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THE MACROSEMIIDAE
(PISCES, ACTINOPTERYGII)
FROM THE UPPER TRIASSIC OF LOMBARDY
(N. ITALY)

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Key words: Macrosemiidae (Pisces, Actinopterygii), Upper Triassic, Lombardy (N. Italy), re-description, new taxon.

Riassunto. Le faune a Vertebrati del Triassico Superiore della Lombardia vengono continuamente incrementate da nuovi ritrovamenti. Alle ormai classiche località del Norico delle Prealpi Bergamasche si aggiunge ora una interessante località del Carnico nei pressi di Varese.

In questo lavoro vengono presi in considerazione esemplari di Pesci provenienti da entrambe le aree ed attribuibili al genere *Legnonotus*, unico rappresentante triassico della famiglia *Macrosemiidae*. Per la specie norica, *Legnonotus krambergeri* Bartram, è stata eseguita una ricostruzione più completa sulla base di materiale meglio conservato di quello originario; per l'unico esemplare del Carnico si è ritenuto invece opportuno istituire una nuova specie *L. obtusus*, attribuendola tuttavia al genere *Legnonotus* solo in via provvisoria. In realtà quest'ultimo materiale è ancora troppo scarso per fornire elementi sufficienti ad una più precisa descrizione e classificazione, anche se vi sono indicazioni per una diversificazione a livello generico. Vengono inoltre discusse alcune conclusioni recentemente proposte per la famiglia *Macrosemiidae*.

Abstract. A new species of Macrosemiid, *Legnonotus obtusus* sp. n. from Carnian aged rocks near Varese, Lombardy, Italy, is briefly described and a re-description given of the species *Legnonotus krambergeri* Bartram based on new material from the Upper Norian beds of the Prealps near Bergamo.

It is concluded that *Legnonotus* is a primitive Macrosemiid.

Introduction.

The Upper Norian beds of the Prealps near Bergamo (Lombardy, N. Italy) have yielded specimens of *Legnonotus krambergeri* Bartram, 1977, a species previously known only from approximately contemporaneous Hallein, Austria, (Gorjanovic-Kramberger, 1905). These specimens are more numerous and better preserved than the original type material thereby allowing us to present a more complete description of the species. Furthermore most of the type material appears to be lost, apart from the holotype and one other specimen, both in the BM (NH) collection.

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The Lombardian fauna shows a close similarity to that of Hallein both possessing *Eomesodon hoeferi* (Gorjanovic-Kramberger) (Tintori, 1981), *Dandya ovalis* (Gorjanovic-Kramberger) (Tintori, 1983) and *Legnonotus krambergeri* Bartram. None of these species have so far been recorded from other Norian localities.

The new species, *Legnonotus obtusus* sp.n. was collected from a new locality near Viggù (Varese-Lombardy, N. Italy) in the Kalkschieferzone of the upper part of the Meride Limestone, which is Carnian in age. This new locality is near Cà del Frate, where, at the beginning of the century, a few fossil fishes were collected from a small quarry (Reposi, 1909; De Alessandri, 1910, p. 20) of approximately the same stratigraphical level. The older specimens from this locality are labelled as from Besano (see *Prohalecites* in BM (NH) collection; C. Patterson, 1981) as are all the others specimens from the «Scisti ittiolitici di Besano» (Grenzbitumen zone). Although Cà del Frate is very close to Besano, it is much higher in the sequence than the classical vertebrate beds of Besano, which are close to the Anisian-Ladinian boundary.

The outcrop is composed of limestones and marly-limestones which are grey or light brown to black in colour. The darker beds are those containing the fossils. These are thinly laminated and only a few centimeters thick and alternate with the lighter pure limestones beds which vary in thickness from a few to thirty centimeters. The limestones show a graded structure, with clay chips in the lower part of the beds which are interpreted as resedimented (torbiditic?) layers. Indeed five kilometers West of the fossiliferous locality (at M. Minisfredo), the Salvatore Dolomite, heteropic with Meride Limestone, goes up to perhaps Middle Carnian (Allasinaz, 1968) and this area may be interpreted as the source of the reworked sediments.

The outcrop is about 15 m thick and, apart from the presumed resedimented layers, all the laminated beds are rich in fossils, principally a large number of very small *Prohalecites*.

Field work has only commenced and so far few fishes other than *Prohalecites* and the new species *Legnonotus obtusus* sp. n. have been collected. The new species can be related to the *Macrosemiidae*, but its true taxonomic position will only be fully defined when further material is available.

Systematic descriptions

Family *Macrosemiidae* Cope, 1890

Genus *Legnonotus* Egerton, 1854

***Legnonotus krambergeri* Bartram, 1977**

Pl. 15, fig. 1, 2; Text—fig. 1

1905 *Ophiopsis attenuata* — Gorjanovic-Kramberger, p. 218, pl. 20, fig. 3, 4.
1977 *Legnonotus krambergeri* Bartram, p. 164, fig. 20.

Material. Fifteen specimens have been investigated. The specimens 4752, 4853, 5117, 5118 are from Cene, the ones 5119, 5120, 5121, 5122, 5123 are from Brembilla and they belong to the Bergamo Museum of Natural History «E. Caffi» collection. The specimens ET23, 24, 25, 30, 31, 37 are from Zogno I and were collected by the authors: also this material will be stored in the Bergamo Museum.

The skull. The frontal is very narrow in the preorbital region only just wide enough to carry the groove for the supraorbital sensory canal. The bone widens above the orbit, assuming a slender triangular shape. Posteriorly the frontal is ornamented with scattered tubercles of ganoine, but does not present the characteristic fenestration above the sensory canal seen in the type-specimens. The parietal is stout, with a postero-ventral embayment and the suture with the frontal is straight. The dermopterotic is small and elongate, but not tubular. In at least one specimen a few small sensory canal fenestrae are visible in the dermopterotic, while in others there are no traces of the canal. The dermopterotic is followed by the smaller rounded supratemporal (extrascapular) behind which lies a drop-like posttemporal. The posttemporal does not reach the midline. All of the roofing bones are ornamented with scattered tubercles.

Three supraorbitals are present along the slight embayment of the frontal; they are ornamented by ganoine tubercles and small ridges. Posteriorly to the supraorbitals, but not contiguous with them, is the dermosphenotic (well preserved in specimen 4853). This bone is small, transversely elongated, and tubular in shape; it is clearly not incorporated in the skull roof, and there is no evidence of the position of the supraorbital canal. Only small fragments of the infraorbital series are present, nevertheless the last infraorbital seems deeper than long (see for example specimen 4853).

The maxilla bears teeth only on the posterior part of the oral margin: up to 13 small, thin teeth are recognizable (cf. Bartram, 1977 who figured teeth along the entire oral margin). The maxilla is an elongate, slender triangular bone, with slightly curved margins, not as straight as illustrated by Bartram (1977). Thus our restoration of the dermal upper jaw is closer to that of *Macrosemius* than to the previous illustrations of *Legnonotus* (Bartram, 1977). The premaxilla is large and powerful, articulating with the anterior tip of the maxilla. It seems to have an expanded vertical process, while along its oral margin it bears 5 teeth which are stouter and longer than those of the maxilla. Nothing is known about the pattern of the remainder of the snout region.

The lower jaw is large and similar in shape to the Hallein specimens. A high coronoid process is generally hidden behind the maxilla, while the anterior

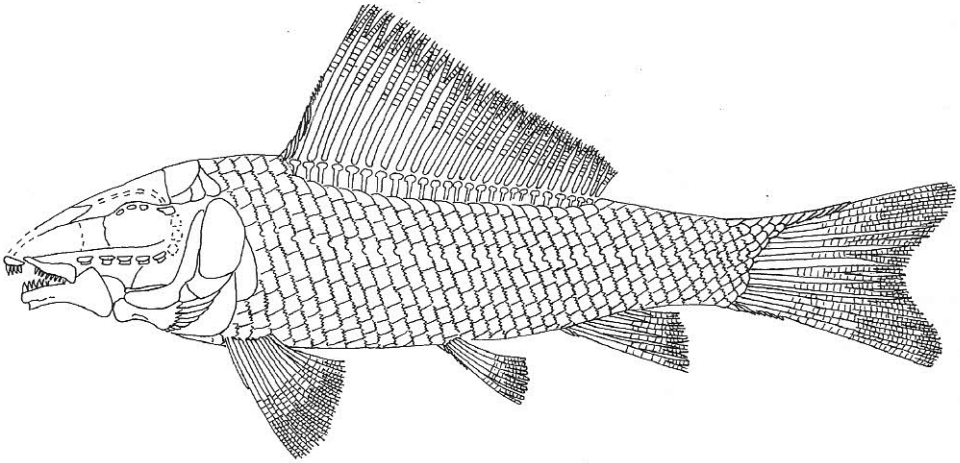


Fig. 1 — *Legnonotus krambergeri* Bartram, 1977. Restoration of the skeleton.

region of the lower jaw is sharply bent inwards. The dentary teeth, which number is more than 8, are stout and similar to those of the premaxilla.

The wide, rounded metapterygoid and the large subtriangular quadrate are preserved in specimen ET 23. These bones are not contiguous, so that a small portion of the intervening region must have been cartilage filled. The metapterygoid shows a clear embayment at the anterodorsal corner and its surface, like that of the quadrate, is slightly vermicular. The latter articulates with the lower jaw just below the beginning of the orbit. Anteriorly to the quadrate there is a long ectopterygoid bearing a few stout teeth which are smaller than those of the premaxilla. The two palatines can be seen: each seem to bear three teeth, similar in size to those of the premaxilla. The quadratojugal is a slender bone enlarged near its articulation with the quadrate and lying along the upper edge of the horizontal branch of the preopercular, as in all other *Macrosemiidae*.

The parasphenoid is elongate, rather thin and toothless, with a small ventral rounded lamina in the orbital region. A well developed ascending process is also present, but the basiptyergoid process itself seems to be smaller.

The preopercular is narrow and elbows, so that the bone is divided into a vertical and a larger horizontal branch. The two arms form an angle of about 110° (open forward) and the posterior outline is more rounded than the anterior. Thus the preopercular shape is rather different from the restoration of Bartram (1977), where the two limbs form an angle of 90° .

The opercular is about one and an half times deeper than wide and shows a straight anterior margin, while the remaining outline is rounded. The subopercular is trapezoidal in shape, deeply embayed dorsally to house the ventral margin of the opercular; its anterior process is well developed. The interopercular is a small triangular bone lying far from the mandible. Eight branchio-

stegal rays are present, showing the characteristic macrosemiid shape. The distal ceratohyal is stout anteriorly, but becomes more expanded and thinner posteriorly. Its inner surface is vermiculate.

Axial skeleton. Only a few vertebrae of the anterior region are visible; they appear to be ossified as complete rings.

Pectoral girdle. The cleithrum is large and strong; it shows an expanded anteroventral region where it lies behind the branchiostegal rays. A single row of ganoine denticles is present along a longitudinal ridge which runs on the dorsal limb.

The postcleithrum is a large plate (specimen 4752), subrectangular in shape with rounded corners. A smaller supracleithrum, with traces of its sensory canal, lies just behind the uppermost region of the opercular.

Paired fins. The pectoral fin consists of 14 long rays preceded by a spine; the first segment of the lepidotrichia and the spine are about half the length of the fin. Fringing fulcra are absent. Five rather large radials are exposed in specimen EP, but probably there were more.

The small, elongated pelvic fin is made up of at least five lepidotrichia; both basal and fringing fulcra are present.

Unpaired fins. The dorsal fin is undivided and consists of about 25 lepidotrichia. The leading ray bears many small fringing fulcra and it is preceded by at least five basal fulcra. The distal portions of the radials are clearly visible owing to the lack of scales in this area, and they equal in number the lepidotrichia.

The anal fin consists of seven rays, the first of which bears four fringing fulcra.

The caudal fin has a clearly forked outline. The upper lobe has 5 rays, the lower 8. The dorsal border of the fin bears six large basal fulcra, followed by several fringing fulcra. Smaller basal and fringing fulcra are also present on the ventral margin.

All the lepidotrichia of the unpaired fins show a long first segment, which is often about one half the length of the whole fin.

Scales. The scales are rectangular, deeper than wide, becoming smaller towards the tail. They are covered by a continuous smooth layer of ganoine; the posterior edge is finely pectinated. The denticles do not change their dimensions caudally but their number decreases on each scale.

Transverse scale rows number about 33, and each is made up of 10 scales at least below the dorsal fin.

The lateral line runs at the level of the fourth scale row below the area devoid of scales, not as in Bartram's restoration (1977). Accessory pits are present in some lateral line scales from the posterior end of the body. There are

also one or two pits in the scales from the lower part of the scaly, tail lobe in two specimens, but we do not think that the lateral line continued on to the tail as in *Ophiopsis* (Bartram, 1975).

L. krambergeri shows a scaleless area beneath the dorsal fin. This area does not however extend beyond the length of the fin. A similar feature is seen only in *Macrosemius* (Bartram, 1977) but here there are additional secondary scale rows not present in *Legnonotus*.

Legnonotus obtusus sp. n.

Pl. 15, fig. 3; Text—fig. 2

Derivatio nominis. *Obtusus* (stout) from the shape of the body.

Locus typicus. Near Cà del Frate (Viggiù — Varese).

Stratum typicum. Kalkschieferzone of the Meride Limestone (Carnian, Upper Triassic).

Holotype. The only known specimen (n. P327 of the Induno Olona Museum of Natural History catalogue).

Diagnosis. Small *Legnonotus* with a short (12 lepidotrichia) dorsal fin; skull bone ornamented with ganoine ridges; supratemporal commissure in the supratemporal bone.

Description.

This small fish has a relatively large head, approximately one third of the total body length. The maximum depth of the body is 13 mm, in the region of the occiput, behind which it decreases regularly till the caudal fin, without giving rise to a clear caudal peduncle.

The skull. The frontal has an elongate shape, narrower anterior to the orbit and becoming wider posteriorly. The large supraorbital canal runs through the middle of the bone and possibly opens on to the surface towards the snout region. Traces of the canal are clearly visible in the posterior region where it bends round to presumably enter the dermosphenotic, which, however, is not preserved. The suture between the frontals is straight anteriorly but more sinuous in the posterior region. The parietal is wide and subrectangular with a slightly wavy outline. The dermopterotic is an elongated bone, which extends anteriorly below the frontal. The sensory canal is partially exposed by fenestrae. The most anterior region of the bone is devoid of any ornamentation and probably was overlain by the demosphentic. A narrow supratemporal lies just behind the parietal and the passage of the supratemporal commissure is marked by a row of pores. There is a large, smooth, oval posttemporal. No traces of the infraorbital series are visible, but a single, large supraorbital is present in the orbital embayment of the frontal.

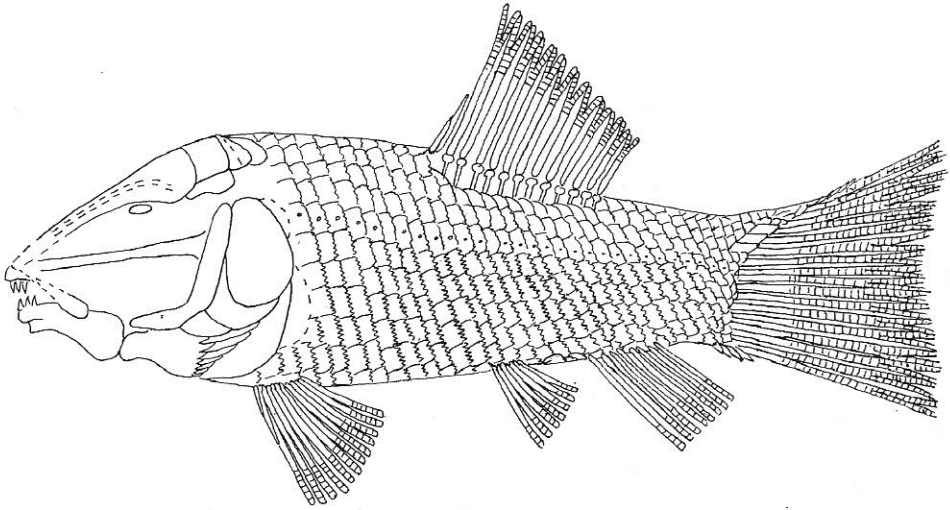


Fig. 2 — *Legnonotus obtusus* sp. n. Attempted restoration of the skeleton. x 2.5.

The opercular is very large and the subopercular boundary with the opercular is concave with a well expanded anterior process. The subopercular is elongate antero—posteriorly, with the anterior region much stouter than the posterior. The interopercular is a small triangular bone completely separated from the lower jaw by the entire ventral limb of the preopercular. At least 7 branchiostegal rays are present; each of which shows an irregular longitudinal ridge of ganoine. Although part of the distal ceratohyal is visible beneath the anterior ends of the first branchiostegal rays, its true shape is not detectable.

The two limbs of the preopercular form an angle of about 130° ; the ventral seems to be narrower than the dorsal.

Owing to the poor preservation of the snout region, only the shape of the mandible is known. This is deeply concave ventrally, the teeth are high and conical, but their number and distribution could not be ascertained.

Paired fins. The cleithrum is visible in impression: it is bent anteriorly below the opercular series and forms an expanded ventral plate. A large post-cleithrum is present just above the fin, while the much narrower supracleithrum lies behind the upper region of the opercular. The pectoral fins are ventrally inserted; they consist of about 12, long lepidotrichia, preceded by a couple of spines. They seem unbranched and are only segmented distally, where there are up to five segments.

The pelvic fins are very close to the anal fin and in the posterior half of the trunk. At least seven lepidotrichia are present, showing the same characteristics as those of the pectoral fins.

Unpaired fins. The dorsal fin is marginally posterior in position, but may have been displaced during fossilization. It consists of 12 lepidotrichia preceded by two or three spines and a few basal fulcra. The lepidotrichia appear to be unbranched except distally and their proximal ends are very expanded; the radials are very thin.

The anal fin is made up of eight long, unbranched lepidotrichia. These are preceded by two spines and one basal fulcrum. Some radials are visible and these are larger than those of the dorsal fin.

The caudal fin is also well developed, with 18–19 lepidotrichia, which branch only once distally. The first segment of each ray is shorter than in the other fins. Basal fulcra and spines are present on both dorsal and ventral fin margins; in addition, there are a few fringing fulcra on the uppermost lepidotrich. The posterior outline of the fin must have been gently forked.

The scale. The true shape of the scales is not well shown, however they seem higher than deep. Ganoine covering is continuous, giving rise in the anterior region of the body to some longitudinal ridges on each scale, these protrude posteriorly as denticles. In the caudal region, scale surfaces are smooth, but the posterior edge is always denticulated. The lateral line is visible and it does not enter the scaly lobe of the tail.

Four large circumanal scales are also present. The preanal scale is rounded and it is the largest. The two lateral anal scales are smaller and elongated, while the posterior scale is a little smaller than the preanal and with two strong denticles.

The scaly lobe for the tail is well developed, with three large rhomboid scales in evidence.

Possibly there is a small scale gap below the short dorsal fin, allowing the radials to be seen. This character, if confirmed, will be very important in the establishing the true taxonomic position of this species. So far we can consider it only as a strong clue for putting the species in the genus *Legnonotus*.

Discussion.

The new species from Viggiù shows some features which place it in *Macrosemiidae* sensu Bartram (1977). The skull roof has a typical macrosemiid frontal, very narrow anterior to the orbital region and with an open sensory canal. The gape is rather small and the interopercular far removed from the posterior margin of the lower jaw. On the other hand certain other characters contrast with this attribution: in particular the short dorsal fin and the scaled axial lobe. Furthermore the supratemporal commissure runs entirely in the supratemporal (rather than in the parietal), and the supratemporals themselves seem to meet in the midline. In this latter character *Legnonotus obtusus* sp. n. resembles

Uarbrichtys Wade, a genus removed from the *Macrosemiidae* by Bartram (1977) because it does not show either of the two unique synapomorphies shared by the *Macrosemiidae*, i. e. the presence of nine infraorbitals and the small interopercular far from the mandible. Bartram made a new family, *Uarbrichtyidae*, for this genus and considered it as the plesiomorphic sister group of the *Macrosemiidae*.

We think that the presence of one unique synapomorphy (the interopercular position) clearly places *L. obtusus* sp. n. in the *Macrosemiidae* and that the large caudal lobe and the position of the supratemporal commissure may be considered primitive characters.

Therefore this well preserved single specimen is assigned to *Legnonotus* Egerton, the only known genus of Macrosemiids from the Upper Triassic. It is sufficiently different from previously known *Legnonotus* to warrant the erection of a new species, *L. obtusus* sp. n. for its reception.

With this new species the earliest record of the family *Macrosemiidae* is pushed back to the Carnian.

Remarks on Macrosemiidae.

In considering the relationships within the *Macrosemiidae*, Bartram (1977, p.224) cited various specializations which he considered either primitive or derived. We consider some of Bartram's primitive characters to be incorrectly identified in the light of the features shown by our new species.

1) Skull roof ornamentation. In our opinion the smooth skull roof of *Macrosemius* is derived and the presence of a ganoine ornamentation, as in *Legnonotus*, is the primitive character, in the same way as the entire ganoine covering on the scales and the presence of a great number of fringing fulcra on the fins is considered primitive for Macrosemiids. In almost all groups of fossil Actinopterygii of this period we see the gradual reduction of these features during time.

2) The caudal fin is weakly forked or rounded, with a reduced numbers of rays. We think that, in defining primitiveness, the number of fin rays is more important than the external shape of the fin itself, which may be an adaptative character. Thus the caudal fin of *L. obtusus*, with as many as 18 lepidotrichia is considered primitive (among *Macrosemiidae*).

3) The dorsal fin. Among Mesozoic Actinopterygians, a short dorsal fin is most common, i. e. more primitive. Elongation of the dorsal fin seems to be a derived condition, often associated with a deep body form: *Dapedium* and other *Semionotidae* (Jain, 1973; Tintori, 1983), Pycnodonts (Nursall, pers. comm.), *Bobasatrania* (Stensio, 1932; Lehman, 1956). No Macrosemiids are really deep bodied, but most of them possess a long dorsal fin. On the other

hand *Legnonotus obtusus* has a very short dorsal fin, while *L. krambergeri* has a long one. However the latter is shorter than that in *Macrosemiis*; this in our estimation throws doubt on the hypothesis that *Macrosemiidae* originated from deep-bodied, long-finned fishes (Gregory, 1933; Saint Seine, 1949). Indeed elongation and/or division of the dorsal fin may be the result of two independent lines of evolution. We conclude that among *Macrosemiidae* the condition in *Legnonotus* (fusiform body, short dorsal fin) is close to the primitive (ancestral) condition.

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All the Norian material will be stored in the Bergamo Museum of Natural History «E. Caffi», Director M. Guerra.

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PLATE 15

Fig. 1 – *Legnonotus krambergeri* Bartram, 1977. Cene (Bergamo). Specimen n. 4853; x 1.5.

Fig. 2 – *Legnonotus krambergeri* Bartram, 1977. Zogno (Bergamo). Specimen n. ET23; x 1.8.

Fig. 3 – *Legnonotus obtusus* sp. n. Holotype. Cà del Frate (Viggiù, Varese). x 2.5.

