

## GABANELLIA AGILIS GEN. N. SP. N., (ACTINOPTERYGII, PERLEIDIFORMES) FROM THE CALCARE DI ZORZINO OF LOMBARDY (NORTH ITALY)

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*Key-words:* Perleidiformes, new taxa, sexual dimorphism, Late Triassic, Northern Italy.

*Riassunto.* Viene descritto, sulla base di una decina di esemplari, un nuovo genere e una nuova specie di perleidiforme, *Gabanellia agilis* gen.n. sp.n.. Viene altresì eretta una nuova famiglia, Gabanellidae, per accogliere il nuovo genere. I caratteri salienti del nuovo taxon sono la forma del corpo molto affusolata, un preopercolo di tipo primitivo, una robusta dentatura da predatore, l'opercolare molto più grande del subopercolare, la pinna caudale quasi simmetrica, molto grande e dotata di 12 raggi epaxiali, le scaglie sottili ed elevate sul tronco, l'elevato numero di file di scaglie (ben 95). *Gabanellia* gen. n. presenta inoltre un dimorfismo sessuale a livello della pinna anale, carattere già riscontrato in altri generi affini. Due esemplari conservano tridimensionalmente un tratto di intestino. *Gabanellia* gen.n. è considerato, con *Saurichthys* e *Birgeria*, uno dei maggiori predatori della fauna norica del Calcare di Zorzino, caratterizzato da un'alta velocità di crociera che gli permetteva di inseguire a lungo le prede.

*Abstract.* *Gabanellia agilis* gen.n. sp.n. is here described on the basis of several, well preserved specimens. A new family, Gabanellidae, is also erected to locate the new genus in the Perleidiformes. *Gabanellia* gen.n. is characterized by a slender body with a large, symmetrical tail with 12 epaxial rays. The preopercular is of primitive shape and the large mouth had a powerful dentition. The opercular is much larger than the subopercular. The very thin scales are arranged in 95 transverse rows. A few specimens show a modified anal fin: this is interpreted as a sexual dimorphism. Gut shape is observed in two specimens, but no evidence on the diet of *Gabanellia* gen.n. is preserved. *Gabanellia* gen.n. is considered, together with *Saurichthys* and *Birgeria*, a near-apex predator among the Norian fishes of the Zorzino Limestone fauna.

### Introduction.

The Calcare di Zorzino (Zorzino Limestone, Middle-Late Norian, Late Triassic) has proved to be one of the main sources of Triassic fossil fishes in the past twenty years (Tintori, 1995a). A few sites have been exploited (Tintori et al., 1985), while only one (the Zogno2 locality) is currently under excavation. The Zorzino fauna comprises at least 40-50 fish genera, among them several neopterygians such as pholidophorids

(Zambelli, 1986) and many durophagous groups (Tintori, 1995b, 1996). Though this fish fauna records the first neopterygian radiation, paleopterygians are still well represented and the apex predators are among the latter. In fact, *Saurichthys*, *Birgeria* and the new genus here described, together with coelacanth, are the larger known piscivores among Norian and, perhaps, Triassic fishes. Predatory reptiles could as well be very large in the Norian (a recently collected specimen being more than 4 m long; Tintori et al., 1996), but they are very rare and, as far as we know, they were never strictly piscivorous.

Though perhaps the fastest swimmer, *Gabanellia* gen.n. is the smallest (Pl. 1, fig. A), of these apex predators, being about 25 cm in standard length (s.l.): *Saurichthys* reached 165 cm, *Birgeria* 100 cm, and our coelacanth probably exceeded 100 cm. The gross morphology is very similar to that of '*Caturus*' *insignis* Kner, 1866, known from almost coeval beds near Seefeld (Austria). '*Caturus*' *insignis* can be 5-10 cm longer than *Gabanellia* gen.n. and, though the two genera are not closely related to each other, they probably occupied a very similar ecological and trophic niche.

The few recovered specimens seem to indicate that *Gabanellia* gen.n. was not common. On the contrary, *Saurichthys*, then present with two species (Tintori, 1990a) was, by far, the most common while *Birgeria* must have been the rarest.

Active predator fishes, at a lower trophic level, are also present; they usually did not exceed 10 cm in s.l. Rather numerous are the 'flying' fish *Thoracopterus* (Tintori & Sassi, 1992) and an undescribed pholidopleurid, while the neopterygian pholidophorids represent about 70% of the whole fish-fauna. They all probably fed on small crustaceans and on larvae of both vertebrates and invertebrates and, at the same time, were food for the apex predators.

## Paleontological description

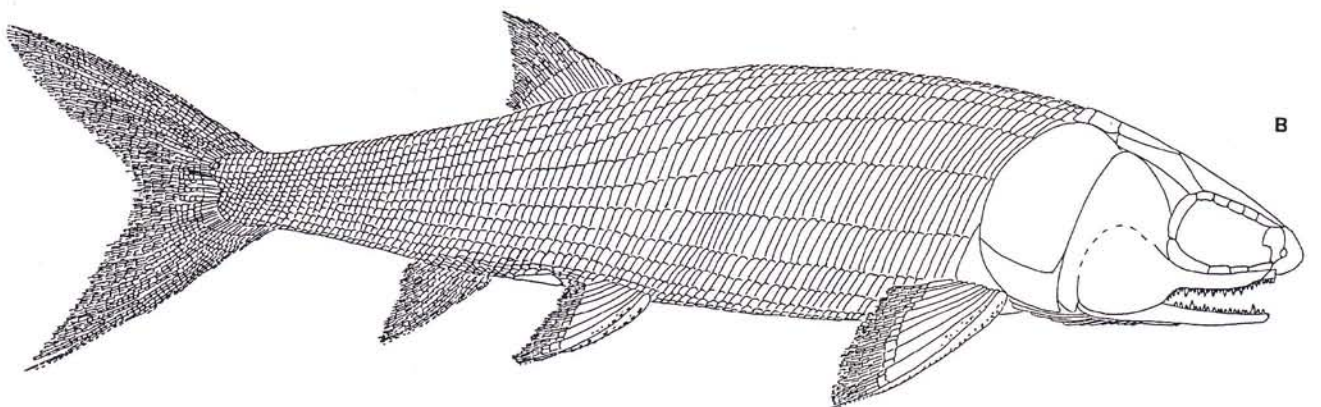
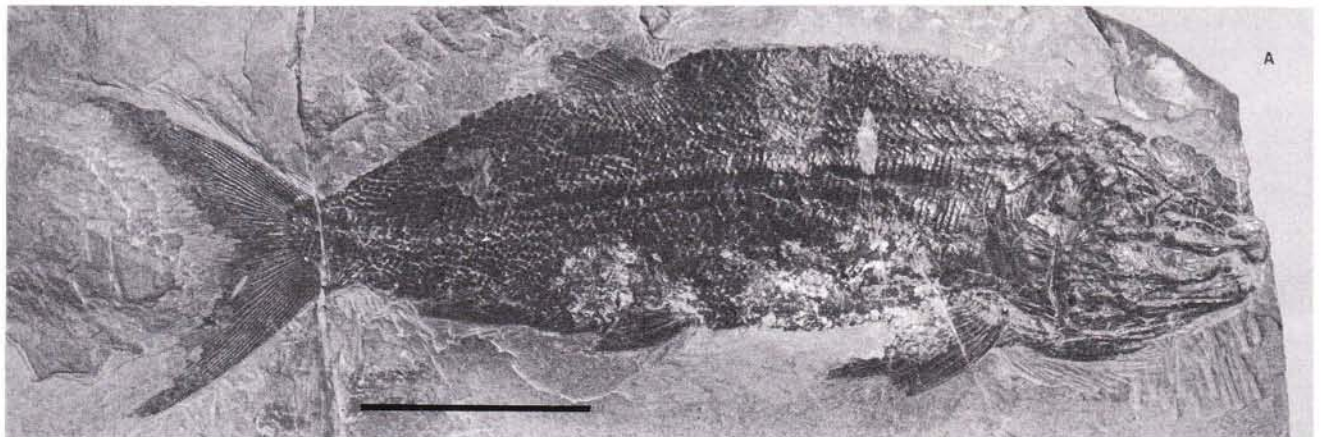
### Order Perleidiformes Berg, 1940

*Gabanellia* gen. n. is a rather unusual perleidid having an elongate fusiform body and a predatory dentition. Furthermore, it shows a mosaic of characters somewhat intermediate between perleidids and peltopleurids, as is the case in other related genera (see below). However, we consider that a large preopercular, with an oblique suspensorium, and the primitive pattern of the supraorbital sensory canal are 'plesiomorphic compared to skull patterns of T2 (*Cleithrolepis* Group) and T3 (*Peltopleurus* Group)' (Gardiner & Schaeffer, 1989), thus leaving *Gabanellia* gen. n. near the node T1 (*Perleidus* Group) of Gardiner & Schaeffer (1989: fig. 12).

The main features used to characterize Peltopleuridae and Perleididae are the shape of the preopercular, the pattern of the supraorbital sensory canal, the shape of the flank scales and the structure of the tail, which has more or less numerous epaxial rays.

The preopercular is still large and wedge-shaped in perleidids, but see *Meridensia* and some species of *Pelto-*

*perleidus* (Bürgin, 1992) whereas it is narrower and vertical in peltopleurids. Except in *Peltopleurus* and *Habroichthys* (Bürgin, 1992), the supraorbital sensory canal in peltopleurids was usually short, ending in the frontal, while in perleidids it was longer, usually entering the parietal. Flank scales are typically thin, narrow and high to very high all along the body in peltopleurids, but only anteriorly in *Peripeltopleurus* (Bürgin, 1992). Perleidids have thicker, subrectangular to rhombic scales and those on the flank can be somewhat higher than long in the trunk region, but are significantly higher in *Peltoperleidus* and *Luganoia* (Bürgin, 1992) and very thin in *Gabanellia* gen.n. The body-lobe of the tail is very characteristic, showing in both groups a number of epaxial rays. The presence of several epaxial rays is not common in fishes, but it is observed in all the perleidids and peltopleurids (Bürgin, 1992; Gardiner, 1988; Gardiner & Schaeffer, 1989; Tintori, 1990b; Tintori & Sassi, 1992). The large number of these rays is considered as a synapomorphic character for Perleidiformes (Gardiner, 1988), and, in our opinion, also for Peltopleuriformes. Most genera, both of perleidids and peltopleurids, show about six epaxials, the Cleithrolepididae (*sensu* Tintori,



### PLATE 1

Fig. A - *Gabanellia agilis* gen.n. sp.n. The holotype (MPUM 7751), a male specimen, from Zogno2 site (Zogno, Bergamo, Italy). Scale bar: 50 mm.

Fig. B - *Gabanellia agilis* gen.n. sp.n. Restoration of female specimen in lateral view.

1990b) have 10 epaxials (Gardiner, 1988) and *Gabanellia* gen. n. shows 12 epaxials.

Other features seem to characterize only a single group; for instance, a few species of different peltopleurid genera, e.g., *Peltopleurus*, *Nannolepis*, *Peripeltopleurus* (Bürgin, 1990, 1992; pers. obs.), have anal fins modified as gonopodial structures. *Gabanellia* gen.n. shows a similar dimorphic anal fin.

On the other hand, *Gabanellia* gen.n. also has characters unknown both in perleidids and peltopleurids, such as the opercular much larger than the subopercular or the absence of fringing fulcra on the paired fins. Both are considered as derived characters, because the small subopercular shows an antero-dorsal process similar to that of semionotids and other neopterygians and the fringing-fulcra have been lost, their function being taken by the ornamentation on the anterior spine and on the first lepidotrichium.

All the above cited features are randomly scattered in the perleidid and peltopleurid genera, so that a clear division between the two orders is not easy to make; this renders the attribution of the new genus to Perleidiformes only provisional. A full revision of the relationships of the Old World 'subholosteans' (*sensu* Schaeffer, 1973), to permit a more confident attribution, is under way on the base of the rich, mainly Middle Triassic, material from North Italy. In fact, this group blossomed during the Middle Triassic, the richest fauna being that yielded by the Formazione di Besano (Grenzbitumenzone of Swiss authors; Brough, 1939; Bürgin, 1992), and then had a few representatives up to the Norian, the last species being those found in the Zorzino Limestone.

Family *Gabanellidae* fam. n.

Bürgin (1992), making a revision of the lower actinopterygians of the Formazione di Besano from Monte San Giorgio (Canton Tessin, Switzerland) acknowledged four perleidid families, Platysiagidae, Perleididae, Cleithrolepididae and Luganoiidae. *Gabanellia* cannot be ascribed to Platysiagidae because of the presence of epaxial rays, absent in that family. Also Cleithrolepididae and Luganoiidae can be ruled out because of the deep body characterizing the former and the free maxilla of the latter family.

Some of the features of *Gabanellia* gen.n. do not fit the Perleididae either. First of all bones and scales are very thin and tend to fuse to each other in the cheek and operculum; the number of transverse scale-rows is very high, more than double the highest number observed in Perleididae. The epaxial rays, 12 in *Gabanellia*, are almost double the usual number in perleidid genera (six-eight). A dimorphic anal fin is described for the first time in a perleidid and size is unusually big; apart

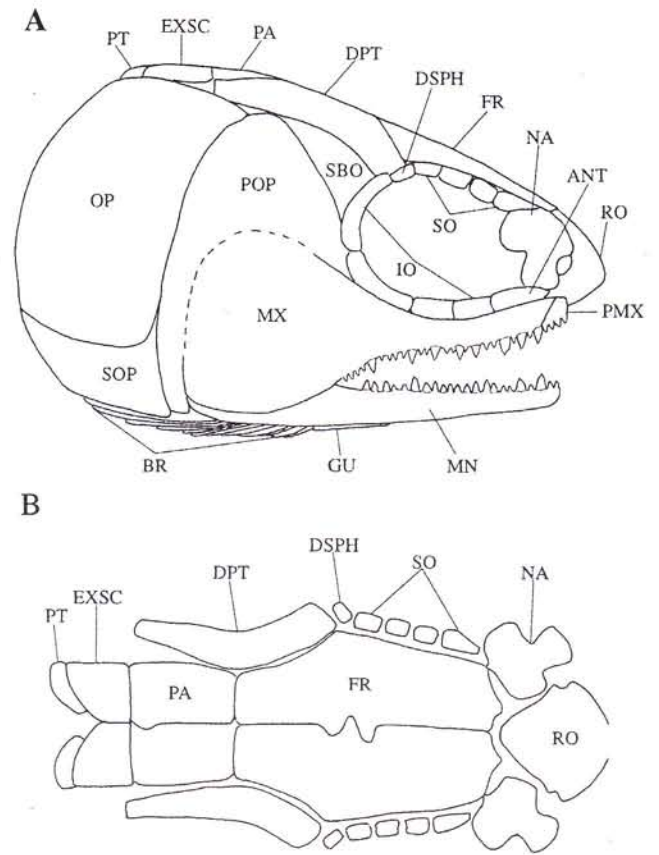


Fig. 1 - *Gabanellia agilis* gen.n. sp.n. A) Restoration of the skull in lateral view. B) Restoration of the skull in dorsal view. Note that bones have been opened on the same plane.

from *Colobodius*, Perleididae are rather small fishes. Other features of *Gabanellia* can be simply related to its mode of life and its diet: the slender body with a large, symmetrical tail and the predatory dentition with sharp, conical teeth. On the basis of these remarks, we feel confident in erecting a new family for *Gabanellia*.

Diagnosis. As for only known species.

**Gabanellia** gen. n.

Diagnosis. As for only known species.

Etymology. From Rev. Don Giulio Gabanelli, parish-priest in Zogno, for his continuous support in the exploitation of the Zogno fossiliferous sites.

**Gabanellia agilis** gen. n. sp. n.

Pl. 1, fig. A, B

Diagnosis. Large perleidid with slender body and deeply forked, almost symmetrical tail. Preopercular large and not totally upright. Opercular more than twice the subopercular. Dentition made of powerful conical teeth of different sizes. Scales thin and arranged in about 95 rows. Flank scales of the trunk region higher than long. Pectoral and pelvic fins with proximal segment of each lepidotrichium very long, embracing each other. Anterior spine and first lepidotrichium in pectoral and pelvic fins ornamented with short, fulcra-like ridges. Caudal fin made of about 50 lepidotrichia, 12 of which are

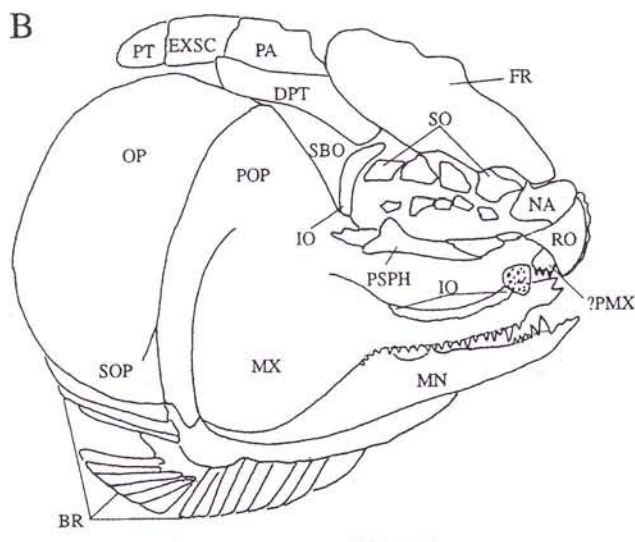


Fig. 2 - *Gabanellia agilis* gen.n. sp.n. A) Head of the holotype. B) Camera-lucida drawing of the same. Scale bar: 10 mm.

epaxial. Posterior margin of all scales minutely serrated; ornamentation present only in the ventral region. Dimorphic anal fin: the modified one presumably acting as a gonopodium.

**Etymology.** From the latin word *agilis*, which means nimble.

**Holotype.** Specimen MPUM 7751 from P12 bed of Zogno2 site.

**Paratypes.** Specimen MPUM 7755 from P8 bed, MPUM 7754, 7757, 7760 from P10 bed and MPUM 7752 from P12 bed, all Zogno2 site; MPUM 7753, 7756, 7758, 7759 from Zogno-Endenna site.

**Age and geographical distribution.** Calcare di Zorzino (Zorzino Limestone): Middle-Late Norian (Late Triassic). So far known only in the Bergamo Prealps.

**Repository.** Museo Paleontologia Università degli Studi di Milano (MPUM), Milano, Italy.

## Description.

The rostral (Fig. 1A,B; 2A,B; 3; 4) is broad and rounded, making the snout convex (MPUM 7752). The ethmoidal commissure ran close to the anterior edge: only a few minute pores are visible in MPUM 7751 and 7759.

The nasal (Fig. 1A,B; 2A,B; 3; 4) is T-shaped, in contact for a short distance with the frontal where the supraorbital sensory canal entered it. The canal itself makes a sharp bend, posteriorly directed, before ending between the two nares (MPUM 7759).

The frontal (Fig. 1A,B; 2A,B; 4) is broad in the orbital region and becomes narrower in the posterior part, where it is flanked by the dermopterotic. The median margin is straight, apart from a couple of indentations in the posterior half (MPUM 7758). The orbit embayment is very slight and the anterior margin is wavy. The sensory canal entered the frontal at the antero-lateral corner and went back to the middle of the bone, where it apparently ended (MPUM 7751, 7753, 7754 and 7758).

The parietal (Fig. 1A,B; 2A,B; 4) is small and squarish (MPUM 7751, 7754, 7758); the interparietal suture shows one or two indentations. Neither sensory pore nor pit line position is known, so that it seems that the supraorbital sensory canal did not enter the parietal.

The dermopterotic (Fig. 1A,B; 2A,B; 4) is elongated and crescentic in shape. Its medial edge contacts the frontal and, for a shorter distance, the parietal too. The sensory canal runs parallel and close to the medial margin (MPUM 7751, 7753, 7754, 7758).

The extrascapulars (Fig. 1A,B; 2A,B; 4) are shorter than the parietals, with a gently rounded posterior edge (MPUM 7751 and 7758). This region is poorly preserved in all specimens, so it is far impossible to state whether there is one extrascapular or two on each side. No pore has been detected.

The posttemporal (Fig. 1A,B; 2A,B; 4) is a small crescentic bone, usually displaced above the extrascapular (MPUM 7751 and 7758).

A narrow anteriorly pointed antorbital (Fig. 1A; 4) reached the anteriormost part of the rostral (MPUM 7751, 7752, 7758 and 7759). The infraorbital series (Fig. 1A; 2B; 4) is then made of two or perhaps three squarish elements that are followed by two elongate bones framing the postero-ventral and the posterior edge of the orbital opening (MPUM 7759). Pores are minute as usual and are visible on the antorbital and on the two posteriormost bones (MPUM 7751, 7758 and 7759). The exact shape of the dermosphenotic is not known, but it should be a small squarish bone, dorsal to the last infraorbital (MPUM 7758). The latter can not be consi-

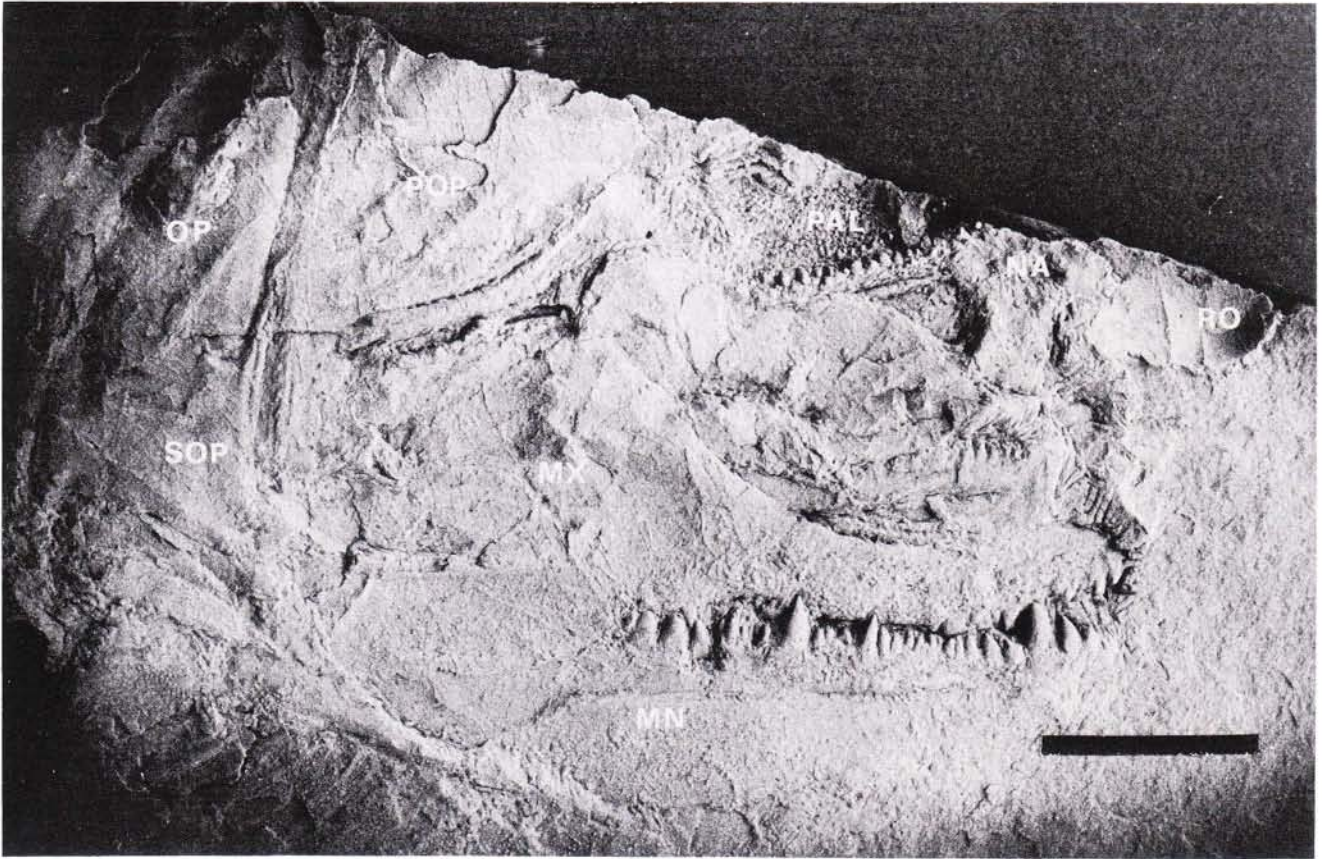


Fig. 3 - *Gabanellia agilis* gen. n. sp. n. Head of the specimen MPUM 7755. Specimen was whitened with ammonium chlorite. Scale bar: 10 mm.

dered as dermosphenotic because the dorsal exit of the sensory canal points clearly forward and not toward the dermopterotic. The circumorbital ring is completed by three or four supraorbitals (MPUM 7751, 7753 and 7758) (Fig. 1A, B; 2A, B; 4). The anteriormost one ends against the postero-lateral edge of the nasal and it is the most elongated. Posterior to the last infraorbital, lying along the anterior margin of the preopercular, there is a triangular suborbital (Fig. 1A; 2A,B); (MPUM 7751, 7753 and 7759).

The upper jaw (Fig. 1A; 2A,B; 3; 4; 5A) is made of a powerful maxilla and a very small premaxilla. The number of teeth borne by the premaxilla is unknown, but the few detected are as large as the biggest borne by the maxilla. This latter has a narrow anterior region which is gently bent. The posterior part is very much expanded, both dorsally and ventrally. The exact shape of the dorsal area is unknown: the boundary between the posterior edge of the maxillary and the anterior one of the preopercular is always questionable and the antero-dorsal outline, the only part always clear, varies from low to relatively high. The oral margin is wavy and teeth are present only in the anterior half, being absent on the convex posteriormost part. The upper jaw dentition is well preserved in three specimens (MPUM 7754,

7756 and 7758): about 10 large teeth are between groups of smaller ones. Distribution and length of the large teeth is uneven: the biggest teeth are anteriorly placed and there are only one or two small teeth in between. Posteriorly, the two groups have more comparable sizes, the large teeth being separated by three to five smaller teeth. All the teeth are conical, with a well developed acrodine tip, and show a radial striation.

Most of the palate was also dentigerous: though it is not possible to identify the single bones, the palatal surface appears completely covered by small pointed teeth (MPUM 7755, 7756 and 7758). Two rows of much longer teeth are borne by each endopterygoid and dermopalatine close to the boundary with the parasphenoid (Fig. 3; 4).

The preopercular (Fig. 1A; 2A,B; 3; 4) is a large plate of typical perleidid shape. The sensory canal runs along the posterior margin, which is nearly vertical in its ventral part; pores irregularly placed on the ventral region are arranged in a line in its uppermost part, where an independent bone, the dermohyal, can be present in some other perleidid genera (e.g., *Perleidus altolepis*). The antero-dorsal edge is never clearly observed and, in a few cases, it seems that a partial fusion between preopercular and maxilla took place.

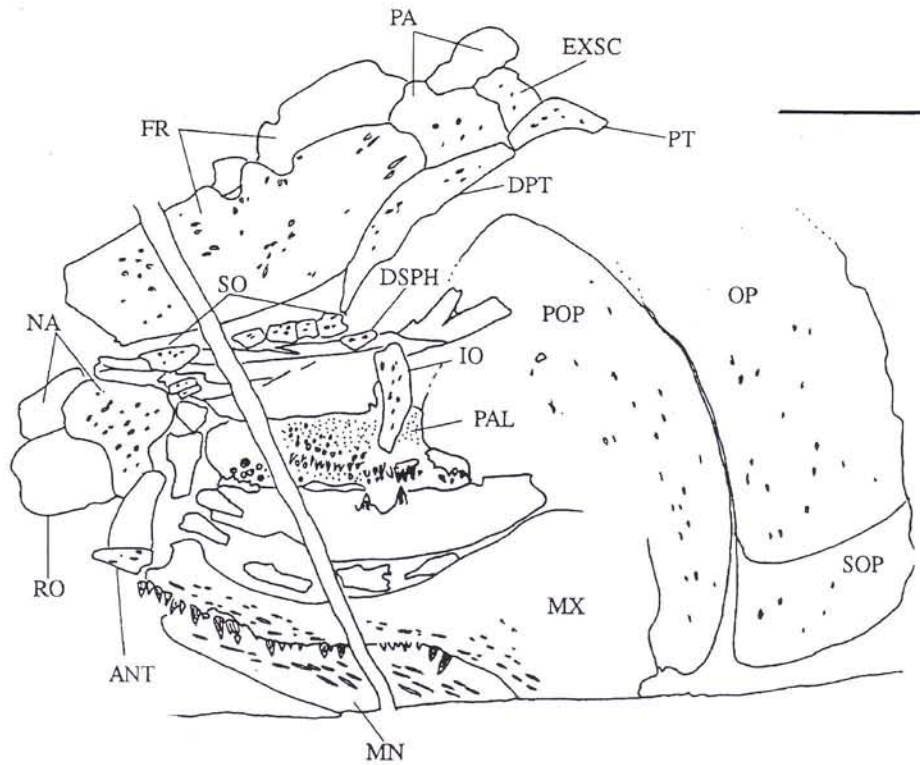


Fig. 4 - *Gabanellia agilis* gen.n. sp.n. Camera-lucida drawing of the head of specimen MPUM 7758. Scale bar: 10 mm.

The opercular (Fig. 1A; 2A, B; 3, 4) is much larger than the subopercular. A small antero-dorsal process of the subopercular gives the position of the boundary between the two bones, while the suture itself is seldomly detectable owing to bad preservation (MPUM 7753, 7757 and 7758).

Branchiostegal rays (Fig. 1A; 2A, B) are numerous: up to 16 were counted (MPUM 7751, 7752, 7753, 7754 and 7755). A lanceolate gular is present between the anterior halves of the lower jaws (MPUM 7752).

The lower jaw (Fig. 1A; 2A, B; 3; 4; 5B) is elongated and has a straight oral margin bearing teeth, except for the posteriormost part where a small coronoid process is present. The mandible has a narrow lateral region, while the ventral part is much more expanded. Together with the wideness of the skull roof, this character of the lower jaw suggests that the head was very large. The dentary stretches a long, narrow ramus ventrally to the angular, but it does not reach the hind edge of the jaw. Teeth are similar in shape to those borne by the maxilla: size is also similar for the large teeth, while the small ones are somewhat smaller. The large teeth are grouped on both the anterior and posterior end of the dentary: the anterior group is made of one to three elements and is separated from the posterior one by a palisade of small teeth (11 to 20). The posterior group is more variable because the large teeth can be either contiguous or separated by different numbers of small ones. Apart from the middle series of small teeth, the dentition is again very irregular (MPUM 7751, 7752, 7755

and 7759). The sensory canal started high on the dentary, soon passing onto the ventral region; pores are regularly arranged (MPUM 7753, 7759 and 7755). The posteriormost part of the mandibular sensory canal ran free, because it did not enter the angular.

Ornamentation is usually present, consisting of small, round tubercles of ganoine; they are much denser on the frontals, nasals and rostral. The anterior region of both the upper and lower jaws shows also elongated tubercles and short, longitudinal ridges. Cheek and opercular bones have the lightest ornamentation.

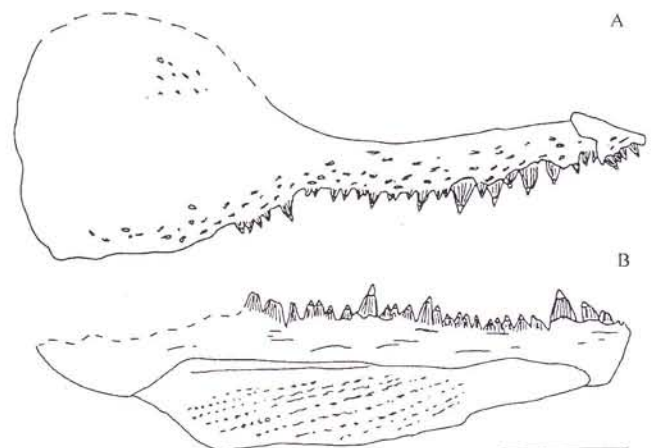


Fig. 5 - *Gabanellia agilis* gen.n. sp.n. A) Maxilla of specimen MPUM 7754. B) Lower jaw of specimen MPUM 7755. Scale bar: 10 mm.

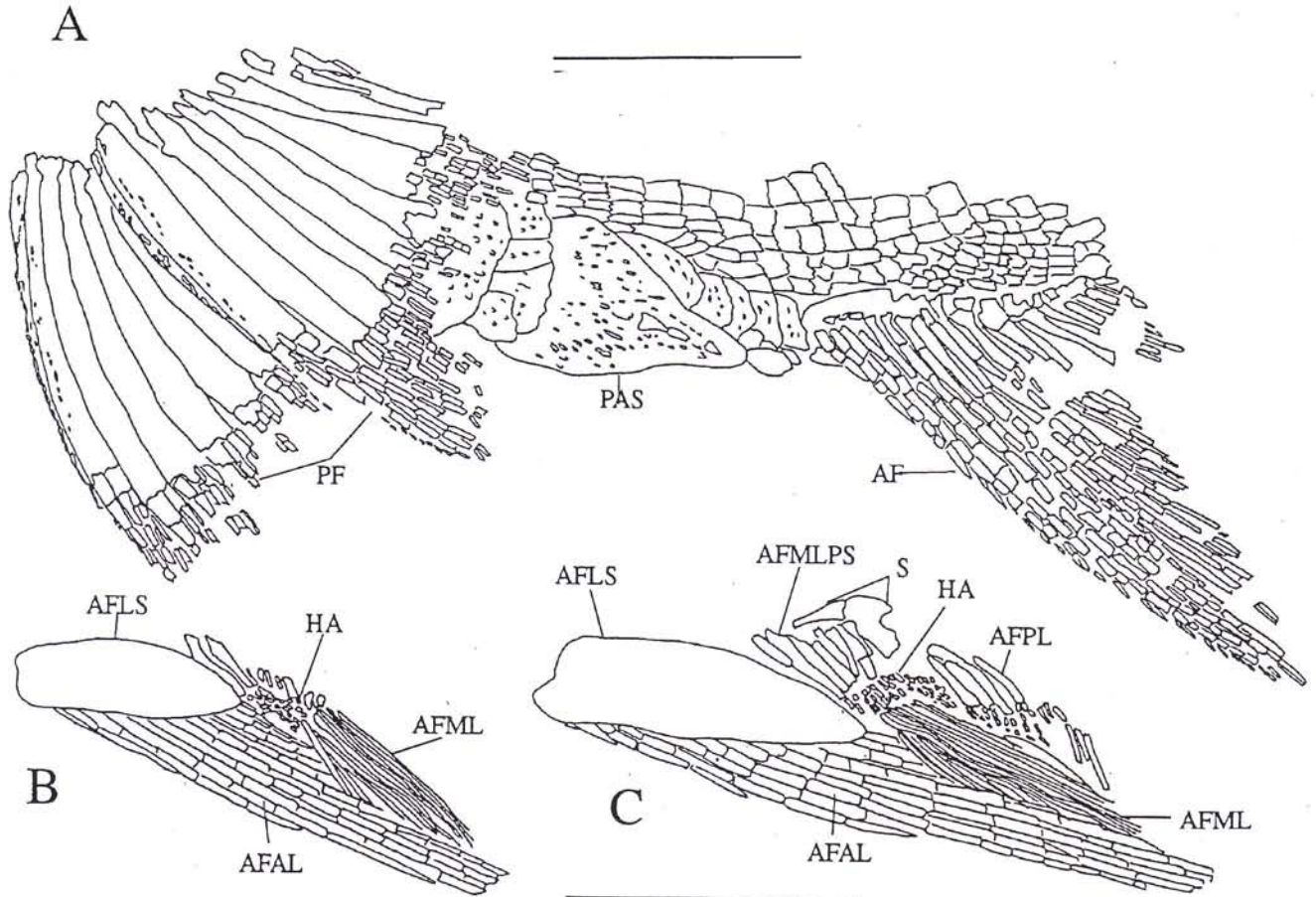


Fig. 6 - *Gabanellia agilis* gen.n. sp.n. A) Anal region of specimen MPUM 7753, a female. B) The modified anal fin of specimen MPUM 7756, a male. C) The modified anal fin of the holotype MPUM 7751. The fin has been laterally reversed for a better comparison with the other two. Scale bars: 10 mm.

The pectoral fins are large (Pl. 1, figs. A, B; Figs. 2A; 7), though incompletely preserved in all the specimens: each one consists of about 14 flat and broad lepidotrichia, each with a very long, stout proximal segment and much shorter distal ones. The first ray is a spine with a large base: it is ornamented on its sides with small ganoine patches, resembling a fringing-fulcra sequence. The first lepidotrichia show a wide imbrication of their proximal segments. Lepidotrichia branch at least twice in a short space, giving rise to uneven branches which remain contiguous. The fin must have been triangular and stiff, making a rather rigid unit.

The pelvic fins (Pl. 1, fig. A, B; Fig. 6A; 7) are smaller than the pectorals and each consist of only nine lepidotrichia; they have the same structure as the pectorals. There is a slender, ornamented spine in front of the lepidotrichia.

The median fins are triangular and relatively small. The dorsal fin is made of 23 segmented lepidotrichia (Pl. 1, fig. A, B), the longest being the eighth one (MPUM 7753 and 7754). The anal is made of at least 18 lepidotrichia (Fig. 6A); (MPUM 7753). These lepidotri-

chia are rounded in transversal section and are wholly segmented; the length of the segments is variable in each specimen. Three specimens show a modified anal fin (Fig. 6B,C); (MPUM 7751, 7754 and 7756). Anteriorly there are about ten lepidotrichia: their proximal elements are covered by an enlarged, lanceolate scale. Each ray is segmented and bifurcates only in its most distal region. The central part of the fin consists of a number of rays with a stout proximal segment, a granulated area ('hinge area' of Bürgin, 1990) and slender and unsegmented distal branches forming a longitudinally stiff structure; they seem to overlap the distal end of the unmodified lepidotrichia. The third part of the fin is made of another series of rays composed of stout proximal elements and smaller distal ones whose segments are always scattered.

The caudal fin is forked and almost symmetrical and is made of about 50 lepidotrichia (Fig. 8A, B); (MPUM 7751, 7752, 7753, 7757 and 7758). There are 27-29 principal rays that are segmented and branched, 9-10 dorsal and about 12 ventral procurrent rays. At least 12 lepidotrichia are dorsal to the short axial body-lobe and

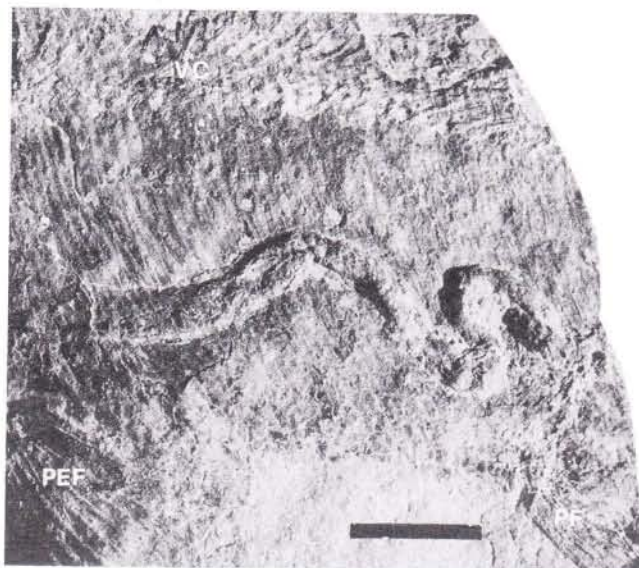


Fig. 7 - *Gabanellia agilis* gen. sp.n. The gut between the pectoral (to the left) and the pelvic fins, as preserved in specimen MPUM 7756. Note neural arches and supradorsals along the upper edge of the picture. All elements are covered by the thin scales. Scale bar: 10 mm.

are thus considered as epaxials. The edges of both the dorsal and ventral lobe bear a series of small fringing fulcra.

The squamation consists of 95 transverse scale rows (MPUM 7751, 7752, 7753 and 7754). The scales are very thin on the flanks, where they are much deeper than broad. The depth of these scales decreases gradually backwards, becoming rhomboidal in the caudal region, from about the 50th transverse scale-row. In the trunk region the depth of the scales decreases both dorsally and ventrally. All the scales have delicately serrated posterior margins. The ornamentation seems to be present only on the scales of the ventral region and consists of delicate, longitudinal ridges and minute granulations. In the belly region, between the pectoral and the pelvic fins there is a patch of very small scales, abruptly differentiated from the flank ones (Pl. 1, fig. A; MPUM 7752, 7753 and 7754). A large, median, lanceolate scale, followed by a couple of smaller ones, is placed in front of the anal fin, marking the anus position (Fig. 6A; MPUM 7753 and 7755). These scales are ornamented by ganoine tubercles and are missing in the specimens showing the modified anal fin (see above).

A couple of specimens show traces of the gut (Fig. 7; MPUM 7753 and 7756): this is a wavy tube starting just behind the cleithrum, with closer folding near the anal opening. The gut is three-dimensionally preserved but, partly due to the scale covering, no food remains are identifiable. Composition of the gut is very similar to that of most coprolites that are commonly found in the vertebrate level yielding *Gabanellia* gen. n.: they are made of homogeneous calcium phosphate.

#### Mode of life.

*Gabanellia* gen.n. is a middle-size fish in the Zorzino Limestone fauna. Its body-shape, slender and fusiform, together with the thin scale covering and the large, symmetrical tail, indicates that the fish was a very good swimmer. Following Braun & Reif (1985), we can confidently ascribe *Gabanellia* gen.n. swimming to the Axial suboscillatory mode or, after Webb (1984), to Body/caudal fin (BCF) periodic propulsion. Thus, *Gabanellia* gen.n. was probably able to keep a high speed for rather long distances, running after small fishes in open waters, though it was not of strictly thunniform design.

Dentition, made of conical, radially striated, uneven teeth, clearly indicates *Gabanellia* gen.n. as a predator: alternating large and small teeth with the same shape on both upper and lower jaw and on palatal bones testifies to the capability to catch and firmly hold preys. The short gut is also related to a carnivorous diet (Bertin, 1957). Though the gut tube is preserved, it's difficult to determine the correct shape of the digestive tract: the gut does not show any anterior enlargement but no decision can be made whether or not a stomach exists. There are many species, belonging to different systematic groups, in which the stomach is missing: most of them possess an effective dentition to crush their preys so that they are prepared for the chemical digestion (Bertin, 1957). Possibly, the tooth batteries of *Gabanellia* gen.n. could tear apart bits of the prey itself which was not swallowed entire. Nevertheless, only the arrangement of prey remains in the body cavity can prove the presence of the stomach as for a few Mesozoic predators where it is possible to observe preyed fishes, mostly still identifiable, piled up in front of the pelvic fins (Viohl, 1992; Maisey, 1994; A.T., pers. obs.). In all those cases the fishes were swallowed entire and occupied a large area, so that they must have lain in a wide cavity.

We must point out that neither in the Zorzino Limestone ichthyofauna, nor in the other Triassic ones, there are very large 'locomotor specialists' comparable to the modern *Thunnus* or *Coryphaena*; these fishes chase widely dispersed food in open waters (Webb, 1984). This fact may be explained by different causes, of paleo-environmental, competitive, or phylogenetic nature. The Zorzino Limestone basins were far from the open sea, being connected to it only through very long (dozens of kilometers) tidal-canals or thin water-layers on the huge carbonate platform of the Dolomia Principale. Large pelagic swimmers could have been prevented to reach such a confined environment. However, though almost all the other marine Triassic fauna belong to near-shore environments they often yield ichthyosaurs, but not large pelagic fishes.



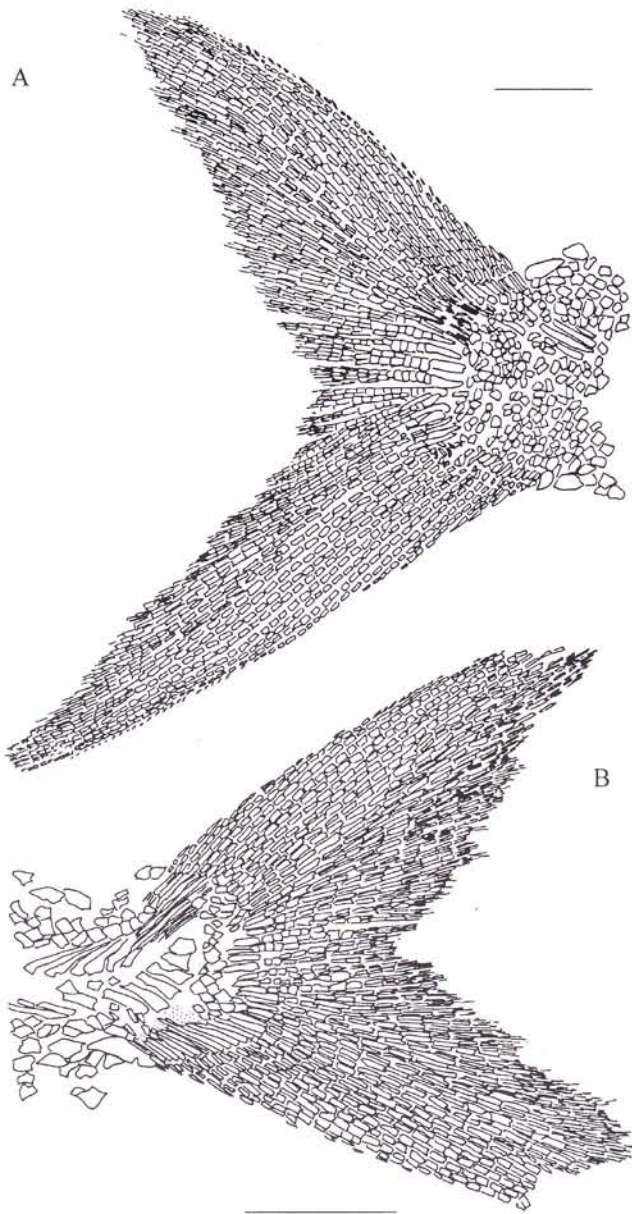


Fig. 8 - *Gabanellia agilis* gen.n. sp.n. Camera-lucida drawing of the tail. A) Specimen MPUM 7752. B) Specimen MPUM 7757. Scale bars: 10 mm.

Competition in open water could be important, as ichthyosaurids and, perhaps, nothosaurids were very common during Middle and Late Triassic, most of them being about 1 m long. Possibly, they were the apex off-shore predators in the Triassic seas.

On the other hand, as already pointed out by Webb (1982) the first large, steady swimmers adapted for search and chase in a pelagic environment are the Jurassic *Caturus*, *Hypocormus* and *Pachycormus*, all neopterygian fishes. Thus, *Gabanellia* gen.n. may have reached the maximum specialization as open-water predator consistent with paleopterygian anatomy. We consider *Gabanellia* gen.n. a fast pelagic chaser of small fishes, such as pholidophorids. As it caught a prey it was able to cut it

by the teeth and swallow small fragments. *Gabanellia* gen. n. was then very different in behaviour from the other Norian large apex predators such as *Saurichthys*, an ambush predator, or *Birgeria*, probably a slower chaser acting close to the bottom. Both these latter genera swallowed their prey whole and usually more than one at the time, as seen in Norian *Saurichthys* (A.T. pers.obs.) and Early Triassic *Birgeria nielsenii* (Beltan, 1980; Bürgin, 1990).

If most of its life was spent off-shore, during the spawning period *Gabanellia* gen.n. probably came in-shore.

Its dimorphic anal fin, in fact, implies a peculiar spawning behaviour that usually takes place in shallow waters (Rosen & Gordon, 1953) or in 'fast moving waters' (Wiley & Collette, 1970). In the basins of the Zorzino Limestone, this kind of environment could not exist except around the edges, where the bottom was oxic and tidal currents were strong (Tintori, 1995b). The other Triassic fishes which show sexual dimorphism (Bürgin, 1990, 1992; pers.obs.) are probably as well shallow water dwellers. They have been found in the Besano-Monte San Giorgio fauna and in the Prosanto Formation (Bürgin, 1990, 1992) as well as in the Ca' del Frate fauna (C.L., pers.obs.). Most of them belong to the 'subholosteans' and lived in the Middle Triassic shallow basins along the Western edge of the Tethys. *Gabanellia* gen.n. is also a 'subholostean' and represents the youngest genus so far described in that group.

*Abbreviations.*

AF, anal fin; AFAL, anal fin anterior lepidotrichia; AFLS, anal fin lateral scute; AFML, anal fin modified lepidotrichia; AFMLPS, anal fin modified lepidotrichia proximal segments; AFPL, anal fin posterior lepidotrichia; ANT, antorbital; BR, branchiostegal rays; DPT, dermopterotic; DSPH, dermosphenotic; EXSC, extrascapular; FR, frontals; GU, gular; HA, hinge area; IO, infraorbital bones; MN, lower jaw; MX, maxilla; NA, nasal; OP, opercular; PA, parietal; PAL, palatal bones; PAS, pre-anal scute; PEF, pectoral fins; PF, pelvic fins; PMX, premaxilla; POP, preopercular; PSPH, parasphenoid; PT, posttemporal; RO, rostral; S, scales; SBO, suborbital; SO, supraorbital bones; SOP, subopercular; VC vertebral column.

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