Ann. Zool. Fennici 15:314—322. 1978

The Lynx from Etouaires, Lynx issiodorensis (Croizet & Jobert), late Pliocene

BJÖRN KURTÉN

KURTÉN, B. 1978: The lynx from Etouaries, Lynx issiodorensis (Croizet & Jobert), late Pliocene. — Ann. Zool. Fennici 15:314—322.

Skeletal material of the extinct Issoire lynx, *Lynx issiodorensis* (Croizet & Jobert) from the early Villafranchian site of Etouaires, Mt. Perrier, France, is described and compared with the recent *L. lynx* (L.). The extinct species had a larger head, longer neck, and shorter limbs, and was more heavily built. Its body length was only slightly greater than that of *L. lynx*. A life reconstruction of the extinct species is presented.

Björn Kurtén, Department of Geology, University of Helsinki, Snellmaninkatu 7, 00170 Helsinki, Finland.

1. Introduction

The Villafranchian lynx *Felis issiodorensis* was first described by CROIZET & JOBERT (1828) from Mt. Perrier, France. The species is now known from many other European sites of Villafranchian age. The same species also occurs in Asia, where it was named *Lynx shansius* by TEILHARD (1945), and in North America, where it was identified as *L. issiodorensis kurteni* by SCHULTZ & MARTIN (1972). Its time range in Europe appears to span the entire Villafranchian, from 3.5 to *ca.* 1 ma BP; incomplete material from the Cromerian (Blanzac and Mauer, *ca.* 0.7 ma) may or may not be referable to the species.

A gradation from *L. issiodorensis* to modern *L. lynx* (L.) was suggested by KURTÉN (1963) and the Issoire lynx thus appears to be ancestral to the living Northern lynx of Eurasia. In view of the close relationships between *L. lynx* and its North American sibling, *L. canadensis* Kerr, it may perhaps be thought that the Canada lynx also evolved from *L. issiodorensis*, and, if so, most probably from the American (late Blancan) population.

Skeletal material of *L. issiodorensis* from Mt. Perrier in the Basel Museum of Natural History gives valuable information on the dimensions of the species, which differs in important respects from living lynxes, suggesting a more "generalized" type of cat. Through the kindness of the late Dr. Samuel Schaub, I had an opportunity to study the material, and also received casts of the more important specimens to facilitate further comparison.

In view of the pivotal phyletic position of the Issoire lynx, a life reconstruction of this extinct species is of interest; it has been executed by Mr. Hubert Pepper. My sincere gratitude is due to him for his patient cooperation, to the late Dr. Schaub, to Prof. A. Johnels of Stockholm for permission to study comparative material, and to the University of Helsinki for travel funds.

Figures 8—9 are by H. Pepper, the others by the author.

2. Material

A. Fossil material

All the fossil material used in the present study comes from the fluviatile Etouaires sands, Mt. Perrier, France, and is in the Natural History Museum, Basel. The Etouaires local fauna is typical of the earliest Villafranchian in Europe and has been radiometrically dated between narrow limits. A sanidine-bearing tuff immediately overlying the fossiliferous stratum has the date 3.4 ma BP, while a basalt near Roca Neyra, which corresponds lithostratigraphically to the Etouaires horizon, is dated at 3.5 ma (TOBIEN 1970). The age of this local fauna may thus be set at 3.5 ma BP.

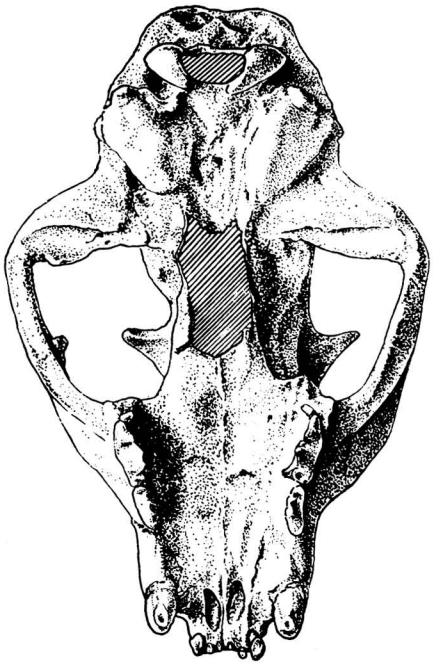


Fig. 1. *Lynx issiodorensis*, Etouaires (Prr 200), skull, ventral view. × 1/2.

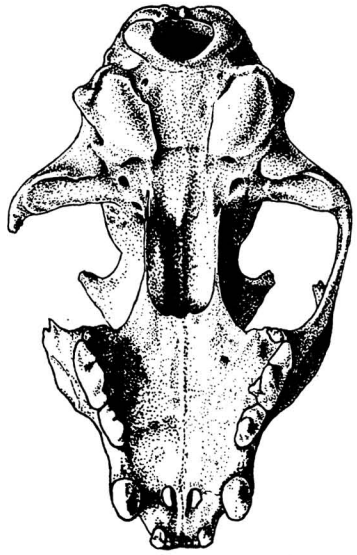


Fig. 2. *Lynx lynx*, recent, Finland (ZMUH), skull, ventral view. × 1/2.

The material used for the reconstruction consists of a partial skeleton, thought probably to represent one individual, and consisting of a skull with mandibles, cervicals 3, 5—7, thoracics 1—2, lumbars 3—7, pelvis, humerus, radius, ulna, femur, tibia, MC 3—4, and MT 2—4. For several elements there is additional material, the mandibles representing a total of seven individuals.

B. Recent material

Comparative material of several *Lynx lynx* was studied in the collections of the Zoological Museum of the University of Helsinki (ZMUH) and in the National Museum of Natural History, Stockholm (NHRM). Since the Etouaires lynx was larger than the living species, a large Recent specimen was selected for the comparative study on which the life reconstruction is based. It is a male from the Korkeasaari Zoo, Helsinki.

Living lynxes differ from most other cats in dimensions, for instance in their relatively longer limbs and small heads. As a representative of felids with more "normal" or generalized body proportions, the puma (*F. concolor* L.) was selected. The specimen studied (formely in the Zoological Institute of Stockholm University, now in the National Museum of Natural History) was a comparatively small individual, probably a female; its provenance is unknown.

Additional material of these and other felid species in various collections has also been studied.

3. Comparison between Lynx issiodorensis and L. lynx

This section is a brief comparative study of the skeletons of the Issoire lynx and the recent Northern lynx, to provide a foundation for a life reconstruction of the former. In addition, reference is made to the puma, insofar as body proportions are concerned.

Table 1. Skull measurements in lynxes. — a = approximate; N = No. of specimens; M = mean; S.D. = standard deviation.

	L. issiodorensis Etouaires		*L. lynx* Finland		
	Prr 200	Prr 201	N	M	S.D.
Palate length midline	82	78	24	57.8±0.5	2.5
Basal length	158	—	24	123.7±1.1	5.5
Condylobasal length	168	—	14	132.5±1.5	5.5
Zygomatic width	120	—	24	102.6±1.1	5.2
Snout across canines	47	47	24	39.1±0.4	1.9
Width across P^4	—	67	23	60.2±0.4	2.0
Width, incisor row	20.3	—	15	16.51±0.22	0.85
Interorbital width	a 36	—	24	31.9±0.5	2.2
Postorbital processes	a 73	—	14	65.0±1.2	4.5
Postorb. constriction	a 41	—	24	39.4±0.5	2.2
Condylar width	38.8	—	16	33.6±0.4	1.4
Mastoid width	68	—	15	62.3±0.6	2.5

A. Skull

The only complete skull from Etouaires (Fig. 1; cf. Fig. 2) has been crushed dorsoventrally. The brain-case and the bullae are flattened and the maxillae have been forced downward and slightly folded in below the palate, reducing the apparent width of the muzzle. In addition, the rostral part shows some lateral compression. As a result, nothing can be said about the profile of the head, although the length measurements are reliable. However, undistorted specimens of *L. issiodorensis* (e.g. from Saint-Vallier: VIRET 1954) show a skull profile resembling that of *L. lynx*, although slightly less vaulted.

The skull is very large for a lynx, being also one of the largest specimens from Etouaires (Table 1). The skull is comparatively narrow (not a result of distortion, for the same character is shared by other *L. issiodorensis* skulls), and the zygomatic arches are not as wide in relation to skull length as in *L. lynx*. The calvarial part is not much longer than in the recent form, and the fossil skull attains its great length mostly because of the absolutely and relatively longer face. In many species, facial length is positively allometric; however, a test for allometry shows that the difference between the fossil and recent species does not arise from simple allometry. The great facial length results from a significantly different growth pattern.

The width of the muzzle across the canines is relatively great in *L. issiodorensis*, but an allometry test (muzzle width/skull length) shows that it could arise from the same growth pattern as that in *L. lynx*. In *L. issiodorensis* the muzzle does not taper as in *L. lynx*, and the cheek tooth rows are less divergent.

The zygomatic arches in the fossil skull are very robust, suggesting a more powerful jaw musculature. On the other hand, the teeth are not much larger than those of *L. lynx*.

The occiput in *L. issiodorensis* is distinctly broader, with larger nuchal crests, and the paroccipital processes are larger than in *L. lynx*, while the mastoid processes appear relatively weaker.

B. Mandible

The lower jaw of the Etouaires lynx is larger and more massive than the recent, and the dentition, again, relatively (though not absolutely) smaller. Table 2 summarizes data on the fossil and recent jaws. The coronoid process is very high, somewhat less backwardly tilted, and without the posterior flange. This seems to be a characteristic of the early population from Etouaires, for in later *L. issiodorensis* (e.g. from Saint-Vallier) the configuration approaches that of the recent form (see Fig. 3). A late Blancan specimen from Mullen, Nebraska, resembles the early Villafranchian form (see SCHULTZ & MARTIN, 1974).

The masseteric fossa is very deep and extends far forward, and its surface is more rugose than in *L. lynx*. Below, it forms a particularly broad shelf, compared with the moderate one in the recent species. The size of the fossa is further increased by the downward deflection of the lower border of the jaw towards the angle, a character seen in most of the fossil jaws but hardly ever in *L. lynx*. In the development of this region *L. issiodorensis* shows some resemblance to F. *concolor*.

The large size of the masseteric fossa and the rugosity of the ascending ramus indicate the superior strength of the jaw muscles. The dis-

Table 2. Mandibular measurements in lynxes. For abbreviations, see Table 1.

	L. issiodorensis, Etouaires						*L. lynx, Finland*		
	Prr 200	Prr 204	Prr[1] 205	Prr 206	Prr 411	Prr 496	N	M	S.D.
Length canine-condyle	116	e95	e90	–	101	94	23	96.3 ±0.9	4.3
Height coronoid-lower border	59	–	–	–	–	–	23	43.7 ±0.6	2.9
Depth condyle-angle	25.4	–	–	19.0	–	a20.0	14	18.7 ±0.5	1.7
Depth behind M_1	22.1	–	a16.5	20.0	21.4	18.9	23	19.75±0.27	1.32
Depth at diastema	20.2	18.2	16.6	–	19.6	18.1	23	18.56±0.22	1.03
Length P_3-M_1	39.6	37.4	35.5	–	41.0	36.2	15	37.5 ±0.4	1.6

[1] Subadult.

tance from the carnassial to the jaw joint is greater, both absolutely and relatively, than in *L. lynx*. The greater muscular strength may have compensated for the longer lever arm.

Little of the development of the inframasseteric shelf seems to be due to the abductor muscles, for the angle is not strongly developed. The area of insertion is denoted by a short longitudinal ridge flanked by two grooves.

C. Dentition

The upper incisors appear relatively weaker than those of *L. lynx*. The third incisor is actually slightly narrower than its modern counterpart and is more pointed. The small posterior cusp of this tooth extends higher toward the summit of the main cusp than in *L. lynx*.

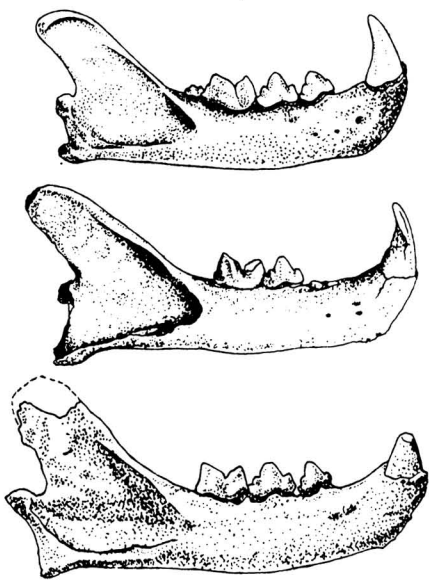
The upper canines are similar in build and relative size to those of *L. lynx*. The diastema behind them is longer.

The upper cheek teeth resemble those of *L. lynx* and indubitably conform more closely to the lynx dental pattern than to that of other medium-sized cats, including the absence of P^2. In some details, however, the two species are different. Thus, P^3 is relatively longer and distinctly more slender in the fossil. The upper carnassial shows a typical lynx character in the presence of a small ectoparastyle, generally present in *L. lynx*; in the Etouaires lynx it tends to be even more prominent. The average fossil P^4 is relatively broader than the recent; the difference is slight but significant. The upper molar is similar to that of *L. lynx*.

The lower canine resembles that of *L. lynx* but tends to be slightly broader in cross-section. The diastema is, again, very long. The cheek teeth tend to be somewhat more spaced in the fossil jaws than in the recent; in most of the jaws P_3 and P_4 are separated by a gap, which is shorter or non-existent in the modern specimens.

Table 3. Measurements of upper dentitions in lynxes. For abbreviations, see Table 1.

	L. issiodorensis Etouaires					*L. lynx* Finland	
	Prr 200	Prr 201	Prr 411	Prr 8	N	M	S.D.
C^s length	10.5	10.2	9.1	10.0	27	9.47±0.12	0.60
width	7.8	8.4	7.1	–	25	7.48±0.09	0.46
P^3 length	14.0	13.6	13.0	–	27	12.30±0.12	0.63
width	6.5	6.4	6.2	–	24	6.41±0.09	0.45
height	–	–	8.6	–	22	8.43±0.11	0.51
P^4 length	20.4	20.5	19.6	19.9	28	19.09±0.16	0.83
greatest width	9.6	9.6	8.9	10.3	26	8.84±0.10	0.50
blade width	6.5	6.4	6.8	6.4	21	6.72±0.08	0.38
paracone length	8.2	8.7	8.2	8.5	24	8.03±0.07	0.35
metastyle length	8.7	8.7	8.2	7.6	23	7.82±0.09	0.42
M^1 width	7.4	7.6	7.8	7.4	25	7.18±0.14	0.70



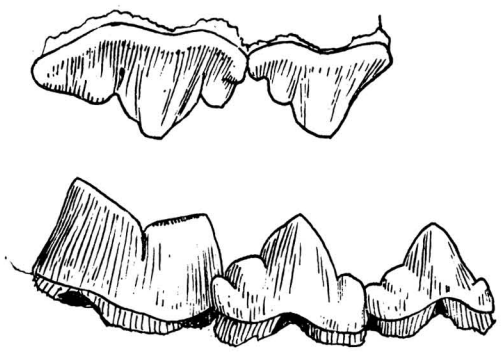


Fig. 3. Right mandibles, external view. Top, *Lynx lynx*, recent, Finland (ZMUH), supernumerary molar present. Centre, *L. issiodorensis*, middle Villafranchian, Saint-Vallier (after Viret, 1954). Bottom, *L. issiodorensis*, early Villafranchian, Etouaires (Prr 200). × 1/2.

Fig. 4. *Lynx issiodorensis*, Etouaires (Prr 200), P'–P-, P'–M', external views. × 3/2.

Table 4. Measurements of lower dentition in lynxes. For abbreviations, see Table 1.

	L. issiodorensis, Etouaires						*L. lynx*, Finland		
	Prr 200	Prr 204	Prr 205	Prr 208	Prr 411	Prr 496	N	M	S.D.
C_i lenght	–	9.9	–	9.4	10.8	–	23	9.37±0.12	0.57
width	7.5	7.2	–	7.6	8.5	8.3	22	7.14±0.11	0.50
P_3 length	10.7	9.8	9.7	–	11.3	10.2	25	10.08±0.14	0.68
width	5.4	5.3	4.9	–	5.5	–	26	5.37±0.07	0.35
height	6.8	6.8	6.6	–	6.8	7.1	20	6.97±0.10	0.44
P_4 length	13.4	12.2	12.4	–	14.3	13.1	26	12.71±0.12	0.61
width	6.4	6.4	5.7	–	6.5	–	24	6.01±0.07	0.34
height	8.5	8.3	8.0	–	8.8	8.6	21	8.31±0.09	0.43
M_1 length	15.3	15.3	14.6	–	16.3	14.0	28	15.98±0.12	0.63
width	6.6	6.7	6.4	–	6.9	–	26	6.96±0.07	0.35
trigonid length$_1$	14.2	14.3	13.9	–	15.4	–	23	13.94±0.12	0.57

[1] Trigonid length = anterior end of tooth to protoconid hind edge.

The Etouaires P_3 are not much larger than the modern. They have a significantly lower main cusp, although the difference is slight. The P_4 are slightly but significantly larger in the fossil form.

The greatest difference may be noted in the lower carnassial. This is very short in the Etouaires lynx and the difference is due to absence of a talonid-metaconid complex like that in *L. lynx*. At most there is a slight basal swelling, merging insensibly into the hind edge of the protoconid blade. In later Villafranchian and mid-Pleistocene lynxes, however, at first the talonid and then the metaconid tend to appear with increasing frequency, a trend which culminates in the recent *L. lynx*. Furthermore, in about 10 % of the modern population a small M_2 is present. I have discussed this peculiar evolutionary trend elsewhere (KURTÉN 1963).

While the profile of the trigonid in the Etouaires M_1 is similar to that in the recent lynx, the occlusal aspect differs: the lingual base is concave, not straight as in *L. lynx*.

Although the characters of the dentition are not in themselves important for the reconstruction of the animal, they have been described in some detail because they corroborate the close affinity to the recent lynx and so suggest that in external characters the extinct species was lynx-like.

D. Axial skeleton and pelvis

Of the axial skeleton of the Etouaires lynx, four cervical, two thoracic and five lumbar vertebrae were studied. Together with the dimensions of the skull and the pelvic girdle they contribute to an assessment of the dimensions of the animal.

Table 5. Measurements of axial skeleton in lynxes and puma.

	L. issiodorensis Etouaires	*L. lynx* 1	2	3	4	*F. concolor*
Skull, basal	158	126	117	115	122	152
Cervical 3	27	21.1	19.6	19.2	19.0	19.6
4	–	19.7	16.9	17.7	17.5	19.0
5	21	19.0	17	16.6	18.5	18.5
6	22	18.0	16.2	15.2	16	19.0
7	22	17.8	16.1	–	16.5	19
Thoracic 1	18.4	18.2	15.3	14.7	16.5	17
2	18.3	17.0	15+	15	16.5	17
Lumbar 3	36.9	34.5	33.1	31.6	35	30
4	40.9	38.1	36.0	37.8	38	32.5
5	39.0	42.6	35.7	37.6	39	34
6	40.8	42.3	38.5	33.1	38	35
7	33.5	35.4	28.2	27.9	30	28.5
Pelvis	128	157	–	–	146	152

L. lynx 1–3 Finland (ZMUH), 4 Sweden (NHRM).
F. concolor (NHRM).

Measurements were made of the central lengths of the vertebrae (median ventral) (see Table 5). The table also gives data for four recent *L. lynx* skeletons and the *F. concolor* skeleton mentioned in section 2.

Compared with *L. lynx*, the fossil form has much longer neck vertebrae, while the thoracic vertebrae are only slightly longer and the lumbar vertebrae hardly longer at all. The pelvis is decidedly shorter than in *L. lynx*. It is possible that this specimen represents a smaller individual than the vertebrae, yet the difference is striking

Table 6. Comparative dimensions of axial skeletion in lynxes and puma.

	Absolute			Relative		
	L. issiodorensis	*L. lynx*	*F. concolor*	*L. issiodorensis*	*L. lynx*	*F. concolor*
Skull, basal	158	126	152	125	100	121
Cervicals 3–7	115	95.6	94.5	120	100	99
Thoracics 1–2	36.7	35.2	34	104	100	97
Lumbars 3–7	191.1	193	160	99	100	83
Pelvis	128	157	152	82	100	97

and in keeping with the evidence (below) of decidedly weaker hind limbs. There is thus a simple gradient in the difference: from the 4th lumbar forwards the elements of *L. issiodorensis* are larger than those of *L. lynx* and the difference increases anterad; from the 5th lumbar posterad, the elements of *L. issiodorensis* are progressively smaller than those of *L. lynx*.

Table 6 lists data on the relative lengths of corresponding parts of the body, in so far as indicated by the material available (length of cervical 4 of the Etouaires lynx interpolated). The right-hand part of the table shows the lengths of the Etouaires lynx and the puma as percentages of the corresponding data for *L. lynx*. (The lynx skeleton is the big zoo specimen referred to in section 2.)

The data bring out the continuous size gradient between *L. issiodorensis* and *L. lynx*. The puma differs from *L. lynx* in a somewhat analogous manner, but the gradient is not smooth: the neck is not elongated and the pelvis is not markedly shorter. Thus a relatively simple change in growth pattern from *L. issiodorensis* to *L. lynx* is indicated, whereas a more intricate change would be needed to transform the proportions of the puma into those of *L. lynx*.

In Table 7, the sums of lengths of the various parts of the *L. lynx* skeleton have been entered, and corresponding values have been estimated for *L. issiodorensis*. The sums of the lengths of skull, vertebrae and pelvis can be used as comparative estimates of total axial length. (It should of course be noted that these estimates fall short of the real lengths; not only are the intervertebral discs missing, but also the distance from the foramen magnum to the occipital condyles.)

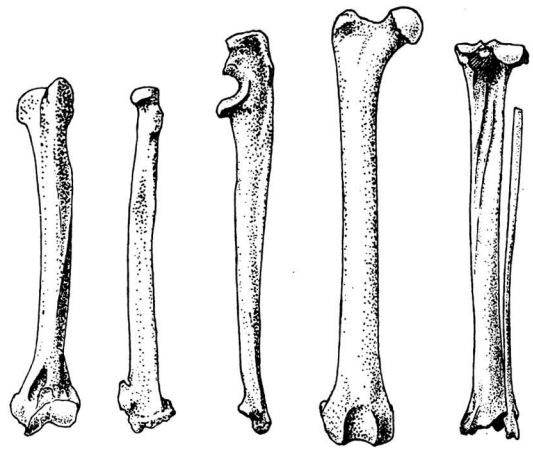
This comparison suggests that the Etouaires lynx was about 4.2 % longer than the recent

Table 7. Axial lengths of lynx skeletons. – e = estimates.

	L. issiodorensis	*L. lynx*
Skull	158	126
Cervical series	e 182	152
Thoracic series	e 239	230
Lumbar series	e 256	259
Pelvis	128	157
Σ (total axial length)	963	924

Table 8. Dimensions of limb bones in lynxes and puma.

	L. issiodorensis Etouaires				*L. lynx* 1	*L. lynx* 2	*L. lynx* 4	*F. concolor*
Humerus length	181	177	–	–	194	178	173	187
shaft width	14.1	16.5	–	–	12.6	11.8	11.8	16.2
Radius length	180	179	177	–	189	172	176	166
Ulna length	215	211	212	201	224	207	207	205
MC 3 length	71	–	–	–	79	71	71	60
shaft width	7.7	–	–	–	5.8	5.6	5.9	7.8
MC 4 length	70	–	–	–	74	67	70	58
shaft width	7.0	–	–	–	5.8	5.3	5.3	7.3
Femur length	232	217	215	–	232	218	218	221
shaft width	18.6	17.8	17.2	–	15.2	14.7	14.1	17.0
Tibia length	211	207	204	–	237	217	215	206
shaft width	15.9	15.2	15.0	–	12.7	13.9	12.5	15.9
MT 2 length	79	81	80	–	96	87	87	72
shaft width	6.9	6.6	7.1	–	6.9	6.7	6.8	7.9
MT 3 length	83	–	–	–	103	98	99	81
shaft width	9.1	–	–	–	8.3	7.9	8.1	9.7
MT 4 length	88	89	89	–	103	98	96	78
shaft width	6.9	7.6	7.2	–	7.1	6.6	7.0	8.3



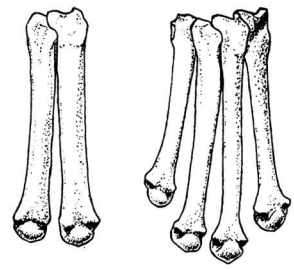


Fig. 5 (upper left). *Lynx issiodorensis*, Etouaires, long bones. Left to right: left humerus, right radius, ulna, femur, tibia. × 1/3.

Fig. 6 (upper right). Metacarpals. Left, *Lynx issiodorensis*, Etouaires, MC 3–4; right, *L. lynx*, recent, Finland, MC 2–5. × 1/3.

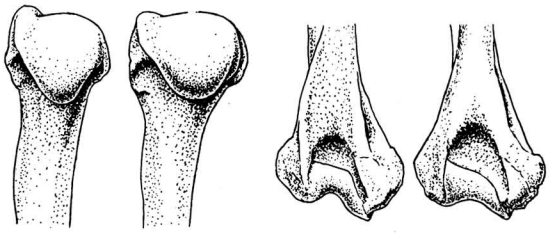


Fig. 7 (lower left). Left humeri, proximal and distal ends. Left, *Lynx issiodorensis*, Etouaires; right, *L. lynx*, recent, Finland. × 2/3.

species. The difference is thus much smaller than is suggested by a comparison of the skulls.

The recent skeleton belonged to an individual that was larger than average. For instance, a sample of 24 Finnish lynxes has an average basal skull length of 123.7 mm, or 98.2 % of that in the specimen used here. This would suggest a length difference of 6.1 % (of the *L. lynx* mean) between the Etouaires lynx and an average recent individual. However, the Etouaires specimen seems to have been somewhat above average size in its population, and a value of about 4 % may be more realistic.

E. Appendicular skeleton

One of the most striking characters of *L. lynx* is its great length of limb and the large size of its paws. The material from Etouaires comprises the three main segments of the fore and hind limbs (long bones and metapodials). Figures 5—6 show representative specimens. Table 8 lists measurements of the Etouaires sample, three Finnish *L. lynx* skeletons, and the puma skeleton.

Most of the limb bones of *L. issiodorensis* are decidedly more robust than their homologues in *L. lynx* and in some cases they reach widths comparable with those in the puma. Evidently the Issoire lynx was a heavier animal than the living Northern lynx.

Otherwise the most conspicuous morphological difference is seen in the humerus (Fig. 7). The caput humeri is narrower in *L. issiodorensis* than in *L. lynx*, and the distal articulation is more deeply grooved. The characters suggest a somewhat more restricted fore-and-aft locomotion in the Issoire lynx.

Table 9 shows a comparison between the lengths of the main limb segments on the three species. The left-hand part of the table gives absolute measurements for the large Etouaires skeleton, the recent lynx No. 1, and the puma. In the central part of the table the measurements of *L. issiodorensis* and *F. concolor* are related to those of *L. lynx*. All segments of the fore limb of *L. issiodorensis* are shorter than those of *L. lynx*; the metacarpals are relatively shorter than humerus and radius. In the puma, the radius is shorter relative to the humerus. In the hind

limb, the femur of *L. issiodorensis* is as long as that of *L. lynx*, while the distal segments are progressively shorter. Much the same gradient is seen in the puma.

The right-hand part of the table shows the lengths of the three segments of the limb when the total length is set at 100. The fore limb of *L. issiodorensis* is similar to that of *L. lynx*, while the hind limb shows puma-like proportions.

Table 10 summarizes the length relations of body and limbs. The limbs of *L. issiodorensis* are markedly shorter in relation to the body than those of *L. lynx*.

Table 9. Lengths of limbs and limb segments in lynxes and puma. — Li = *Lynx issiodorensis*, Ll = *L. lynx*, Fc = *Felis concolor*.

	Absolute			Relative			Segments relative		
	Li	Ll	Fc	Li	Ll	Fc	Li	Ll	Fc
Humerus	181	194	187	93	100	96	42	42	45
Radius	180	189	166	95	100	88	42	41	40
MC 3	71	79	60	90	100	76	16	17	15
Σ (Fore Limb)	432	462	413	94	100	89	100	100	100
Femur	232	232	221	100	100	95	44	41	43
Tibia	211	237	206	89	100	87	40	41	41
MT 3	83	103	81	81	100	79	16	18	16
Σ (Hind Limb)	526	572	503	92	100	89	100	100	100

Table 10. Relative lengths of limbs in lynxes.

	Lynx issiodorensis	*Lynx lynx*
Estimated axial length	963	924
Fore limb	432	462
Hind limb	526	572
Fore limb as percentage of axial length	45	50
Hind limb as percentage of axial length	55	62

4. Life reconstruction

The study of body proportions outlined above served as the basis for the life reconstruction in Fig. 8, which may be compared with the drawing of a modern *L. lynx* in Fig. 9.

The length of the tail is not known but, since all living members of the genus *Lynx* are short-tailed, it appears highly probable that the same was true of the Issoire lynx.

The external characters are, of course, entirely unknown. As ear tufts are another feature common to all living *Lynx* they are assumed to have been present in *L. issiodorensis*. They are represented as slightly less prominent than in *L. lynx*, more like those of *L. rufus* and *L. pardina*.

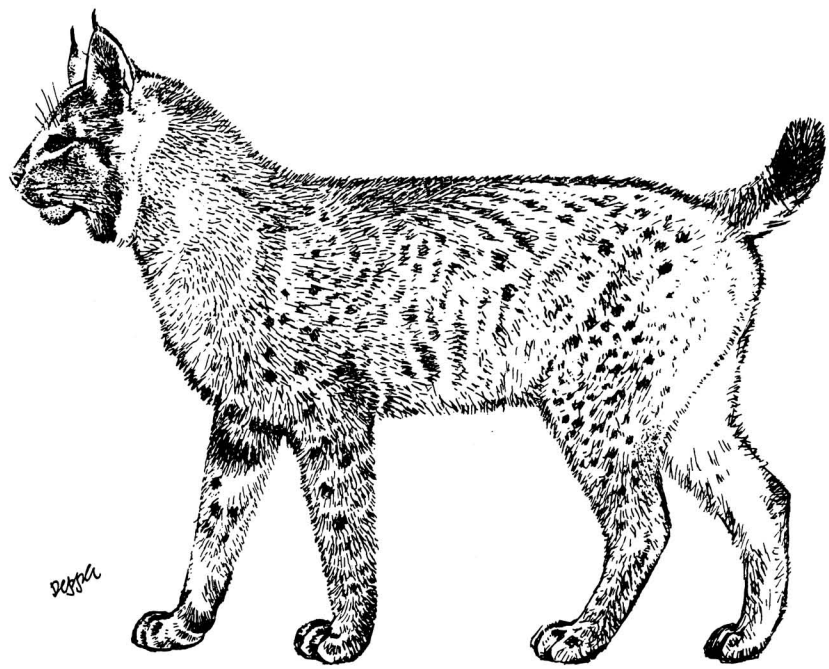


Fig. 8. Life reconstruction of *Lynx issiodorensis*, drawn by H. Pepper. About × 1/10.

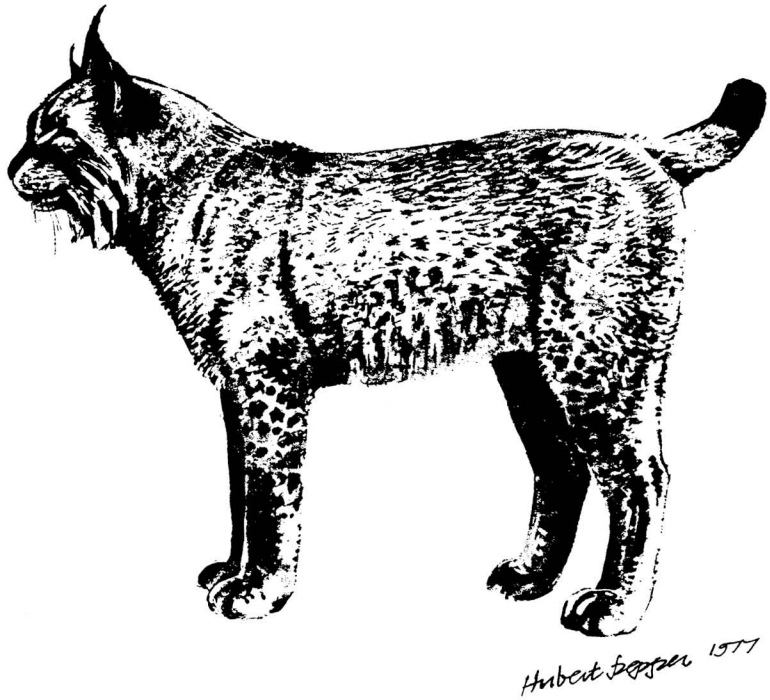


Fig. 9. Recent *Lynx lynx*, drawn by H. Pepper. About × 1/10.

It is not unlikely that *L. issiodorensis* was ancestral, in Eurasia, to *L. pardina* as well as to *L. lynx*. Its environment was probably nearer to that of the pardel lynx. In a warm-temperate climate, the Etouaires lynx probably had shorter fur and a somewhat less developed "beard" than *L. lynx* (and *L. canadensis*). Thus, the external characters are based mainly on *L. pardina*.

The main purpose of the reconstruction, however, is to show, to the best of our ability, the body proportions of the animal as they may have appeared in life.

References

Croizet, J.-B. & Jobert, A.-C.-G. 1828: Recherches sur les ossemens fossiles du département du Puy-de-Dome. — 224 pp. 57 pls. Paris.

Kurtén, B. 1963: Return of a lost character in the evolution of the felid dentition. — Comment. Biol. Soc. Sci. Fenniae 26 (4): 1—12.

Schultz, C. B. & Martin, L. D. 1972: Two lynx-like cats from the Pliocene and Pleistocene. — Bull. Univ. Nebraska State Mus. 9:197—203.

Teilhard de Chardin, P. 1945: Les formes fossiles. — In: P. Teilhard & P. Leroy, Les Félidés de Chine: 5—35. Peking.

Tobien, H. 1970: Biostratigraphy of the mammalian faunas at the Pliocene-Pleistocene boundary in middle and western Europe. — Palaeogeography, Palaeoclimatology, Palaeoecology 8: 77—93.

Viret, J. 1954. Le loess à bancs durcis de Saint-Vallier (Drôme) et sa faune de mammifères villafranchiens. — Nouv. Arch. Mus. Hist. Nat. Lyon 4:1— 200.

Received 24. IV. 1978
Printed 30. XII. 1978