Eggs of *Tripteroides (Rachionotomyia) aranoides* (Theobald) and *Topomyia (Suaymyia) yanbarensis* Miyagi[1]

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ABSTRACT. Eggs of *Tripteroides aranoides* and *Topomyia yanbarensis* are described with notes on their biology. *Tripteroides aranoides* eggs resemble those of *Tp. bambusa* in surface structure, but differ in size.

Mattingly (1969, 1974) reviewed the mosquito eggs of the tribe Sabethini so far known. This revealed that our knowledge of the sabethine eggs is still poor. A greater knowledge of them may broaden our understanding of inter- and intratribal taxonomic relationships. In the present study we give the first description of the eggs of two autogenous mosquitoes, *Tripteroides (Rachionotomyia) aranoides* (Theobald) and *Topomyia (Suaymyia) yanbarensis* Miyagi. Also some observations on their biology were made, including oogenesis and floating posture. Morphology and biology of *Tp. aranoides* were compared with those of *Tp. (Tripteroides) bambusa* (Yamada) which is best known species in this genus.

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MATERIALS AND METHODS

All eggs observed were obtained from laboratory colonies maintained in Saga Medical School. The colony of *Tp. aranoides* was established with larvae collected in San Pa-Tong, south of Chiang Mai, Thailand; that of *Tp. bambusa* with larvae collected in Saga, Kyushu, Japan; and that of *To. yanbarensis* with larvae collected on Nakanoshima Island, the Tokara Archipelago, Japan.

Observations were made by light and scanning electron microscopes. For the scanning electron microscopy, eggs were taken out of water two or three days after oviposition, quickly mounted on a specimen stub and spatter-coated with gold. Examination and photography were performed with a Hitachi S-700 at 20kv. Terminology follows that of Harbach and Knight (1980).

RESULTS

Tripteroides (Rachionotomyia) aranoides (Theobald)

Description. Egg whitish grey, fusiform in ventral view, domed in lateral view (Fig. 1A) and round in end view. Length and width are given in Table 1. Anterior end blunt, with small but conspicuous corolla (Fig. 1B), posterior end pointed. Outer chorionic tubercles fungiform; upper part of each tubercle with somewhat flattened polygonal cap (Fig. 1A); tubercles of two orders of cap size and height, larger and higher ones arranged in hexagonal reticulum enclosing smaller and lower ones. Posterior end of egg ornamented with small, raised, wrinkled tubercles separated from neighboring ones, each of which placed on hexagonal basal plate (Fig. 1C). Inner chorion brownish black, strongly sclerotized.

Biology. Development of follicles began asynchronously in an ovary. Follicles of a newly-emerged female are at stage I of Macan's system (1950). Those located near the common oviduct developed to IIb or IIIa stage and those at the distal part of an ovary remained at I stage 48 hours after emergence (Fig. 1D). Follicles of stages IIIb-I were arranged from base to end of the ovary after 64 hours (Fig. 1E). Follicles at the basal part of ovary developed to stage V, and those at distal part remained at stage I after 96 hours (Fig. 1F). Females appeared to ovulate with micropyle toward the rear, since eggs in oviducts always lay with the pointed end towards the gonotreme. Transverse dehiscence took place at about 1/4 of the distance from the anterior end.

Eggs hang vertically from the water surface, with the micropyle downwards, or often lay horizontally under the surface, but never floated on the surface. They readily submerged irrespective of floating posture when the water was shaken, and returned slowly to the surface. Many eggs aggregated side-by-side in a cluster at the center and along the margin of oviposition bamboo cups; the clusters were easily broken by disturbing the water surface. Eggs did not float when experimentally stripped of their outer chorion.

Topomyia (Suaymyia) yanbarensis Miyagi

Description. Egg brownish black, ovoid, 411 μm long by 244 μm wide. Anterior end blunt and posterior end somewhat pointed (Fig. 1G). Outer chorion thin; tubercles of two sizes, each hemispherical, surface sculptured like a clover flower, scattered on a background of fine reticulum (Fig. 1H). Micropyle and corolla inconspicuous. Inner chorion dark brown, strongly sclerotized. Dehiscence took place at about 1/4 of the distance from the anterior end of the egg.

Biology. Oogenesis is asynchronous; some follicles had yolk at emergence. Three dilatations were observed on an ovariolar stalk of a female 65 days after emergence.

Eggs are negatively thigmotactic with the inside wall of oviposition bamboo internodes and other floating objects, but thigmotactic between themselves. They floated horizontally on the water surface aggregating at central part of the internodes. Eggs sank when pressed below the water and 1st-instar larvae hatched two or three days after oviposition. Eggs were intolerant of desiccation.

DISCUSSION

The egg of *Tp. aranoides* closely resembles that of *Tp. bambusa* (Yamada) in surface structure. Those of the latter species have been studied fairly well (Yamada 1917, Moriya et al. 1973, Matsuo et al. 1974, Mattingly 1974), however, the features of the posterior end have not been referred to in these studies. The surface structure of the posterior end is nearly the same in both species. Distinction of eggs between the two species is difficult by surface structure, while easy by size and shape. *Tripteroides aranoides* eggs were significantly shorter but as wide as those of *Tp. bambusa* (Table 1).

In most mosquitoes, follicles develop synchronously and all mature eggs of a clutch are laid during a short period. However, in certain mosquitoes, e.g., *Toxorhynchites rutilus* (Coq.) and *To. yanbarensis*, some of the follicles sequentially develop to maturity (Watts and Smith 1977, Miyagi and Toma 1978), and the oviposition period lasts for a long time. Oogenesis in *Tp. aranoides* is an intermediate type between these two, namely, follicles asynchronously start to develop but mature at almost the same time.

Frank et al. (1981) observed that eggs of *Wyeomyia vanduzeei* Dyar and Knab float with the micropyle upwards when vertically situated. Contrarily, *Tp. aranoides* eggs floated with the micropyle downwards. Eggs of *Tp. aranoides* with an intact outer chorion usually floated. But it is still unknown which really acts as a float, the outer chorion itself or air retained between outer and inner chorions. The ability of eggs of *Tp. aranoides* to be readily submerged by water surface disturbances may prevent them from being washed away from breeding sites during rainfall. The floating posture and trait of easily submerging of *Tp. bambusa* eggs were the same as those for *Tp. aranoides*.

Topomyia yanbarensis is the first species whose egg is described in this genus. The surface structure is quite unique and no outer chorion of this kind is found in other sabethine species. Eggs of *Toxorhyinchites amboinensis* (Doleschall) have a similar thigmotaxis as seen in *To. yanbarensis* (Steffan et al. 1980).

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Table 1. Egg sizes (μm) in *Tripteroides aranoides* and *Tp. bambusa*.

	Tp. aranoides			*Tp. bambusa*			
	N	Mean ± S.D.	Range	N	Mean ± S.D.	Range	*t*-test
Length	50	312 ± 11.0	288-336	50	420 ± 23.5	376-472	**
Width	50	156 ± 6.7	144-168	50	166 ± 5.0	160-176	**

** Significantly different at *p* = 0.01.

Figure 1. Egg and ovary of *Tripteroides aranoides* (A-F) and *Topomyia yanbarensis* (G-H) (scale is 50 μm for A and G, or 5 μm for B, C and H).

A. Egg in lateral view (anterior end at right and ventral at top).
B. Micropylar cup.
C. Posterior end.
D. Ovarioles 48 hours after emergence.
E. Ovarioles 64 hours after emergence.
F. Mature (Stage V) oocytes 120 hours after emergence.
G. Egg in ventral view (anterior end at bottom).
H. Outer chorionic tubercles and reticulum.