* (Reeve), Kuroda & Habe, Check-list Bibl. Rec. Mar. Moll. Japan, p. 56; 1966 Powell, Bull. Auckland Inst. Mus. No. 5: 130.

TYPE LOCALITY. Baclayon, Bohol I, Philippines.

Shell *c*. 10.0 mm in length, fusiform, with 5½ mature whorls and almost 2 embryonic whorls which are sculptured with dense, minutely granulose striae. Sculpture latticed, early mature whorls with 2 elevated spiral cords, body whorl with 4 cords, axial sculpture consisting of *c*. 15-16 cords which are slightly arcuate on the presutural ramp and then descend vertically on to the spiral cords; window-like interspaces of cords with a slightly finer central thread and additional fine spiral striae. Labial sinus deep and tilted, outer lip thickened and minutely plicate on the edge, columella almost vertical, smooth, siphonal canal moderately produced, fasciole obliquely striate. Brown in colour, spiral cords paler, protoconch light fawn, aperture bluish-white.

The species has remained unfigured and the protoconch was unknown. Recent specimens have been collected at Crash boat Basin, Apra Harbour, Guam I, Marianas Is, in 15 feet (4.6 m) under rock and coral rubble (*leg*. R. Salisbury). The species has been previously reported from the Philippines and Japan.



Figs. 50-52. *Eucyclotoma hindsii* (Reeve). 50. Type specimen from Baclayon, Bohol I, Philippines; BMNH, dimensions not available (negative by courtesy Dr A. W. B. Powell). 51, 52. Specimen from Apra Harbour, Guam I, Marianas Is; 10.6 × 3.8 × 5.0 mm.

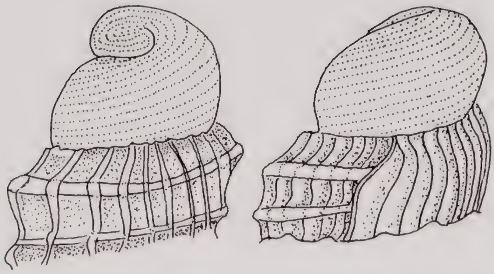
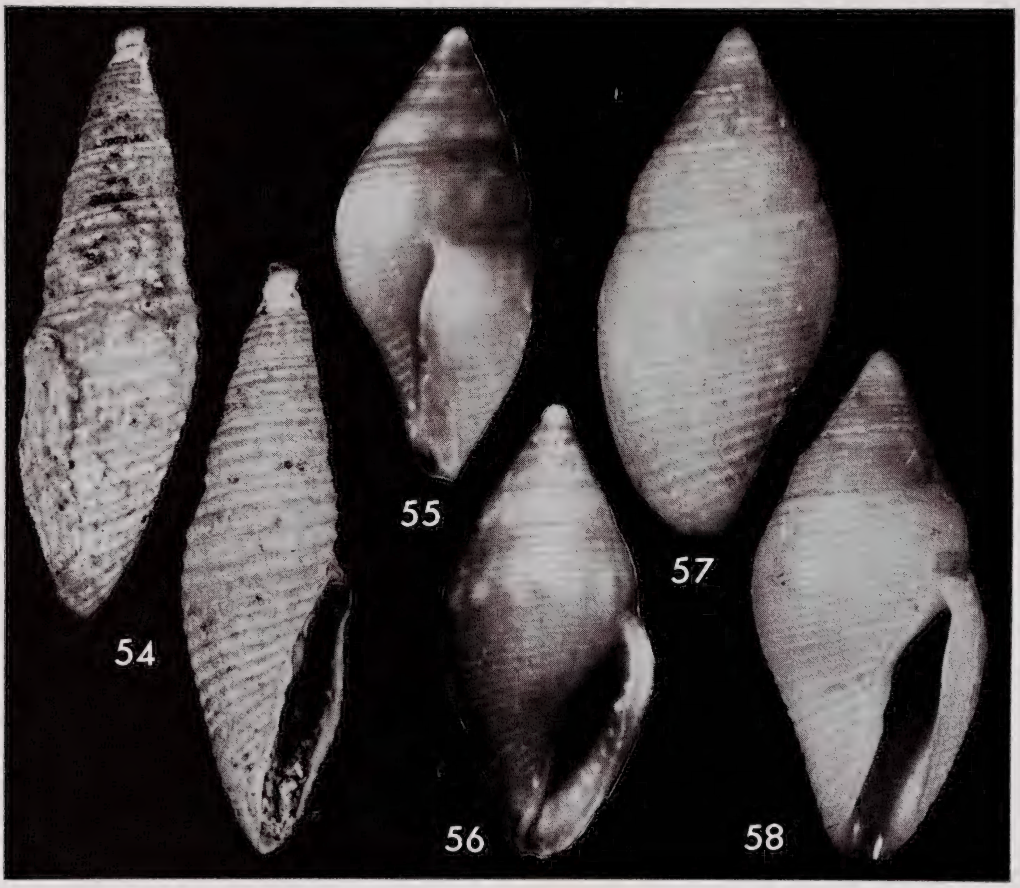


Fig. 53. *Eucyclotoma hindsii* (Reeve). Protoconch.

Subfamily MITROMORPHINAE Casey, 1904

1888. Diptychomitrinae Bellardi, Mem. R. Accad. Sci. Torino 39: 152 (*nomen oblitum*).
1904. Mitromorphini Casey, Trans. Acad. Sci. St. Louis 14 (5): 126, 169 (19th May 1904).
1904. Mitrolumnidae Sacco, Moll. terr. terz. Piem. Liguria Pt. 30: 88 (August 1904).



Figs. 54-58. 54. *"Mitra (Subcancilla)" musa* Olsson, Quebrada Camarones, Esmeralda form., Mio-Pliocene of Ecuador; holotype USNM No. 643951, 20.0 × 6.0 × 10.0 mm. 55, 56. *Mitrolumna olivoidea* (Cantraine); lectotype Inst. Roy. Sci. Nat. Brussels, 8.3 × 4.1 mm (photo courtesy Dr W. Adam, Brussels). 57, 58. *M. alba* (Petterd), Western Port, Victoria, Australia, 5-10 fathoms (9-18 m); 6.2 × 3.2 mm.

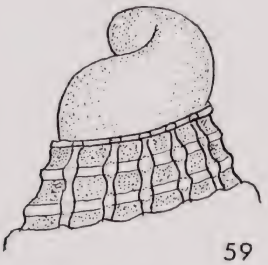
Genus **Mitrolumna** Bucquoy, Dautzenberg & Dolfuss, 1883

Mitrolumna Bucquoy, Dautzenberg & Dollfus, 1883, Mol. mar. Roussillon 1 (3): 115, 121. Type species by OD *Mitra olivoidea* Cantraine, 1835. Recent, Mediterranean.

1922. *Mitrithara* Hedley, Rec. Aust. Mus. 13 (6): 233. Type species by OD *Columbella alba* Petterd, 1879. Recent, S.E. Australia.

The recent report of a new species of *Mitrolumna* from the Galápagos Is by Emerson and Radwin (1969) extend the geographical range of the formerly monotypic genus *Mitrolumna* from the Mediterranean and West Africa to the Eastern Pacific. Emerson and Radwin (*op. cit.*) gave a detailed history of *Mitrolumna* and remarked that the existence of the Galapagan *Mitrolumna keenae* Emerson & Radwin, 1969, seemingly presents zoogeographic incongruities. However, this zoogeographic anomaly will be resolved if other genera closely resembling *Mitrolumna* are re-examined in the light of new evidence.

The S.E. Australian turrid genus *Mitrithara* Hedley, 1922, has been disassociated from *Mitrolumna* mainly on the assumption that *Mitrolumna* was confined to European waters. A detailed comparison, however, of the type species *Mitrithara alba* (Petterd) and *Mitrolumna olivoidea* (Cantraine), has failed to disclose characters which would merit a separation of these two genera. Both species have an ovate-biconic shell, a bi-plicate columella, a weak sutural sinus, a posteriorly indented outer lip, a wide, unnotched siphonal canal and a predominantly spiral sculpture which may occasionally become granulose, especially on the spire whorls (Figs. 55-58). The protoconchs are also basically similar, with *Mitrolumna* having only a slightly more narrowly dome-shaped protoconch than *Mitrithara* (Figs. 59, 60).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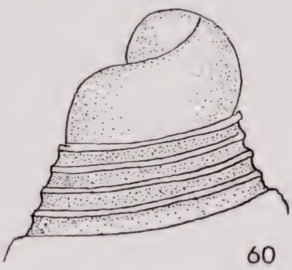
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Figs. 59, 60. Protoconchs. 59. *Mitrolumna olivoidea* (Cantraine). 60. *M. alba* (Petterd).

Two groups appear to be represented in the Mitromorphinae: the *Mitrolumna* group, which includes species with a bi-plicate columella and contains the subgenera *Helenella* Casey, 1904, *Cymakra* Gardner, 1937, and *Arielia* Shasky, 1961. The group of *Mitromorpha* Carpenter, 1865, includes species with an edentulous columella and should embrace the Indo-Pacific subgenus *Lovellona* Iredale, 1917, as suggested by Orr-Maes (Orr, 1959).

"Mitra (Subcancilla)" musa Olsson, 1964 (Fig. 54)

1964. *Mitra (Subcancilla) musa* Olsson, Neog. Moll. N.W. Ecuador p. 132, pl. 38, fig. 12 only.

TYPE LOCALITY. Quebrada Camarones, Esmeralda formation, Mio-Pliocene of Ecuador.

Olsson's (1964) diagnosis of *M. (C.) musa* is a composite description based on two different species. The holotype illustrated by Olsson (*op. cit.*, pl. 38, fig. 12) is actually a mitromorphine turrid whereas the paratype (*op. cit.*, pl. 38, fig. 11) is a juvenile mitrid *Subcancilla*. The description of the protoconch, number of spirals and 3 columellar plaits have been based on the juvenile *Subcancilla* species and not the turrid holotype. The holotype of *musa* in the National Museum of Natural History, Washington, No. 643951 (dimensions 20.0 × 6.0 × 10.0 mm), is a fusiformly biconic shell of 4½ mature whorls and a remnant of *c.* 2½ embryonic whorls of a form unknown in the Mitridae. Contrary to the original description, the spire is not considerably longer than the aperture but equal in height, the penultimae whorl has 5 spiral cords and the body whorl 19. The aperture is narrow and elongate, the labial sinus is represented by an indentation of the outer lip near the suture, the columella has only 2 medial, typically mitrolumnine folds of which the posterior one is larger and swollen and the anterior one smaller. The siphonal canal lacks the mitrid siphonal notch and is spout-shaped and the anterior end of the columella has a slight twist towards the aperture. Features of protoconch, indented outer lip, bi-plicate columella and spout-shaped siphonal canal exclude an assignment of the holotype of *musa* to *Subcancilla* or any other genera of the Mitridae. The species belongs in the Mitromorphinae and generically resembles the living species *Arielia mitriformis* Shasky, 1961, from the Gulf of California. The latter species, however, has an overall reticulate sculpture whereas *musa* is clathrate only on the first two post-embryonic whorls and the sculpture becomes predominantly spiral on the last 2 whorls.

Acknowledgements. The loan of specimens received from the following persons is gratefully acknowledged: Dr F. Climo, National Museum, Wellington; Mrs H. Dale, Seychelles Is; Mr T. A. Garrard, Sydney; Dr W. Ponder, Australian Museum, Sydney; Dr H. Rehder, Smithsonian Institution, National Museum of Natural History, Washington; Mr R. Salisbury, Honolulu; Ms E. Turner, Tasmanian Museum and Art Gallery, Hobart; and Mr W. Zeidler, South Australian Museum, Adelaide. I further would like to thank Mr T. Garrard for recognising the types of *Mitra stadialis* as a *Microvoluta* and Dr H. Rehder for information and literature pertaining to *"Nassa" semitexta*. Dr R. Kilias, Zoological Museum, Humboldt University, Berlin, kindly supplied a photograph of the type of *Nassarius pulvinaris* for which I am grateful. My thanks are due to Dr J. Taylor, Mr J. Peake, Mr P. Nuttall and Ms K. Way, British Museum (Natural History), London, for facilities provided and access to the Museum's type collection.

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INDEX TO VOLUME 12

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