FURTHER NOTES ON THE MOLLUSCS FROM THE HOLOCENE PEAT AT TUXFORD, NOTTINGHAMSHIRE

by

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Summary

Twelve new molluscs for the Holocene Peat at Tuxford are recorded, together with a table showing the distribution of molluscs through a seven foot section of the deposit. The environmental history of the peat bog is described on the basis of the changing mollusc fauna.

Introduction

The occurrence and fauna of the Holocene Peat exposed during the construction of the Tuxford By-Pass was recorded by Rundle and Taylor (1967). In this work the faunal list and table of molluscan frequency was based on samples collected from the upper four feet of the deposit. Owing to other commitments at the time the peat was exposed, these authors were unable to collect a vertical series of samples. A vertical column of the peat had, however, been collected from a position now under the By-Pass (about SK 749699), $\frac{1}{4}$ mile S.E. of the exposure studied in the earlier paper. This was deposited in the University Museum, Nottingham, and carefully processed by Mr. R. C. Alvey by dividing it into one foot lengths and dissecting out the molluscs. The purpose of the present paper is to put on record the results of a study on these specimens, which were made available by Mr. Alvey after the earlier paper had gone to press.

The Mollusc Fauna

The column of peat was about 7 feet long and 2 by 3 inches in cross section. Each individual one foot sample processed thus having a volume of about 72 cubic inches. As even minute specimens and fragments were present in these processed samples a meaningful count was possible to ascertain any faunal change. The identification and counting of these specimens revealed twelve species not previously recorded from this deposit, bringing the total number of species recorded to 39. They were:-

EXPLANATION OF PLATE 24

Fig. 1 *Acme fusca* (Montagu). (1.7 mm.)

Fig. 2 *Aplexa hypnorum* (Linné). (5.5 mm.)

Fig. 4 *Succinea putris* (Linné). (7.5 mm.)

Fig. 3 *Pupilla muscorum* (Linné). (3.2 mm.)

Fig. 5 *Vallonia costata* (Müller). (2.5 mm.)

Fig. 6 *V. pulchella* (Müller). (2.4 mm.)

Fig. 7 *V. excentrica* Sterki. (2.5 mm.)

Fig. 8 *Hygromia liberta* (Westerlund). (7.3 mm.)

Fig. 9 *Punctum pygmaeum* (Draparnaud). (1.3 mm.)

Fig. 10 *Carychium tridentatum* (Risso). (1.7 mm.)

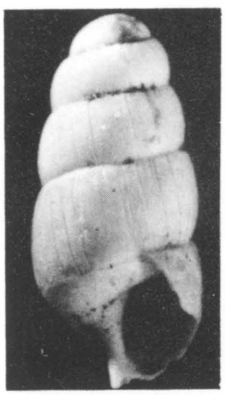
Fig. 11 *Pisidium obtusale* (Lamarck). (1.7 mm.)

Fig. 12 Drawings of the body whorls of the two British species of *Carychium* to show the characteristic internal columellar folds.

a) *C. minimum* Müller

b) *C. tridentatum* (Risso)

All quoted measurements are of the maximum dimensions in each of the views given. The figured specimens have been deposited in the Department of Geology, University of Nottingham.



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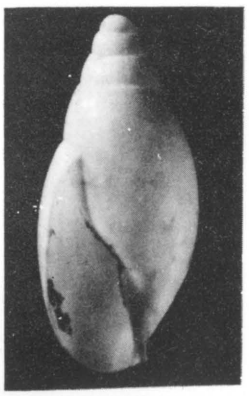

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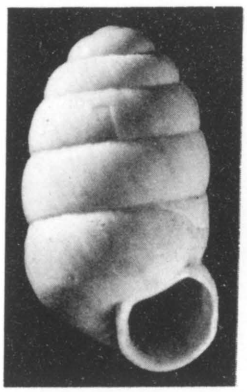

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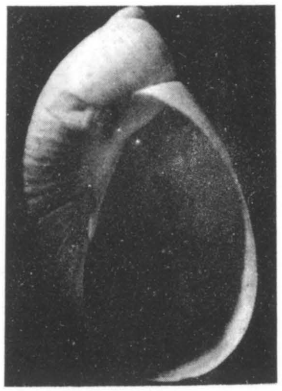

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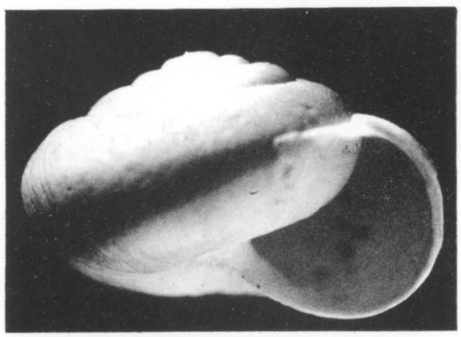

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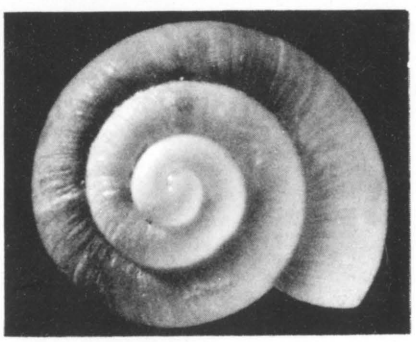

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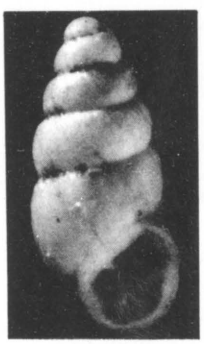

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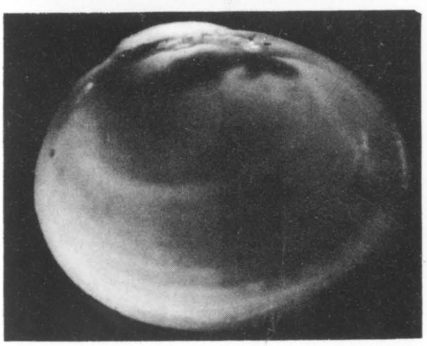

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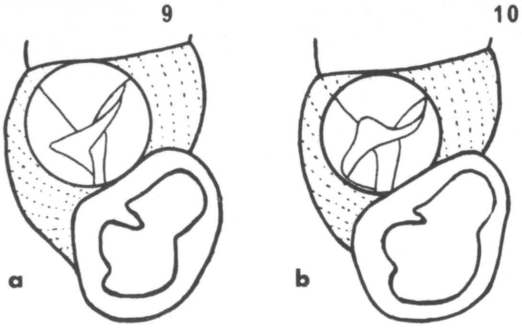

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Acme fusca (Montagu)

Carychium tridentatum (Risso)

Aplexa hypnorum (Linné)

Succinea putris (Linné)

Columella edentula (Draparnaud)

Pupilla muscorum (Linné)

Vallonia costata (Müller)

V. excentrica Sterki

Hygromia liberta (Westerlund)

Vitrea contracta (Westerlund)

Pisidium casertanum (Poli)

P. milium Held

The presence of a few well preserved Aplexa hypnorum showed the previous identification of the species (Rundle and Taylor, 1967: pp. 321, 323; pl. 11, fig. 4) as Physa fontinalis to be in error. The presence of Carychium tridentatum was discovered by dissecting specimens of the genus and examining the columellar folds within the body whorl. It ought to be stated that although fifty specimens had been so examined for the earlier paper, all had proved to be C. minimum.

Table 1 shows the result of a count of the mollusca in seven samples taken at one foot intervals. Sample 1 is the lowest, its base being marked by numerous Keuper sandstone fragments (skerry) and sample 7 is the highest, its top being defined by the topsoil. The nomenclature of the list of species in this table follows that of Ellis (1951).

Four further points concerning the production of this table are given below:-

1. Only the apical portions of gastropod shells were counted, and although the bivalves were counted as single valves, this number was halved to represent individuals.
2. In samples 3 and 5 where juveniles of Carychium were present, there were sufficient determinate adults to estimate the relative frequency of the two species. In sample 5 this is based on the dissection of 50 of the 225 specimens counted.
3. Juveniles of Vallonia were also present in samples 3 and 5, but it was considered unwise in this case to specifically allocate the juveniles owing to the small number of adults.
4. As the majority of the specimens of Succinea were practically indeterminate juveniles, specimens of this genus are not specifically identified in this table.

The Environmental Conditions

Mollusc species found in Post-Glacial deposits still survive. By comparison with the ecology of relevant extant species an assessment of past environmental conditions for such deposits is possible. The results of such a study, based on the details given in Table 1, are presented below:-

TABLE 1

Frequency of Molluscs in seven successive peat samples

Species	Percentages of specimens per sample						
Sample numbers:	1	2	3	4	5	6	7
Valvata cristata Müller	-	-	-	-	0.5	-	-
Acme fusca (Montagu)	-	-	-	-	0.1	-	-
Bithynia tentaculata (Linné)	-	-	2.3	0.8	0.1	-	-
Carychium minimum Müller	3.7	-	9.8	-	22.1	-	6.7
C. tridentatum (Risso)	-	-	2.8	-	7.8	-	-
Lymnaea truncatula (Müller)	7.4	26.3	13.2	9.2	15.1	-	6.7
L. palustris (Müller)	-	-	0.5	-	0.1	-	-
L. peregra (Müller)	-	-	1.2	19.1	6.2	-	-
Aplexa hypnorum (Linné)	-	-	1.2	1.5	0.4	-	-
Planorbis leucostoma Millet	7.4	5.3	14.3	14.5	4.8	-	-
P. crista (Linné)	-	-	-	-	0.1	-	-
Succinea spp.	-	10.5	2.3	-	3.5	100.0	40.0
Cochlicopa lubrica (Müller)	11.1	21.0	7.5	6.9	3.6	-	-
Columella edentula (Draparnaud)	-	-	-	0.8	-	-	-
Vertigo antivertigo (Draparnaud)	29.7	5.3	5.7	18.3	4.1	-	6.7
V. angustior Jeffreys	-	-	-	-	2.3	-	-
Pupilla muscorum (Linné)	-	-	-	0.8	0.3	-	6.7
Vallonia costata (Müller)	-	-	-	-	0 3	-	-
V. pulchella (Müller)	-	-	9.2	3.8	1.8	-	26.5
V. excentrica Sterki	-	2.6	-	-	0.4	-	-
V. spp. juv.	-	-	13.2	-	16.0	-	-
Helix nemoralis Linné	-	-	3.5	0.8	0.1	-	-
Hygromia liberta (Westerlund)	-	-	-	0.8	0.3	-	-
Helicidae spp. juv.	-	2.6	-	2.3	0.9	-	-
Punctum pygmaeum (Draparnaud)	-	-	-	-	0.7	-	-
Discus rotundatus (Müller)	22.2	-	1.2	3.0	2.1	-	6.7
Euconulus fulvus (Müller)	-	-	2.3	5.3	0.5	-	-
Vitrea contracta (Westerlund)	3.7	-	-	-	0.9	-	-
Retinella radiatula (Alder)	7.4	13.2	4.6	5.3	1.3	-	-
Zonitoides nitidus (Müller)	3.7	13.2	3.5	3.0	0.7	-	-
Pisidium casertanum (Poli)	-	-	-	-	0.9	-	-
P. personatum Malm	-	-	1.2	3.0	1.8	-	-
P. obtusale (Lamarck)	3.7	-	0.5	0.8	-	-	-
P. milium Held	-	-	-	-	0.1	-	-
Total number of specimens per sample:	27	38	174	131	755	24	15
Total number of species per sample:	10	9	20	19	32	1	7

Sample 1 — Sparce fauna, dominantly of terrestrial forms which are characteristic of a marsh environment. Two truly aquatic species (P. leucostoma and P. obtusale) which can tolerate stagnant conditions are also present.

A peat bog with restricted aquatic conditions must have existed at this time.

Sample 2 — Sparce fauna of similar aspect to that of sample 1, but with a pronounced increase in the number of individuals of terrestrial species usually found at the margin of aquatic environments (Succinea spp., R. radiatula and Z. nitidus). V. antivertigo, the marsh species common in sample 1, becomes rare at this level.

There was probably a slight lowering of the water level at about this time, allowing a typical marginal fauna to become established.

Sample 3 — Rich fauna with more aquatic species than previously. The marginal species common in sample 2 become rare.

A rise in the water level is indicated by this fauna.

Sample 4 — Rich fauna composed of about equal numbers of truly aquatic and truly terrestrial species. Although this and the previous sample are dominated by the stagnant water forms, there are significant numbers of those not found in such extreme conditions in this sample (e.g. L. peregra).

The water level was about the same as before, but conditions had become more favourable for the aquatic fauna.

Sample 5 — Very rich fauna, both in number of individuals and number of species. The large number of species only represented by a few specimens indicates a transported fauna, at least in part. This is supported by a consideration of the environmental requirements of the molluscs present. These come from a relatively wide range of environments, for example A. fusca is a woodland species and V. cristata normally inhabits moving water. Evidence that this was caused by stream action is shown by the presence of abundant clastic grains of quartz, only found at this horizon. Also this is the only sample to contain Charophyte "fruits" which characterise clear, hard water. It is interesting to note that the most abundant genus in this sample (Carychium) is a terrestrial form with shells of similar size to the sand grains and was probably transported along with them.

The bog was inundated by a stream at this point but detailed conditions cannot be inferred from a transported fauna such as this.

Sample 6 — Scarce fauna consisting entirely of one genus (Succinea). This genus is a characteristic marginal form living high on bordering plants. As there are no associated molluscs the conditions around the base of the plants must have been such that molluscs were unable to live there.

A reed bed growing in shallow stagnant water unsuitable for even the most tolerant species seems to be the most likely environment at this time.

Sample 7 — Scarce fauna with a dominant marginal character, but with more forms characteristic of damp ground.

Conditions were by now much drier and approach that of a damp meadow near a body of water.

The sequence of conditions described above can be further illustrated by a consideration of the relative frequencies of truly terrestrial and truly aquatic species in each sample (Table 2). The percentages shown in Table 2 take account of all species listed with the exception of L. truncatula, which is eliminated from consideration as it is ecologically transitional between aquatic and terrestrial.

Another indicator of the fluctuation of conditions is the total number of specimens per sample. In a terrestrial environment mollusc shells rarely accumulate in the sediment in large numbers (cf. samples 1, 2, 6 and 7). There are many reasons for this, such as the solution of shells by rainwater, the usual lack of terrestrial sedimentation, and their fragmentation by plant roots. In still aquatic conditions the shells are gently deposited and protected from solution by the comparatively rapid deposition of sediment (cf. samples 3 and 4). When water movement occurs shells can be mechanically concentrated giving abnormally large numbers of shells in places (cf. sample 5).

TABLE 2

Vertical distribution of terrestrial and aquatic species within the peat

Sample number	1	2	3	4	5	6	7
Percentage of terrestrial species	88.0	92.8	75.6	56.3	70.4	100.0	100.0
Percentage of aquatic species	12.0	7.2	24.4	43.7	29.6	0	0

Conclusions

It is concluded that all but one of the samples (sample 5) represent in situ faunas from which the local environment can be ascertained.

The peat bog had initially shallow water, becoming deeper as it developed, with some fluctuations in level. A stream then inundated the area probably producing a rise in the water level causing the formation of an outlet which eventually drained the bog. The marshy ground left afterwards was probably colonised by tall plants (e.g. reeds) before a typical terrestrial fauna became established.

Acknowledgements

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