

## Description of the larva and the case construction of *Synagapetus anatolicus* Çakın, 1983 (Trichoptera, Glossosomatidae)

### Descripción de la larva y el comportamiento constructor de *Synagapetus anatolicus* Çakın, 1983 (Trichoptera, Glossosomatidae)

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#### Abstract

The previously unknown larva of *Synagapetus anatolicus* Çakın, 1983 is described and illustrated. The case construction of the larva is complicated due to the two floors of the case: upper floor is a solid U-shaped curved tube, where the larva sits. The pupal case has a construction totally different from the cases known in family Glossosomatidae.

**Keywords:** Caddisflies, *Synagapetus*, larva, case, case construction, taxonomy, Turkey.

#### Resumen

La larva de *Synagapetus anatolicus* Çakın 1983, inédita actualmente, es descrita e ilustrada por primera vez. La construcción del estuche larvario es complicada debido a la existencia de dos niveles: el nivel superior, en el que se aloja la larva, es un tubo sólido curvado en forma de U. El estuche pupal tiene una estructura completamente diferente de la de todos los estuches conocidos en la familia Glossosomatidae.

**Palabras clave:** Tricópteros, *Synagapetus*, larva, estuche, comportamiento constructor, taxonomía, Turquía.

#### INTRODUCTION

*Synagapetus anatolicus* Çakın, 1983 is an endemic species, described from Yedigöller National Park in Bolu province, northwestern Turkey (ÇAKIN, 1983). Later this species was discovered in many places in northern Turkey, and also found in southern Anatolia (SİPAHİLER, 2003, 2010, 2012). The unknown larva of *S. anatolicus* is described in the present paper, based on the material collected from the type locality.

The larvae of the family Glossosomatidae construct dome-shaped cases with a ventral plastron and the openings on the anterior and the posterior side of this floor. In the genus *Synagapetus* the larval case has a more complex structure and dif-

fers from the genus *Agapetus* by having a large fringe and two flaps on the ventral openings. In the larval case of *S. iridipennis* McLachlan, 1879 (BOHLE & FISCHER, 1983) the flaps and the fringe are found but the dome-shaped upper floor is the only retreat for the larva, i.e. the dome-shaped enclosure is not divided into two floors like the remarkable case of *S. anatolicus*. The 18 known species of the genus *Synagapetus* which occur in Europe have such cases. The affiliation of the figures of a curved tube-shaped case given by BOTOSANEANU (1955) for the larva of an unknown species named as “*Agapetin*”, and cited as *Agapetus* larval case by MALICKY (1973) is still unknown. In the present paper the larva and the construction of the larval and pupal case of

*S. anaticus* are described. It is also explained that the curved, tube-shaped case described by BOTOSANEANU (1955) is a last stage of the construction of the larval case before pupation and belongs to the genus *Synagapetus*. The construction of the larval case of *S. anaticus* containing a curved tube from the beginning of the first stage to the last stage of the larva could be homologous to the portable tubes for feeding in the Annulipalpia and Integripalpia and could offer a starting point for the evolution of both fixed and portable tubes in these suborders (WIGGINS, 2004).

## MATERIALS AND METHODS

Specimens were collected by hand. The material collected was preserved in 80% ethyl alcohol and deposited in the Insect Collection at Hacettepe University, Department of Biology Education. The figures were drawn using a Zeiss Stemi SV 6 microscope.

## DESCRIPTIONS

**Material examined:** Turkey, Bolu, Yedigöller National Park, 815 m, 40°56'N/ 31°44'E, 29.5.2009, 50 larvae, 95 pupae; same place and date, 557 m, 18 pupae; Zonguldak, Alaplı, Bölüklü, 1170 m, 12.7.2011, 2 larvae, 4 pupae; same place, 1185 m, 10 pupae, 3 prepupae; Karabük, Kapullu, Yenice, Başköy, 635 m, 14.7.2011, 6 males, 12 females, 14 larvae, 4 pupae; Karabük, Safranbolu, Mencilis, 690 m, 41°16'N/32°37'E, 13.7.2011, 19 pupae, 2 larvae; Konya, Beyşehir, Pınargözü, 13.6.2007, 37 larvae, 70 pupae, leg. and coll. Sipahiler.

### Larva

The length of the last-instar larva is 4.5-5 mm (n=10) (Fig. 7). The head, pronotum, the sclerites of meso- and metanotum, the legs and the abdominal sclerites are brown, the abdominal segments dorsally brown, ventrally yellowish.

**Head** (Figs. 1-3, 6). The head capsule is broadly oval, brown, with paler brown spots on the posterior and lateral sections; around the eyes paler brown; labrum is brown, with six setae on the anterior part; anterior and posterior edges weakly sclerotized and

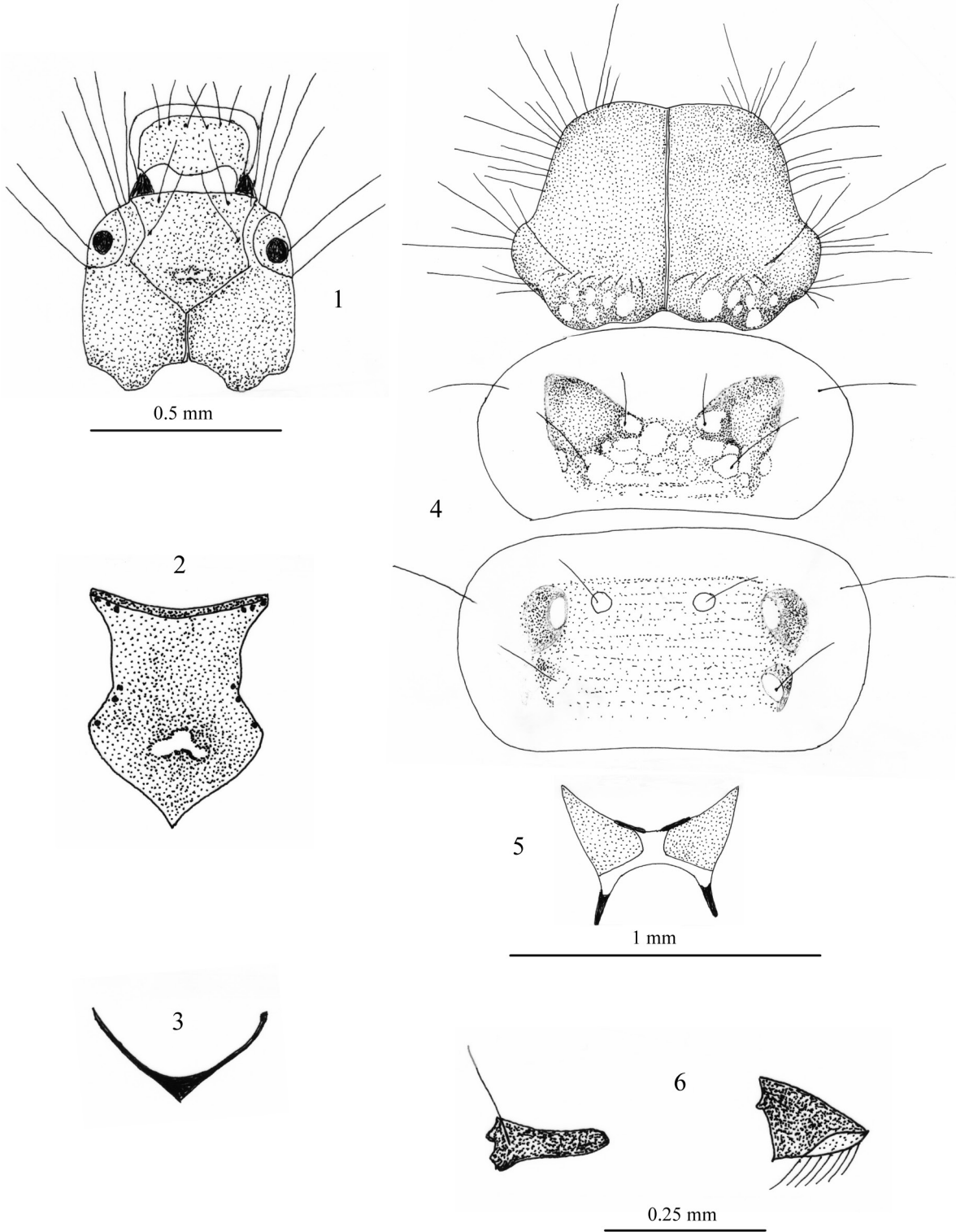
almost transparent (Fig. 1); laterally, the mandible (Fig. 6) is long and narrow, the apex rounded; in ventral view, the mandible is broadly triangular, the ventral edge with 7 pale setae; the submentum is moderately long in its posterior portion (Fig. 3); fronto-clypeal apotome is brown, with a pale patch located in the middle of the posterior part (Fig. 2).

**Thorax** (Figs. 4, 5): Pronotum is almost uniformly brown; only the posterior part with pale brown oval spots; sides of prosternite with triangular projections on the anterior edge; the posterior sclerites are narrow. Mesonotum is pale brown; the median part has two large, broadly triangular, brown sclerites directed laterally; the area between them has paler oval spots; there are two pairs of setae located at the bases of the triangular sclerites, on the anterior and the posterior portions. Metanotum is pale brown; there are two almost oval sclerites located on the sides on the anterior half; between them two pale spots with two setae are present; there are pale and rounded spots, located posterior of the lateral sclerites, each with one seta; the outer edges of these spots are sclerotized.

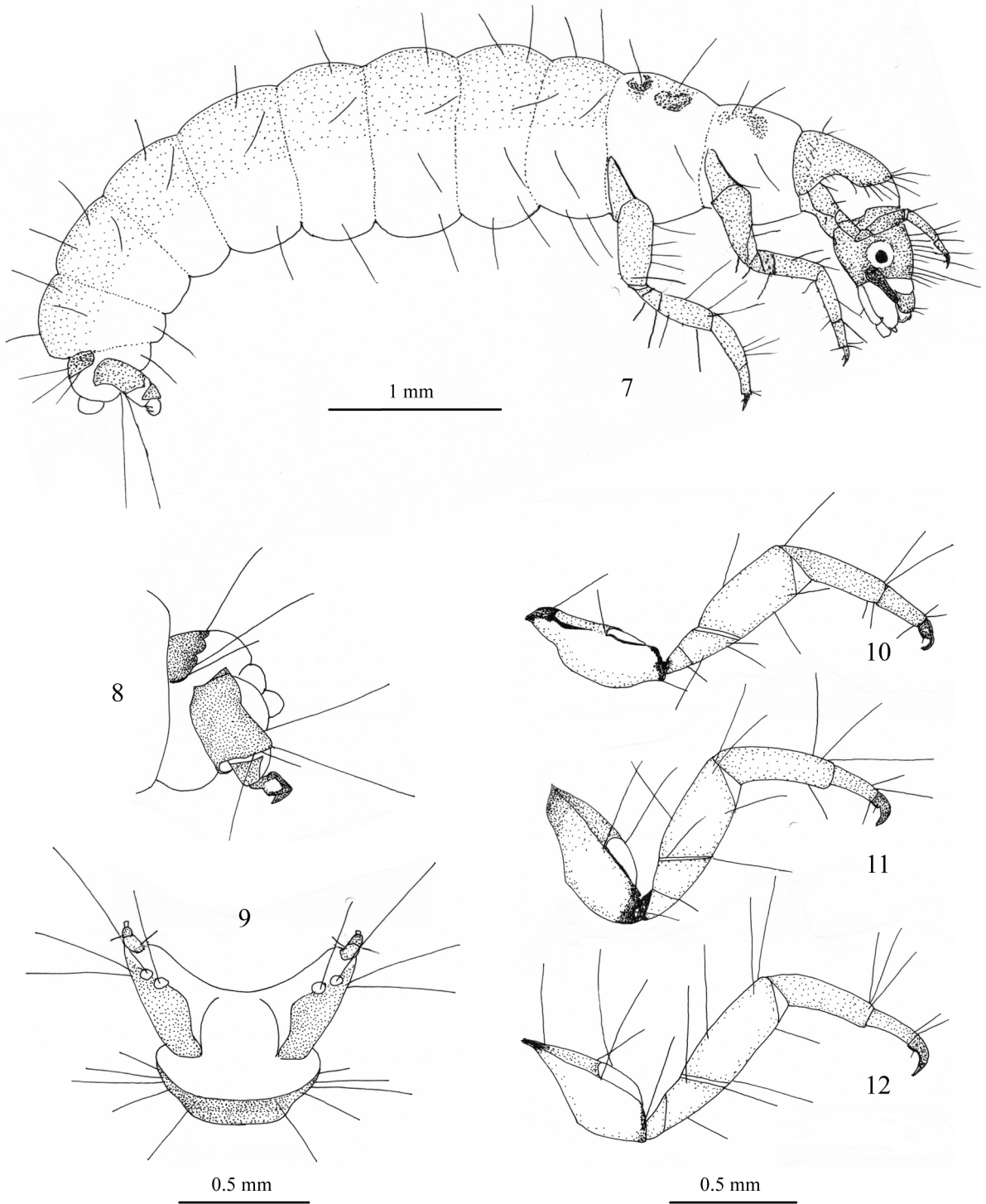
The legs (Figs. 10-12) are brown, tibia, tarsus and tarsal claw darker; all legs are almost equal in length.

**Abdomen** (Figs. 7-9): The abdominal segments are dorsally brownish, ventrally pale yellowish; 9th abdominal dorsal sclerite with 10 setae on the posterior edge, of which the two pair of setae located on each outer side are paler, shorter and thinner than the others. The ventral setae of the 6th and 7th segments are lacking; the lateral setae are present on the dorsolateral parts of abdominal segments 1-8 and on the ventrolateral parts of abdominal segments 1-3.

**Larval case** (Figs. 13-18): The first-instar larva begins to build the two-floor case, of which the dorsal length is 2 mm. There are larval cases 3 mm, 3.5 mm, 4 mm, 4.5 mm and 5 mm long in the same population collected on the same day. They are all in similar construction; the differences are seen only in size. The case is roundly oval, dome-shaped, made of small and larger rock fragments and sand grains; the sand grains are mostly found on the fringe. There are two small respiration openings, located dorsally on the anterior and the posterior part of the case; two larger

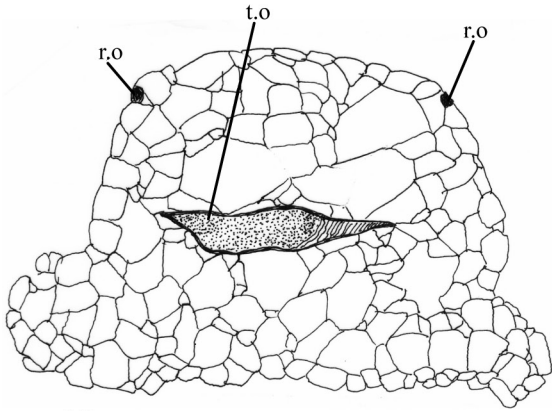


Figures 1-6: *Synagapetus anatolicus*, last-instar larva. 1, head capsule and labrum, dorsal view; 2, frontoclypeal apotome; 3, ventral apotome; 4, thorax, dorsal view; 5, prosternite, ventral view; 6, right mandible, lateral and ventral view.

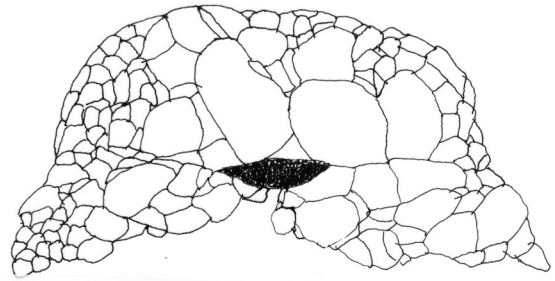


Figures 7-12: *Synagapetus anatolicus*, last-instar larva. 7, lateral view; 8, 9th abdominal segment, lateral view; 9, 9th abdominal segment, dorsal view; 10, prothoracic right leg, lateral view; 11, mesothoracic right leg, lateral view; 12, metathoracic right leg, lateral view.

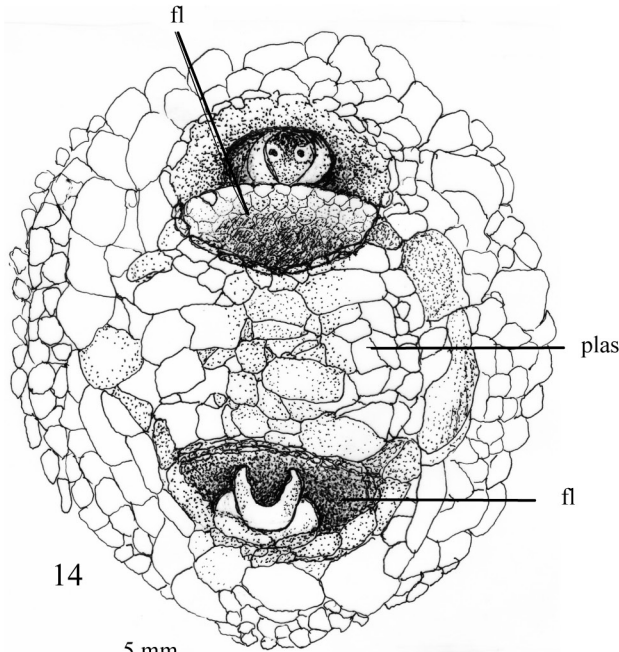




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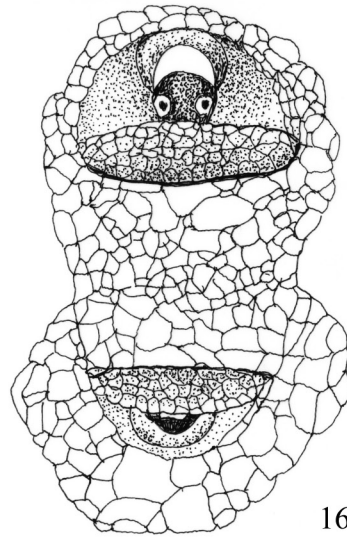


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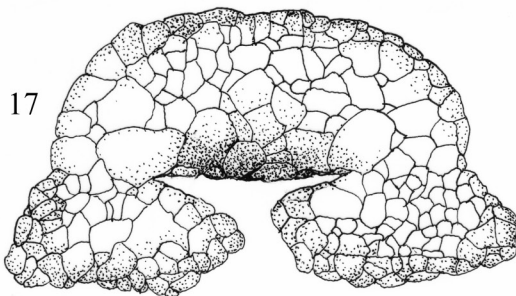
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5 mm



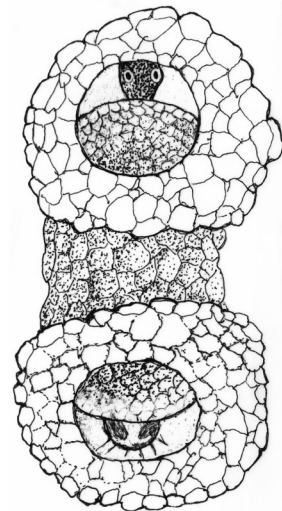
16

5 mm



17

5 mm



18

Figures 13-18: *Synagapetus anatolicus*. 13-14: larval case. 13, lateral view; 14, ventral view (t.o= transversal opening; r.o= respiration opening; fl= flap; plas= plastron); 15-16: larval case before pupation; 15, lateral view; 16: dorsal view. 17-18: tube like larval case before pupation, plastron removed; 17, lateral view; 18, ventral view.

openings are placed transversally in the middle of both sides of the case, above the fringe (Fig. 13). In some specimens the transversal openings can be smaller. In ventral view, there are anterior and posterior openings, which are broadly oval, each with a rounded flap made of small sand grains; between the anterior and the posterior opening a plastron is present (Fig. 14). The plastron is made of small stones. The stones of the plastron and the fringe are loosely connected to each other. If the plastron is removed, it is seen that there is a floor, which begins from the anterior flap and ends in the posterior one; the larva sits on this tube-like solid and curved dorsal floor.

Two larval cases, collected in July from Zonguldak Alaplı, Bölüklü, which are 5 mm long and housing the same larvae described above, were in the last stage, before the beginning pupal case. Last instar larvae begin to cut the side fringe in the middle, starting from the side openings; at this stage the flaps and the plastron are already present (Figs. 15, 16). In the next step, the larva bites off the fringe and the plastron and constructs large collars around the ventral openings, which are made of small stones (Figs. 17, 18). In this stage the case is a low U-shaped tube, both ends curving ventrally. Both ends of this tube can be closed by flaps.

**Pupal case** (Fig. 19): Larvae built completely new dome enclosures with different construction before pupation, as usual in the family Glosso-somatidae. The pupal case is oval, made of rock fragments, the larger one are mostly found on the sides; dorsally, the sand grains are scarcely placed between them; the small sand grains are also found on the edge of the ventral opening.

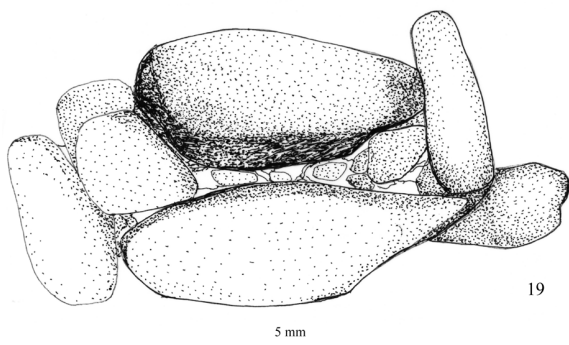


Figure 19: *Synagapetus anatolicus*: pupal case, dorsal view.

## REMARKS

The larva of *Synagapetus anatolicus* constructs a two-floor larval case; the larva sits on the dorsal floor. The dorsal floor is a curved tube, which is a remarkable feature of the case. The larva of *S. ater* Klapalek (syn. *S. iridipennis*) built similar cases with a fringe and two ventral flaps, which is regarded as a two-floors case, i.e. the larva sits on the dorsal floor, namely in the dome-shaped part, and the second floor is the area covered by the fringe (MALICKY, 1973); however, the case of *S. anatolicus* differs from this by the shape of the dorsal floor, which is a solid tube made of sand grains; beneath it, the central part of the case possesses two transversal openings, which probably help prevent the case from drifting. In the area covered by the large fringe the larva can safely graze on epilithic algae. The construction of the case, especially the tube-shaped stage before pupation, resembles the figures of the case of an unknown species of “*Agapetin*” given by BOTOSANEANU (1955), which is also tube-shaped. According to the figures, this unknown species should belong to the genus *Synagapetus*.

Although under laboratory conditions the uncased larvae of *Agapetus fuscipes* Curtis, 1834 construct provisional tubes (MAJECKI *et al.*, 1997) and the larvae of *Synagapetus iridipennis* leave the domed case when they are disturbed and begin to construct a slightly curved tube (BOHLE & FISCHER, 1983), the tube-like floor of the larval case of *S. anatolicus* is a constant enclosure, which is found in every stage of the larval case.

The case of the population that occurs in southern Anatolia is taller than that of the northern populations and the transversal openings are smaller.

## ACKNOWLEDGEMENTS

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