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Uncia uncia.

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Uncia Gray, 1854

Uncia Gray, 1854:394. Type species *Felis irbis* Ehrenberg (1830) by tautonomy, the name *irbis* being derived from the common name of the snow leopard, and by restriction by revisors who removed from the genus other species assigned by Gray to *Uncia*.

Leopardus Matschie, 1895:198. Included in this genus were the species *pardus* and *onca*; the type species of *Uncia* was referred as a subspecies to *L. pardus*. No type species fixed.

CONTEXT AND CONTENT. Order Carnivora, Family Felidae, Subfamily Pantherinae. The genus *Uncia* includes only one species *Uncia uncia.*

Uncia uncia (Schreber, 1775)

Snow Leopard, Ounce

Felis uncia Schreber, 1775: pl. 100. Type locality unknown, fixed by Pocock (1930) to the Altai Mountains. Ognev (1935) considered the southern slope of the Kopet-Dagh Mountains as the type locality.

Felis irbis Ehrenberg, 1830:394, 410. Type locality Altai Mountains.

Felis uncioides Horsfield, 1855:105. Type locality Nepal.

Uncia uncia: Pocock, 1916*b*:315, 316, first use of current name combination.

CONTEXT AND CONTENT. Context noted in generic summary above. The status of subspecies needs clarification. *Uncia uncia schneideri* (Zukowsky, 1950) was based on one aberrant individual only, from Sikkhim, and was proposed for future use if all individuals of the Sikkhim population of the species should have the same features as the type specimen. Stroganov (1962) distinguished the central Asiatic snow leopard, *Uncia uncia uncia*, from the subspecies of Tibet and northwestern China, *Uncia uncia uncioides*, by coat color and pattern.

DIAGNOSIS. The following diagnosis applies to the genus and the species: spots on the neck elongated, forming interrupted dorsal stripes; spots on the flanks in form of rings or rosettes with a diameter of about 50 to 90 mm, fewer in number and farther apart than in leopards or jaguars; muzzle short; forehead elevated; distance between the tips of the postorbital processes of skull greater than 43% of the basal length; anterolateral chamber of the bulla very large in proportion to posteromedial chamber; *superficies labialis* (front of chin) of the mandible almost vertical, coronoid process relatively small (compiled from Haltenorth, 1937; Hemmer, 1966; Pocock, 1916*b* and 1930).

GENERAL CHARACTERS. This great cat has a length of head and body of about 1.0 to 1.3 m; the tail about 0.8 to 1 m and about 75 to 90% of the head and body length; height at the shoulders is about 0.6 m; weight is 25 to 75 kg. The head is relatively small. The coat is long and thick, longer in winter than in summer. Hair on the flanks is about 25 mm long in summer, on the belly and tail about 50 mm; in winter, hair on the back is 30 to 55 mm, on the sides about 50 mm, on the belly up to 120 mm, and on the tail to 60 mm. Ground color is a pale gray to a creamish smoke-gray, shading to a lighter whitish tint on the underparts of the body. Spots on the head, neck, and lower limbs are solid. Large rings or rosettes, most enclosing some small spots, appear on the sides of the body and on the tail. A median longitudinal row, formed by fairly compact elongated spots and two lateral rows of elongated rings, extends on the back to the root of the tail. In juveniles, these longitudinal bands on the hinder portion of the back are frequently formed by solid black stripes, which in the course of growth break up into large spots whose centers become paler.

The skull is relatively short and broad (figure 1). Its characteristic shape, with a depression of the profile line at the upper end of the nasal bones and a highly vaulted and broadened forehead, is caused by a wide expansion of the nasal cavity, probably as an adaptation to the cold habitat of the species (for detailed discussion of this phenomena see Haltenorth, 1937). Nasal bones are especially broad at the nasal opening. Ectotympanicum (outer chamber) of the unusually flat bulla is expanded and nearly as large as the entotympanicum; the line of the partition is clearly visible. Basioccipital is deeply excavated laterally. Height of the mandible before the third premolar is at least as great as, or even greater than, the height behind the first molar. Greatest length of the skull is 165 to 200 mm, condylobasal length 155 to 182 mm, basal length 144 to 169 mm, zygomatic breadth 114 to 139 mm, length of the mandible 112 to 133 mm. The border zone of the somewhat overlapping range of sizes for males and females in the skull length is about 175 to 180 mm, and in condylobasal length at about 165 mm. The suspensorium of the hyoid is imperfectly ossified as in the genus *Panthera* (see section on Remarks for status of this name).

The lower molar (m1) has a short paraconid (anteroposterior paraconid length is 46 to 52% of greatest tooth length—see figure 2) and low position of the notch between the protoconid and paraconid (distance from the margin of the enamel at base of crown on buccal side of tooth to the notch is 49 to 62% of the greatest breadth of the tooth); p4 has short protoconid (anteroposterior protoconid length is 43 to 50% of the tooth length) and broad anterior portion (greatest anterior breadth of the tooth at the paraconid is 41 to 45% of the tooth length); p3 has high and anteroposteriorly short protoconid (length of protoconid is 77 to 93% of its height from enamel margin at base of crown to tip of cusp) and broad posterior and anterior portion (anterior breadth of tooth is 44 to 53% of the tooth length); P4 has anteroposteriorly short metacone and long paracone (length of the metacone is 81 to 97% of the length of the paracone) and a small breadth behind the deuterocone (this breadth is 85 to 95% of the breadth of the posterior portion of the tooth); P3 has broad anterior portion (anterior breadth is 46 to 53% of the tooth length) and great height (height is 63 to 75% of the length). Upper and lower canines have relatively round cross section (maximal transverse dimension in per cent of the maximal anteroposterior dimension: upper canine 80 to 86, lower canine 73 to 77).

Description compiled from Haltenorth (1936, 1937), Hemmer (1966), Ognev (1935), Petzsch (1968), Pocock (1916*a*, 1916*b*, 1917*b*, 1930), Schaposchnikov (1956), Schmid (1940), Stroganov (1962), Weigel (1961), and investigations of the author. For longer descriptions, measurements, and figures of skin color and pattern, see Pocock, (1930), Weigel (1961), and Hemmer (1966), and of skull, see Pocock (1916*b*), and Haltenorth (1936, 1937). For details of teeth, Schmid (1940), and for general descriptions, see especially Ognev (1935), Pocock (1930), and Stroganov (1962).

DISTRIBUTION. For the geographic distribution of the species see figure 3 (compiled from statements by Blanford, 1888–91; Ellerman and Morrison-Scott, 1951; Novikov, 1956; Ognev, 1935; Shou Chen-Huang, 1962, cited in Simon, 1968; and Stroganov, 1962). Reports of the species in central and northeastern China and occasionally from Sakhalin (Kuroda, 1928) seem to be dubious. For many regions, no reliable data exist. Records from central China, the Amur region, and the Persian mountains may be due to confusions with pale-colored and long-haired leopards, *Panthera pardus* (see Pocock, 1930). The distribution shown in figure 3 should be regarded as provisional. Generally, the species is an inhabitant of the high mountain regions of central Asia and may be found today from northwestern China, Tibet, and the Himalayan chain and Kashmir, to the Alai, Tianshan system, Alatau, Tarbagatai and Altai mountains, and the Tuva region.

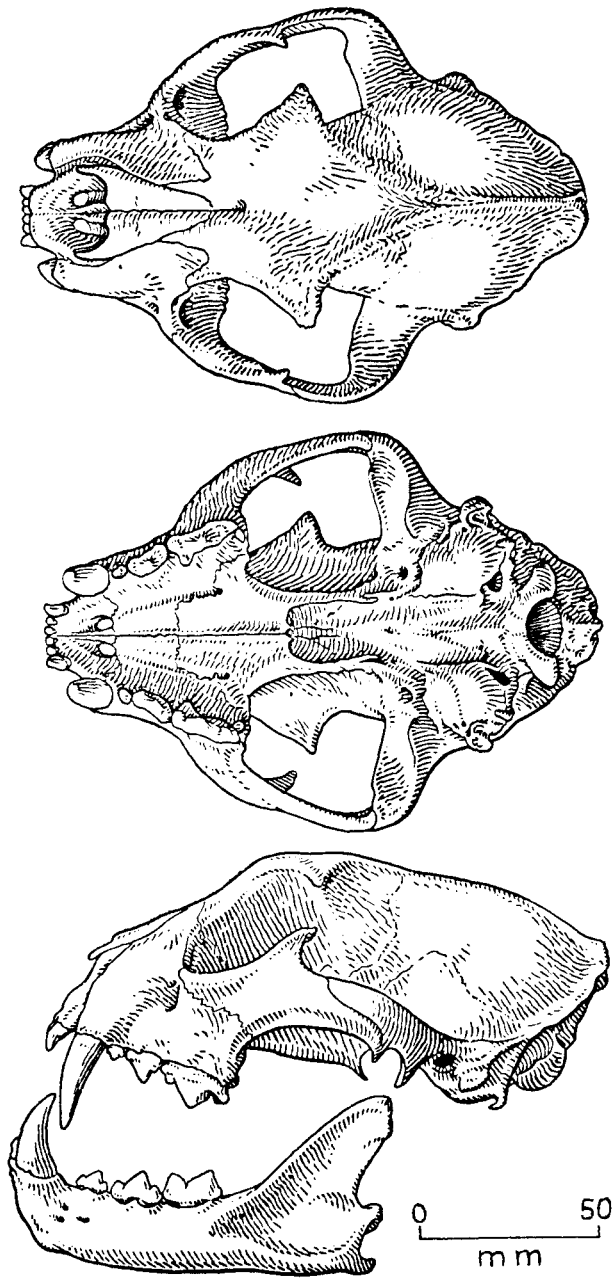

FIGURE 1. Dorsal, ventral, and lateral views of skull (adapted from Stroganov, 1962: fig. 170).

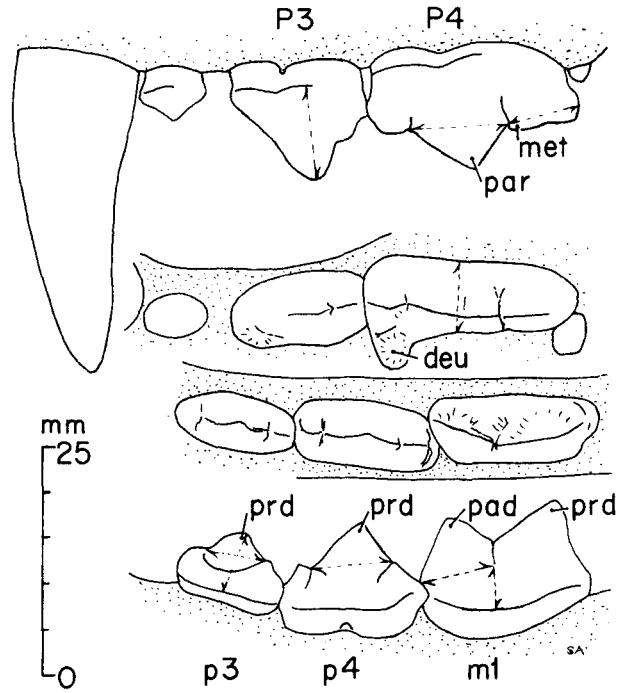

FIGURE 2. Dentition, in part, of *Uncia uncia* showing parts discussed in text: par = paracone, met = metacone, deu = deuterocone, prd = protoconid, pad = paraconid. Views from top to bottom are: lateral view of left upper teeth, occlusal view of left upper teeth, occlusal view of left lower teeth, and lateral view of left lower teeth.

Throughout its range it seems to have an extremely low population density. A crude population estimate for the Himalayan region is 200 to 600 individuals (Dang, 1967, cited in Simon, 1968).

Altitudinal range in Turkestan from 1500 to 4000 m; in the Himalayas in summer, from 2700 to 6000 m, and during winter to 1800 m (Ognev, 1935; Stroganov, 1962); in the Alatau mountain system it ranges as low as from 600 to 1200 m (Novikov, 1956; Stroganov, 1962). This cold-adapted animal seems to be prevented by climatic factors from spreading over other than high mountain or oreal regions.

FOSSIL RECORD. Brandt (1870) and Tscherski (1892) reported upper Pleistocene fossil remains of the species from Altai caves. Remains of "*Felis* sp. 1" from locality 1 of Choukoutien described by Pei (1934) and compared by him with the snow leopard seem to belong to *Panthera pardus* (Hemmer, 1968). "*Felis* cf. *pardus*" from locality 3 of Choukoutien (Pei, 1936) was determined as *Uncia uncia* by Kurtén (1960), but this may be incorrect (Hemmer, 1971). Thenius (1969) described some resemblances of two presumably lower middle Pleistocene mandible fragments from Stránská skála (CSSR) with the snow leopard, but these probably represent *Panthera pardus* (Hemmer, 1971). Remains of "*Leopardus irbisoides*" Woldrich from the Upper Pleistocene of Austria likewise do not belong to *Uncia uncia* but to the lynx (Thenius, 1957).

FORM. For the length of the hairs and the normal color of the skin see above (General Description). Albinotic and melanotic specimens were reported by Krumbiegel (1953) from the Turkestan region. A whorl of hairs lies immediately below the back of the ears as in smaller cats, rather than on the neck or the shoulders as in the genus, and especially the subgenus, *Panthera* (Leyhausen, 1950; see also Hemmer, 1966). As in the genus *Panthera*, the short hair of the nose spreads almost to its anterior margin, so that in dorsal view none, or only a very narrow naked area, of the rhinarium is visible in front of the hair (for *Panthera* see Pocock, 1917*a*, for *Uncia* Hemmer, 1966). Also the form of the rhinarium itself is the same as in *Panthera* as described by Pocock (1917*a*). Pupil of the eye is not fully circular, but somewhat pointed at the upper and lower end, at contraction in form of pointed ellipse or rhomb (Schneider, 1930). Detailed comparative description and functional interpretation of all skull features may be found in Haltenorth (1936, 1937), and of the auditory bulla in Pocock (1916*b*, 1916*c*). Elastic ligament interposed between the ceratohyal and the upper element of the hyoidean suspensorium as in the genus *Panthera* (Pocock, 1916*a*). Other organ systems have not yet been studied.

FUNCTION. Some traits in the behavior of the species may be seen as functional correlations of the size and proportions of the body. The sleeping postures in cats seem to vary with body size in correlation with temperature. The large members of the family sleep sometimes stretched out on the back. The smaller the species, the higher seems to be the temperature necessary for taking this position and, therefore, the rarer this sleeping posture may be seen. In comparison with leopards of about the same size, the snow leopard sleeps on its back at lower temperatures showing its adaptation to a cold environment (Hemmer, 1966, 1968). The posture usually taken at eating seems to vary logarithmically with body size (Hemmer, 1968). So the snow leopard usually eats in a squatting posture as the smaller species, whereas the greater species frequently or mostly eat in a lying position (Hemmer, 1966, 1968). The jumping ability seems to be enormously

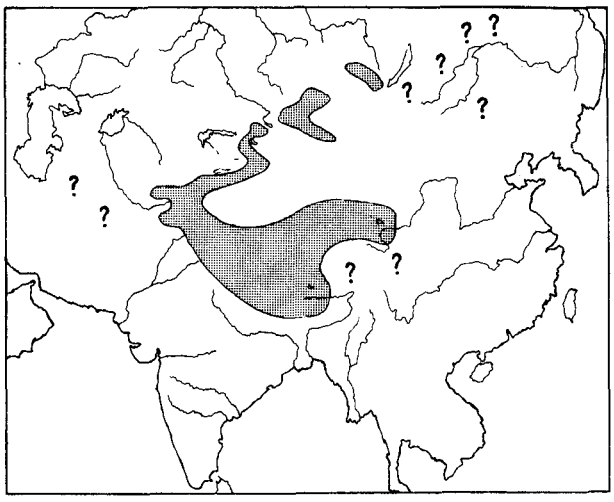

FIGURE 3. Map showing the geographical distribution of *Uncia uncia*. Question marks indicate uncertain records probably based on confusions with the common leopard *Panthera pardus*. For further explanation see text.

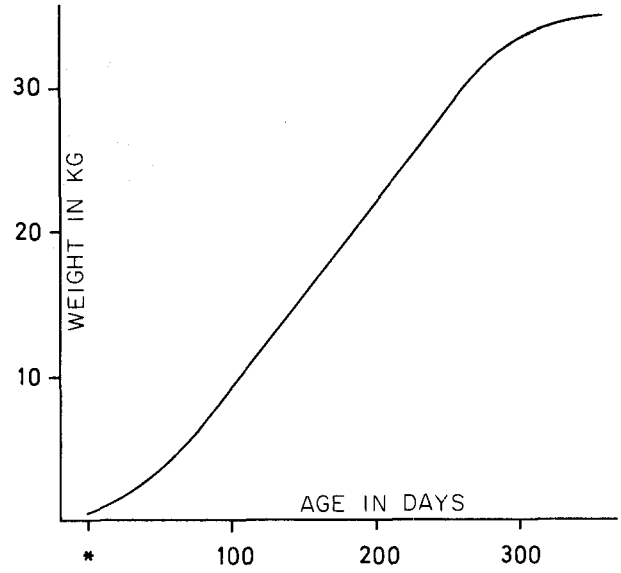

FIGURE 4. Growth of the snow leopard from birth (*) to the age of one year. Drawn from data given by Andersen for one individual combined with data for two individuals at birth and at the age of one month (Jun̆cys, 1964).

developed in the medium-sized and posteriorly long-legged snow leopard. Ognev (1935) reported an observation by Ionov of a 15 m leap; Novikov (1956) mentioned jumps up to 6 m; T'an Pang-Chieh (1964) calls the species "agile like a monkey." Molt occurs twice yearly (Novikov, 1956).

ONTOGENY AND REPRODUCTION. Schaposchnikov (1956) described the coat of a fully developed embryo as thick and yellowish tinted, with a marked black pattern. The number of cubs per litter varies usually from 2 to 3, rarely from 1 to 5 (Jun̆cys, 1964; Novikov, 1956; Schaposchnikov, 1956; Shou Chen-Huang, 1962, cited in Simon, 1968; Stroganov, 1962). Birth usually takes place in April, May, or June both in the natural environment (Novikov, 1956; Stroganov, 1962; Shou Chen-Huang, 1962, cited in Simon, 1968) and in the zoos of North America and Europe (S. Andersen *in litt.*; Jun̆cys, 1964; Schneider, 1937; Nickon, 1960). The weight at birth amounts to 450 ± 90 g (320 to 567 among seven cubs—Andersen *in litt.*; van Bree, 1965; Jun̆cys, 1964; Nickon, 1960), the length of head and body ranged from 230 to 237 mm and of tail from 168 to 181 mm in two newborn cubs (van Bree, 1965). The eyes are closed at birth and open about the seventh day (Jun̆cys, 1964). The coat of the cubs is thick and wooly and more intensively tinted than that of adults (Jun̆cys, 1964; Pocock, 1930). The pattern consists of black markings, including three black bands that extend along the hinder portion of the back, and big black spots with slightly paler centers on the flanks and thighs (Pocock, 1930; van Bree, 1965).

Development of body weight from birth to the age of one year is shown in Figure 4. At the age of two months the young begin to eat solid food (Jun̆cys, 1964). The nursing time amounts to five months (Petzsch, 1968). At two months of age, the moving ability is well developed (Jun̆cys, 1964) and at three months the young already follow their mother (Novikov, 1956). The litter continues hunting together in the first winter (Novikov, 1956). Sexual maturity seems to be reached at the age of about two years (Petzsch, 1968). Concerning the alterations of the coat color and pattern, see section on General Characters. The teeth erupt in the following succession (upper and lower case initials refer to upper and lower teeth): I1 or i1, I2 or i2, m1, P2, M1, I3, C or c, P4, P3, p3, p4 (Pocock, 1916*b*). The mating season is in the winter and early in the spring; the gestation period is from 90 to 100 days (S. Andersen *in litt.*; Jun̆cys, 1964; Nickon, 1960; Novikov, 1956; Petzsch, 1968; Stroganov, 1962). The litter is born in a rocky shelter (Petzsch, 1968) and the female produces for the cubs a small nest consisting of hairs from the underparts of her body (Hagenbeck, 1908; Krumbiegel, 1937). In zoos, snow leopards have lived for nearly nine years (Crandall, 1964; Flower, 1931), which probably means real ages of such individuals of more than ten years.

ECOLOGY. Generally the snow leopard lives in high mountain regions from the belt of alpine meadows, treeless rocks, and snow deposits to the belts of juniper and spruce forests, and bush vegetation. Especially during winter, it may descend to the lower zones, whereas in some regions it inhabits constantly these lower altitudes (Novikov, 1956; Ognev, 1935). Obviously, individuals have expanded hunting grounds through which they roam regularly in the course of about one week (Ognev, 1935; Schaposchnikov, 1956). Regular movements from one part of the individual range to another may depend on climatic conditions such as snowfall or rain (Ionov, 1929, cited by Ognev, 1935). Seasonal migrations from higher to lower zones in the mountains also may depend on climatic features and on the movements of ungulate herds (Novikov, 1956; Ognev, 1935; Stroganov, 1962). Nothing is known concerning true territoriality (in the sense of Schenkel, 1966). The sleeping or resting quarter is made in rocky caverns, crevices of rocks, and secluded clefts, occasionally also in nests of vultures (Novikov, 1956; Stroganov, 1962).

The snow leopard mainly preys upon mountain wild goats and sheep (*Capra ibex, Capra falconeri, Hemitragus jemlahicus, Ovis musimon*); in low altitudes it hunts deer and boars; in the Aktau Mountains it feeds on Persian gazelles. Small animals including marmots and pikas are also eaten. Concerning domestic animals, it attacks especially goats and sheep, but sometimes also dogs, cattle, and young ponies (Blanford, 1888–91; Novikov, 1956; Ognev, 1935; Schaposchnikov, 1956). Schaposchnikov (1956) reported the killing and eating of a two-year-old bear. In zoos, snow leopards are fed on the basis of 2 to 3 kg of meat daily (Crandall, 1964; Jun̆cys, 1964).

Nothing is known about population structure and dynamics. Shooting and trapping may seriously reduce the small and scattered populations; 40 to 50 individuals are said to be killed annually in the Mongolian P. R. (Hibbert, 1967, cited in Simon, 1968). They are protected only in the USSR and India, but are nevertheless hunted in India and also occasionally killed in the USSR (Kirk, 1968). The fur is of great commercial value. In 1969, there were 38 males and 52 females in 28 zoos (Simon, 1970). Most individuals are injured by unsuitable methods of trapping (broken canines, missing toes on the forelimbs). Breeding in captivity has been repeatedly successful (Crandall, 1964), but is not nearly sufficient to maintain the captive population. Only 15 of the 90 individuals mentioned above were born in captivity (Simon, 1970). Problems in the management of the species in zoos are its susceptibility to heat and diseases (especially ascites) and parasites of the intestines (Crandall, 1964; Jun̆cys, 1964; Krumbiegel, 1937*a*).

BEHAVIOR. Walking, running, leaping, and climbing movements are as in the other members of the Pantherinae. For jumping ability see above (Function). The postures are

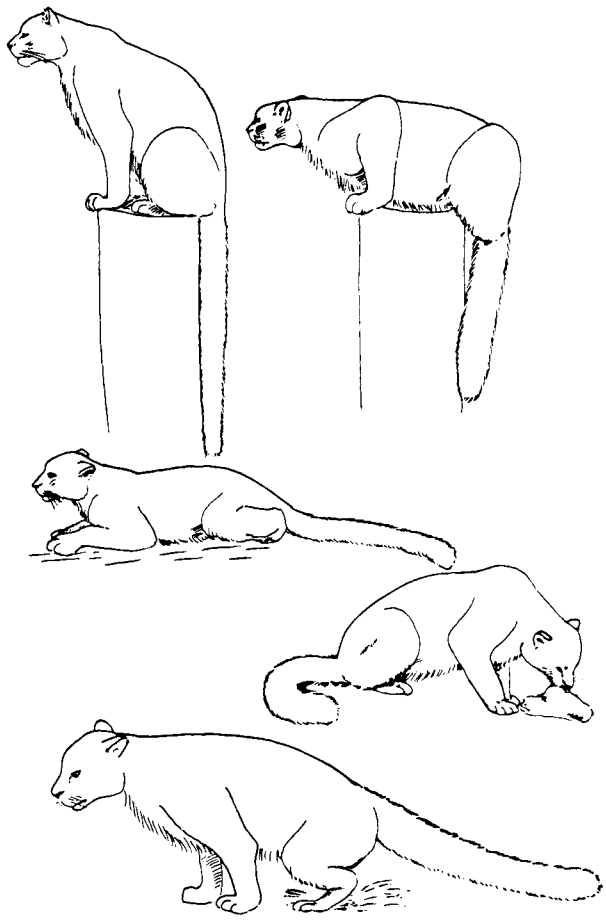

FIGURE 5. Postures (from top to bottom) at resting, exploring, lurking, eating, and excrementing with scraping (see text). Adapted from Hemmer (1968: figs. 57 through 61).

basically the same as in other Pantherinae (figure 5). Detailed description of such behavioral patterns may be found in Hemmer (1968). Sleeping positions depending on temperature vary from stretched to rolled up as found in other cats (see Function). Snow leopards wash the face with the licked forepaws and, like the other Pantherinae, do not reach behind over the ears. Eating usually is done in squatting posture (figure 5), holding the flesh with the forepaws during tearing action only. The body of larger animals seems to be opened by the snow leopard at the anal or belly region (Schaposchnikov, 1956—eating of a young bear) as in other Pantherinae (Hemmer, 1966). Normal excrementing and urinating usually is accompanied by scraping with the hind paws. The meaning of a scraping with the forepaws observed by Hemmer (1968) is not yet clarified.

There is a wide range of facial expressions, as described by Hemmer (1968, 1969). Irritation and excitement are followed by opening of the mouth and raising of the lips with wrinkling of the nose graduated with its intensity. The mouth is somewhat opened in angry or surprised (gesture of surprise—Hemmer, 1968, 1969) animals as well as during the gesture of "Flehmen" (Schneider, 1932; Hemmer, 1968, 1969). A wider opening of the mouth and raising the lips so as to bare the canine teeth occur in fury and defensive threat. At this gesture, snow leopards also lay the ears backward, spread the vibrissae, and dilate the pupils. At the "Flehmen," the tongue hangs over the incisors as in the tiger (figure 6; see also Hemmer, 1968, 1969). Expressive movements of the body are the friendly presenting with the tail raised almost vertically, the friendly rubbing of the head and neck against a sexual or social partner, and movements of the tail in excited animals (Hemmer, 1969).

There is no true roaring as in *Panthera*. The loudest call is the long drawn out moaning partner-call (Hemmer, 1966, 1968) of snow leopards in heat. Other vocalizations in sexual and social contact are different lower grunting, miaowing, and

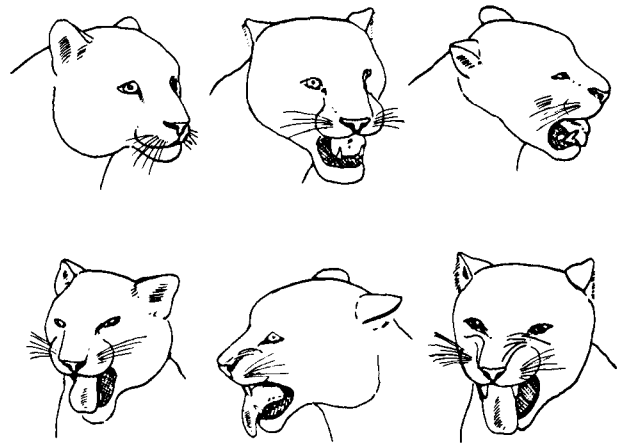

FIGURE 6. Facial expression at rest (above at the left) and different intensity-levels of "Flehmen." Adapted from Hemmer (1968: figs. 62 through 67).

moaning sounds. Not as frequently as the tiger, the snow leopard utters in friendly greeting situations the "Prusten" as a soft grunting or puffing sound. Purring is expiratory and inspiratory as in the smaller cats. Growling, snarling, hissing, and spitting are expressions of annoyance as in other Felidae. A short, loud coughing sound is sometimes uttered by angry or attacking animals (more detailed description in Hemmer, 1968). In the first two weeks, cubs grunt like young pigs, later they vocalize like bird sounds (Junčys, 1964).

The social organization seems to be as described by Schaller (1967) for the tiger—essentially solitary, but not unsociable (concerning territoriality, see section on Ecology). Schaposchnikov (1956) reported occasional hunting in groups of up to five individuals. Ionov (cited in Ognev, 1935) observed an encounter with play of two snow leopards. Petzsch (1968) reported the species living in pairs. This seems to be derived from captive specimens, for Krumbiegel (1937*b*) described participation of the male at the rearing of the cubs. Concerning communication, nothing is known about whether they spray scent in the wild as do other Pantherinae. Sharpening the claws leaves claw marks of possible communicatory value (observed in captive animals by Hemmer, 1968). Grooming between males and females also was described by Hemmer (1968).

In fighting the snow leopard mostly uses its forepaws for striking. The methods of catching and killing the prey are poorly known. Partially it seems to lurk in the covering of rocks. Probably it does not jump on its victims immediately from above (Hemmer, 1968). For such actions, learning should have an important role. Playing being connected with learning ability is well developed. Krumbiegel (1937*a*) reported play with motion and play in the snow. Inquiring behavior and stereotypic locomotion of captive animals were described by Hemmer (1968). The main daily activity periods as observed in zoos (Hemmer, 1968) are early in the morning and in the evening at nightfall, only short activity phases occur in the other day hours. Novikov (1956) stated the snow leopard is active chiefly at twilight and at night, but is occasionally observed during the day. Changes in behavior during the year result from the mating season in winter and early spring, seasonal migrations, and the birth of the cubs.

REMARKS. Snow leopards at one time or another have been placed in *Felis* and *Panthera*. The number of recognized genera of Felidae and the species to be included in each have varied widely depending on the author. The nomenclature of some genera is also somewhat unstable. For example, the name *Panthera* Oken, 1816, was widely used in the last 50 years not only in special taxonomic papers, but also in most of the general mammalogical and nonmammalogical literature and text books. Oken's publication has been ruled to be inconsistently binomial and unavailable for nomenclatural purposes by the International Commission on Zoological Nomenclature. In the interest of reducing nomenclatural confusion and increasing the stability of names, the Commission was requested to validate the generic name *Panthera* Oken, 1816, as allowed by Opinion 417 (for discussion of this problem especially see Hemmer, 1967, and Mazák, 1968).

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