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THE SUBANTARCTIC LAND SNAIL, *NOTODISCUS HOOKERI* (REEVE, 1854) (PULMONATA, ENDODONTIDAE)

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THE SUBANTARCTIC LAND SNAIL, *NOTODISCUS HOOKERI* (REEVE, 1854) (PULMONATA, ENDODONTIDAE)

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Notodiscus hookeri was described from Kerguelen Island more than a century ago. Subsequently it was recorded from Possession and Amsterdam Islands (Gaillard, 1954). Dell (1964) described a new subspecies, *N. hookeri heardensis*, from material collected on Heard Island. During an extended study trip in 1962 I saw the type specimens of the nominate race and scattered material in many museum collections. Through the kindness of Dr A. W. B. Powell and the Auckland Institute and Museum, it was possible to borrow specimens from Kerguelen, Heard and Possession Islands for detailed analysis. Subsequently a series collected on Marion Island by Professor E. M. Zinderen-Bakker was loaned by the Natal Museum through the courtesy of Dr A. C. van Bruggen.

Conchological variation in populations from several parts of Kerguelen and more limited material from Possession, Heard and Marion Islands was reviewed. Specimens from Kerguelen, Heard and Marion Islands were dissected. There is one species present whose variability is below the level conventionally accepted as warranting subspecific designations.

I am deeply indebted to Dr van Bruggen and Dr Powell for loan of this material and to the authorities of their museums for permitting dissections to be made. The illustrations are by Mrs Patricia Smiley and Miss Margaret Moran. Most statistical calculations were done by Mrs Sandra Rendleman. This work was supported by National Science Foundation Grants G-16419, GB-3384, and GB-6779.

CLASSIFICATION

Thiele (1931, p. 575) described the genus *Notodiscus* on the basis of radular and genital figures in von Martens (1877, pl. 2). No comparisons were made with extralimital genera. Currently I am working on a generic level revision of the Southern Hemisphere 'endodontid' snails. It is premature to indicate exact affinities of *Notodiscus* or to make a subfamily reference. There are several unusual anatomical features—the secondary ureter passing under and across the hindgut to the parietal

margin, the partial folding of the kidney, very short and bulbous talon, exceedingly long and multi-folded vas deferens and free oviduct, reflexed apical portion of spermatheca that may or may not be swollen, short penis with a true verge, and broadly cusped central and lateral radular teeth—that remove *Notodiscus* from phylogenetic affinity with the South African endodontid taxa, *Trachycystis* and *Afrodonta*. Many more similarities are evident with Australian and New Zealand taxa, but I am not prepared at this time to delineate subfamily units or indicate probable origins.

The descriptions of anatomy and shell provided below follow the pattern developed in studies of Pacific Island endodontids (Solem, in press) and cover those features I have found useful in delineating genera.

SPECIES ACCOUNT

Notodiscus hookeri (Reeve, 1854) Figs. 1–8

Helix hookeri Reeve, 1854, *Conch. Icon. Helix*, Plate 208, Fig. 1474—Kerguelen's Land (J. D. Hooker); Studer, 1879, *Arch. Naturgesch.* **45**, (1), 111—sea level up to 2000 ft elevation, Kerguelen Island.

H. (*Patula*) *hookeri* Reeve, Pfeiffer, 1856, *Malak. Blätt.* **2**, 126; Pfeiffer, 1859, *Monog. helic. viv.* **4**, 87–88; Pfeiffer, 1868, *Monog. helic. viv.* **5**, 152; Pfeiffer, 1876, *Monog. helic. viv.* **6**, 159; Smith, 1877, *Phil. Trans. R. Soc.* **168**, 183–184—Royal Sound, Kerguelen Island.

H. (*Hyalina*) *hookeri* Reeve, Dall, 1876, *Bull. U.S. natn. Mus.* **3**, 45.

Patula hookeri (Reeve), von Martens, 1877, *Mber. Königl. Akad. Wiss. Berlin*, 1877, 269–271, Plate 2, Figs. 5–10 (anatomy)—Betsy-Ceve inland to above 1000 ft elevation, Kerguelen Island.

Helix (*Amphidoxa*) *hookeri* Reeve, Tryon, 1887, *Man. Conch.* **3** (2), 48, Plate 5, Fig. 83.

Amphidoxa (*Stephanoda*) *hookeri* (Reeve), Pilsbry, 1893, *Man. Conch.* **9** (2), 40–41, Plate 1, Figs. 14–16; Plate 7, Figs. 16–18.

Endodonta (*Amphidoxa*) *hookeri* (Reeve), Lamy, 1931, *Bull. Mus. Hist. Nat., Paris* (2nd ser), **3** (6), 518—Dôme Rouge, Kerguelen.

Notodiscus hookeri (Reeve), Thiele, 1931, *Handb. Syst., Weichtierk.*, **1** (2), p. 575—generic description; Powell, 1959, *Rep-B.A.N.Z. antarct. Res. Exped.* (series B), **6** (7), 138—Jeanne d'Arc and BANZARE stations, 49, 56, 56B, Kerguelen Island.

Endodonta hookeri (Reeve), Gaillard, 1954, *Bull. Mus. Hist. nat.*, Paris (2nd ser), **26** (4), 525—Port aux Français, Bras Karl Luyken, Baie de l'Aurore Australe, Péninsule Courbet, Port Hopefull and Baie Arétas on Kerguelen Island. Ile de la Possession. Nouvelle Amsterdam.

Notodiscus hookeri hookeri (Reeve), Dell, 1964, *Trans. R. Soc. N.Z.* (*Zool.*), **4** (11), 167–168, Figs. 3,4—Kerguelen Island.

N. hookeri heardensis Dell, 1964, *Trans. R. Soc. N.Z.* (*Zool.*) **4**, (11), 168, Figs. 1, 2—Atlas Cove, Laurens Peninsula, near Red Island and West Bay on Heard Island.

Diagnosis

Shell large, diameter of adult 4·30–7·70 mm (mean 5·52 mm), with $3\frac{1}{2}$–$4\frac{5}{8}$ rather loosely coiled whorls. Apex and spire variable in height, usually moderately, sometimes slightly or strongly elevated, last whorl descending distinctly more rapidly, H/D ratio 0·491–0·727 (mean 0·574). Umbilicus narrow, last whorl decoiling more rapidly, D/U ratio 4·58–11·4 (mean 7·30). Apical whorls $1\frac{7}{8}$–2, surface often eroded, sculpture, when present, of about ten to twelve low and indistinct spiral ribs. Postnuclear whorls with macroscopically smooth surface broken only by occasional growth wrinkles. Under 96× magnification, surface occasionally smooth and shining, most frequently with faint traces of microreticulation. Sutures

impressed, whorls more strongly rounded above and on basal margin than on outer periphery, very slightly compressed laterally on upper palatal margin. Color greenish-yellow, with narrow to moderately wide, rather regularly spaced, reddish streaks that follow lines of growth. Aperture wide, ovate, slightly compressed laterally above periphery, inclined about 20° from shell axis. Periostracal layer distinctly thicker than calcareous, latter recessed up to 0·5 mm within aperture on palatal wall in all but gerontic individuals.

Some of the New Zealand and Tasmanian 'flammulinid' species have a pattern of shell coloration and form that approximates to that shown by *Notodiscus hookeri*. The retention of spiral apical ribs, kidney shape and ureter position, reflexed spermathecal apex and very small penis differentiate the latter from any Austro–Zelandic taxa that have been dissected up to the present time.

Description

Shell large, with 4⅛ loosely coiled whorls. Apex and spire moderately and evenly elevated, body whorl descending a little more rapidly, H/D ratio 0·607. Apical whorls 1⅝, surface eroded. Remaining whorls with heavy periostracum which contains a very faint microreticulated surface sculpture overlying vague, irregular growth wrinkles in the calcareous portion of the shell. Sutures moderately impressed, whorls evenly rounded above and on lower margins with slightly more sharply rounded periphery. Color greenish yellow-brown with vague reddish streaks. Umbilicus minute, choked by debris, contained six times in the diameter. Aperture wide, sub-circular, slightly compressed laterally above and below periphery, inclined about 15° from the shell axis. Height of lectotype 4·05 mm, diameter 6·67 mm.

Lectotype

Kerguelen Island. Collected by Dr Joseph Hooker. British Museum (Natural History) number 47.4.12.20.

Paratypes

British Museum (Natural History) number 47.4.12.21-29.

Range

Recorded from Amsterdam, Kerguelen, Heard, Possession (Crozet), and Marion (Prince Edward) Islands. Probably lives on St Paul, Prince Edward and the remaining Crozet Islands.

Description of soft parts

Foot about equal to shell diameter in length, rather broad, 'U'-shaped posteriorly with slight tapering, bluntly rounded anteriorly. Pedal grooves high on foot (Fig. 2b), pedal very strongly impressed, suprapedal somewhat weaker. Sole undivided longitudinally, but strongly corrugated transversely, the corrugations being continuations of the lateral slime grooves below the pedal groove. Tail without mid-dorsal groove, but with a lighter color streak, broadly rounded in outline. No caudal

foss or horn. Both pedal grooves unite above tail. Slime network irregularly rectangular, sharply outlined.

Color variable in preservative. Head and body dark grey brown, foot sole and grooves of slime network yellow white.

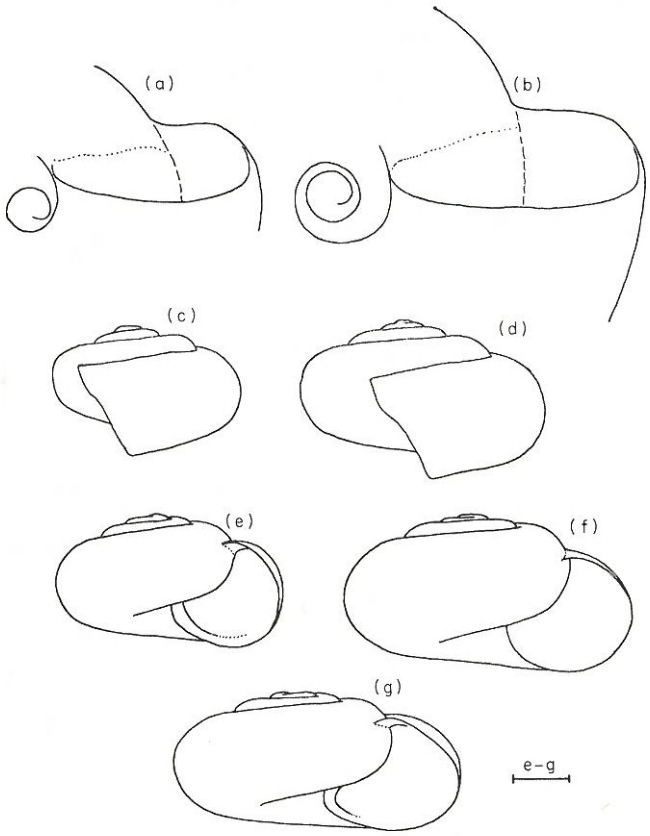

FIG. 1. Shell variation. (a) Umbilicus of juvenile; (b) umbilicus of adult; (c) lip edge of juvenile; (d) lip edge of adult; (e) side view of Long Island specimen (No. 724) with elevated spire; (f) side view of typical Kerguelen shell (No. 903); (g) side view of depressed Heard Island example (No. 360). Scale line for (e–g) equals 1 mm.

Mantle collar (MC, Fig. 2a) short and rather thick, anterior edge bluntly rounded to outer margin (Fig. 2b, LL). Pneumostome masked by a thick, short right mantle lappet (MR, Fig. 2f) and a small, crescentic-anterior left mantle lappet (MA).

Anus (A) opening directly above and slightly in front of external ureteric pore (KX). Latter opening on parietal wall directly below hindgut into urinary chamber (LK), a shallow groove passing through pneumostome.

Pallial region (Fig. 2f) occupying one-third whorl in contracted specimens.

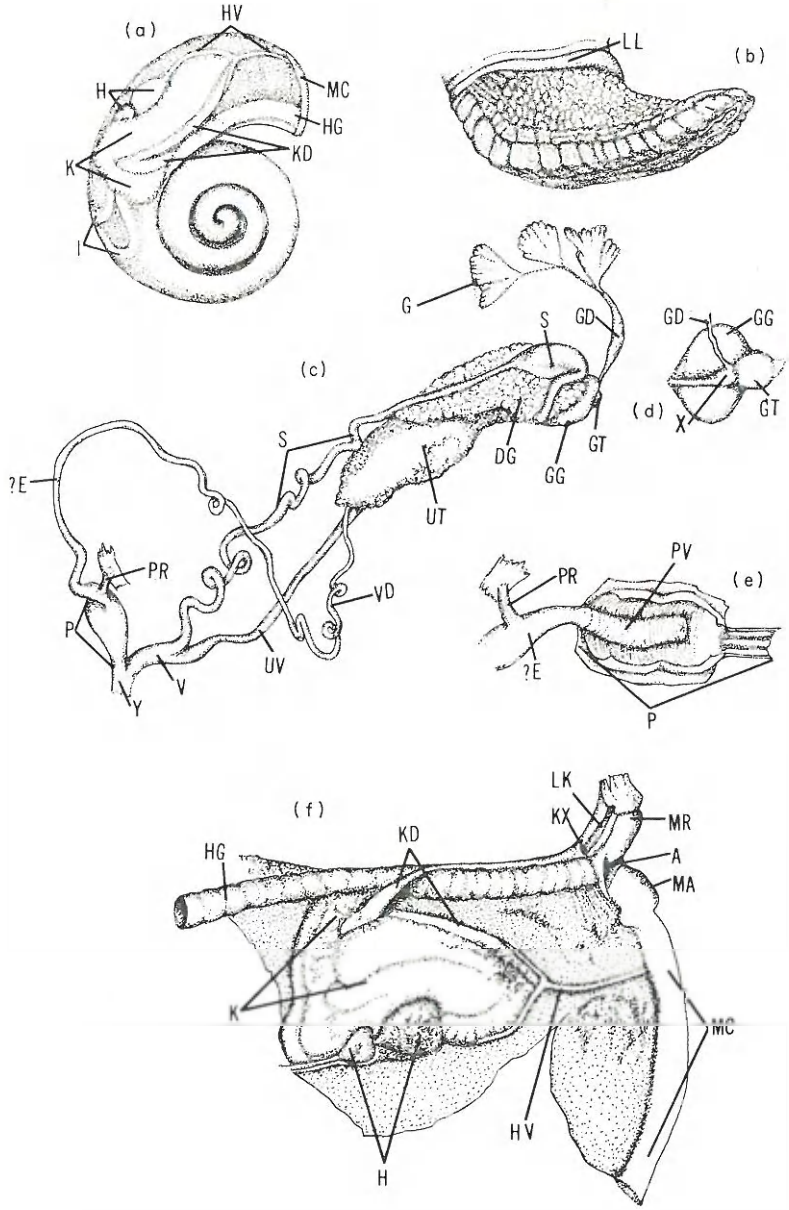

FIG. 2. Anatomy of *Notodiscus hookeri*: (a) View of entire animal, partly retracted, with shell removed; (b) foot and tail; (c) genital system decoiled to show origins and insertions; (d) union of hermaphroditic duct (GD) and talon (GT) at carrefour (X); (e) internal structure of penis; (f) pallial complex. Based on specimens in the Natal Museum from north of Junior Kop at 100 m elevation, Marion Island.

Lung roof with black speckles concentrated above pericardium and ureter reflexion, a few to many clumped spots on lower anterior lung roof. Kidney (K) massive, less than one-and-a-half times longer than wide, about one-quarter of length lying along hindgut (HG). Length of kidney 2·3–2·5 mm, occupying two-thirds length of pallial cavity. Ureter (KD) sigmurethrous, peculiarly curved medially at apex (Fig. 2a), then recurved along rectal arm of kidney to hindgut, passing under hindgut to lie along parietal wall (Fig. 2f), passing directly forward to external ureteric pore (KX). Base of kidney slightly lapped over loop of intestine (Fig. 2a, I). A strip of lung roof separates kidney arm of ureter from hindgut. Hindgut (HG) lying at parieto-palatal angle to apex of pallial cavity, then deflected downwards immediately. Heart (H) slightly less than two-thirds length of kidney, relatively large. Principal pulmonary vein (HV) short, reaching mantle collar, without conspicuous secondary venation.

Ovotestis (Fig. 2c, G) imbedded in digestive gland above stomach–intestine reflexion, consisting of numerous clumped, palmately clavate alveoli (Fig. 1c) spread linearly along hermaphroditic duct collecting tubule, distinctly lighter in color than reddish digestive gland. A small patch of digestive gland separates lowest acinar clump from stomach–intestine reflexion. Hermaphroditic duct (GD) a slender tube lying at basal-palatal margin of whorl, becoming grossly expanded just before anterior end of stomach, narrowing abruptly just before reaching base of albumen gland (GG), reflexing up to insert laterally on stalk of talon (GT, Fig. 2d). Albumen gland (GG) variable in size, lying above pallial cavity from its apex to point where expanding stomach reaches parieto-palatal margin, very finely textured. Talon short, globose, not tapering before entering only slightly expanded carrefour (X) which opens directly into prostate–uterus. Prostate (DG) short, of large acini fastened to the wall of uterus (UT). Latter badly compressed and distorted by contraction in all available material, apparently differentiated into an upper thin-walled chamber and a broader, heavily glandular chamber with internal pilasters. A thin lamella of tissue seems to provide separation of prostate and uterus, but I am not certain if one edge was folded against the opposing uterine wall or loosely attached to it.

Vas deferens (VD) very long, highly convoluted, slender, not bound to penio-viducal angle, expanding in width shortly above insertion of penial retractor (PR) (forming an epiphallus?, E in Fig. 2e). Penial retractor short, thick, arising on diaphragm, inserting distinctly above head of penis. Penis (P) very short, bulbous, internally (Fig. 2e) with a long cylindrical verge (PV) with blunt tip, terminal pore and circularly wrinkled sides. Area of penis below verge extension with weak longitudinal pilasters extending into atrium. Vas deferens also with longitudinal pilasters. Atrium (Y) fairly short, without distinctive sculpture.

Free oviduct (UV) long, weakly convoluted, quite slender, with weak longitudinal pilasters. Spermatheca (S) with slender highly convoluted shaft, not expanded basally, upper part buried in albumen gland, expanded or not near apex, with a fingerlike lobe reflexed along albumen gland surface. Vagina (V) short, slightly thicker than oviduct, with strong longitudinal pilasters.

Buccal mass rather short, massive, with prominent generative sac. Esophagus entering top of buccal mass about midway from jaw, a thin-walled tube with longitudinal pilasters extending well past pallial cavity. Stomach–esophageal union marked by a transition zone of conical expansion before stomach reaches full size about one-sixth whorl above pallial cavity. Stomach proper extending apically for two-thirds of a whorl, occupying entire parietal and upper two-thirds of palatal walls. Stomach narrowing slightly apically, reflexes down and back to intestine. This reaches baso-columellar margin about one-third of way anterior from stomach apex, continuing forward to point opposite lower anterior edge of expanded stomach, then angling diagonally upwards to lower base of kidney, angling upwards abutting slightly under kidney base (an artifact of contraction?) then looping backwards well below parieto-palatal angle, turning downwards along outer wall just before stomach expansion to point above first arm of intestine looping (as hindgut) diagonally upwards, inwards and forward, passing inside kidney loop of intestine, finally reaching parieto-palatal angle just before apex of pallial cavity, which it follows to anus.

Salivary glands paired, white, lateral to esophagus, touching both above and below. Ducts of salivary glands slender, straight, inserting laterally on esophageal base.

Digestive gland extending from apex of soft parts to pallial cavity, narrowed to a tongue-like lobe in region of stomach, expanding between base of stomach and pallial cavity.

Buccal retractors inserting at midpoint of base in a 'U'-shaped fan, weakly split. Buccal retractor uniting with tail fan to form columellar retractor a very short distance posteriorly. Right ommatophoral retractor passing through penioviducal angle, then uniting with rhinophoral retractor before joining tail fan. Entire free muscle system extremely short and compact.

Jaw (Fig. 3a) very delicate, fragmented in mounting, composed of narrow, overlapping plates, about fifteen to seventeen per half jaw, central portion fused with only weak traces of sutures left.

Radular teeth (Fig. 3b) rather large, central 16 μ long and 11 μ wide, first lateral 16 μ long and 18 μ wide. Central with single long cusp, sometimes longer, sometimes shorter than adjacent laterals. No ectoconal cusps present. Laterals eight to eleven in number, first few with width of supporting basal structure only slightly exceeding length. Last three laterals have basal plates distinctly wider than long. Laterals are unicuspid until seventh or eighth, then a moderate sized endocone and a smaller, short ectocone develops. By the last lateral tooth, the endocone is very large, but the ectocone is still a small, inconspicuous cusp. Transition from laterals to marginals occurs suddenly by a dramatic shortening of the supporting structure and great size increase of the ectoconal cusp. The early marginals (Fig. 3b, 12, 16) are only 12 μ long, but 13 μ wide. Outer marginals are only 5μ long and 13 μ wide, with the outermost becoming a remnant only 6 μ wide without distinctive cusp structure. Marginals number fourteen to sixteen, with a gradual change in cusping until the mesocone is scarcely larger than the endocone and ectocone. Splitting

of the cusps occurs in only a small minority of marginal teeth, more frequently in the endocone, rarely in the ectocone, and quite rarely in the mesocone.

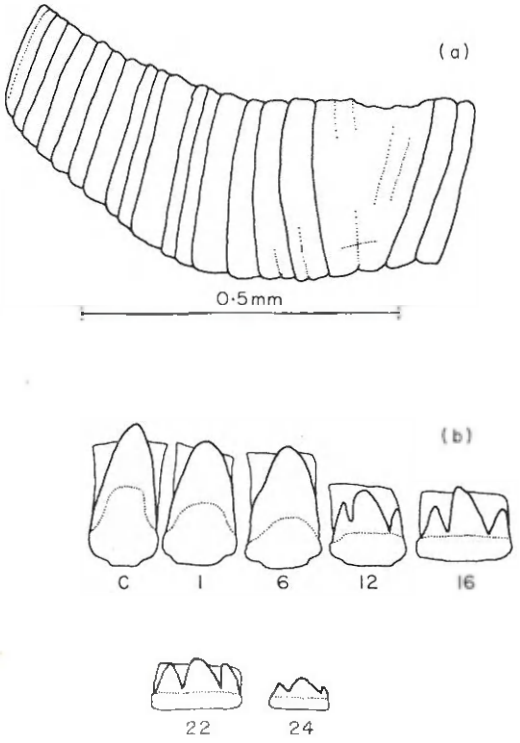

FIG. 3. (a) Partial jaw; (b) radular teeth. Based on material in the Auckland Institute and Museum from Kerguelen and Heard Islands.

Remarks

Some 181 adult and 132 subadult to juvenile examples were studied. While growth in the endodontid snails is not terminated upon reaching sexual maturity, it slows down considerably and there will be subtle to prominent changes in growth pattern. *N. hookeri* shows two changes that can define an adult specimen: first, a marked widening of the umbilicus (Fig. 1a, b); second, an increased rate of descent during growth of the shell lip (Fig. 1c, d). When both changes are present for one-sixteenth or more whorls, then I consider the shell to be adult. Such growth may continue for up to one-quarter whorl (gerontic individuals), but usually is restricted to about one-eighth whorl. Only adult or gerontic individuals were measured.

Population range diagrams for the shell height, shell diameter, height/diameter index, diameter/umbilicus index, and whorl count are given in Figs. 4–8. All measurements were made personally, except those in samples 1 and 17, which were

taken from Dell (1964, p. 169) and analysed. The larger standard deviations shown for these samples probably reflect both the inclusion of subadult specimens and the use of a vernier caliper read only to the nearest 0·1 mm. My measurements were made with an ocular micrometer. The limits of accuracy and definition of indices and measurements used are discussed in Solem (in press).

Certain samples are biased in respect to size. For example, the few specimens from Observatory Bay in the Powell collection (sample 10) were selected from sample 9. There are much larger (Figs. 4, 5 and 8), but identical in proportions (Figs. 6 and 7). The tendency for collectors and curators to use smaller specimens as trade items and to retain larger ones in their collection is well documented (Solem, 1966, p. 16). This makes many museum sets of little value for statistical analysis. The relatively larger size of the types in the British Museum (Natural History) (population 5) possibly is an artifact caused by this practice. The types were collected near Christmas Harbour, Kerguelen between 15th May and 20th July in 1840 (see Eaton, 1879, pp. 4–5). This may be a population of large specimens. The remaining samples were field collections and had not been selected or divided.

Temporarily ignoring samples 1 and 17, it can be said that variation is moderate, reaches statistical significance only occasionally, and in no case suggests systematic

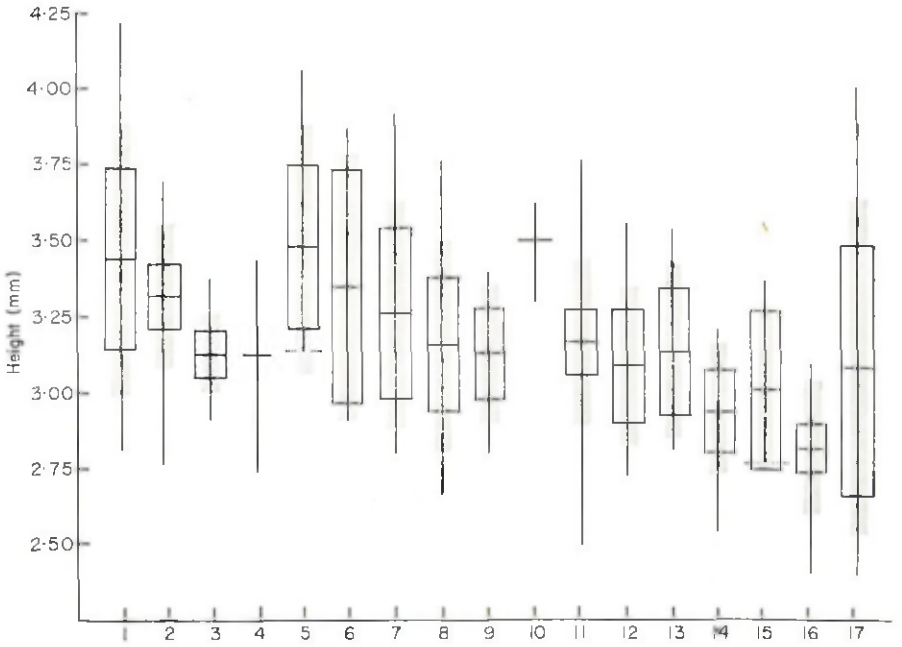

FIG. 4. Population range diagram of height, giving range (thin line), mean (cross line), one standard deviation on each side of mean (solid bar) and two standard errors of the mean on each side (open box).

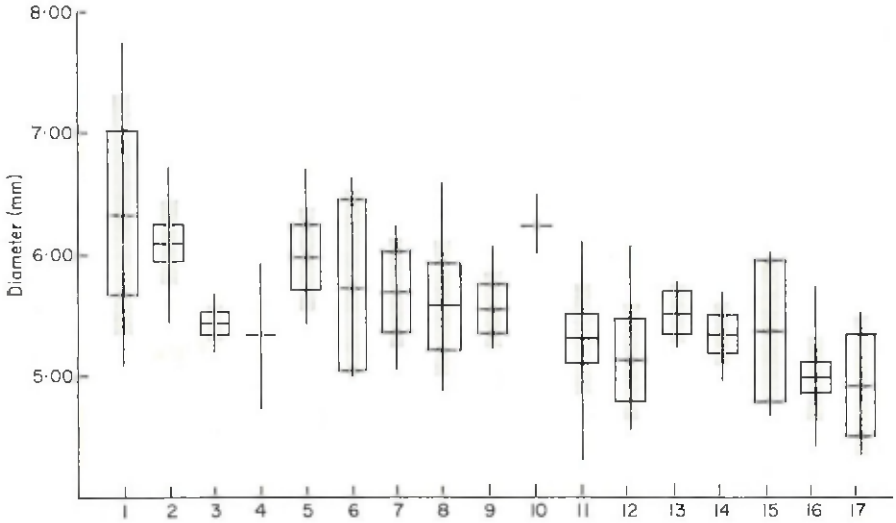

FIG. 5. Population range diagram for diameter.

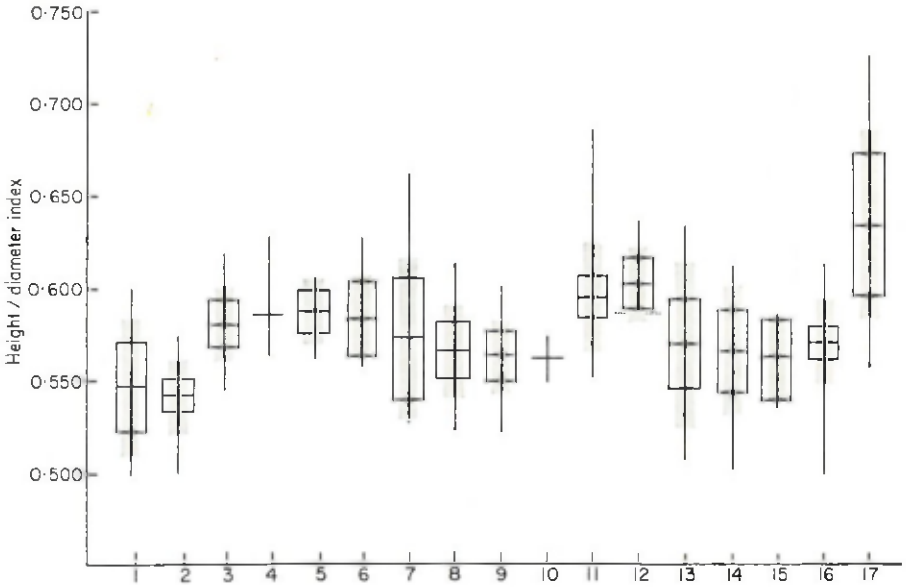

FIG. 6. Population range diagram for height/diameter index.

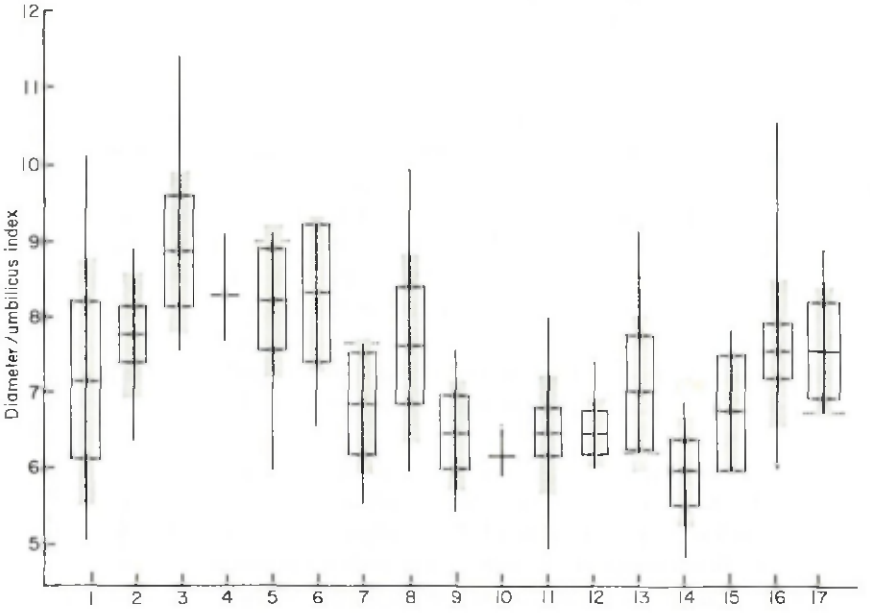

FIG. 7. Population range diagram for diameter/umbilicus index.

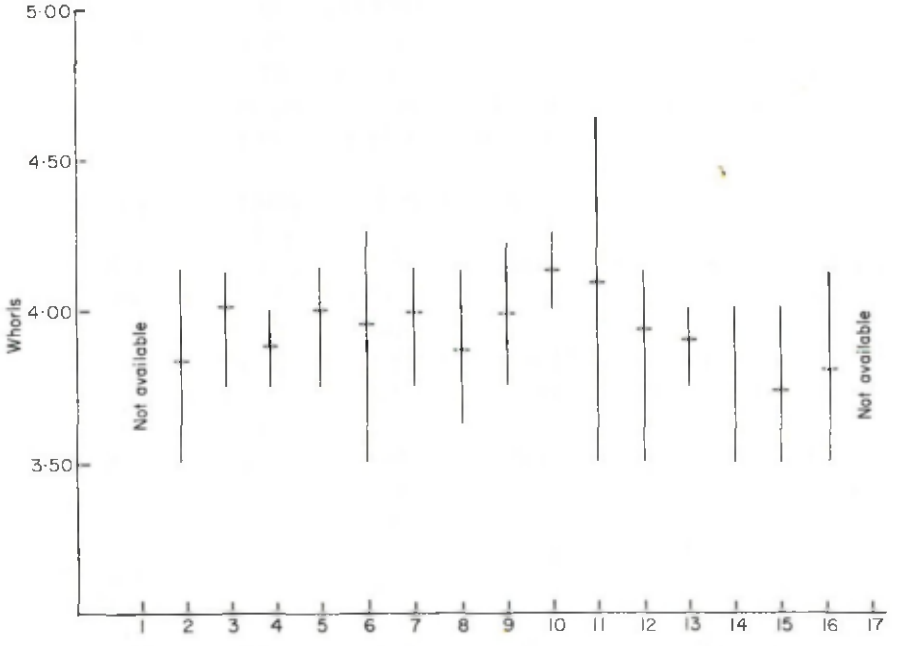

FIG. 8. Population range diagram for whorl count. Only mean and range given. No data available for samples 1 and 17.

TABLE I. Variation in *Notodiscus hookeri*, giving mean, range and standard error of the mean

Sample No.*	No. of specimens	Height	Diameter	H/D ratio	Whorls	D/U ratio
1	7	3·43 ± 0·148 (2·80–4·20)	6·31 ± 0·328 (5·10–7·70)	0·547 ± 0·0124 (0·491–0·600)	Not available	7·21 ± 0·515 (5·13–10·20)
2	20	3·30 ± 0·053 (2·76–3·68)	6·11 ± 0·077 (5·43–6·71)	0·540 ± 0·0044 (0·500–0·574)	$3\frac{7}{8}$ – ($3\frac{1}{2}$–$4\frac{1}{8}$)	7·76 ± 0·180 (6·40–8·95)
3	9	3·12 ± 0·041 (2·90–3·36)	5·38 ± 0·049 (5·20–5·66)	0·579 ± 0·0066 (0·541–0·618)	4 + ($3\frac{3}{4}$–$4\frac{1}{8}$)	8·93 ± 0·353 (7·68–11·43)
5	9	3·46 ± 0·135 (3·14–4·05)	5·90 ± 0·135 (5·36–6·67)	0·586 ± 0·0057 (0·562–0·607)	4 – ($3\frac{3}{4}$–$4\frac{1}{8}$)	8·21 ± 0·333 (6·00–9·22)
6	5	3·34 ± 0·190 (2·90–3·85)	5·70 ± 0·360 (4·90–6·60)	0·588 ± 0·0099 (0·559–0·627)	$3\frac{7}{8}$ – ($3\frac{1}{2}$–$4\frac{1}{8}$)	8·36 ± 0·449 (6·70–9·31)
7	7	3·25 ± 0·139 (2·80–3·91)	5·68 ± 0·167 (5·03–6·18)	0·573 ± 0·0164 (0·527–0·661)	4 – ($3\frac{3}{4}$–$4\frac{1}{8}$)	6·84 ± 0·333 (5·53–7·65)
8	10	3·15 ± 0·108 (2·66–3·75)	5·58 ± 0·178 (4·80–6·58)	0·566 ± 0·0077 (0·521–0·612)	$3\frac{7}{8}$ – ($3\frac{5}{8}$–$4\frac{1}{8}$)	7·67 ± 0·384 (6·00–10·28)
9	9	3·13 ± 0·076 (2·80–3·39)	5·55 ± 0·097 (5·23–6·05)	0·563 ± 0·0066 (0·521–0·601)	4 – ($3\frac{3}{4}$–$4\frac{1}{8}$)	6·50 ± 0·239 (5·41–7·57)
11	26	3·16 ± 0·053 (2·50–3·75)	5·28 ± 0·088 (4·31–6·12)	0·599 ± 0·0058 (0·553–0·687)	4 + ($3\frac{1}{2}$–$4\frac{1}{8}$)	6·50 ± 0·151 (4·89–7·90)
12	8	3·08 ± 0·093 (2·73–3·55)	5·12 ± 0·167 (4·51–6·02)	0·602 ± 0·007 (0·567–0·634)	4 – ($3\frac{1}{2}$–$4\frac{1}{8}$)	6·50 ± 0·158 (6·04–7·42)
13	7	3·13 ± 0·103 (2·81–3·53)	5·50 ± 0·084 (5·23–5·75)	0·569 ± 0·0170 (0·511–0·631)	$3\frac{7}{8}$ + ($3\frac{3}{4}$–4)	7·13 ± 0·382 (6·28–9·22)
14	10	2·94 ± 0·066 (2·55–3·20)	5·20 ± 0·081 (4·90–5·69)	0·566 ± 0·0111 (0·505–0·612)	$3\frac{7}{8}$ – ($3\frac{1}{2}$–4)	6·17 ± 0·221 (4·58–7·17)
15	4	3·01 ± 0·129 (2·73–3·36)	5·35 ± 0·289 (4·64–5·99)	0·564 ± 0·0111 (0·535–0·589)	$3\frac{3}{4}$ – ($3\frac{1}{2}$ – 4)	6·78 ± 0·380 (6·07 – 7·85)
16	28	2·83 ± 0·041 (2·43–3·19)	4·96 ± 0·064 (4·38–5·72)	0·571 ± 0·0042 (0·500–0·617)	$3\frac{3}{4}$ + ($3\frac{1}{2}$–$4\frac{1}{8}$)	7·53 ± 0·181 (6·04–10·64)
17	9	3·08 ± 0·203 (2·40–4·00)	4·83 ± 0·210 (4·30–5·50)	0·636 ± 0·0192 (0·558–0·727	Not available	7·60 ± 0·315 (6·75–8·83)

* See appendix.

nearest relatives, but until after their phylogeny has been interpreted, any comments would be idle speculation.

SUMMARY

Study of over 300 specimens of the endodontid land snail *Notodiscus hookeri* (Reeve, 1854) from Kerguelen, Heard, Possession and Marion Islands resulted in considering that no subspecific units can be recognized. Variation between populations found on the Kerguelen Islands is greater than differences between populations from the other islands. Probably the species has been transported accidentally by birds. Anatomical features indicate closer affinities to New Zealand or Australian, rather than South African taxa.

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APPENDIX

List of samples in Figs. 4–8

1. Heard Island: Atlas Cove, Laurens Peninsula and West Bay. 1950–53. On Kerguelen Cabbage and among moist broken rocks (nine specimens). Data copied from Dell (1964, p. 169).
2. Heard Island: No. 360. Beneath damp vegetation on steep slopes. XII-1-1929 (twenty specimens). BANZARE.
3. Marion Island: No. 61, North of Junior Kop at 100 m elevation. III-18-1963. Under moss cushions (nine specimens). E. M. Van Zinderen Bakker.
4. Possession Island: American Bay. XI-3-1929. No. 87 and No. 109, half-a-mile inland. Wet moss near edge of water hole and attached to piece of rock (three specimens). BANZARE.
5. Kerguelen Island: Type specimens. Dr Joseph Hooker (nine specimens). British Museum (Natural History) 47.4.12.20-29.
6. Kerguelen Island: No. 149, Royal Sound. II-14-1930 (five specimens). BANZARE. Part of this listed by Powell (1957).
7. Kerguelen Island: No. 311. XI-22-1929 (seven specimens). BANZARE.
8. Kerguelen Island: No. 904, Preservation Bay. II-19-1930. From vegetation (ten specimens). BANZARE.
9. Kerguelen Island: No. 903, Stn 56B, Observatory Bay District. II-18-1930 (nine specimens). BANZARE.
10. Kerguelen Island: Stn 56C, Observatory Bay, at 100–200 ft elevation. II-21-1930 (three specimens). BANZARE.
11. Kerguelen Island: No. 255, Shore Station (twenty-six specimens). BANZARE.
12. Kerguelen Island: Shore Station (eight specimens). BANZARE.
13. Kerguelen Island: Jeanne d'Arc. Under stones at 1000 ft elevation, above winter snow line. II-20-1930 (seven specimens). BANZARE.
14. Kerguelen Island: collected by Aubert de la Rue in 1928–29 (ten specimens). Inst. Roy. Sci. Nat., Brussels, ex Dautzenberg, material mentioned by Lamy (1931).
15. Kerguelen Island: Long Island, No. 49 (four specimens). BANZARE.
16. Kerguelen Island: Long Island, No. 724, II-11-1930. Under stones (twenty-eight specimens). BENZARE.
17. Kerguelen Island. No exact locality (seven specimens). Data copied from Dell (1964, p. 169).