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Short Communication

Longevity of captive shrews in Hokkaido

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Information concerning the longevity of animals is invaluable for various biological studies. The longevity of some shrew species (Soricidae) has been reported both from the wild and in captivity (Churchfield 1990). Churchfield (1990) also showed that captive shrews tended to live longer than those in the wild in general, because of the preferential conditions in the laboratory. For a shrew species of Hokkaido, Inoue (1990) reported a maximum estimated life span of 511 days for *Sorex unguiculatus* in the field. For *S. unguiculatus* in captivity, Yokohata (1989) reported a maximum keeping period of 493 days and estimated that the oldest might live for 710-830 days. However, longevity for *Sorex caecutiens* and *S. gracillimus*, other common soricine species in Hokkaido, is little known. In the present study, all the three species were kept in the laboratory, slightly modifying Yokohata's (1989) rearing method. The purpose of the present study is to report the longevity of captive *Sorex caecutiens* and *S. gracillimus* along with that of *S. unguiculatus*.

MATERIALS AND METHODS

1. Animals examined

Shrews were collected in June 1992 and 1993 from Tomakomai (Yufutsu moor), and in June 1992 and August 1993 from Horonobe near the Teshio Experimental Forest of Hokkaido University. The methods of capturing shrews were essentially the same as those described by Ohdachi (1992). Seventeen *S. caecutiens*, 22 *S. gracillimus*, and 28 *S. unguiculatus* were used for analysis.

The animals examined for the present report were originally used for behavioral laboratory experiments (Ohdachi 1994, 1995a, b). During the experiments, laboratory conditions were maintained at either 16L8D, 20°C or 10L14D, 5-15°C. After the experiments, the animals were kept in order to record their longevity, but photoperiodic cycle was no longer controlled. Mixed paste diets of pork meat, pork liver, canned tuna, dog food and rabbit pellets were supplied every day. In addition to the mixed pastes, living mealworms (*Tenebrio* sp.), living earthworms and frozen silkworm pupae (*Bombyx mori*) were given occasionally. The supplementary natural foods seemed to contribute to the

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greater longevity of these captive shrews. Animals that were sexually immature when captured experienced neither copulation, pregnancy, nor parturition during their lives. The most significant difference between Yokohata's (1989) rearing methods and those in the present study was that I always kept cages clean while Yokohata did not. See Ohdachi (1994) for more detailed methods.

2. Estimation of Longevity

Two methods for estimating longevity were used depending on the age of the shrews when captured; the first is for young of the year, and the second for individuals that have overwintered. Ages at capture were assessed on the basis of wear to hair and body weight (Abe 1958, Ohdachi and Mackawa 1990).

The young shrews that were caught were all considered to be fully independent from their mothers. Inoue (1990), who reviewed the literature concerning lactation periods (\approx the period from birth to independence) of six soricine species (*Sorex cinereus*, *S. vagrans*, *S. araneus*, *Cryptotis parva*, *Neomys fodiens* and *Blarina brevicauda*), concluded that the lactation periods ranged from 16 to 30 days. Inoue (1990) also estimated that the lactation period of *S. unguiculatus* in the field averaged 27.6 days. Churchfield (1990) considered that the period from birth to complete independence in *S. araneus* lasted 25 days. In the light of these studies, it is assumed that for the three soricine species in Hokkaido, the period from birth to independence averages 25 days. Therefore, in order to estimate the life span of the individuals that were captured as youngsters, 25 days were added to their survival periods in the laboratory, thus, giving a minimum estimate of longevity, as 25 days is the estimated minimum age of the young animals captured from the wild.

Most soricine species bear young from spring to autumn (mostly in spring) and new-born individuals, usually, do not become sexually mature until the following spring (e.g., Crowcroft 1957, Churchfield 1990). In *S. unguiculatus* of central Hokkaido, most females bear offspring between April and September (Inoue 1990). Pregnant female *S. caecutiens* and *S. gracillimus* were recorded no later than in late September, although some females are known to survive until November (Ohdachi unpublished data). It is assumed, therefore, that the last possible birth date of shrews in Hokkaido is October 1st. Thus, in order to estimate the age of shrews that were captured after they had overwintered (i.e., sexually mature individual), the period from October 1st of the previous calendar year to the date of capture was added to the period survived in the laboratory. Again, this method of estimation provides only a minimum life span, since the estimated period survived in the wild is also a minimum.

RESULTS AND DISCUSSION

Most wild-captured shrews were successfully introduced into the laboratory, although several died during transportation. Two out of 17 *S. caecutiens*, 2 out of 22 *S. gracillimus*, and 4 out of 28 *S. unguiculatus* which were success-

fully introduced to the laboratory died within the first week. Most *S. caecutiens* and *S. unguiculatus* which survived the first week in the laboratory survived for more than 100 days. In contrast, 13 out of the 20 surviving *S. gracillimus* died within 100 days (mean = 52.4 days). In most cases, animals died suddenly without apparent symptoms, and the cause of death were unknown.

The maximum estimated life span for *S. caecutiens* was 609 days, for *S. gracillimus* 419 days and for *S. unguiculatus* 946 days (Fig. 1). The maximum life span for *S. caecutiens* would, in fact, have been longer, had it not died as a result of its water supply failing. The maximum of 946 days for *S. unguiculatus* reported here is one of the longest life span records among the Soricinae (Churchfield 1990).

Churchfield (1990) pointed out that larger shrew species tended to live longer than smaller species, which seems to be related to activity and basal metabolic rates. *S. unguiculatus* is the largest species and *S. gracillimus* the smallest among the three species in Hokkaido, and in the present study *S. gracillimus* tended to live shorter lives than the other two species (Fig. 1). It seems, therefore, that interspecific differences in the maximum estimated life spans of Hokkaido shrews seems to be related to body size, as pointed out by Churchfield (1990).

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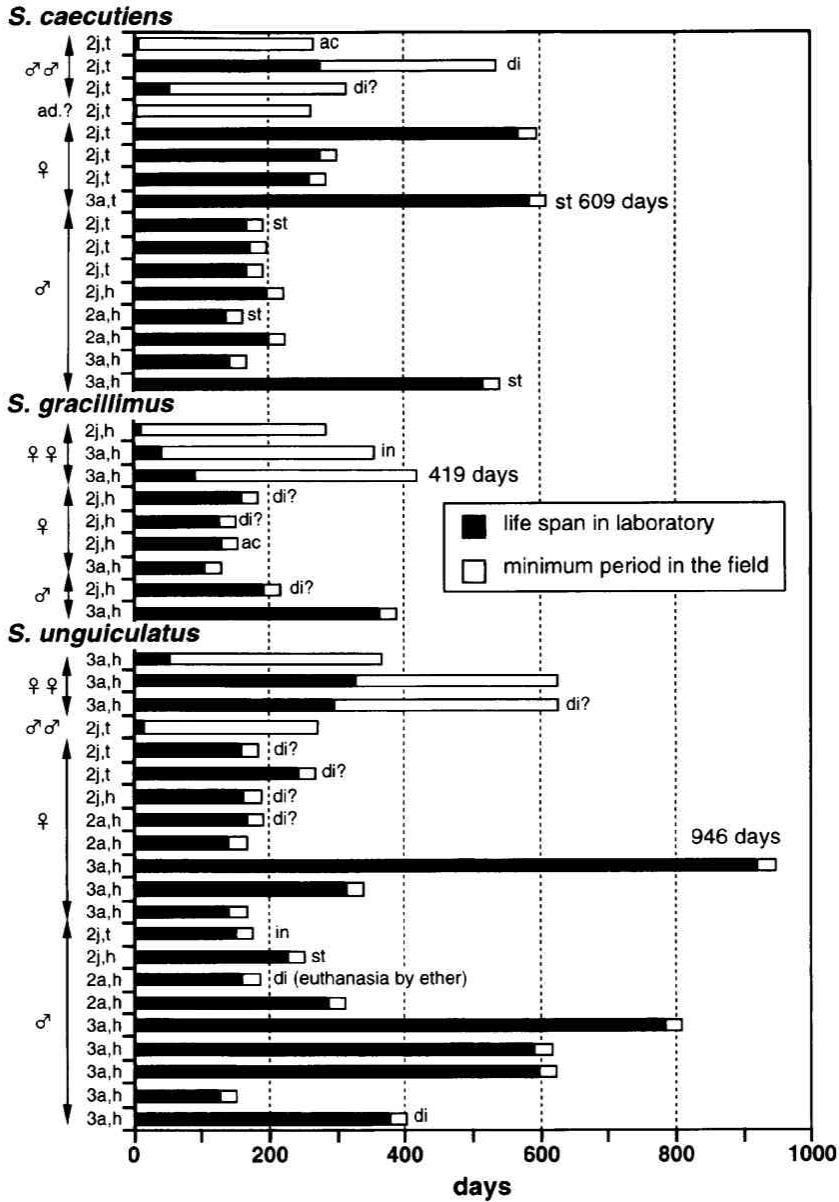


Fig. 1. The estimated longevity of three species of *Sorex* in captivity in Hokkaido. Black bars indicate the actual period shrews survived in the laboratory, and white bars indicate the estimated minimum duration in the field (see text for calculation). Young animals surviving fewer than 100 days in the laboratory were omitted from the figure. Letters to the left of the bars indicate dates of capture and localities ("2j, t" = June 1992 in Tomakomai, "2j, h" = June 1992 in Horonobe, "2a, h" = August 1992 in Horonobe, and "3a, h" = August 1993 in Horonobe). Letters to the right of the bars record the causes of death (ac = accidental kill, di = disease, st = starvation or a lack of water, in = injured, and no letter = unknown). Double sex symbols denote sexually mature animals when captured, and single ones immature animals (ad.? = sex-unknown but mature individual).

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