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REFERENCES

from the Amazon Region. *Instituto de*
p. 306.
den aus dem Amazonas-Gebiet. *Archiv.*

Molluscs from Pará State, Brazil. *Nautilus*,
shells: further remarks and descriptions.
97-132.

Abaco dos Molluscos do Brazil. *Arquivos*
Art. 1, 66-69.
family Ampullariidae. *Proc. Malac. Soc.*

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L. W. STRATTON.

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SOME VARIATIONS IN THE UNIONIDAE

By L. W. STRATTON

(Read before the Society, 9 April 1960)

The following is an account of a Unionid population in which a considerable amount of variation was observed.

This unusual colony of Unionidae lives in a backwater of the River Thames a short distance above Windsor Bridge on the north side of the river. It is found along the base of a concrete wall, in water varying from four to five feet in depth. The shells are most abundant close up under the wall, where the bottom consists of thick mud; further out, on a gravelly bottom, only stray shells occur.

The colony was first discovered in 1949, when four species were taken: *Anodonta anatina* (Linné), *Anodonta minima* Millet, *Unio pictorum* (Linné) and *Unio timidus* Philipsson. *Sphaerium rivicola* (Lamarek) and *Viviparus viviparus* (Linné) were also present.

The *A. anatina*, of which the largest shell measured 83 mm. in length, were of the typical form, the dorsal margin ascending to an obtuse angle before curving downwards to the posterior end. Three *A. minima* were taken, the largest measuring 82 mm. *U. timidus* was also typical of the species, measuring up to 74 mm. They were handsome shells, corresponding to the description by Ellis (1947), brown "with alternating zones of paler hue, greenish, marked with divergent yellow rays". There were two forms of *U. pictorum*, the typical one and that attributed to var. *curvirostris* Dupuy. These were all rather small, up to 72 mm. long in the typical form and 70 mm. in *curvirostris*. The colour was pale, a deep straw colour with concentric bands of dark brown which widened towards the ventral margins. Some of the typical shells had traces of green colour. The *curvirostris* shells were much shorter in relation to width when compared with the shell figured by Ellis (1947, plate 6, figure 27), which measures 93 × 41 mm., and approach much more nearly to figure 28 on the same plate. The measurements of three preserved specimens are 72 × 36 mm., 65 × 31 mm. and 66 × 38 mm., the last being slightly deformed in front of the umbones. The ventral margins are generally more incurved than in Ellis's specimens. In all, the teeth and muscular impressions are typical of *U. pictorum*.

In 1958 a sample of shells was taken from the same place, and it became clear that significant changes had taken place in the population. The same four species occurred. Only two *A. minima* were taken, and these were much smaller than the 1949 specimens. Two distinct forms of *A. anatina* were found, neither conforming to that of 1949. Of 30 shells taken, 17 approached most nearly to the form *incrassata* Sheppard, and 13 to *rostrata* Rossmässler, as figured by Bloomer (1938). The largest shell of the former measured 80 mm. in length, and of the latter 92 mm., and the average size of the whole sample was greater than that of 1949. In the extreme form of *incrassata* the angle at the posterior end of the hinge-line was entirely absent, the shell being oval in outline. In the

rostrata form the hinge-line was short, there was an obtuse angle quite close to the umbones, and the posterior end of the shell was long, slightly incurved on the dorsal side and wedge-shaped. Between these two extremes were many which were intermediate, and some were difficult to separate. The coloration was generally brown, with still darker brown growth lines. In some cases the young shell, up to 35 mm., showed clearly round the umbones, being a pale greyish-brown colour.

Five juveniles measuring 14 mm., 24 mm., 30 mm., 31 mm. and 36 mm. in length were taken. The first two showed the incurved hinge-line figured by Kennard, Salisbury and Woodward (1925, plate 13), but in the last three it was straight. The dorsal margin of all these shells rose steeply from the umbones to an angle, which could also be seen in the same parts of the adult shells mentioned above. This angle was lost in the adult *incrassata*, but maintained in the *rostrata*. The colour of these juveniles was the same greyish-brown, and each had two greenish rays radiating from the umbones to the posterior end. In only one adult shell was there any trace of green colour.

The *Umo* population was even more interesting, for the colony seemed to have developed what may be described as a *curvirostris* complex. The average size of the shells was also a good deal larger than the 1949 samples. The changes seem to justify more detailed descriptions.

SIZE

U. tumidus: the two largest shells were 91 mm. and 90 mm. in length and several others were larger than the 1949 shells.

U. pictorum: 88 mm. was the maximum length, the average of eight shells being 76 mm.

var. *curvirostris*: largest 88 mm., the average of eight shells 75 mm.

COLORATION

U. tumidus: brown, with dark brown growth lines, paler at the umbones; the "dark form" of Kennard, Salisbury and Woodward (1927). There was no green colour in any shell and the pale rays were entirely absent.

U. pictorum: much darker than the 1949 shells; brown with dark concentric bands, but not so dark as the *U. tumidus* shells.

var. *curvirostris*: a good deal of variation in colour, from dark *tumidus* brown to the pale yellowish-brown of the 1949 shells. All had dark concentric bands which varied a good deal in width. In some shells these bands were of a fibrous nature. There is often a fibrous edge along the ventral margin of *U. pictorum*, which had obviously been preserved during growth and not overlaid with shelly substance as is usually the case.

FORM

U. tumidus: while some shells were slightly more elongated than others, all but two maintained the typical outline of the species. These two, however, had ventral margins slightly incurved, giving them a *curvirostris* appearance.

U. pictorum: generally typical, with subparallel dorsal and ventral

margins; two with incurved ventral margins and one with the ventral margin convexly curved as in *U. tumidus*.

var. *curvirostris*: a good deal of variation, the one constant feature being that described by Ellis (1947), "posterior end curved and wedge-shaped, bringing the extremity below the longitudinal axis of the shell." The anterior ends varied considerably, some being typical of *U. pictorum*, "the dorsal margin almost straight and continued well in front of the umbones passing abruptly into the rounded anterior margin" (Ellis). In others the margin fell away abruptly from the umbones as in *U. tumidus*. There were intermediates between these two extremes. The ventral margins varied from incurved, through straight to convex curves.

RUGAE

U. tumidus: all showed the typical W formation.

U. pictorum: typical of the species.

var. *curvirostris*: in all but three the umbones were more or less eroded so that the rugae were obliterated. In these three the rugae were typical of *U. pictorum*.

TEETH

U. tumidus: all typical.

U. pictorum: all typical.

var. *curvirostris*: again there was a great deal of variation, though in most shells the teeth were nearer to *U. pictorum*. In one shell the inner anterior lateral of the right valve was as large as in *U. tumidus*, with the outer tooth vestigial. In two the cardinals and anterior laterals were continuous, forming one long tooth. There were other minor variations.

MUSCULAR IMPRESSIONS

U. tumidus: all typical.

U. pictorum: all typical.

var. *curvirostris*: much variation, both in shape and position of the scars. In some shells the anterior adductor and anterior retractor-pedis scars were separated by a high ridge; in others the two scars were contiguous. The distance of the scars from the dorsal margins also varied. In some shells the protractor-pedis was broad as in *U. pictorum*, in others narrow and crescentic as in *U. tumidus*. The posterior adductor scars varied from shell to shell, some being ovoid as in *U. pictorum*, some spade-shaped as in *U. tumidus*, and some of these latter showed the herring-bone pattern often found in *U. tumidus*.

It will be seen from the above descriptions that some of the true *U. tumidus* and *U. pictorum* showed certain unusual features. The rest must be assigned to *U. pictorum* var. *curvirostris*, but quite a number of them exhibited *U. tumidus* resemblances both in teeth and muscular impressions.

In addition to the shells already described, there was one which may be described as intermediate between *U. tumidus* and *U. pictorum*. The colour and outline were most nearly that of *U. pictorum*, with a tendency towards the *curvirostris* posterior curve. The anterior lateral teeth of the right valve were as in *U. pictorum*, though the inner tooth was rather large.

The anterior laterals of the left valve approached more nearly to *U. tumidus*. The muscular impressions were all those of *U. tumidus*. This shell is very similar to one taken in 1947 from the River Lea at Broxbourne, Herts. In this shell the teeth were all *U. pictorum* and the muscle scars all *U. tumidus*. Mr. Salisbury and Mr. Ellis agreed that this shell was an intermediate between the two species.

It was felt that further investigation was desirable, so the locus was visited again in 1959. No great changes were expected, but some confirmation of the 1958 findings was hoped for. Twenty-two specimens of *Anodonta* and 30 of *Unio* were taken. There was no specimen of *A. minima*, all 22 being *A. anatina*. Of these, six were of the typical form, with steep hinge-line and clear-cut angle, nine were the *incrassata* form with oval shell, and seven the *rosstrata* form with wedge-shaped posterior end. Coloration was much as in 1958, though several shells showed traces of green. The shells were generally large, the largest of each form measuring 84 mm., 90 mm. and 102 mm. respectively.

Of the 30 *Unio* taken, eleven were *U. tumidus*. All but one were of the dark form, the exception being paler with green rays. The largest shell measured 93 mm., the average of the eleven was 82 mm. and the ratio of length to height was 1.95:1. As in 1958, two shells had incurved ventral margins.

Only one typical *U. pictorum* was taken, a half-grown yellow and green shell of 71 mm., rather short for the species, the ratio being 2.44/1.

Of the remaining 18 shells, 17 must be assigned to the form *curvirostris*. As in the 1958 sample there was considerable variation in shape, some approaching that of *U. tumidus* with convex ventral margins, others straight or incurved. The two largest shells each measured 87 mm., the average was 75.7 mm. and the ratio 2.09/1. Coloration was as in 1958, and both teeth and muscular impressions showed similar variations. In several shells the ligament approached more nearly to *U. tumidus* than to *U. pictorum*. There were fewer eroded shells, and all showing the rugae were typical of *U. pictorum*.

Again there was one shell with unusual features, but in many ways different from the "intermediate" of 1958. On outward appearance it would be assigned to *U. tumidus*, but the shell was abnormally thin, like an *Anodonta*. The rugae resembled *U. pictorum*, the ligament *U. tumidus*. The teeth of the left valve were nearer to *U. pictorum*, those of the right valve to *U. tumidus*. The muscle scars were generally nearer to *U. pictorum*, though the anterior adductors had *U. tumidus* affinities. This shell may be described as an intermediate.

This 1959 sample of *Unio* produced another peculiarity. Several shells had present in the interior a brown incrustation of a material similar to that of the ligament. One *curvirostris* shell had the teeth completely covered with this material, two *U. tumidus* had deep pits beneath the umbones filled with it, and another *curvirostris* shell had a similar pit near the ventral margin. The sample also showed several cases of deformity, especially in the teeth.

Kennard, Salisbury and Woodward, in their 1927 paper on the *Unio* from Repton Park, Derbyshire, refer to them as "hybrids". This term

has been omitted deliberately from this paper, as there is no evidence of interbreeding between the two species of *Unio* in the River Thames locus. It may have occurred, but it was thought better to use the term "intermediate". The Repton Park locus was a running pond, closed at the lower end by a dam, so that interbreeding in such a confined locus was a distinct possibility. The locus of this paper is a backwater with free access to the main stream of the River Thames some sixty yards away.

SCENARIO

The Unionid population of the River Thames locus has, in ten years, reached a stage of considerable variability. Three forms of *Anodonta anatina* have developed. In *Unio*, the form of *tumidus* seems to have remained fairly constant, but in *pictorum* the *curvirostris* form has almost entirely superseded the typical form. It also shows signs of *tumidus* affinities. Two shells have been found which may be described as intermediates between the two species of *Unio*.

REFERENCES

- BROOKER, H. H., 1938. The British species of *Anodonta* Lamarck and their varieties. *J. Conch.*, 21, 33-48.
- ELLIS, A. E., 1947. *Synopsis of the British fauna*. No. 5. Linnean Society of London.
- KENNARD, A. S., SALISBURY, A. E., and WOODWARD, B. B., 1925. Notes on the British Post-Pliocene Unionidae. *Proc. Malac. Soc.* 16, 267-287.
- KENNARD, A. S., SALISBURY, A. E., and WOODWARD, B. B., 1927. Notes on the British Post-Pliocene Unionidae. II. *Proc. Malac. Soc.* 17, 191-197.

Hygromia subvirescens (Bellamy) in Pembrokeshire.—The occurrence of this species in Wales was known from a single shell collected at Newgale, Penm., by Mr. R. P. Smith, of Belmont, Surrey, in 1938; this specimen is in the British Museum (Natural History). At the suggestion of Mr. A. E. Ellis, I searched for *H. subvirescens* in Pembrokeshire in August 1959, and discovered two colonies on cliffs near St. Bride's Haven (SM 804114). The coast-line is deeply indented, with cliffs of Old Red Sandstone falling steeply to the sea from a height of about 70 feet. Both colonies were on slopes facing south-west, and extended down almost to the limit of vegetation, but were confined to within a few yards of the cliff top above. Low down the cliff the snails lived under mats of sea campion (*Silene maritima*) on bare well-drained sandstone, where the only associated species was *Lauina cylindrica*. Higher up they were found under sea campion, thrift (*Armeria maritima*) and ribwort plantain (*Plantago lanceolata*), together with *Cochlicopa minima*, *Vertigo pygmaea*, *Helix nemoralis*, *Ulicella seperata*, *Oxychilus alliarius* and *Vithina pellicuda*. Cloughs were seen probing the grassy slopes of nearby cliffs: they are probably one of the predators of this snail.

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