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# A study of diurnal activity rhythms in Snow leopards and Lynx

*Panthera uncia* and *Felis lynx*

# at Novosibirsk Zoo

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To ensure the successful upkeep of animals in captivity it is necessary to acquire a comprehensive knowledge of their biology and behaviour. It is preferable, therefore, that all aspects of their activity are studied. Between December 1976 and November 1978 Novosibirsk Zoo conducted research into the rhythms of diurnal activity in some representatives of the Felidae. By undertaking the studies we hoped to: (1) determine the patterning of these rhythms; (2) ascertain to what extent they may be species specific; (3) discover to what degree they were distorted by conditions at our zoo. The observations recorded here were made on 2.3 Snow leopards *Panthera uncia* and 1.3 Lynx *Felis lynx*.

Although there is a great deal of information available on the diurnal activity rhythms of some groups of mammals, written data of this kind on the Felidae are scarce (Kavanau, 1971). It has been established that internal factors underlie basic patterns of activity, but that the observed behaviour of animals results from a combination of internal and environmental influences.

The Snow leopards and Lynx at Novosibirsk Zoo are kept in open air enclosures all year round which means that temperatures vary

from 36°C to −44°C. Each cage measures 7 × 2·5 m and is fitted with a wooden hut which is divided into two sections and covered with stones. The entrance is surrounded by logs and branches of pine and fir trees to effect partial camouflage of the opening and also to give the animals climbing facilities. The floor of the enclosure is spread with sand. Both species are fed twice in 24 hours, the first feed being at 1100 hours and consisting of milk with egg and the second, of meat, at 1600 hours. The cages are cleaned between 0900 and 1000.

| SPECIES | | NO. OF ANIMALS | OBSERVATION PERIODS | |
|---|---|---|---|---|
| Snow leopard | | | | |
| *Panthera uncia* | ♂♂ | 2 | 8 | |
| | ♀♀ | 3 | 10 | 18 |
| Lynx | | | | |
| *Felis lynx* | ♂♂ | 1 | 5 | |
| | ♀♀ | 3 | 9 | 14 |

Table 1. Number of 24-hour periods spent in the study of the activity rhythms in Snow leopards and Lynx.

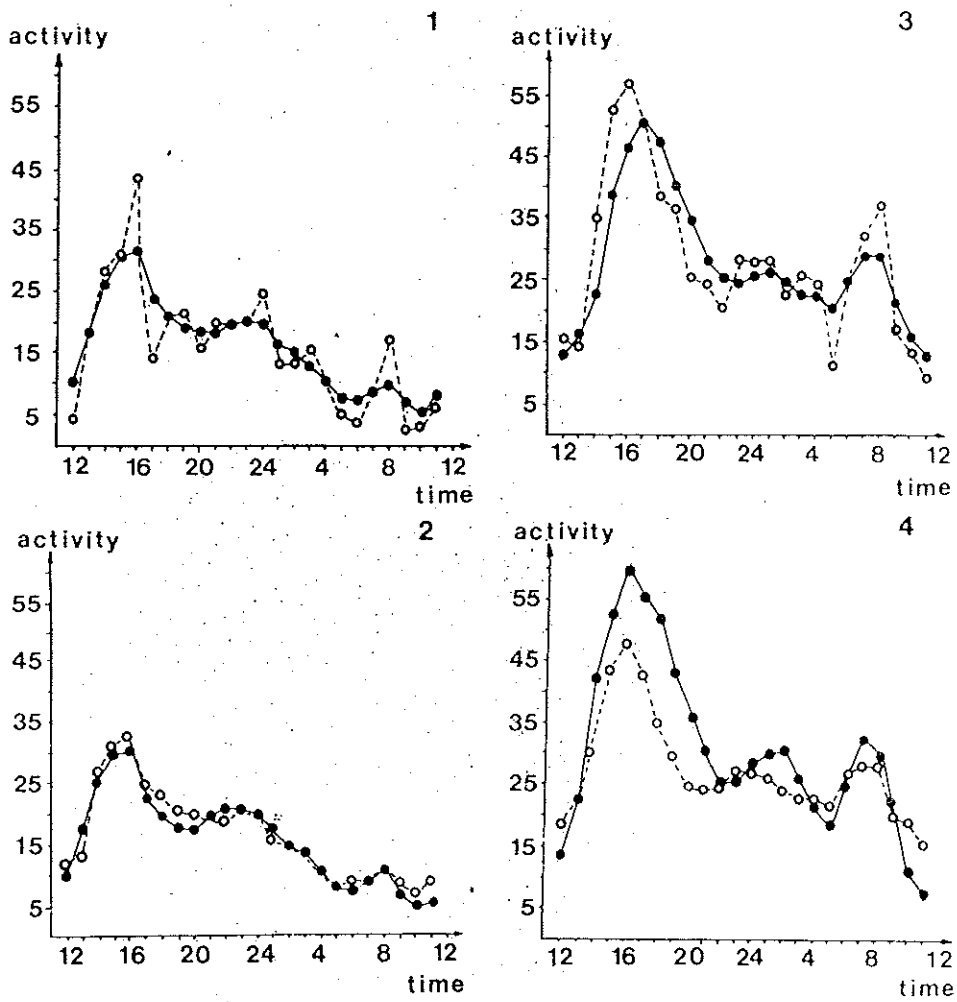
Our research involved gathering data by the time-study method (Erdakov, 1979): observers stood about 2 m away from the cages noting the state of activity of each animal at one-minute intervals. Thus if the cages were suitably positioned, it was possible for one person to observe ten animals simultaneously. Activity was considered to be indicated by the eyes being open so that only sleep or dozing were discounted. It was assumed that the presence of the observer had no marked effect on the subjects, as he was careful to make no noise or sudden movements and used no supplementary lighting. The amount of time spent studying the two species is given in Table 1.

It is well known that Snow leopards in the wild rarely appear during the day, being active mainly in the twilight hours before sunset and sunrise (Gepiner & Sludskij, 1972). It has been noted that in captivity the animals usually spend most of the day in one spot, beginning to move only as evening draws in (Gepiner & Sludskij, 1972). Our observations indicated that the usual period of wakefulness in the leopards was not great, averaging 380 minutes per 24 hours. There was little difference in wakefulness between ♂♂ and ♀♀ (Fig. 2) and the crepuscular activity levels were similar for both sexes: 395 minutes per 24 hours in ♀♀ and 375 minutes in ♂♂. The animals displayed what can be termed a 'polyphased' rhythm of activity (Fig. 1); it had several peaks, the highest of which was at 1600 hours when they were fed. This peak is thought to be an artificially induced result of the feeding time, a supposition supported by the fact that activity levels decline sharply immediately after feeding (Figs 1 and 2). This decline probably compensates for the preceding disturbance in the natural rhythm of the species.

It is usually stated in the literature that nocturnal activity is rare in felids. To some extent our leopards were active at night with minimum activity occurring between 0500–0700. We believe this pattern is unlikely to be induced by captivity since at night the animals' rest is not disturbed either by visitors or by the approach of feeding time. Observations of nocturnal movements seemed to demonstrate the natural temporal rhythm of the leopards better than those made during the day. It was found that the nocturnal rhythm was stable and therefore likely to have arisen as a result of mainly biological factors, especially as this final activity peak before dawn (between 0700–0800) seemed to occur spontaneously.

Wild Lynx are usually active in the evening and at night. If they are awake during daylight hours this can usually be explained by a lack of food or the fact that a ♀ is in oestrus (Gepiner & Sludskij, 1972).

Patterns of activity in the Lynx were found to be polyphased (Fig. 3) showing irregularly distributed but basically low overall activity and two main peaks. Normally, the animals were awake for an average of 680 minutes per 24 hours, an unusually long period which is probably linked to the fact that owing to the organisation of its digestive process, this species has to feed several times a day; our Lynx were seen returning to their meals a number of times during a 24-hour period. Unlike for the Snow leopards, the high peak of activity at 1600 hours was not followed by a subsequent sharp decline which leads us to




1 and 3 (top) dotted line empirical curve; solid line smoothed curve. 2 and 4 (bottom) dotted line ♀♀; solid line ♂♂.
Figs 1 and 2 *left.* The diurnal activity of the Snow leopard *Panthera uncia* at Novosibirsk Zoo.
Figs 3 and 4 *right.* Diurnal activity of the Northern lynx *Felis lynx.*

believe that the peak was not artificially induced. The same can be said about the marked peak of activity in the morning. It is worth bearing in mind, however, that these peaks may not be quite so distinct in the wild; they have probably been slightly enhanced by captive conditions.

It is likely that, under natural conditions, Lynx are more active at night than are Snow leopards. This was certainly true of our Lynx, though their nocturnal activity levels were not as high as those in the early evening. There was some sexual divergence in diurnal activity (Fig. 4). The ♂ averaged 725 minutes per 24 hours while the ♀♀ averaged 655 minutes, a difference of 70 minutes. Thus both maximum peaks of activity were higher in the ♂. There was also a difference in the distribution of activity over time: in the ♀♀ it was distributed evenly between the two peaks forming a noticeable 'plateau' on the graph, while in the ♂ it increased appreciably between 2100 and 0200.

When comparing the activity rhythms of the two species, it is obvious that the Lynx has the most polyphased pattern. In the wild the Snow leopard is probably most alert in the late evening and early hours of the night, while it appears that the Lynx is awake during the late afternoon and at dusk, as well as during part of the night. Sexually divergent phases seem to occur only in the Lynx.

Our research has led us to the following conclusions:

1. The variation in the frequency and amount of activity in the two felids seems to indicate that the biological rhythms of each are species specific. The character of the activity distribution, however, is determined by environmental factors.
2. Diurnal rhythms of both species are polyphased, but in the leopards the rhythm is considerably distorted by captive conditions, while in the Lynx it is hardly distorted at all. It is likely that the rhythms of both species are stable in the wild.
3. As an animal is likely to suffer some ill effects if its biological pattern of activity is disturbed by captive conditions, it is important that the daily regime of captive felids is studied so as to coincide feeding times with natural peaks of activity which, in Snow leopards, was found to be 0700 – 0800 hours and in the Lynx 1600 hours. Studies of this kind are also relevant to other aspects of animal husbandry, such as housing.

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