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FOOD STORAGE OF THE EUROPEAN WATER SHREW,
NEOMYS FODIENS (PENNANT, 1771)GROMADZENIE POKARMU PRZEZ RZĘSORKA,
NEOMYS FODIENS (PENNANT, 1771)

We find only sporadic data in literature on food storage by insectivorous mammals, in particular *Soricidae*. Cases of food storage by *Blarina brevicauda* (Say, 1923) (Shull, 1907; Ingram, 1942) and also by *Sorex araneus* Linnaeus, 1758 (Bachmann, 1837 — acc. to Shull, l.c.; Dehnel, 1961) have been recorded. Where the water shrews is concerned we have know only of the observation made by Formozov (1948), who found 6 snails (*Vivipara*, *Lymnea stagnalis*, *L. auricularia*) in a water shrew's hole.

On November 1st, 1962 we came across abundant food stores consisting chiefly of dead frogs of medium size, with body length of up to 50 mm., belonging to two species (*Rana temporaria* Linnaeus, 1758 and *Rana arvalis* Nilsson, 1842). The frogs were lying under the loosely placed stones reinforcing the bank of the drainage ditch. The ditch ran through the meadows immediately adjacent to the Białowieża National Park and was situated about 100 m. from the edge of the forest. The stored frogs were placed at the outlet of a concrete drain at a distance of 0.3—1.5 m. from the water, which flowed slowly along the bottom of the ditch. We distinguished 4 larger accumulations of frogs, placed on both banks of the ditch (Fig. 1). No

Table 1.
Numbers of frogs collected by water shrew.

Date	Stand				Total
	I	II	III	IV	
1.XI.1962	30			23	53
5.XI.1962	30	15		23	68
7.XI.1962	53	15	14	23	105
9.XI.1962	82	15	14	23	134
13.XI.1962	106	15	18 ^{*)}	23	162

*) Plus two fish.

Note: Stand III was observed for the first time on November 7th. 1962.

additions were made to two of them (II and IV) during the two weeks of observations and the food store decayed slowly since temperatures remained low (about 10°C). We observed systematic increases in the stores on the remaining stations, in the form of fresh frogs, which were placed on the specimens already lying there. The results of repeated "stock-takings" of the number of frogs are given in Table 1.

All the frogs were more or less damaged in a way characteristic of *Neomys fodiens* (Pennant, 1771) (cf. M. Pucek, 1959). They were usually bitten on the back and sides of the body, in a backwards direction from the fore limbs. In almost all the cases at least part of the internal organs had been eaten. Occasionally fairly considerable diminutions had been made in the muscles of the hind limbs, the back, and the spine. Frogs consumed to a greater extent were found only sporadically.

In addition to frogs, on November 13th 1962 two fairly large fish [*Esox lucius* Linnaeus, 1758 — total length 120 mm., and a half-eaten *Lota lota* (Linnaeus, 1758)] were found in the store nearest the water (III). The pike was also bitten at the back of the head and the back, as has been observed in the frogs (Fig. 2).

Excreta typical of *Soricidae* was found on the stones just by the stored food. In order to make sure that we had to do with the water shrew (*Neomys* sp.) night observations were undertaken, using the infra-red light method described by Andrzejewski & Olszewski (1963). A water shrew was also observed several times as it ran between its food store and the water. Its entry into the water was noiseless, while a distinct splash was heard as it emerged from the water. Although the species

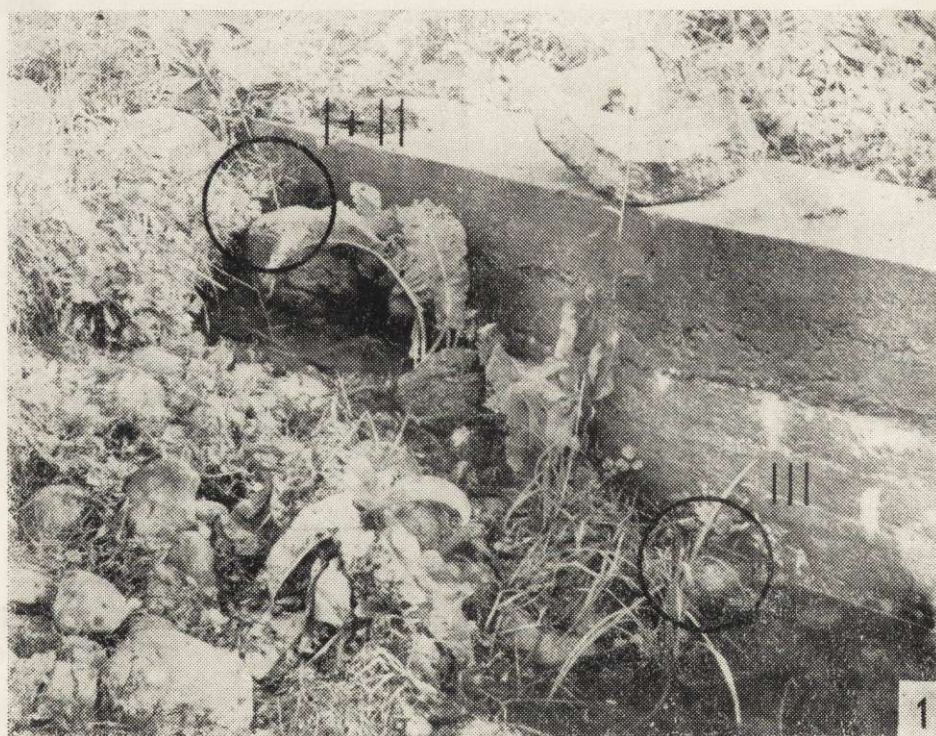
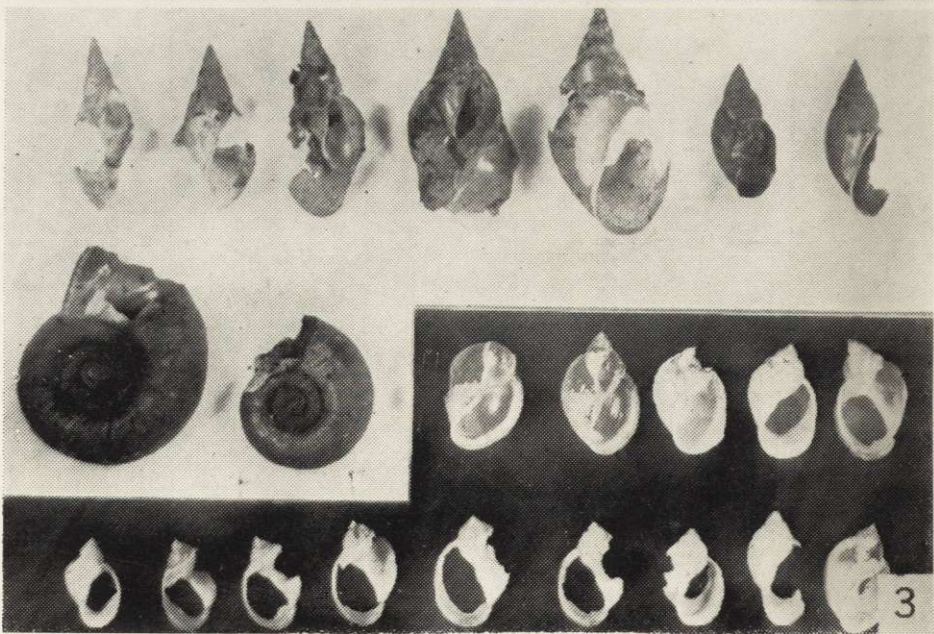
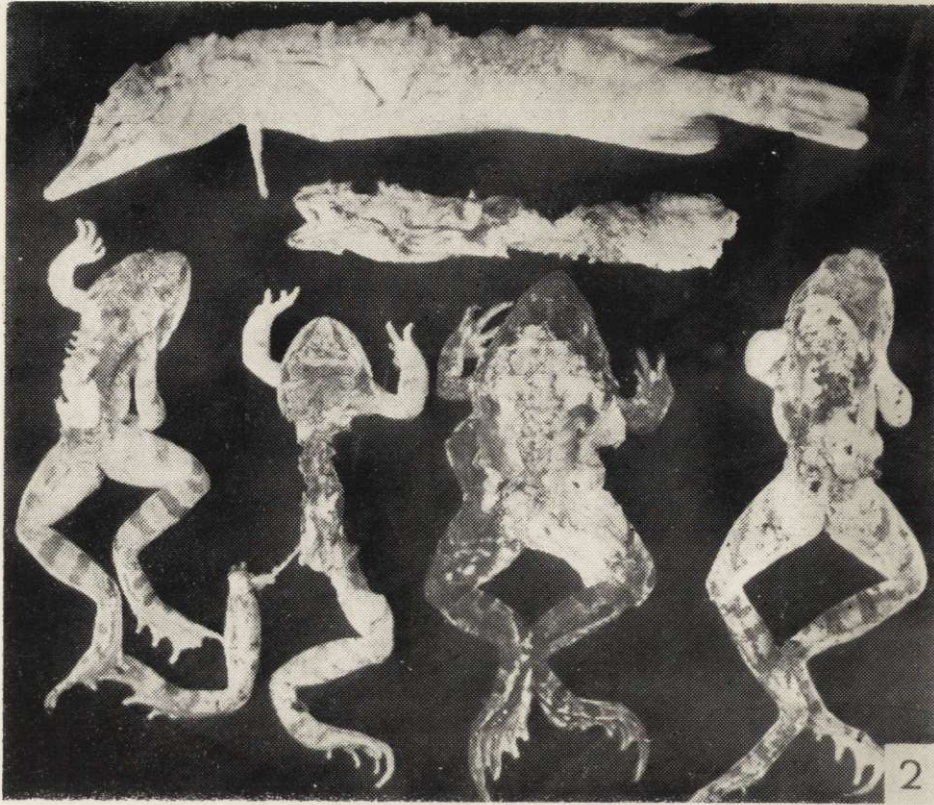


Fig. 1. Place in which accumulations of frogs and snail shells were found.

of water shrew was not identified, we assume that the frogs found were collected together by the European water shrew, *Neomys fodiens* (Pennant, 1771).

Our observations were made for two weeks only, as their continuance was impossible owing to the water from the meadow, following heavy rain, beginning to flow into the drainage ditch, exactly in the place where groups of frogs were placed in the row. As a result during the interval between two consecutive observations (15.XI.—16.XI.) all the stored frogs were washed away by the rapidly-flowing stream of water. After the extremely heavy rains the reinforcement of the bank of the ditch was repaired.

Re-inspection of the same place between October 10th — 18th 1963 showed that the station was again occupied by the water shrew. On both sides of the ditch, under



Figs. 2—3. Explanations in text.

the stones, 7 places were found in which snail shells, chiefly *Radix* sp., had been stored. There were found over 630 shells of *Radix ovata* Drap., and also 10 specimens of *Lymnea stagnalis* Linnaeus, 2 — *Stagnicola palustris* O. F. Müller, 3 — *Planorbis corneus* Linnaeus, 2 — *Tropidiscus planorbis* Linnaeus, and a few remains of *Dytiscus* sp. During the month time further 1300 shells of *Radix ovata* Drap. and few other snails were found in this place. The shells of the snails were damaged in a characteristic way (Fig. 3). Similar injuries to the snails' shell were made by *N. fodiens* (Pennant) kept in captivity.

During the observations, which lasted several days, it was found that the snails, occurring abundantly in the ditch, were carried under the stones and eaten there. Two water shrews seen several times during this period, were captured and identified as *Neomys fodiens* (Pennant, 1771).

Numerous corridors were also found in the bank of the ditch. This tunnels led us to the nest of *Microtus oeconomus* (Pallas, 1776) in which we found 4 dead individuals of this species, aged about 2 weeks. The water shrew had probably taken over the hole previously occupied by *Microtus oeconomus*.

It is difficult to interpret the observations described above. In the case of the snails it is undoubtedly a question of the place on which the food brought there was consumed. The partial consumption of the frogs may, however, suggest that they formed stores accumulated for use later on. It is, also possible that in this case we observed the feeding place of the water shrew, which in view of the abundance of food (frogs) made only partial use of it, eating the favourite parts of the frog — the internal organs.

Our observations also throw light on the qualitative composition of the water shrew's food and the considerable flexibility of its food requirements. During the same seasons it can feed on extremely varied food, which may be uniform at certain times but is easily accessible.

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