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The discovery of the impression of the ventral side of *Eopelobates anthracinus* Parker, 1929 holotype

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Abstract. In the paleontological collections of the Rheinische Friedrich-Wilhelms-Universität of Bonn, F.R.G., the ventral counter-impression of the holotype of *Eopelobates anthracinus* Parker, 1929 was found. This enabled us to complete the description of the whole specimen, as well as to give full diagnosis of the genus and species. Some doubts are expressed concerning the validity of *Eopelobates bayeri* as an independent species.

Introduction

In 1980, one of the present authors (Z.V.Š.), when reviewing fossil frogs from the collection of the Geological paleontological Institute of the Rheinische Friedrich-Wilhelms-Universität in Bonn, noticed a specimen which attracted his attention by a rather peculiarly shaped sternum. It was stored in a box in the special collection of the Lower Miocene locality Rott near Bonn within the collections of that institute.[1] The specimen displayed features of the genus *Eopelobates*. Later it was lent to Prague where it turned out to be the ventral impression of the holotype of *Eopelobates anthracinus* Parker, 1929. The dorsal impression of the holotype specimen is deposited in the British Museum (Natural History), numbered R. 4841, and according to Parker (1929: 271, 277) it comes from the Lower Miocene lignite beds of Rott near Bonn.

Description

The ventral impression of the holotype specimen displays most of the skull elements, as well as the disarticulated pectoral girdle, while the posterior section of the vertebral column, the pelvis, the posterior extremities, and probably also the right anterior extremity are preserved in original articulation. Some skeletal elements are lacking, either because they were cartilaginous and hence not fit to be preserved (e.g. carpal and tarsal elements), or because they were lost during fossilisation.

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[1] Now catalogued under "Špinar und Roček 1, GPU Bonn").

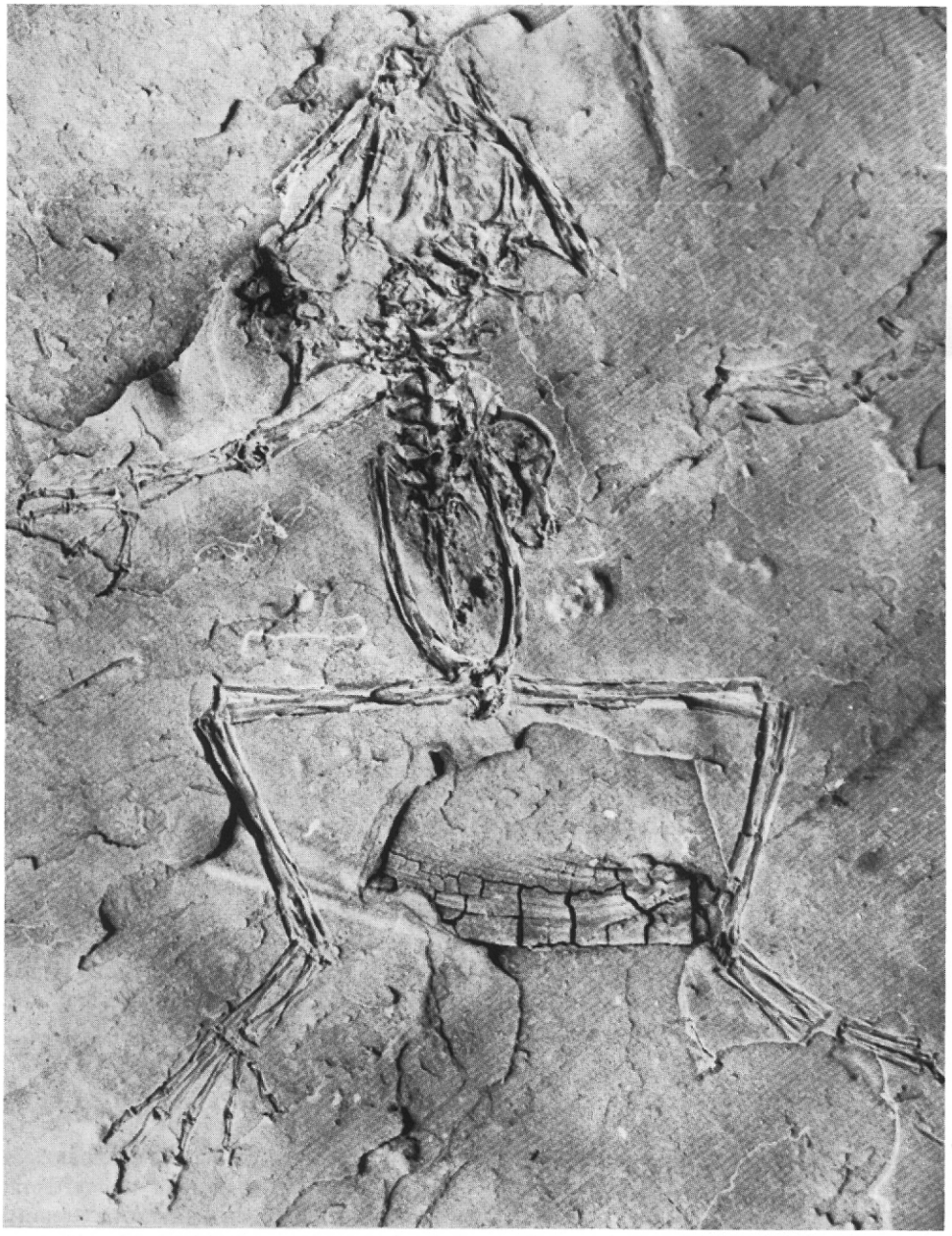

Fig. 1. *Eopelobates anthracinus* Parker, 1929, holotype (coll. of the Geologisch-paläontologisches Institut of the Friedrich-Wilhelms-Universität). Impression of the ventral side. Photo by Z. V. Špinar.

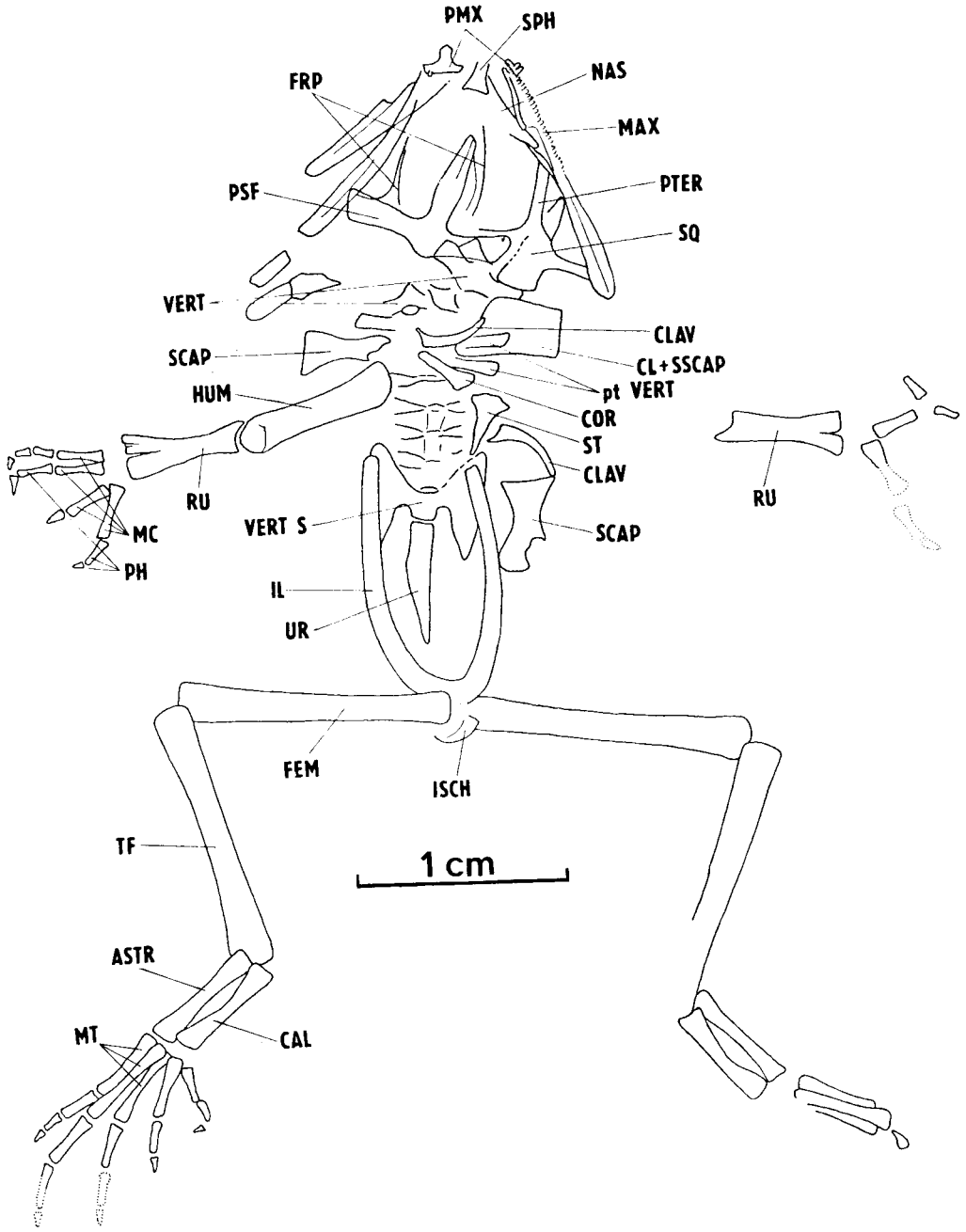

Fig. 2. *Eopelobates anthracinus* Parker, 1929, holotype (coll. of the Geologisch-paläontologisches Institut of the Friedrich-Wilhelms-Universität). Drawn after the ventral impression of the specimen. Pitted lines indicate parts of skeleton still covered by sediment. Abbreviations: ASTR – astragalus; CAL – calcaneus; CL SSCAP – complex cleithrum suprascapula; CLAV – clavicle; COR – coracoid; FEM – femur; FRP – impressions of the frontoparietal lateral margins; HUM – humerus; IL – ilium; ISCH – ischium; MAX – maxilla; MC – metacarpals; MT – metatarsals; NAS – nasal; PH – phalangs; PMX – praemaxilla; PSF – parasphenoid; PTER – pterygoid; RU – radioulna; SCAP – scapula; SPH – sphenethmoid; SQ – squamosal; ST – sternum; UR – urostyle; TF – tibiofibula; VERT – vertebra; VERT S – sacral vertebra; pt VERT – processus transversus vertebrae.

Skull: a) Neural endocranium

Sphenethmoid. Its ventral surface is flat. It tapers anteriorly, and its lateral margins are clearly defined; the latter suggests that cartilaginous parts of the solum nasi (see Roček 1981, fig. 5) were destroyed before the definite embedding of the specimen into the sediment.

Neither prooticooccipital nor any part of the visceral endocranium is distinguishable in this impression, although some traces of these elements are undoubtedly visible in the dorsal impression, according to Parker's statement (1929: 279): "Pro-otic of the left side ... partially visible, apparently not encrusted" and "descending process to the quadrate sharply marked off and not encrusted" (it is difficult to understand why Parker was so surprised that both elements were not "encrusted", and what he meant with the term "descending process to the quadrate").

b) Neural exocranium

Praemaxilla (fig. 3A). A well defined impression of the right praemaxilla is preserved, including one rather robust conical tooth. The total count of tooth positions could reach about 12. The preserved part of the pars facialis is concave and does not bear any pointed convexity on its medial margin.

Nasal. Only a faint impression of the left nasal is preserved. It seems that the pars lateralis is long and slender, bearing neither proc. parachoanalis nor proc. paraorbitalis. The margin of the bone between the proc. anterior and pars lateralis is only slightly concave.

Frontoparietal. Only its lateral margins are impressed. Approximately in the middle of the anterior-posterior diameter there is a distinct convexity, quite similar to conditions in *Eopelobates bayeri* (see Estes 1970, fig. 12B; Roček 1981, fig. 49 c; Špinar 1972, fig. 82 A′).

Maxilla. It is a quite elongate, tooth-bearing bone. Teeth are preserved as faint impressions. However, as it is not possible to determine the posterior termination of the tooth row, the total number of the tooth positions can consequently not be estimated.

Squamosal (fig. 3 E). An incomplete impression of the left squamosal is preserved. Proc. posterolateralis is comparatively slender close to its base, but it widens distally. Its tip is lacking in the described ventral impression, but is well defined in the dorsal one (see Špinar, 1972, pl. 165). The posterior part of the lamella alaris is preserved. The proc. zygomaticus is not preserved, however, the dorsal impressions of both squamosals (Parker, 1929, fig. 4; Špinar, 1972, pl. 165; Estes, 1970, fig. 1) suggest that the lamella alaris is rather similar in shape to *E. bayeri* (cf. Estes, 1970, fig. 20 A; Roček, 1981, fig. 49 b; Špinar, 1972, fig. 83). Hence the proportions of the proc. posterolateralis and the anterior part of the lamella alaris do not correspond to those figured in Špinar, 1972, fig. 93 E.

Parasphenoid (fig. 3 B). An almost complete impression of the bone is preserved, the left proc. lateralis being rather damaged. Its shape is clearly visible from fig. 3 B, and very similar to that of *E. bayeri* (Roček, 1981, fig. 49 e). There is a distinct keel on the anterior part of the pars medialis.

Pterygoid. Only an impression of its central part is preserved, displaying its margo orbitalis.

c) Visceral exocranium

Praearticular and dentary are partly preserved. Both elements seem to be very slender, the former distinctly "S" shaped.

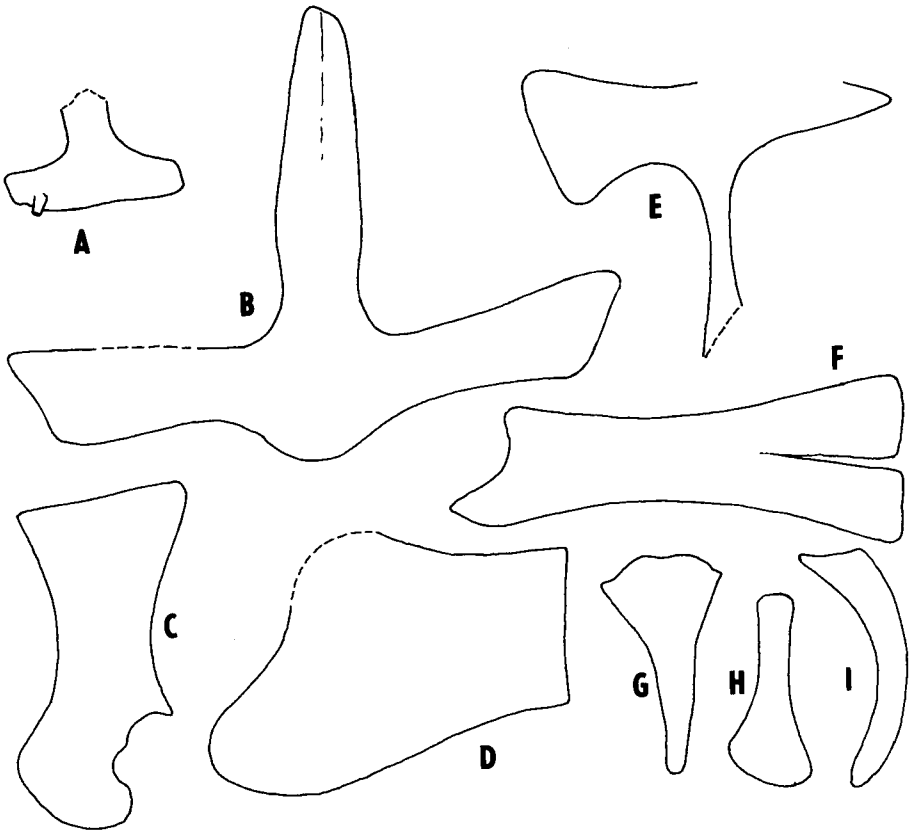

Fig. 3. *Eopelobates anthracinus* Parker, 1929. Different skeletal elements drawn after the ventral impression of the holotype. A – praemaxilla; B – parasphenoid; C – left scapula; D – left cleithrum and suprascapula complex; E – left squamosal; F – left radioulna; G – sternum.

Vertebral column

Only five praesacral vertebrae can be distinguished by the more or less well preserved impressions of the centra. The proc. transversi of the 2. – 4. vertebrae are robust and preserved as slightly displaced parts of these vertebrae. The first vertebra is probably not preserved at all. There were probably eight praesacral vertebrae.

The proc. transversi of the sacral vertebra are apparent from figure 2.

The urostyle is not fused with the sacral vertebra. Most probably its lateral surface is impressed so that the dorsal longitudinal ridge is visible.

Pectoral girdle

All elements are preserved though displaced.

Cleithrum + suprascapula complex (fig. 3 D). A faint impression of this element can be found laterally from the vertebral column which suggests that same cartilaginous elements have been preserved in this specimen.

Scapula (fig. 3 C). Both scapulae are preserved as impressions. Their distal part is slightly bent inwards (viewed as if in natural position). The cavitas glenoidalis is not visible completely, as impressions of both scapulae display their inner surfaces.

Coracoid. Its shape is clearly visible from fig. 3 H.

Clavicle. Impressions of both clavicles are preserved. The shape of this element is clearly visible from fig. 3 I.

Sternum. An impression of the sternum is well preserved, and its shape is apparent from fig. 3 G.

Forelimb

Humerus (fig. 2). An impression of the proximal end of the right humerus is preserved almost in original articulation with the scapula. The impression of the bone itself does not display any distinct dilatation, as is the case in *Pelobates*.

Radioulna (fig. 3 F). Left radioulna is in original articulation with the humerus. Its distal part is clearly divided, not fused.

The carpal elements are completely lacking.

Metacarpals. Metacarpals II-V are preserved, however, similar to phalangs they do not provide much diagnostic information.

Pelvic girdle

Ilium. Its shape and proportions are apparent from figure 2.

Both ischium and pubis are strongly damaged and indistinct.

Hindlimb

Femur. It is straight, and of the same length as the tibiofibula.

Astragalus and calcaneus are free from one another. The distal row of tarsals, the praehallux and praepollex are not preserved. Other elements of this extremity do not provide much diagnostic information, except for their porportions.

Some dimensions

Head + body length 33.5 mm; urostyle 5.8 mm; humerus 8.0 mm; radioulna 6.0 mm; metacarpal III 2.6 mm; femur 12.5 mm; tibiofibula 12.5 mm; astragalus 5.9 mm; calcaneus 5.3 mm; metatarsal IV 4.7 mm (all dimensions represent the longest diameter).

Discussion of the individual age of the specimen

Several features suggest that a specimen is concerned that is not yet fully grown, viz. (1) The rather subtle anterior process of the sphenethmoid indicating the small degree of the ossification of the interior. of the proc. praenasalis medius. (2) The urostyle is not fused with sacral vertebra. (3) All carpals and distal tarsals are not preserved, although these parts of the extremities are in their original position. These elements were probably still cartilaginous. (4) The distal part of the radioulna is still divided. Whether this is due to the age of the specimen or one of the characters of this species can be a matter of discussion. However, judging by the conditions in adults of *Eopelobates bayeri* (Špinar, 1972: 210) and young postmetamorphic specimens of *Pelobates*, it seems more probable that it is an ontogenetic character.

Because these characters can be modified by ontogeny, it is not possible to include them among diagnostic characters listed below.

The position of the animal, the presence and lack of certain parts, and its dimensions confirm that the ventral impression of the holotype is concerned. As in the above description much additional information is given, a revised diagnosis of the genus, as well as of the species can be given.

Eopelobates Parker, 1929

For synonymy see Špinar, 1972: 197
Species typica: *Eopelobates anthracinus* Parker, 1929
Diagnosis: (1) The frontoparietal complex embryonically developing with the participation of unpaired median element adjoining the tectum synoticum. In the definitive complex in the adult the median suture never reach the posterior margin of this bone complex. (2) The frontoparietal complex is not in contact with the squamosal. (3) There is a sculpture consisting of tiny pits on the frontoparietal complex, maxilla, and lamella alaris squamosi, while it is tubercled in *Pelobates*. (4) The pars lateralis of the nasal is long and slender, bearing neither proc. parachoanalis nor proc. paraorbitalis. The margin of the bone between the proc. anterior and pars lateralis is almost straight. (5) Sternum well ossified. (6) Astragalus and calcaneus not fused. (6) The spade is lacking.
Discussion: Contrary to statement of Parker (1929: 277), the tibiofibula is apparently fused. This diagnosis also differs from those by Estes (1970: 296, 298) and Špinar (1972: 196-197) in that it does not mention the relative size of the femur and tibiofibula, as the former is of the same length as the latter.

Eopelobates anthracinus Parker, 1929

1929 – *Eopelobates anthracinus* n. sp. Parker, 1929; Parker, H. W.: Two Fossil Frogs etc., pp. 278-280, fig. 4.
1952 – *Eopelobates anthracinus* Parker, 1929; Špinar, Z. V.: Eopelobates bayeri etc., pp. 457-459, fig. 1
1955 – *Eopelobates anthracinus* Parker, 1929; Wettstein-Westersheim, O.: Fauna der miozänen Spaltenfüllung etc., pp. 811.
1956 – *Eopelobates anthracinus* Parker, 1929; Zweifel, R. G.: Pelobatid frogs from the Tertiary etc., pp. 9, 11, fig. 8.
1970 – *Eopelobates anthracinus* Parker, 1929: Estes, R.: Fossil Pelobatid frogs etc., p. 295, 304-306, fig. 1, 8, 9g, 15a, 20c, 21A.
1972 – *Eopelobates* cf. *anthracinus* Parker, 1929; Špinar, Z. V.: Tertiary frogs etc., pp. 216-219, fig. 93.
1981 – *Eopelobates anthracinus*; Roček, Z.: Cranial anatomy of frogs etc., p. 145.

Holotypus: The impression of the dorsal surface of the skeleton figured in Parker, 1929, fig. 4; Špinar, 1952, fig. 1; Zweifel, 1956, fig. 8; Estes, 1970, figs. 1, 8, 9g, 15a, 20c, 21A; Špinar, 1972, fig. 93, pl. 165, and described in Parker, 1929: 278-280; Estes, 1970: 304-306; Špinar 1972: 218. Deposited in the British Museum (Nat. Hist.), coll. number R. 4841.

The impression of the ventral surface of the skeleton, described and figured in the present paper. It is deposited in the collections of the Geological-paleontological Institute of the Rheinische Friedrich-Wilhelms-Universität in Bonn, catalogued: "Špinar und Roček 1, GPU Bonn".

Diagnosis: (1) The sternum tapers so that its posterior end is the most narrow part of the bone. The anterior margin bears four convexities; the medial ones are the largest. (2) The medial margin of the pars facialis praemaxillae is straight, bearing no convexity. (3) Praearticular and maxilla seem to be very slender. (4) Femur and tibiofibula are of the same length.

Discussion: Character (1), however, is questionable, especially when it is considered that the *E. anthracinus* holotype is a not yet fully ossified specimen. The anterior margin of the sternum represents the boundary between the cartilago and bone, and hence with advancing ossification it can change its shape. As for character (3) it is necessary to consider the fact that only parts of these bones are preserved in the ventral impression; the remaining parts are preserved in the dorsal one. Consequently if one observes the impressions separately, conclusions concerning the exact shape of the bones can be false. Although the ratio between the femur and the tibiofibula remains considerable stable during the growth of an animal (e.g. Roček, 1974: 217, fig. 5), character (4) also displays some individual variation (Roček op. cit.: 219). Differences in characters between *E. anthracinus* and *E. bayeri* mentioned by Špinar (1972: 216) can either be explained by ontogenetic variation and consequently by the attained degree of ossification (e.g. the shape of the urostyle), or by individual variation (the shape of the parasphenoid) or, it turned out that some of them are not differences at all (e.g. the proc. transversi of the sacral vertebra; see Špinar, 1972, fig. 93 A for *E. anthracinus* and fig. 86 for *E. bayeri*). The latter holds also for the frontoparietal whose lateral margins are well defined in the ventral impression, and does not correspond in this respect to that figured by Estes (1970, fig. 8). The shape of the squamosal cannot be determined without studying both impressions.

It may be concluded that the differences between the *Eopelobates anthracinus* holotype, which represents a specimen that undoubtedly had not reached yet its maximum degree of ossification, and *Eopelobates bayeri* are rather minute. Consequently the possibility arises that both forms may be conspecific. This problem cannot be solved without studying both impressions of the holotype of *Eopelobates anthracinus*, and comparing them with large series of *Eopelobates bayeri* (present in the collections of the Dept. of Palaeontology, Charles University, Prague), displaying both individual and ontogenetic variation. However, as the *E. anthracinus* holotype is not a fully grown specimen, the discovery of a fully ossified specimen from the type locality would be decisive.

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