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CONTRIBUTION TO THE STATUS OF «*HELIX*» *WOLLASTONI* LOWE
AND «*HELIX*» *FORENSIS* WOLLASTON (PULMONATA : HELICIDAE)¹

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ABSTRACT. The systematic status of «*Helix*» *wollastoni* LOWE 1852 and «*Helix*» *forensis* WOLLASTON 1878 is examined. The examination based on specimens collected alive in Porto Santo and Ilhéu de Fora proves that two subspecies can be distinguished. A table of biometric data of fossil and recent shells is added. The occurrence of crosses between *wollastoni* and *Leptaxis nivosa* is confirmed.

RESUMO. A posição sistemática de «*Helix*» *wollastoni* LOWE 1852 e «*Helix*» *forensis* WOLLASTON 1878 é examinada com base em espécimes colhidos vivos em Porto Santo e Ilhéu de Fora e prova-se que podem ser distinguidos duas subespécies. É dada uma tabela com a biometria das conchas fósseis e recentes. A ocorrência de cruzamentos entre *wollastoni* e *Leptaxis nivosa* é confirmada.

Already in 1828 LOWE had collected semifossil shells belonging to a species live material of which was later collected by WOLLASTON on Pico do Concelho of Porto Santo in 1849. LOWE only described the latter in 1852 as *Helix wollastoni* in the section *Iberus*. In spite of the fact that LOWE (1852) compares his specimen to *Helix scabriuscula*

1) *Contributions to the Molluscs of the Archipelago of Madeira* No. 8, No. 7 : K. GROH & J. HEMMEN (in press) : Zur Kenntnis der Vitriniden des Madeira-Archipels (Pulmonata : Vitrinidae). — Arch. Moll., 116 (4/6); Frankfurt a. M.

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DESHAYES (= *Murella*) later authors (ALBERS (1854), PAIVA (1867)) place it in the section *Crenea* ALBERS.

Likewise, WOLLASTON (1878) places *wollastoni* in the section *Iberus*, furthermore compares it to *Helix scabriuscula* together with *H. digna* MOUSSON (= ? *Hemicycla*) and describes *Helix forensis* from Ilhéu de Fora as a new species to science. PILSBRY, in TRYON (1894), was the first to place *wollastoni* in the genus *Leptaxis*. MANDAHL-BARTH (1950) raises *Katostoma* LOWE 1854 from section to subgenus in which he places apart from *nivosa* (SOWERBY 1824) and *psammophora* (LOWE 1831) also *wollastoni*. In disagreement with ZILCH (1960) we agree with MANDAHL-BARTH in considering *Katostoma* apart from *Leptaxis* s.s. and *Cryptaxis* subgenera of *Leptaxis* for the following reasons :

1. Geographic isolation (restricted to the Porto Santo-group).
2. Differing conchological characters (colour of the protoconch, granulation and ribbing, respectively malleation of the teleconch).
3. Differing anatomical character (long pedunculus).

Katostoma is apparently closer to the subgenus *Cryptaxis* LOWE 1854 than *Leptaxis* s.s. LOWE 1852 (bunched ductus hermaphroditicus, relative length of the pedunculus, sculpture of the surface of the shell and shape of the basal plates of the lateral teeth (compare MANDAHL-BARTH (1950))).

Having amassed extensive material of the subgenus *Katostoma* derived from visits to Porto Santo (1980, 1981, 1983 and 1985) we examined the status of «*Helix*» *wollastoni* and «*Helix*» *forensis* in greater detail.

Leptaxis (Katostoma) wollastoni wollastoni (LOWE 1852)

- 1852 *Helix (Iberus) wollastoni* LOWE, Ann. Mag. nat. Hist., (2) 9 : 119 (loc. typ.).
 1854 *Helix (Crenea) wollastoni*, — ALBERS, Malac. Madeir. : 22, T. 4 F. 1-3.
 1878 *Helix (Iberus) wollastoni*, — WOLLASTON, Test. Atlantica : 99.
 1895 *Leptaxis wollastoni*, — PILSBRY, Man. Conch. : 293.
 1950 *Leptaxis (Katostoma) wollastoni*, — MANDAHL-BARTH, Abh. senckenb. naturf. Ges., 469 : 40, T. 13 F. B, T. 14 F. 7 (anatomy, radula).
 1957 *Iberus (Iberus) wollastoni* and *wollastoni* var. *forensis*, — SILVA, Mem. min. geol., 44 : 28, T. 4 F. 5-8.
 1983 *Leptaxis (Katostoma) wollastoni wollastoni*. — WALDÉN, Ann. zool. Fennici, 20 : 268 and footnote 76 (partim).

As already indicated by GROH & HEMMEN (1984) the illustrations of *L. w. wollastoni* and *L. w.* var. *forensis*, wrongly referred to the genus *Iberus* in SILVA (1957), tab. 4, fig. 5-8, belong in fact in both cases to the nominate form.

M o r p h o l o g y o f t h e s h e l l : Shell compressed spherical with about five evenly increasing whorls, 1.5 of which fall on the small very finely dotted protoconch; whorls strongly keeled, this keel in the upper one third of the last whorl; its sculpture consisting of strong, irregular ribs (about 6/cm in the middle of the last whorl), between them \pm equal granulation; last whorl descending only a short distance before the lip at an angle of about 45° down to the elliptical, on both ends laterally pointed mouth. The shell is not umbilicated, even in young specimens, the margin of the columella is slightly turned over. The border of the mouth is connected, narrow-lipped and forms a strong parietal callus. In the columellar region the border of the mouth is distinctly thickened. The colour of the shell is light reddish brown with two obscure dark-brown bands partly dissolving into spots above and below the keel; the protoconch as well as the whole area of the mouth is rose-coloured.

M e a s u r e m e n t s : see table.

A n a t o m y o f t h e g e n i t a l s : The genital organs of the animals examined by us agree largely with the very appropriate illustration by MANDAHL-BARTH (1950: pl. 14. fig. 7). The length of the musculus retractor penis and of the flagellum can vary, likewise can the number and dimension of the mucous gland.

R a d u l a : MANDAHL-BARTH (1950: pl. 13, fig. 6) illustrates a section of a row of teeth, according to which the half-row-formula re-

sults in $\frac{C}{1} + \frac{17}{2} + \frac{12}{3} + \frac{\geq 4}{2}$.

D i s t r i b u t i o n : Recent specimens so far only know from the southern slope of Pico do Concelho between about 200 to 250 m. Fossil quaternary finds in hand are from the Vale do Touro (colluvial sediments), Barbinha (eolian and colluvial deposits), a sand-pit at Porto dos Frades (eolian deposits), Zimbral d'Areia (eolian deposits) and the Ilhéu de Ferro (one specimen, gastric stone of a gull?).

N o t e : The fossil distribution of the species therefore covered a much larger area in the south-eastern part of Porto Santo during the quaternary.

As can be seen in table 1, the diameter of the shell of the fossil animals is significantly greater than that of the recent ones. From this a considerably greater volume results (actually more than one third if the shape of the shell is visualized as a hemisphere). Similar dimensional differences in size between recent and fossil shells have been observed in *Idiomela subplicata* (compare HEMMEN & GROH (1984)) and also occur in other species of this archipelago (for example *Leptaxis undata*, personal observation) and on other Mid-Atlantic islands (compare GROH (1985)). This phenomenon may be caused most probably by climatic circumstances.

Leptaxis (Katostoma) wollastoni forensis (WOLLASTON 1878)

- 1867 *Helix (Crenea) wollastoni* var. β *minor* PAIVA, Moll. Inst. Madeir.: (Ilhéu de Fora, nom. nud.).
- 1878 *Helix (Iberus) forensis* WOLLASTON, Test. Atlantica : 99 (loc. typ. : «Ilhéu de Fora»).
- 1895 *Leptaxis wollastoni* var. *forensis*, — PILSBRY, Man. Conch. : 293.
- 1950 *Leptaxis (Katostoma) wollastoni forensis*, — MANDAHL-BARTH, Abh. senckenb. naturf. Ges., 469 : 45.

The taxon indicated by PAIVA (1867) as *wollastoni* var. *minor* from Ilhéu de Fora remains a nomen nudum. WOLLASTON (1878) described it as independant species *forensis*.

MANDAHL-BARTH is the first to consider *forensis* a subspecies of *wollastoni*, while all previous authors consider it a variety.

Morphology of the shell: Compared with *L. w. wollastoni* this subspecies possesses a distinctly larger protoconch. Shells of similar height are significantly narrower. The granulation of the teleoconch continues over the ribs, the average number of which is lower. The last whorl descends over a longer distance at a lesser gradient (about 30°) towards the mouth. The colour of the shell is darker, an upper banding is no longer visible, the band below the keel is significantly broader.

Measurements: See table.

Anatomy of genitals: The anatomical examination produced no significant differences in the organs, respectively in their relation to one another in comparison with the nominate race. What does stand out is the great size of the genital organs, which — in spite of the smaller dimensions of the shell — corresponds to those of the animals from Porto Santo.

Distribution: Recent animals so far only known from Ilhéu de Fora situated about 3 km north-east of Porto Santo.

Notes: Judging from the large size of the protoconch poly-ecithal eggs are laid. Provided the embryos are spherical, they show an increase of volume of about 80 % in comparison to the nominate race. We consider this an adaptation to the extreme environmental conditions of the Ilhéu de Fora. Thus *L. w. forensis* must be considered a typical k-strategist.

LIETZ & SCHWARZBACH (1971) indicate that in the north-eastern area of Porto Santo we must reckon with a coastal-line-regression of max. 12 cm/a. This means that the population of *L. wollastoni* on Ilhéu de Fora became isolated about 25.000 years ago. This space of time was evidently not long enough for a conspicuous genitomorphic differentiation to have taken place. However, the differences in shape of the shells are so great that subspecific separation seems justified.

Leptaxis (Katostoma) × subdubia (WOLLASTON 1878) stat. nov.

1878 *Helix (Iberus) wollastoni* var. α *subdubia* WOLLASTON, Test. Atlantica : 99.

1983 *Leptaxis (Katostoma) wollastoni wollastoni*, — WALDÉN, Ann. zool. Fennici : 268 and footnote 76 (partim).

N o t e s : WOLLASTON (1878) refers shells of *L. w. wollastoni*, which are smaller, less granulated and much less keeled, to var. α *subdubia*. (Among the more than 500 recent and fossil shells of the nominal race we have, there is only one of such a shape and sculpture). WOLLASTON considers them possible transitional forms towards *L. n. nivosa*. In disagreement with WALDÉN (1983) we consider *subdubia* not an infrasubspecific form and thus a synonym of *L. w. wollastoni*, but as a result of interbreeding between *L. w. wollastoni* and *L. n. nivosa*. Although the possibility that the two species have crossed, resulting in a hybrid with intermediate characters of the shells, is very slight, we believe it to be the only way to explain the regular intermediate shell-characters at such distant intervals without showing gradual transition from character to character. It is true that at the locality where recent specimens of *L. w. wollastoni* were found *L. n. nivosa* could not be directly traced, however, the latter is found in higher situations. Both occur only seldom synchronously in quaternary layers and, therefore, possibly never lived syntopically.

The single specimen of \times *subdubia* of recent times was found by our friend JOCHEN GERBER in the middle of the western slope of Pico do Concelho and he remembers the circumstances of the occasion well: the shell was found together with few dead specimens of *L. w. wollastoni* in an altitude and situation where the population of *wollastoni* decreases rapidly; a few metres higher and in more north-western situation he could only find *L. n. nivosa* — in the beginning only empty shells — later also live specimens. This fact yields further evidence that we are really dealing with a cross between the two species.

One possible «syntype» of \times *subdubia* is deposited in the MELVINTOMLIN collection of the National Museum of Wales in Cardiff (No. 1955.158.857). This specimen shows mainly characters of *L. n. nivosa* and we therefore are seriously in doubt about the syntypic status of this shell.

A second «cotype» of \times *subdubia* is stored in the collection of the Rijksmuseum van natuurlijke Historie in Leiden (Netherlands) and Mr. RIPKEN (pers. comm.) pointed out that this specimen agrees very well with the shell found by us. The latter also agrees well with WOLLASTON's original description.

Specimens of the subspecies discussed are in the Senckenberg Museum, Frankfurt a. M. (SMF), the Museu Municipal do Funchal (MMF) and in the author's private collections. Further, a conchologically intermediary shell (\times *subdubia*) under No. 305475 is deposited in SMF.

	n	size of shell- \emptyset min.-max. (mm)	n	Height min.-max. (mm)	n	Number of whorls min.-max.	n	Apex- \emptyset min.-max. (mm)	n	Ribs min.-max. (last whorl)
L. w. wollastoni (fossil)	164	22.45 \pm 1.11 18.4-25.8	164	10.53 \pm 0.96 8.8-14.5	158	4.86 \pm 0.20 4.2-5.6	30	1.72 \pm 0.12 1.5-2.0	85	40.24 \pm 2.97 35-50
L. w. wollastoni (recent)	62	18.85 \pm 0.97 16.9-21.6	61	10.37 \pm 0.79 8.9-12.5	60	4.88 \pm 0.17 4.6-5.2	27	1.77 \pm 0.14 1.5-2.0	32	37.84 \pm 2.91 30-43
L. w. forensis	25	17.28 \pm 0.60 15.9-18.1	25	9.54 \pm 0.79 7.5-11.3	24	4.95 \pm 0.17 4.6-5.3	19	2.41 \pm 0.17 2.1-2.7	13	32.85 \pm 2.85 27-38

Tab. 1.— Biometric data of the shells of *Leptaxis (Katostoma) w. wollastoni* and *L. (K.) wollastoni forensis*. Arithmetic median values with standard deviation, minimal and maximal measurement, n = number of measured shells.

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