

incisors for several months, but in September 1973 slightly oblique wear of the incisors was again found.

It would appear that care of the teeth carried out systematically for a considerable time on young animals may lead to complete elimination of the defect, not only by correcting the bite, but by gradually straightening the position of the jaws. Defective wear of the incisors in adult animals, on the other hand, with the exception of certain cases of excessive growth of the incisors, is of a permanent character and periodical inspection and operation must be continued in the case of captive animals.

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Polish Academy of Sciences, Institute of Genetics and Animal Breeding, Popielno, 12-222 Wejsuny, Poland. Accepted, October 29, 1973.

Wirgiliusz ŻUROWSKI & Zbigniew JACZEWSKI

#### OBSERVATIONS ON THE RELEASING OF THE EUROPEAN BEAVER

##### OBSERWACJE NAD WYPUSZCZANIEM BOBRÓW NA SWOBODĘ

Two pairs of old beavers were released from a beaver farm, one in 1965 and the other in 1968. The new environment was a small and shallow lake, surrounded by a birch and pine forest. To prevent the pair separating — a frequent occurrence when beaver are released — a special arrangement was prepared: an artificial beaver lodge and a wooden palisade as a temporary hindrance to leaving the new place. The first experiment was rather unsuccessful. In the second experiment a second artificial lodge was prepared on the lake side and the animals were released not in August as in the first case, but in November. The second experiment was more successful, as the pair lived together during the winter and produced young in the spring.

The economic and ecological value of beavers depends on many factors and is difficult to evaluate (Yeager & Hill, 1954). In many countries the artificial introduction of beavers has been carried out on a large scale and with great success (Curry-Lindahl, 1967; Zharkov, 1969; Lahti & Helminen, 1969), but has sometimes not been very successful (Myrberget, 1967).

The beaver farm, situated near the large lake Śniardwy, at Popielno, on the Experimental Station of the Polish Academy of Sciences, was founded in 1958. Pairs of beavers have escaped from the farm three times up to the present. In each case it was observed that the pair separated in the new environment and the animals went off in different directions.

Beavers have been described as behaving similarly in Finland (Helminen & Lahti, 1970).

The purpose of the experiments was elaboration of a method of introduction of a beaver pair from farm into the natural environment, without the dispersion of the animals. The experiments were performed on a small, shallow lake, about 9 ha in area, situated in the forest. The dominant plants in the water are the water lily (*Nuphar luteum* (L.)) and the great reedmace (*Typha latifolia* (L.)). The lake is surrounded by peat type vegetation and forest with birches (*Betula* sp.) and pine (*Pinus silvestris* L.) as dominant trees. It was presumed that this lake was a somewhat unsuitable place for beavers, but as it was isolated in the forest and situated within the area belonging to the Station, it was appropriate for experiments.

**I Experiment.** The first pair of old animals was released on August 18th, 1965, at 3 p.m. They had come to Popielno in 1958 as mature animals of unknown age and were already unable to reproduce on the farm. The pair was placed in a special artificial lodge, surrounded by a wooden fence (Figs. 1 and 2). Beavers could get out only after cutting through the fence. This temporary obstacle was intended to facilitate the beavers' adaptation to the new surrounding. The distance between the lodge and the edge of the lake was about 40 metres. Additional food in the shape of branches of willow (*Salix cinerea* L.), poplar (*Populus alba* L.) and bread was placed at the edge of the lake, as this food was provided on the farm. The beavers cut through the palisade during the first night, but returned to the lodge in the morning. For about ten days the beavers swam in the lake at night, taking the additional food supplied and returning to the lodge in the morning. Toward the end of August the animals began active cutting of birches and digging of canals from the lodge to the lake side. The rhythm of activity changed. On the farm the beavers had started their activity about 5 p.m, but in the new environment their activity began later, at dusk. The beavers did not store any food for the winter. On October 20th the male deserted the lake and was found nearly 2 km from the place of release. It was replaced in the lodge. The store of food for the winter was artificially prepared and immersed in the lake near the lodge. On November 5th the male deserted the lake again, but after capture it was again put in the lodge. On November 15th the lake began to freeze and the first snow fell. The beavers lived in the lodge, drawing on the winter food store, and sometimes went on the ice through the air-holes they had made. On December 3rd the male deserted the lake again and was not found. The female lived in the lodge till December 26th, then also deserted the lake, but was found and brought back to the farm. The beavers' migrations in this experiment were probably also connected with their being disturbed by anglers.

**II Experiment.** In 1968 another pair of old beavers were released in the same place. These animals were captured as adults in 1961 and taken to the beaver farm at Popielno. They produced young in 1962, 1963, 1964, 1965 and 1967. In 1966 and 1968 no offspring was produced by the pair. They were released in the same manner as before, but a second additional lodge connected with the burrow was prepared on the lake side. The entrance to this artificial lodge was situated beneath the water

surface. The new pair were released on November 6th, 1968, at 10 a.m. The palisade was cut through during the day and in the evening the female was seen swimming in the lake. On November 8th the beavers moved to the lodge on lake side and began cutting the birches. As in the first

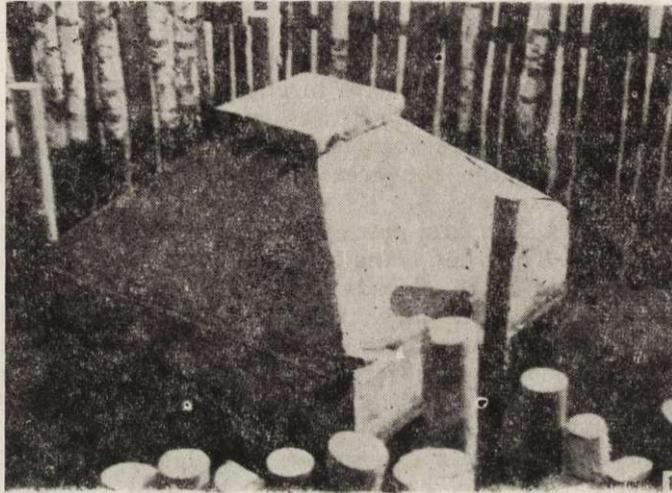


Fig. 1. The artificial lodge surrounded by a wooden palisade. Picture taken on August 18th, 1965. (Phot. B. Gałka).

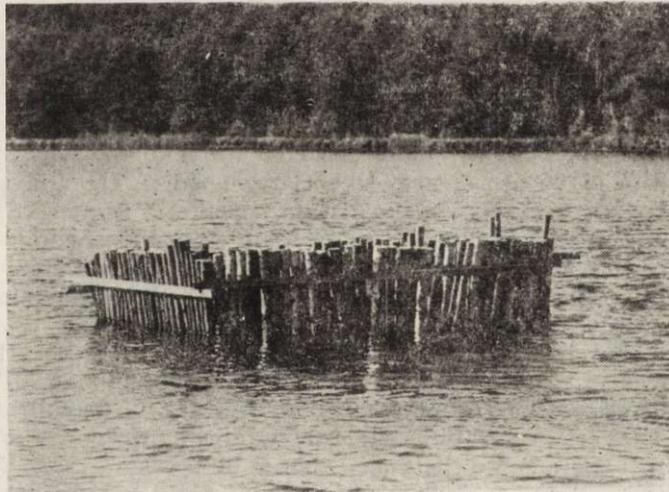


Fig. 2. The wooden palisade — fence. Picture taken on August 18th, 1965. (Phot. B. Gałka).

experiment, additional food was placed at the edge of the lake — branches of willow, poplar, bread and also carrot. Till November 15th beavers lived alternately in the lodge on the lake side or in that on the lake. They dug

many burrows in the lake side. The activity of the beavers changed depending on the hours of twilight. On November 15th the lake froze. The beavers were then living in the lodge on the lake side and in the burrows. They kept the air-holes open. Bread and carrot were put into the lodge, and branches of willow, poplar and birch into the air-holes. The beavers could be heard gnawing the tree-branches in the burrows very often during the day. The beavers' activity increased during the thaw, as they started to go out and even began cutting the birches. During hard frosts the activity of the beavers decreased and was unnoticeable. About January 15th the beavers' activity increased and on January 17th noisy behaviour, characteristic of the rutting period, was audible. Another period of increased activity began toward the end of February. The beavers went out more and more often and began intensive cutting and feeding. The ice disappeared from the lake at the beginning of April, and the water level became higher. The beavers moved from the burrows to the lodge on the lake side. On April 29th the birth of two young was observed. On May 6th the beavers moved to the lodge on the lake, probably on account of disturbance caused by lumbermen. One young beaver was observed swimming in the lake in the evening of June 5th, 1969. The beavers returned to the burrows at the beginning of August, by which time the water level had become far lower. The activity of beavers during the spring and summer began at twilight. They cut mainly birches and great reedmace. The old male died at the end of August on account of overgrowth of the incisors. The old female died on September 3rd, 1969; on dissection a tumour about 10 cm in diameter was found in the abdominal cavity. The remains of one young beaver were found in September; it had probably died in May. The second one lived alone in the lake and in the burrows. It was very wild and timid. The last traces of its activity were noticed on January 16th, 1970. The cause of its death is unknown, but could have been due to the heavy snowfall that winter, to predators or to some other cause.

The observations presented here are hardly sufficient to draw clear conclusions. Literature data (Helminen & Lahti, 1970; Myrberg et, 1967) and the observations described above seem to indicate that releasing of beaver pairs often results in the animals separating from each other. The artificial preparations described above seem to diminish the possibility of such an undesirable occurrence, the procedure applied in the second experiment being especially successful: the old animals adapted themselves very well to the new situation, as can be judged from their ability to produce offspring in the new environment, in spite of fact that on the farm they had not reproduced in the previous year. The second experiment indicates that November is probably more suitable for releasing beavers than August, as there is less time for them to separate before the winter. The wooden palisade as a temporary hindrance to leaving the new environment also seems to be useful. The preparation of artificial lodges and food in beaver releasing was also recommended in North America (Couch, 1942).

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Polish Academy of Sciences, Institute of Genetics and Animal Breeding, Popielno, 12-222 Wejsuny, Poland. *Accepted, February 20, 1974.*

Stefan BUSZKO

ADDITIONAL TRIANGLE ON  $M^2$  IN *MICROTUS NIVALIS*

(MARTINS, 1842)

WIEŁOPĘTLOWOŚĆ ZĘBA  $M^2$  U *MICROTUS NIVALIS* (MARTINS, 1842)

The considerable variations in the structure of certain molars in voles often leads to occurrence of forms defined by the term anomalies (Rörig & Börner, 1905; Ognev, 1950; Reichstein & Reise, 1965; Ruprecht, 1967 *et al.*). A classic example of such variations is the  $M^2$  in *Microtus arvalis* (Pallas, 1779) and *Microtus agrestis* (Linnaeus, 1761). In certain individuals of *M. arvalis* this tooth exhibits a tendency to formation of a fourth triangle of enamel, resulting in a similarity to the *agrestis* type. Some individuals of *M. agrestis*, on the other hand, exhibit the reverse tendencies (Rörig & Börner, 1905; Schaefer, 1935; Reichstein & Reise, 1965 and others). Cases are known of similar occurrence of an additional triangle of enamel from the aboral end of  $M^2$  also in *Microtus socialis* Pallas, 1773 (Schaefer, 1935). Variations of this kind often make it difficult to identify either fossil or contemporary material (Dienske, 1969), and therefore all deviations in the structure of teeth in voles should be recorded.

A individual of *M. nivalis* was found among skull material of this species in the collection of the Mammals Research Institute, Polish Academy of Sciences, at Białowieża, which had been correctly identified on the basis of external descriptive and measurement characters as originating from the Tatra Mountains (no. coll. 51821, ♂ ad), caught on 4.7.1961 in the Hala Gąsienicowa (Gąsienicowa Alp) near Czarny Staw (Black Pool) at an altitude of 1620 m above sea level. The vole in question had an  $M^2$  on both sides, exhibiting and additional fourth triangle of enamel c, which was clearly separate from the third triangle (Fig. 1;  $V_4$ ). All the other cranial characters of this individual, in particular the lines of muscle insertions on *os parietale* and the prominent *bullae tympanici*, are characteristic of *M. nivalis*.

Examination was made of the whole of the *M. nivalis* material, numbering about 60 skulls, originating from two Polish Tatra populations — near the Morskie Oko Lake (49°12'N, 20°05'E) and the Gąsienicowa