cup of cow's milk, which it lapped from a bowl, was given daily.

Occasional diarrhoea, presumably from overfeeding, occurred which was treated with Kaopectate, a patented remedy mixed in milk. No vaccinations or prophylactic medications were given.

This 'pouch' method has proved successful in rearing a wallaroo *Macropus robustus* and a Kangaroo Island dama wallaby *Macropus eugenii decres*, both received in the nursery at approximately the same stage of development as the Red kangaroo; the wallaroo measuring 22·8 cm and the wallaby 10.1 cm from head to base of tail. The only variation was that a narrower 'pouch' had to be made for the wallaby, since it was less than half the size of the other two. Six other baby marsupials, rejected by their mothers, have been brought to the nursery, all 7·6 cm long or smaller, but died within a few hours.

PRODUCTS MENTIONED IN TEXT

Pedi-Vite: a multiple vitamin manufactured by Wolins Pharmacal Corp., Melville, New York.

Calf-Startina: a pellet manufactured by Ralston Purina, St Louis, Missouri.

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Capture, transport and husbandry of the Pyrenean desman

Galemys pyrenaicus[1]

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The Pyrenean desman *Galemys pyrenaicus* is a small insectivore (family Talpidae) which superficially resembles the water shrew *Neomys fodiens* in appearance. Its elongated snout and webbed hind paws are quite distinctive features. The dorsal surface is dark grey or black in colour with a pale, almost white, ventrum. On average it weighs 60 g and measures 15 cm overall.

Smaller than the Russian desman *Desmana moschata*, the Pyrenean desman is found only in the Pyrenees and in a few localities in Spain (*4*; *7*; *2*). Its biotope is restricted and yearly becomes more so because of pollution of the mountain streams (*6*). It is not only rare but virtually impossible to observe in the wild and difficult to capture or to keep alive and its biology therefore presents numerous mysteries. (*2*; *7*).

Like other Talpidae, its eyesight is poor and its forefeet are adapted for digging; such anatomical characteristics make it an unlikely inhabitant of mountain torrents. But the desman obviously compensates for its apparent deficiencies by effective adaptations, such as the extraordinarily sensitive tactile vibrissae an either side of its snout (*1*; *5*) and the Eimer organ surrounding the nasal apertures whose function seems analogous to that of the lateral line in fish, although of completely different anatomical origin.

CAPTURE

The first problem is the absence of tracks on the river bank. The animal is territorial as capture and re-capture experiments (*5*) have proved. It also marks its territory but in the wild these traces are invisible to the naked eye. The trapper must rely on his intuition and previous experience. It is necessary to emphasise their surprising fidelity to specific loci; certain areas of the river will always bring results whereas others, apparently similar, do not. Long after one individual has left the area, another will come and install itself – showing an

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Fig. 1. Half-submerged metal fish trap used to capture the Pyrenean desman *Galemys pyrenaicus.*

attraction to the site rather than a territorial take over. (*5*).

We first used half-submerged metal fish traps (Fig. 1) in shallow water, the conical end pointing downstream so that the desman could enter only while swimming upstream. This proved to be the only successful position. When tame desmans were released they were carried downstream by the current, avoiding obstacles, but when swimming slowly upstream they use the obstacles to hang on to or else scramble between rock clefts.

Several precautions must be taken if the animal is not to die of starvation, chilling or suffocation. Like all insectivores, the desman has a rapid metabolic turnover which forces it to eat frequently – up to its own weight of food daily. When imprisoned in the half-submerged trap it cannot survive for more than two or three hours. The traps must be inspected twice a night to avoid this eventuality. Peyre (*3*) advised us to add to the trap a long terminal funnel made of wire mesh, resting on the bank, where the desman could keep dry. But the trap then became too cumbersome. We placed wooden boxes on top of the funnel (Fig. 2) where the desman could climb out of the water on a ramp.

We now use collapsible nylon nets (Fig. 3) to

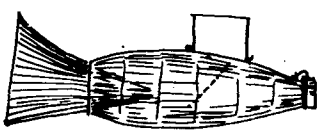

Fig. 2. Wooden box on top of the trap's funnel into which the Pyrenean desman *Galemys pyrenaicus* **could climb to keep dry.**

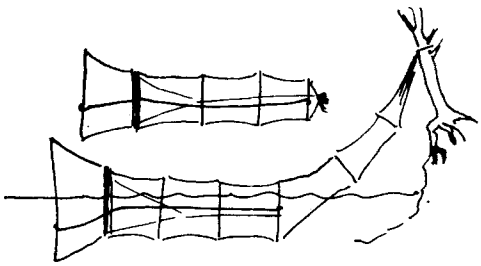

Fig. 3. Collapsible nylon nets now used to trap Pyrenean desman *Galemys pyrenaicus.*

which we have added a long 'nose' which can be tied to the bank, above the waterline. These have the advantage of being economical, light and without the numerous hazards of sharp wire netting.

BANDING

The captured desman is released into a bucket; trapping such a quick, agile animal by night, one runs the risk of its slipping away accidentally. By grasping its tail and lifting its hind feet off the ground (Fig. 4) one can easily sex and ring the desman. It is important to allow the front paws to rest on the ground as, left dangling in mid-air, it will roll forward and bite one's fingers. Handling instruments proved useless – the added stress was fatal or the animal would wriggle free.

Passerine rings were tolerated without trouble, provided they were loose enough to be mobile; a ringed *Galemys* was recaptured 2½ years later.

HUSBANDRY

While it is thus relatively easy to capture, the desman is very difficult to keep alive. Feeding and housing are the most demanding aspects of its husbandry (*3*).

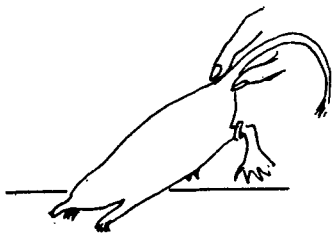

Fig. 4. Method used to sex and ring the Pyrenean desman *Galemys pyrenaicus.*

The desman, like most insectivores, eats a lot and its choice of food is restricted. In the wild, it eats small aquatic arthropods (5–30 mm), crustaceans, insect larvae and pupae, spiders and worms. In captivity its food is easy to find in summer but not in winter. It is necessary to maintain and breed crickets and other arthropods for that purpose. Chopped mice or chick meat can be mixed with beef or veal, finely minced; lung or liver are better as the desman's feeble jaws are incapable of chewing tendons. It is advisable to wash the food first to avoid contaminating the water or the animal's fur. Provided its fur is dry, the desman is quite capable of withstanding temperatures as low as —15°C, but it will not survive a summer's day if it cannot dry itself. For this reason it is essential to provide absolutely clean water which rinses its fur of all food particles and contains no rotting matter that would dissolve the sebum which lubricates and waterproofs the hair. If the desman is not perfectly dry within a few minutes of leaving the water, the water is probably not clean enough. A desman that continually grooms itself is doomed. A small amount of water, sufficient to cover the animal, is enough and can be easily kept clean. The desman only enters the water to catch its food, eating it on the bank afterwards. A ramp will help it to dip its food into the water while eating, a normal behaviour pattern.

The desman's periods of activity are broken by even longer rests and the shelter where it consequently spends a great deal of its time must be completely dry (Fig. 5). Although no actual observations have been made, it seems probable that in the wild it hides amongst the rocks of the bank where the narrow access presses its fur dry. In the humid atmosphere of an aquarium the bedding must be changed frequently. The nesting chamber can be lined with straw or sponge and the access funnel, passing through straw, will ensure that the desman is brushed and dried by the time it reaches the den.

We have not yet been able to maintain a captive colony in Paris. In the Pyrenees we were able to ascertain that pairs confined together show extreme aggressiveness, usually ending in the death of one of the animals. This is probably the rule except for periods of a few hours at a time, when the ♀ becomes receptive as in other insectivores. We intend to provide our animals with a large 10 × 10 m enclosure criss-crossed with artificial streams so that the partners can seek out the other sex as and when they wish. We have never found a ♀ with her litter or even a young desman in the wild, which goes to show just how little we know about this endangered species.

TRANSPORT

Our first unsuccessful attempt resulted in the death of a desman after a brief car journey. We had made the mistake of leaving a little water in the bottom of the aquarium; this was soon dirty and soiled the animal's fur, condemning it to die of cold.

The second attempt was made with two young

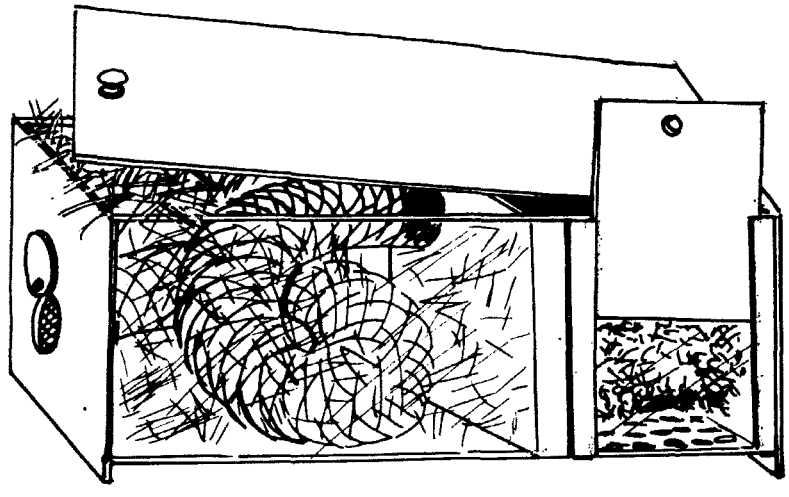

Fig. 5. Travelling box for transporting Pyrenean desmans *Galemys pyrenaicus.*

♀♀ that withstood the 12-hour car journey very well. They were kept isolated and dry in transport cages filled with hay. They were fed twice and their fur rinsed afterwards. When kept warm and dry the desman can withstand a day of fasting provided it is given a larger quantity of food on arrival. This amount corresponds to twice its body weight. The ♀♀ reacted violently to contact with the chlorinated Paris tap water – racing through the straw, grooming feverishly and refusing to re-enter the water, which was fatal. This unexpected problem remains to be solved.

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A mixed species exhibit of lemurs at the Los Angeles Zoo

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Widespread habitat destruction in Madagascar has been responsible, in large part, for the endangered status of most members of the family Lemuridae today. Many zoos exhibit lemurs and breeding potential in captivity is relatively high. Basilewsky (*1*) outlines in some detail the keeping and breeding of Madagascan lemurs in captivity and cites many instances of successful captive reproduction.

The Los Angeles Zoo currently has three species on exhibit: the Ring-tailed lemur *Lemur catta*, the Mongoose lemur *L. mongoz*, and Red-fronted lemur *L. macaco rufus*. Until six months ago the species were housed in separate exhibits. The nine Ring-tails were located in a large circular exhibit filled with rocks, tree stumps, and hanging branches. In concurrence with observations made in the wild (*2*), they spend a large part of the day on the ground and rarely utilise the upper part of the exhibit including many of the tree branches and stumps. On the other hand, the Red-fronts were observed to spend nearly all their time in the upper branches.

A review of the literature indicates that the range of *L. catta* in part of Madagascar overlaps that of *L. macaco rufus*. I assume this overlap occurs because the animals are separated spatially within a territory by different vertical preferences, and there is little direct competition for food. The range of *L. catta* also overlaps that of *L. macaco collaris*. Jolly (*2*) in her studies on *L. catta* includes data on a troop that contained a ♂ *L. macaco collaris*. No inter-breeding was observed and the Ring-tails accepted the single ♂ as a peripheral member of the troop.

One ♂ *L. catta* was continually harassed by other members of the troop. Similarly, the Red-fronts also ostracised a ♂ and eventually it had to be removed.

Jolly's observations of a mixed species troop in the wild indicated that it might be possible to integrate *L. macaco rufus* in captivity. Additionally, it seemed possible that if the two groups would intergrate, the less dominant members of both troops might be more readily accepted by their