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## The larvae of *Potamophylax inermis* MORETTI & CIANFICCONI, 1994 and *Potamophylax gambaricus spinulifer* MORETTI, 1994

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**Abstract.** The larvae of *Potamophylax inermis* and *Potamophylax gambaricus spinulifer* are illustrated and compared.

The revision of the European species belonging to the *Potamophylax cingulatus* group (MORETTI et al., 1994) includes two species and one subspecies endemic to the Italian fauna: *P. gambaricus* MALICKY, 1971 in the southern Apennines and Sicily; *P. inermis* MORETTI & CIANFICCONI, 1994 in the central Apennines; *P. gambaricus spinulifer* MORETTI, 1994 in the north central Apennines (CIANFICCONI, 2002) (Fig. 1).

Aquatic stages of these taxa have not been described yet. In this paper the larvae of *P. inermis* and *P. gambaricus spinulifer* are considered, following the description of *P. cingulatus* larva by HICKIN (1967).

Photographs of the larval cases, drawings of the 5<sup>th</sup> instar larvae and their silk glands and micrographs of the silk weave are presented.

### Material examined

The larvae of the two taxa were collected in several sampling stations in association with adult specimens. Those illustrated here come from running water in Central Italy (Umbria). *P. inermis* from the River Nera (Triponzo, PG, 405 m a.s.l.; MORETTI et al., 1997) and *P. gambaricus spinulifer* from the Carpina stream, a tributary of the River Tiber (PG, 700 m a.s.l., leg. Radicchi).

These biotopes are characterized by clear water, a pebble substrate and a covering of beech leaves. Chemo-physical characteristics are within tolerance limits for these larvae (T 7 to 9 °C; O<sub>2</sub> 85 to 100 %), total hardness 20 to 40 Fr. dgr., pH 7 to 7.8; organic matter 2 to 3 mg/l).



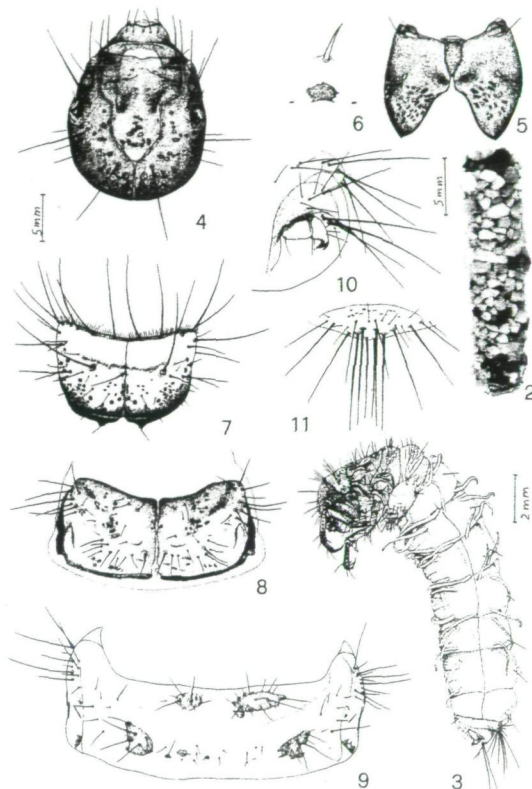
Fig. 1. Distribution map of *Potamophylax inermis* (□) and *P. gambaricus spinulifer* (●) in the Italian Peninsula up to 2003.

### Larval case and silk weave

*P. inermis*: The larval case is built from small sand grains, sometimes with leaf fragments. The posterior end is rounded and partially closed. It is 20 mm long and 4 mm in diameter (Fig. 2).

*P. gambaricus spinulifer*: In winter the larval case, 20-30 mm long, is flat and wide, made of overlapping fragments of dead beech leaves (Fig. 12 a). In spring the case is initially a combination of leaves and sand grains and is slightly curved (Fig. 12 b) and then only sand grains and is cylindrical, 19-22 mm in length and 4-5 mm in diameter (Fig. 12 c).

The silk glands in both larvae are long and extremely convoluted (Fig. 27). A dense silk weave holds the sand grains together. By removing the grains from the case (Fig. 28) it is possible to see the loose silk threads forming a web (Figs. 29 b, 31) with reinforcements that appear as a raised dense frame (Fig. 29 a) around each grain (Fig. 30).



Figs. 2-11. *Potamophylax inermis*: 2, larval case; 3, larva (5<sup>th</sup> instar) laterally, showing single tracheal gills; 4, head, dorsal; 5, head, ventral; 6, prosternite and prosternal horn; 7, pronotum; 8, mesonotum; 9, metanotum; 10, anal claw and lateral sclerite; 11, dorsal sclerite segment IX.

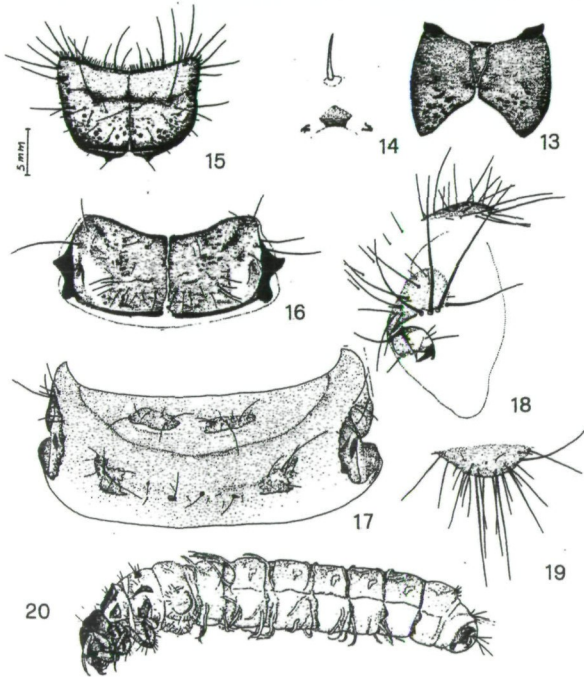
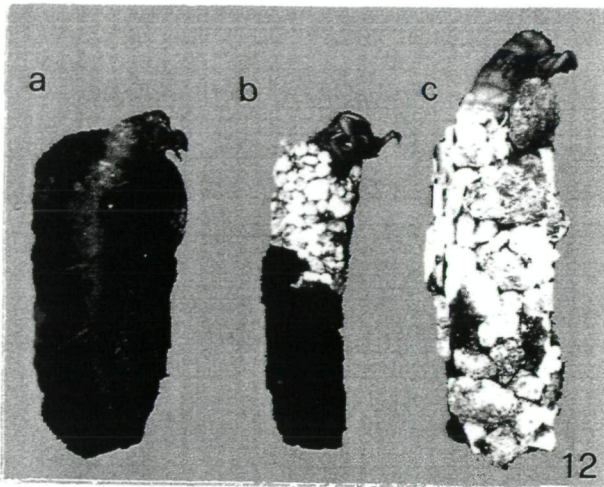
### Larva

The larva of *P. gambaricus spinulifer* (20 mm long) (Fig. 20) is bigger and darker than that of *P. inermis* (18 mm long) (Fig. 3).

The dark spots on the dorsum of the head are similar in both larvae (Fig. 4). In *P. gambaricus spinulifer* the colour of the head is much darker and the ventral apotome is slightly longer (Fig. 13) than in *P. inermis* (Fig. 5). The two small black lateral sclerites of the prosternum in *P. gambaricus spinulifer* are larger (Fig. 14) than in *P. inermis* (Fig. 6). The border line between anterior and posterior parts of the pronotum is more marked and darker in *P. gambaricus spinulifer* (Fig. 15) than in *P. inermis* (Fig. 7) and the anterior margin has shorter setae. The pigmented area of the mesonotum is more extensive in *P. gambaricus spinulifer* (Fig. 16) than in *P. inermis* (Fig. 8) and the lateral sclerite of the metanotum is more evident and marked by an elongated black spot (Fig. 17). The anal claw is longer in *P. gambaricus spinulifer* (Fig. 18) than in *P. inermis* (Fig. 10) and the setae of the lateral sclerite are more numerous.

The dorsal sclerite of segment IX is less rounded in *P. inermis* (Fig. 11) than in *P. gambaricus spinulifer* (Fig. 19) and has a row of dots

on the anterior margin. The longitudinal rows of dark brown dots on the thoracic leg segments are more evident in *P. inermis* (Figs. 21, 22, 23) than in *P. gambaricus spinulifer* (Figs. 24, 25, 26) and the tarsal claw is longer.



Figs 12- 20. *Potamophylax gambaricus spinulifer*: 12, larval cases: a) winter case; b) spring case with leaf fragments; c) spring case made only of sand grains. 13, head, ventral. 14, prosternite and prosternal horn; 15, pronotum; 16, mesonotum; 17, metanotum; 18, anal claw and lateral sclerite; 19, dorsal sclerite segment IX; 20, larva (5<sup>th</sup> instar) lateral view.

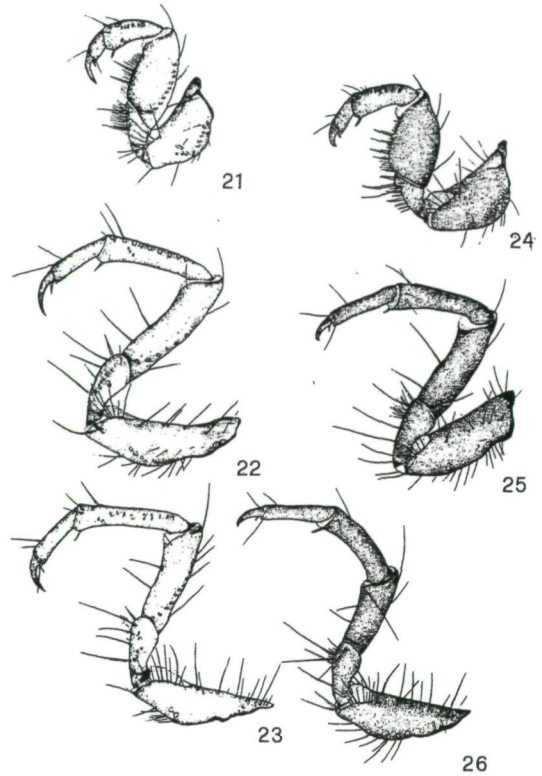
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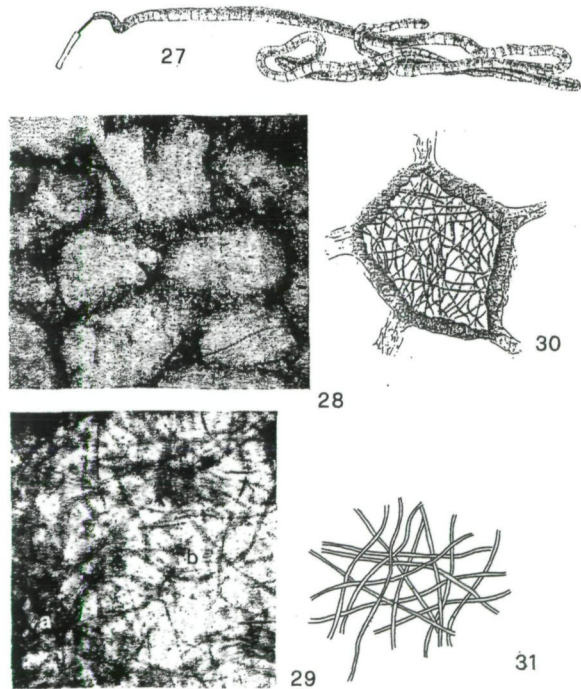
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Figs. 21-26. Left thoracic legs. *Potamophylax inermis*: 21, foreleg; 22, midleg; 23, hindleg. *P. gambaricus spinulifer*: 24, foreleg; 25, midleg; 26, hindleg.



Figs. 27-31. Silk weave. 27, right silk gland; 28, structure of silk threads after removal of sand grains from case; 29, SEM micrograph. a) part of raised frame with dense silk weave; b) loose irregular threads under sand grains; 30, drawing of frame and silk web (average size 154 μ long x 66 μ wide); 31, detail of silk web. (diameter of silk thread 1- 5 μ; meshes from 20 x 10,1 to 20 x 25.μ)

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