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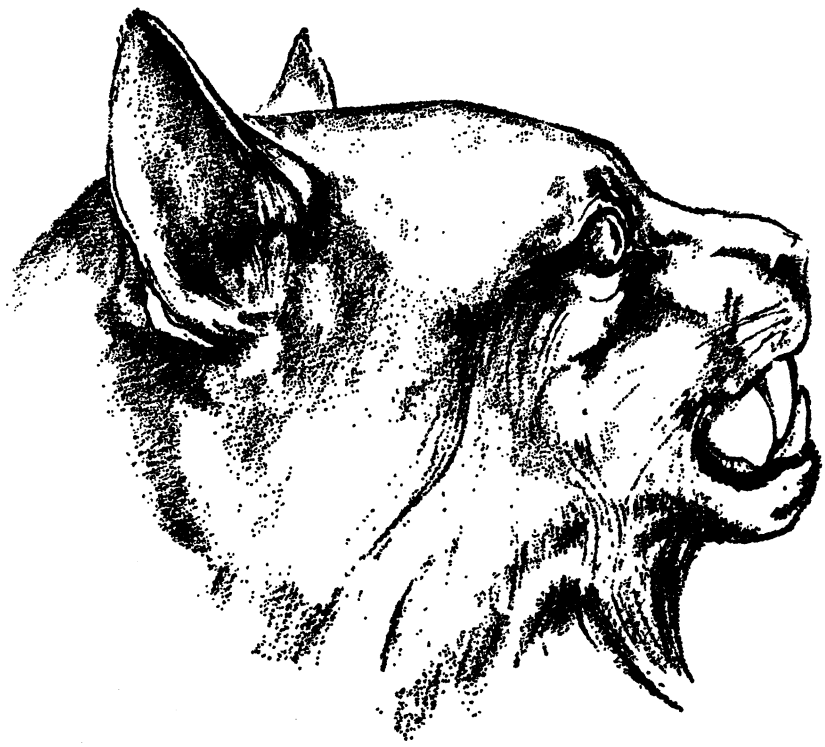

Frontispiece.—Restoration of the head *Lynx stouti*, new species. X1.

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ABSTRACT

Two Lynx-like Cats from the the Pliocene and Pleistocene

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A new species *(Lynx stouti)* of small felid is described from the lower Pliocene of Colorado. This form has several characters in common with the modern *Lynx* and may be ancestral to that genus. A new subspecies of *Lynx issiodorensis* Croizet and Jobert is described as *L. i. kurteni* from the Mullen Assemblage, Cherry County, Nebraska. The relationships of this form to other lynxes are discussed along with the paleo-distribution of the genus.

CONTRIBUTION OF the Department of Geology, College of Arts and Sciences, and the Division of Vertebrate Paleontology of the Museum.

Schultz[1] Martin[2]

Two Lynx-like Cats from the Pliocene and Pleistocene[3]

INTRODUCTION

The classification of the felinae has always been somewhat controversial, especially at the generic level. One fairly homogenous group of cats which has been separated from the genus *Felis* are the lynxes. The ancestors of the modern lynxes can be traced back at least to the Villafranchian although the early forms did not have the characteristic short body and long legs found in the living species (Kurten, 1968, p. 80). New material from the Early Pliocene of Colorado U.N.S.M.[4] 25490 suggests that the separation of these small felids from other lines of felid evolution may have occurred quite early. By the Early Pleistocene the lynxes had already achieved a holartic distribution and are found in the Villafranchian of Europe and China as well as in the Blancan of North America. The characteristic form of this period is *Lynx issiodorensis* Croizet and Jobert which is known primarily from the Villafranchian of Europe. This species, or very closely related forms, are also known from Early Pleistocene sediments in North America and add strength to the already considerable arguments (Schultz and Stout, 1945, 1948; Schultz and Martin, 1970) for the correlation of the Villafranchian with the Blancan.

Lynx stouti,[5] new species

Holotype.—Palate with I^{1-3}, C/, P^{1-4}, M^1 and most of the zygomatic arches, several fragments of skull including the right petrosal bone, mandible with I_{1-3}, /C, P_{2-3}, M_1, atlas vertebra; U.N.S.M. 25490 (Fig. 1, A-H); collected by T. M. Stout and Lyle Harvey, 1940.

Type Locality.—From SW. ¼, Sec. 27, T. 12N., R 55W., Logan County, Colorado.

Stratigraphic Occurrence.—Early Pliocene (Valentinian), from lower part of Ogallala Group, in basal coarse reddish silts and clay, below a prominent concretionary zone.

Diagnosis.—A cat smaller than *"Felis" longignathus* Shotwell and *"Felis" proterolyncis* Savage with the following characteristics: dental formula I 3/3, C 1/1, P 4/3, M1/1; face very short with only a small distance between C 1/1 and P 3/3; I 3/3 only slightly larger than other incisors; prominent metaconid on M_1.

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[3] The research for this paper has been supported by grants from the University of Nebraska Research Council, including a research assistantship (September, 1969, to June, 1970) for the junior author. The Board of Regents, University of Nebraska, also granted the senior author a leave of absence from his regular duties for six months (1969-1970) for paleontological research in Europe and United States.

[4] Abbreviations used in descriptions: alv., alveolus or alveoli; br., broken; rt., root or roots; U.N.S.M., University of Nebraska State Museum.

[5] Named in honor of Professor Thompson Mylan Stout who helped collect the holotype and who has made so many valuable contributions to a better understanding of the Cenozoic history of Nebraska.

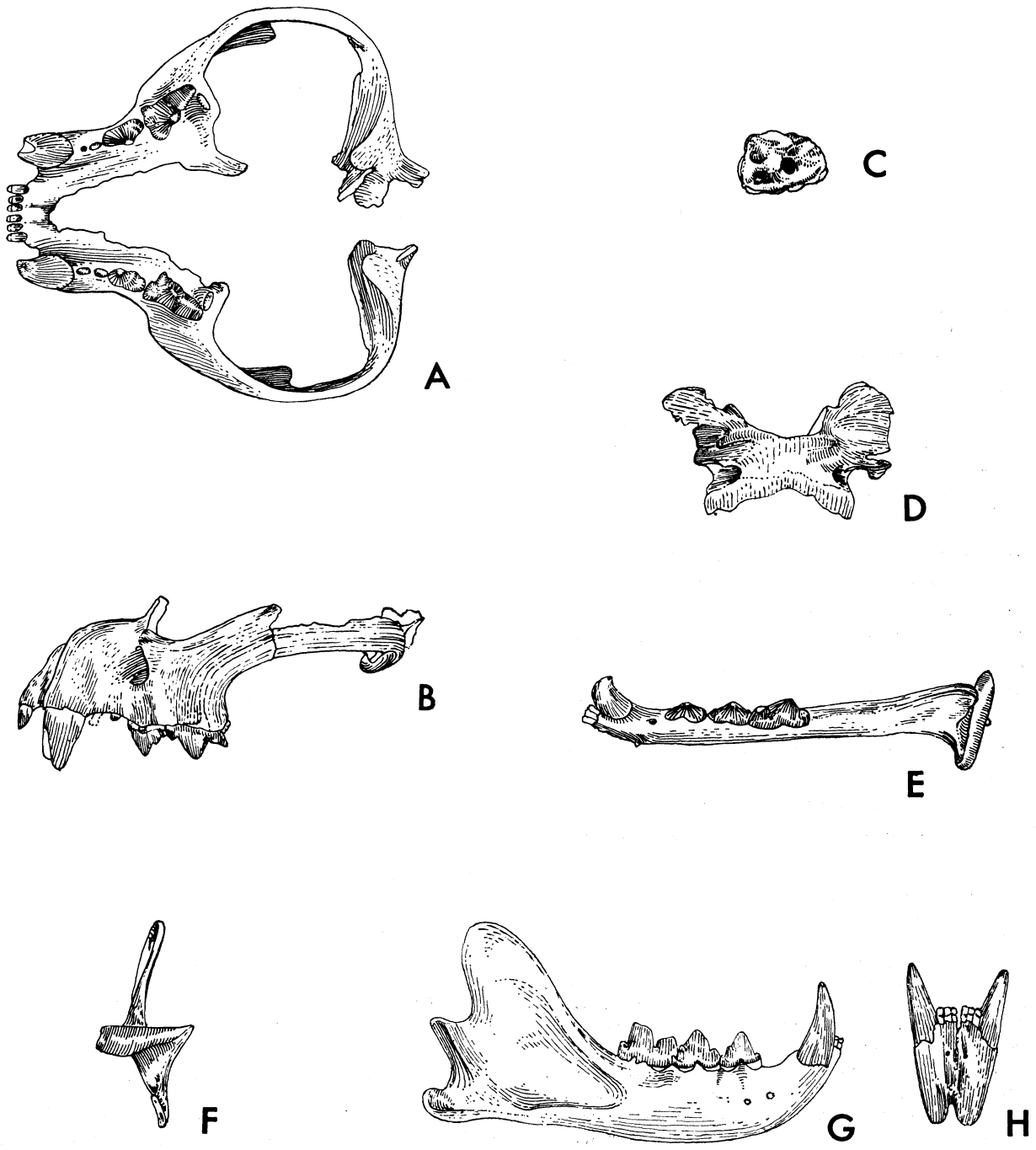

Fig. 1—*Felis stouti,* new species, holotype, U.N.S.M. 25490, partial skull (A, lateral, and B, palatal views); right petrosal bone (C, internal lateral view); atlas vertebra (D, ventral view); right ramus (E, dorsal; F, posterior; and G, lateral views); mandible (H, anterior view), from the Valentine Formation, Logan County, Colorado. X1.

TABLE 1
Lynx stouti, NEW SPECIES
MEASUREMENTS[1] OF SKULL

Palate	*L. stouti* n. sp. Holotype U.N.S.M. 25490
Greatest width across muzzle at canines	25
Greatest width across zygomatic arches	(62)[2]
Anterior palatal width (minimum) between superior canines	14
Width across palate between posterior ends of alveoli for superior carnassials	32
Length from anterior end of canine alveolus to posterior end of M^1	31
Length from anterior end of P^1 to posterior end of M^1	23
I^1 greatest transverse diameter	1.1
I^2 greatest transverse diameter	1.3
I^3 greatest transverse diameter	1.5
C/ anteroposterior diameter	6.5
C/ transverse diameter	4.7
P^1 anteroposterior diameter	2
P^1 greatest transverse diameter	1.5
P^2 anteroposterior diameter	2.4
P^2 greatest transverse diameter	1.5
P^3 anteroposterior diameter	6.8
P^3 greatest transverse diameter	3.8
P^4 anteroposterior diameter	10
P^4 greatest transverse diameter	5.4
Width of incisor series measured between outer sides of alveolae for third upper incisors	9
M^1 greatest diameter	3.6

[1] The measurements are taken to the nearest millimeter except on dentition where they are measured to the nearest one-tenth of a millimeter.
[2] ( ) = approximate

Description.—A cat the size of *Felis catus,* with a short broad muzzle; petrosal wide and flat; alveoli for upper canines expanded about as in *F. pardalis;* infraorbital foramen large; skull short and enlarged; canine relatively massive and long; canine flattened on the lingual side with an anterior-lingual ridge; anterior face of canine not grooved as in many *Felis;* P^{1-2} relatively large and lacking a pronounced parastyle; P^4 with large parastyle, large protocone, paracone large and posteriorly inclined, carnassial notch deep and metacone elongated about as in *Felis catus;* M^1 small and single cusped; deep circular embrasure pit between P^4 and M^1. Mandible with short gap between /C and P_2; shape of anterior portion of ramus and position of the two small mental formina similar to those in the domestic cat; ramus massive for its small size; angular process unusually large; mandibular condyle slightly built but proportionally very wide; masseteric fossa large and extending under posterior margin of M_1; coronoid process relatively wide; I_{1-3} small single cusped teeth with I_3 very slightly larger than other incisors; canine relatively large; P_2 small single cusped, "peg-like" tooth; P_{3-4} about equal in size with paraconid and metaconid about equal in size; deep, open carnassial notch and a large metaconid; atlas vertebra with wings more posterior and dorsal surfaces more excavated, and with the intervertebral foramen more rounded than in *Lynx rufus.*

Discussion.—*Lynx stouti* is a very small lynx-like cat. It differs from the two small cats near-

TABLE 2
Lynx stouti, NEW SPECIES
Lynx issiodorensis kurteni, NEW SUBSPECIES
COMPARATIVE MEASUREMENTS
OF MANDIBULAR RAMI

MANDIBULAR RAMI	*Lynx stouti*, n. sp. Holotype U.N.S.M. 25490	*Lynx issiodorensis kurteni*, n. subsp. Holotype U.N.S.M. 59233	*Lynx issiodorensis kurteni* Referred U.N.S.M. 25504
Length from anterior end of symphysis to posterior end of condyle	63	114	
Length from anterior end of /C to posterior end of M_1	34	46	48
Distance between alveoli for /C and P_3	6	11	11
Length from anterior end of P_2 to posterior end of M_1	25		
Length from anterior end of P_3 to posterior end of M_1	22.2	36	(36)
Depth of ramus below posterior end of M_1	12	24	23
Thickness of ramus below M_1	6	11	10
Height from inferior border of angle to summit of condyle	16	26	
Height from inferior border of angle to summit of coronoid process	32	56	
Transverse width of condyle	15	26	
Greatest depth of condyle	5	10	
I_1 greatest transverse diameter	.8		
I_2 greatest transverse diameter	1		
I_3 greatest transverse diameter	1.2		
/C greatest transverse diameter	4.2		(7.3)
/C greatest anteroposterior diameter at base of enamel	5.2		(11.3)
P_2 greatest transverse diameter	1.3		
P_2 anteroposterior diameter	1.7		
P_3 greatest transverse diameter	3.1	5	5.5
P_3 anteroposterior diameter	6.1	9.1	10.3
P_4 greatest transverse diameter	3.3	6	(6)
P_4 anteroposterior diameter	7.2	12.2	(10.7)
M_1 greatest transverse diameter	3.9	6.9	(5.7)
M_1 anteroposterior diameter	9	14	(14.2)

est it in age *"Felis" proterlyncis* Savage and *"F." longignathus*[6] Shotwell in having a relatively longer distance between /C and P_3, in the presence of P_2, the presence of a metaconid on M_1; and the absence of the bulbous cusp in the lingual valley of *"F." longignathus* described by Shotwell (1956, p. 735). The posterior margin of the petrosal is wide and flat (rounded and grooved on *Lynx rufus*). The anterior margin of the petrosal does not seem to be expanded as in *Lynx rexroadensis* (Stephens, 1959, p. 41). *Lynx rexroadensis* lacks P_1 but does have a very small P_2. The canine is ridged and bears a flattened lingual surface in *L. rexroadensis* and *L. stouti.* A talonid is not developed on the metaconid of M_1 as is usually the case in *Pseudaelurus.* The canines in most specimens of *Pseudaelurus* are less conical and more saber-like than they are in *Lynx stouti;* however, the presence of four upper premolars is re-

[6] Incorrectly spelled as *longignatha* in Shotwell (1956, p. 735) and as *longignatus* in Stephens (1959, p. 45).

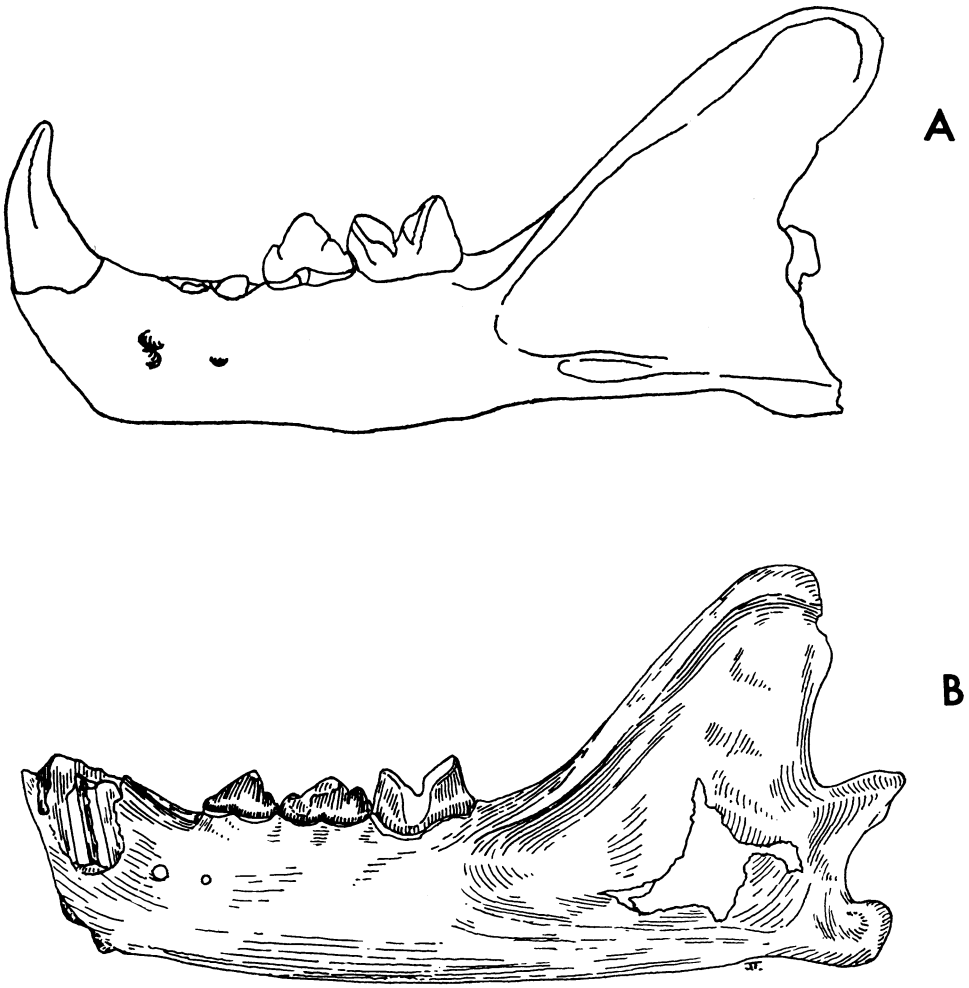

Fig. 2—*Lynx issiodorensis,* referred specimen from the Villafranchian of Saint-Vallier, France, A. lateral view of left ramus (after Viret, 1954, Plate 17, Figure 9). X1. *L. issiodorensis kurteni,* holotype, U.N.S.M. 39233, B. lateral view of left ramus, from the ?Early Kansan, Cherry County, Nebraska. X1 .

garded as characteristic of *Pseudaelurus* by Stock (1934, p. 1057). Probably *Felis stouti* should be named the genotype of a new genus. The diagnosis of this new genus would be difficult without a thorough revision of all the Felinae, and we have not undertaken it for this paper.

Lynx issiodorensis kurteni,[7] new subspecies

Holotype.—Left ramus with I_{1-3} al., /C rt., P_2-M_1, U.N.S.M. 39233 (Fig. 2, B).

[7] Named in honor of Bjorn Kurten (of Helsinki, Finland), who has made significant contributions to the study of fossil felids.

Type Locality.—U.N.S.M. Coll. Loc. Cr-102, NW. ¼, sec. 18, T. 25N., R 33W, southern Cherry County, Nebraska.

Stratigraphic Occurrence.—?Early Kansan.

Referred Material.—Right ramus with /C al., P_2 and P_3-M_1 rts; U.N.S.M. 25504; partial maxilla with C/ rt., P^3 anterior rt. U.N.S.M. 76013; distal end of a left humerus; U.N.S.M. (Fig. 3); U.N.S.M. 76013 from same locality as holotype, and U.N.S.M. 25504 from U.N.S.M. Coll. Loc. Cr-10, Pit 4, Cherry County, Nebraska.

Diagnosis.—A felid intermediate in size between *Lynx canadensis* and *Felis concolor* and resembling *Lynx issiodorensis* (Fig. 2, A) from

which it differs in the angle and length of the coronoid process.

Description.—A felid the size of *Lynx issiodorensis* with I_{1-3} indicated by small crowded alveolae; canine large, diastema short; P_3 with small metaconid; P_4 with large paraconid, protoconid, and relatively well-developed metaconid and talonid, M_1 small, with deep, open carnassial notch and no metaconid; two mental foramina in front of and under P_2; coronoid process relatively short and straight, upper canine large; upper diastema short, humerus larger and more expanded distally than in *Lynx canadensis.*

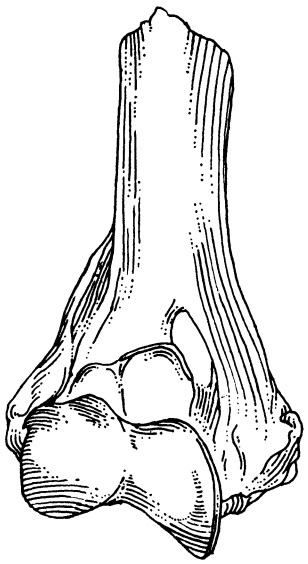

Fig. 3—*Lynx issiodorensis kurteni,* referred specimen, U.N.S.M. 76025, anterior view of left humerus. X1.

Discussion.—The assignment of the Nebraska material to a European species must be regarded as tentative. As we have recognized no consistent differences between *Lynx issiodorensis kurteni* from *L. issiodorensis* of Europe except for the shape of the coronoid process a subspecific separation is all that seems warranted at the present time. Examination of a population of *L. rufus* indicates that even this character is somewhat variable. *Lynx issiodorenis kurteni* is smaller than *Felis studeri* Savage, *F. palaeoonca* Meade, *F. lacustris* Gazin and the cat from the Cita Canyon Local Fauna described by Savage (1960, p. 337) as *Felis,* ?aff. *Felis (Lynx) issiodorensis* (Croizet and Jobert). *Lynx rexroadensis* is based on upper dentitions only and therefore cannot be successfully compared, but seems to be a cat of about the same size as *L. i. kurteni.* The age of *L. i. kurteni* is probably late Blancan although the Mullen Assemblage includes both late Blancan and early Illinoian forms (Martin, 1972).

SUMMARY AND CONCLUSIONS

Lynx stouti was a small cat with certain lynx-like characteristics. It possesses a number of primitive features including the presence of P^1 and P_2 as well as the large metaconid on M_1. It is older than, and perhaps ancestral to *"Felis" proterolyncis* Savage from the Hemphillian Optima Local Fauna of Oklahoma, which, however, lacks P_2 (Savage, 1941, p. 698). *Lynx rexroadensis* Stephens which retains the P^2 may also be descended from *L. stouti. Lynx rexroadensis* is about the same size and age as *Lynx issiodorensis* and its relationship to this form should be carefully evaluated. At the present time there seems to be considerable evidence for a separate lineage of small cats which may be included in the genus *Lynx,* and we have used *Lynx* as a genus rather than subgenus of *Felis* (as in Simpson, 1945) for that reason. The presence in the Early Pleistocene (Blancan) of North America of a complex of small felids related to *Lynx issiodorensis* of the Villafranchian of Eurasia is fairly well established (Savage, 1960, p. 318 and pp. 337–339). The assignment of *L. i. kurteni* to the European species is made with some misgivings and may have to be revised when better material is available. However, there is little doubt that it belongs to this general group of felids. *Felis lacustrus* (Gazin, 1933) is a larger cat than *Lynx issiodorensis* and is similar in size to the couger, *Felis concolor.*

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