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Note on *Pusula dartevellei* KNUDSEN 1955

(Gastropoda : Triviidae)

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According to my last catalogue of living and fossil Cypraeacea (SCHILDER 1941, Arch. Moll., 73:76) the living species of *Pusula*, subgenus *Pusula* JOUSSEAUME 1884 are restricted to the West coast of America. In Tertiary times, however, they occurred also in the Caribbean area (*P. guppyi* SCHILDER 1939 and *P. radians orientalis* SCHILDER 1939), and two species closely allied each to the other even spread to the Azores and Canary Islands (*P. parcicosta* BRONN 1862 and *P. canariensis* ROTHPLETZ & SIMONELLI 1890, of which *P. alienigena* SCHILDER 1928 as a synonym); but no Recent representant was known in the Atlantic Ocean in 1941.

Then a single living « *Trivia* » *maltbiana* SCHWENGEL & MCGINTY 1942 (Nautilus, 56:13) was discovered off North-western Florida, which may be interpreted as an Atlantic representant of the Pacific *Pusula sanguinea* SOWERBY 1832. Far more surprising, however, was the discovery of a *Pusula* near the mouth of the Congo river: it is evidently allied to the Recent West-American *P. solanderi* SOWERBY 1832 and *P. radians* LAMARCK 1810!

This « *Trivia* » *dartevellei* KNUDSEN 1955 (Rev. Zool. Bot. Afric., 51: 102) has been established on an unique slightly worn specimen collected in 1937 on the beach of Landana. Three years later, I have published a second specimen (SCHILDER 1958, Arch. Moll., 87:81) which had been worn by a native of Banana as amulet. This use seemed to indicate that the species cannot be very rare in this area, and has been overlooked only accidentally hitherto. In fact, in the subsequent years I could examine some more specimens in various collections, espe-

cially in the Musée Royal de l'Afrique Centrale at Tervuren, so that the number of known shells of *dartevellei* rose to eighteen. This number seems to justify an attempt to compare statistically the West African species with its allies coming from elsewhere.

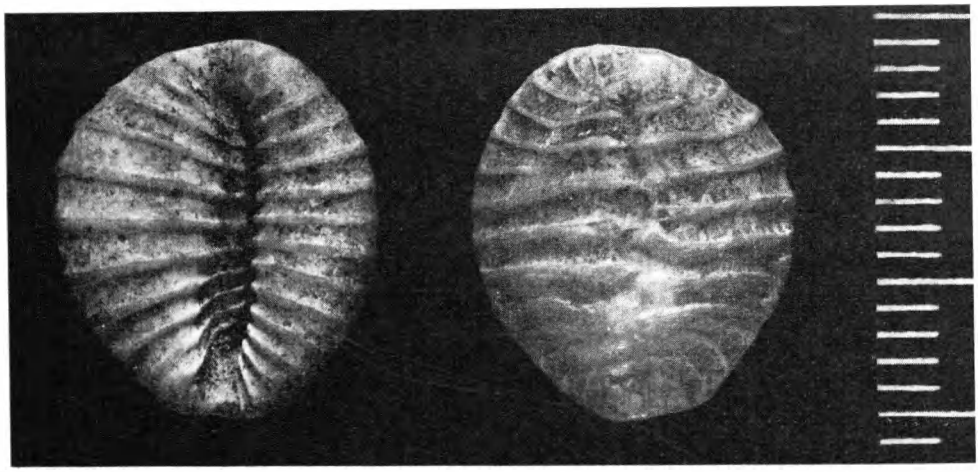

Fig. 1. — *Pusula dartevellei* KNUDSEN: ventral and dorsal view.

The following list indicates measurable or countable characters, *viz.*

L = length of the shell in tenths of millimeter,
BL = breadth of the shell in per cent of its length,
LT = number of labial teeth along the aperture (so that short denticles not continued as basal ribs are included),
CT = number of columellar teeth (the terminal ridges bordering the outlets are included),
MR = number of marginal ribs crossing the circumference of the shell (the feeble ribs inside the outlets are included),
DR = number of dorsal ribs starting from the dorsal sulcus on both sides (the rather longitudinal terminal ribs and thin ribs intercalated between the dorsal nodules are excluded).

These six characters have been arranged by a formula as follows:

L/BL, LT:CT, MR:DR.

The following shells of *Pusula dartevellei* have been examined.

Landana, leg. DARTEVELLE 1937. Mus. Tervuren no. 521253.
136/90, 16:11, 32:21 (Holotype: Rev. Zool. Bot. Afric., 51:102, fig. 8-9)

Banana, leg. P. HESSE. Senck.-Mus. Frankfurt no. 160938.
114/93, 15:12, 30:16 (amulet; Arch. Moll. 87:81, fig. 1)

Landana, collector unknown, Coll. SCHILDER no. 10878.
129/84, 16:12, 32:18

Chinchoxo, leg. FALKENSTEIN, Mus. Berlin no. 26656.
115/82, 14:11, —:— (worn)
116/84, 14:10, —:15
126/79, 18:12, —:20
128/85, 15:10, —:18 (all specimens: MR not counted)

Banana, collector unknown. Coll. SCHILDER no. 16045.
131/89, 16:12, 34:20

Moanda, leg. BITTREMIEUX. Mus. Tervuren no. 277531, etc.
92/84, 14:10, —:— (worn)
107/89, 17:10, —:16 (MR not counted)
111/84, 14:12, —:18 id.
125/89, 15:10, —:— (worn)
132/92, 16:10, —:18 (MR not counted)
142/85, 17:13, —:20 id.
142/95, 15:12, 30:19 (now in coll. SCHILDER no. 16358)
145/87, 17:12, —:16 (MR not counted)
146/86, 16:12, —:19 id.
162/86, 17:13, —:21 id.

These 18 specimens of *Pusula dartevellei* from a restricted area north of the mouth of Congo River encourage a comparison of its measurable and countable characters with those of examined specimens of the closely allied species, *viz.*

5 *P. canariensis* ROTHPLETZ & SIMONELLI 1890 from about middle Miocene of the Canary Is. (*P. alienigena* SCHILDER 1928 is a synonym).

23 P. *parcicosta* BRONN 1862 from the same Miocene beds of the Canary Is. and from the Azores.

242 *P. solanderi* SOWERBY 1832 from the West coast of North America (California to Mazatlan). These shells can be separated into three series:

157 shells from Puerto Peñasco (see SCHILDER 1966, J. of Conch., 26:131)

43 shells from Gulf of California (see SCHILDER 1966, J. of Conch., 26:133)

42 shells from various other localities or of unknown habitat.

44 *P. radians* LAMARCK 1810 from the West coast of Central and South America (Acapulco to Chimbote in Peru, about 400 km

north of Lima, according to W. WEYRAUCH; the two Pliocene or Pleistocene shells from Trinidad called *orientalis* SCHILDER 1939 (Abh. Schweiz. Pal. Ges., 62:11, fig. 2-3) have been included.

6 *P. rota* WEINKAUFF 1881 from western Colombia and Ecuador (separable from *radians* according to SCHILDER 1931, Zool. Anz., 96:66).

The figures entered into the following table indicate the limits of « usual variation », *i.e.* the limits of two thirds of specimens approaching the mean; these figures practically coincide with the values « mean ± standard deviation » and exclude extreme specimens; the mean of these two limits approaches the median of the series (see SCHILDER & SCHILDER 1966, Veliger, 8:209); the length has been rounded up to classes of half a millimeter.

	L	BL	LT	CT	MR	DR
canariensis	5.5- 9.5	70-75	17-21	12-16	44-54	16-23
parcicosta	7.5- 9	75-81	12-16	11-14	36-42	16-18
dartevellei	11.5-14	84-90	14-17	10-12	30-33	16-20
solanderi mean	12.5-15.5	70-76	16-18	12-14	32-36	15-19
id. P. Peñasco	12.5-15.5	70-74	16-18	11-13	32-36	16-19
id. Calif. Gulf	12 -14	68-75	16-18	12-14	32-36	15-17
id. various	13 -16	73-79	16-19	12-14	32-37	14-20
radians	15.5-20.5	73-84	14-16	12-14	36-43	15-20
rota	18 -20.5	82-91	14-16	12-14	39-41	12-14

If we plot these usual limits of characters by pairs in diagrams, the rectangles characterizing each species show their mutual relation. So, for instance, diagram 1 illustrating the relation between length and breadth shows two different trends of becoming larger and broader: *canariensis-parcicosta-dartevellei* and *solanderi-radians-rota*! However, if we plot length against the number of marginal ribs in diagram 2, the two fossil species become distinctly separated from the trend of Recent species *dartevellei-solanderi-radians-rota.*

This method can be simplified by the following table, in which the evolution of each character has been indicated by six degrees: the numeral 1 indicates the smallest and narrowest species and the largest number of teeth or ribs which characters use to be primitive in other

Diagrams I-II. — Range in usual variation in *Pusula*: A = *canariencis*, B = *parcicosta*, C = *dartevellei*, D = *solanderi*, E = *radians*, F = *rota*.

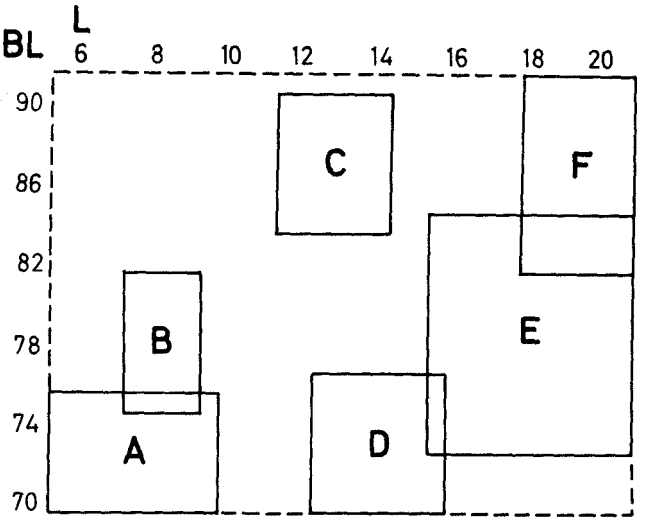

Diagram I : Length and breadth.

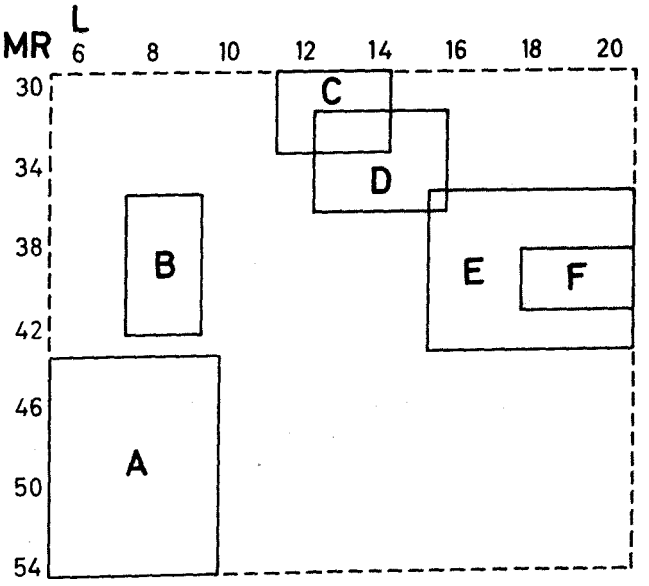

Diagram II : Length and marginal ribs.

branches of Triviidae; and the numeral 6 designates the largest and broadest species and the most distant teeth or ribs; the numerals 2 to 5 show intermediates according to their intervals from these extremes.

	L	BL	LT	CT	MR	DR	sum
canariensis	1	1	1	1	1	1	6
parcicosta	2	4	6	4	3	3	22
dartevellei	4	6	4	6	6	2	28
solanderi	4	2	3	3	5	4	21
radians	5	4	5	3	3	3	23
rota	6	6	5	3	3	6	29

One will observe that there is a rather irregular mixture of primitive and progressive characters so that no phylogenetical tree can be constructed, except that *canariensis* is the most primitive species, and *radians* and *rota* are closely allied each to the other.

The qualitative characters of the six species of *Pusula* are rather uniform, though the nodules bordering the dorsal sulcus are less developed in *dartevellei* and in *rota* than in the other species. The short denticles which are intercalated between the labial ribs in *solanderi* (SCHILDER 1966, J. of Conch., 26:133) can also be observed in *canariensis* and *parcicosta* (where they originate from interrupted ribs), but almost never in the other species. The reddish brown central dorsal blotch characterizing the living American *Pusula* can be observed even in some bleached beach shells of *dartevellei* also.

The most curious fact is that *Pusula dartevellei* occurs in an area so far from its West American allies, and that this area is so restricted, as the species has been collected only on the beach of one hundred kilometers between Landana and Banana hitherto; contrary to other Cypraeacea it seems not to spread to the Senegal area, as no specimen is preserved in the collection of the Institut Fondamental d'Afrique Noire at Dakar.