

A Biological Study of *Silana Farinosa* (Coleoptera: Chrysomelidae), A pest of *Murraya Koenigii* (Sinhala: Karapincha)

by

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Abstract

Silana farinosa (Boheman) feeds on the leaves of *Murraya koenigii*, the Karapincha, often causing considerable loss. These studies have shown that in Sri Lanka, it has several generations a year, each consisting of 8 stages. Morphological characters of each stage were studied. Factors contributing to mortality of the pest were also studied and a chalcid parasite, which might be of use in control, discovered.

Introduction

Silana farinosa (Boheman) is a pest of *Murraya koenigii*, a spice plant which is widely used in cooking vegetables and meats. Both larvae and adults feed on *Murraya* leaves and destroy them. The insect is found throughout Sri Lanka where *Murraya koenigii* grows.

Distribution and Records

Silana farinosa was first reported by Boheman in 1856 who named it *Cassida farinosa*. The genus *Silana* was erected for it by Spaeth. It is a monotypic genus, no other species having been recorded. The existing description of the species, which is limited to the shape of the body, the structure of the antennae and claws, is inadequate and incomplete, and the biology of the insect has not hitherto been recorded.

Materials and Methods

Living colonies of the pest were maintained on potted plants of *Murraya* and kept under observation. All the stages from egg to adult were collected from these colonies and examined both in vivo and after temporary or permanent preparations had been made. Slide mounts were used for detailed studies, the first and second instar larvae only being stained in Borax Carmine. The drawings were made on graph paper using a square graticule eyepiece. Specimens were also collected from the field and similarly studied.

Description : Adult

Adult female measure 7.5 mm. by 5.0 mm. (average of 18 specimens) Males measure 6.5 mm. by 4.8 mm. (average of 21 specimens). Since the male genitalia lie concealed within the abdomen, the sexes can be distinguished externally only by their size difference and the positions they assume during mating.

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The newly emerged adult is creamy white except for a brownish patch on the prothorax, the black mandibles and eyes, the brown legs with orange brown tarsi and the transparent elytra. At this time the posterior ends of the membranous wings project beyond the elytra, but in about 10 minutes they are withdrawn and kept in repose under the elytra. Tanning is complete in about 30 minutes. Dorsal surface of the adult is soon covered by a white powdery coating. When this is removed, the elytra is seen to be a shiny and chocolate brown. The underside of the animal is a light brown.

The body form (Fig. 1.) is roughly oval, with prothorax extended over the head. The outline of this extended prothorax is continuous with that of the elytra, giving the insect the shape of a tortoise.

Head flattened, hypognathous; eyes elongate oval; the space between the roots of the antennae and the labrum punctate. Antennae 11 segmented, arising in between eyes and carried in repose under the explanate margin of the prothorax. Mouth parts are of biting type, consisting of a labrum, a pair of mandibles, a pair of maxillae with 4 segmented maxillary palps and a labium with 3 segmented labial palps (Fig. 2.)

Prothorax trapezoidal, sloping very steeply from base to apex. Scutellum triangular; its apex smooth, shiny and impunctate, elytra slightly broader at base than prothorax, with the basal angles rounded; surface irregularly punctate-striate, covered with scattered fine hairs. Underside (Fig. 3.) impunctate, with fine hairs (Fletcher, 1914). Well developed legs, each ending in 2 claws; each tarsal segment with a brush-like structure ventrally. Abdomen with 5 visible sternites; genitalia concealed.

Egg

Eggs are laid in oval or slightly kidney shaped oothecae, (Fig. 4) which measure 4.0 mm. by 3.5 mm. (average of 23 specimens). Upper side convex; surface smooth and reddish brown. Underside flat, brownish orange and papery. Eggs per ootheca vary from 5 to 17. Eggs elongate, yellowish white, 1.7 mm. by 0.8 mm. (average of 17 eggs).

Larvae

There are 5 larval instars, all similar except for size and colour. The newly hatched first instar larva is yellow except for legs, head, prothorax and upper side of the ninth abdominal segment which are black. Larva (Fig. 5) elongate oval, dorsally convex, each segment with marginal lateral cuticular projections and a row of black thickenings along the anterior and posterior margins. Head round; concealed under the prothorax except when feeding. Three pairs of lateral ocelli and a pair of knob-like antennae. Mouth parts consist of a labrum, a pair of strong mandibles with sub apical teeth, a pair of maxillae and a labrum.

The prothorax, the largest of the three thoracic segments has two more or less round large shiny black patches on the upper surface. Two pairs of spinulate projections arise anteriorly on either side; a third pair arises posteriorly. Meso and meta thoracic segments sub-equal. Mesothorax with three

pairs of projections, anterior and posterior pairs longer than the middle. Two meso thoracic spiracles at the base of the first pair of projections. Meta thorax with two pairs of projections; the anterior pair being shorter. Three pairs of stout three segmented legs, each armed with a single strong, dark brown terminal claw.

Abdomen with 9 segments, each with a pair of lateral spinulate projections; a spiracle at the base of each projection on segments 2–7. Ninth segment elongated posteriorly, anus at the apex of this prolongation. Marginal projections of the anal segment abnormally long, and forming supra anal prolongations which give the animal a 'forked tail' (Maulik, 1919). In the newly hatched larva, these prolongations are about one-third the body length, this ratio diminishing with each successive larval instar to about one-fifth in the last. Larval colour similarly changes gradually from yellow to black in successive instars.

Larval life extends over 17 to 20 days (mean 18). Sexes not distinguishable externally.

Sizes of the larval instars are:

- first instar :** 1.6 mm. by 0.7 mm.
- second instar :** 2.8 mm. by 1.7 mm.
- third instar :** 4.2 mm. by 2.7 mm.
- fourth instar :** 5.5 mm. by 3.6 mm.
- fifth instar :** 6.6 mm. by 4.5 mm.

Length was measured from the anterior margin of the prothorax to the point of re-curvature of the tail (average of more than 18 specimens). Average duration of each of these instar was 3.6, 3.5, 3.1, 3.8 and 4.2 days respectively. (average of more than 7 specimens.)

Pupa

Creamy yellow when newly formed tanning in about 1 hour to brownish yellow, with brown and black dorsal markings. The cast last larval skin is retained over the posterior and leaving only about six segments exposed. The first 5 bear each a pair of short stout lateral spinulate projections; the first 4 each a pair of spiracles, one at the base of each marginal projection (Fig. 6).

Biology of the species

Ootheca is attached to the underside of the tender leaves of the host plant, rarely more than one per leaf. Its hard upper covering may provide some protection for the eggs against parasitisation and predation. Emergence takes place 5-8 days after laying. Emerging first instar larvae escape through the margin between the dorsal and ventral surfaces of the ootheca. Newly emerged larvae remain aggregated near the ootheca for about 36 hours. and though they later disperse, the tendency to remain in groups persists through several successive instars. The younger instars are generally found on the underside of the leaves, but the older instars, especially the last are located on both surfaces. They move to the leaf stalks and the stems when the leaves have been largely consumed. Newly hatched larvae starts feeding within

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minutes of emergence and continue during most of the larval life, are the cause of much damage to the host plant. Leaf veins remain intact with feeding, but tender leaves may be completely consumed by older larvae.

The larva has a most interesting habit. By carrying on its 'forked tail' which is bent over the dorsum, earlier exuvia and excrement, it has a means of camouflage. Whenever disturbed this tail is bent further towards and downwards concealing almost the entire body. This could be an effective defence against external attacks.

The full grown last instar larva about 40 hours before pupation fastens itself onto a leaf. During this inactive prepupal period, it sheds the excreta and exuvia collected on the tail and ejects any undigested material left within the gut. The colour gradually changes to a dull yellow, due to the newly forming pupal skin. The larval cuticle splits and gradually collects towards the posterior end where it remains throughout the pupal stage. In the laboratory, pupation sometimes occurs in the fourth instar larva when it has had insufficient food. The pupa gives rise to an adult after about 6 days.

The adults rest mainly on the underside of the leaves, though during mating they are found on the upperside as well. They also feed on the leaves only but do not cause much damage as they are not voracious. Feeding begins two days after emergence.

Mating takes place 10 to 18 days (average 15 days) after emergence. Copulation was generally observed late in the evening or early in the morning. The male climbs on to the female, with its head directed towards hers and takes a firm grip of the female's elytra with all three pairs of legs. The penis is inserted into the female's genitalia under the posterior edge of her elytra. Copulation lasts 45-90 minutes.

Oviposition begins about 10 days later. First, the female selects a suitable site for oviposition which is usually a fresh tender leaf. Using a secretion from the vagina, she first makes the base of the ootheca, and then begins laying eggs on it in rows one upon the other. The number of eggs per row decreasing rapidly so that there is generally no more than one or at most two in the top row. This pattern of egg laying gives the ootheca, the appearance of a blunt cone. It takes about 15 seconds to lay one egg. Once an egg is laid, the female draws her genital opening along the surface of the egg, once or twice, probably to apply an adhesive to attach the eggs together. The ootheca is completed with a thick yellow secretion also from the vagina. Egg laying lasts about 75 days, during which period a female will have laid 160-520 eggs in about 15-40 oothecae. The life time of adult is 4½ months.

Dispersal is solely by the adult. It flies from one host plant to another specially when most of its leaves have been consumed and the host plant is no longer suitable for oviposition and feeding. Adult beetles have also occasionally been seen resting on plants other than *Murraya koenigii*, though they do not feed on them.

Predation and parasitism as well as factors yet unknown contribute to the mortality of this insect. One or very rarely two eggs may fail to hatch. Thus the uppermost egg may not develop is then seen as a grey mass within the ootheca. A tiny hole, presumably made by a parasite has been observed on the dorsal surface of two of the ootheca examined. Heavy rains, often wash larvae onto the ground where they perish, and this factor contributes largely to the mortality of the larvae of particularly those on leaves which have been largely consumed. No natural enemies of these larvae have been observed. The pupa is frequently parasitised by a chalcid which emerges as an adult. A hole in the dorsal surface of the pupal abdominal segments remains as a record of the attack. A parasitised pupa is an abnormal brownish black in colour. It was noted however that some such abnormally coloured pupae had not been attacked by this chalcid, but did not develop were undersized and lacking in most of the body contents for some other reason. Predation of pupae was not observed.

The garden lizard *Calotes versicolor*, and the ant *Diacamma rugosum* were found to be predators of the adult insect. The ant feeds on the adult insect before the body covering gets thickened. Parasitisation of the adult was not detected.

The control of this insect is important. The methods locally adopted is to bathe the plant in soap solution and or lop off the infested branches. Though reportedly effective and certainly free of polluting side effects, this method has the disadvantage that the adults may escape. The use of the chalcid parasite as a means of biological control awaits investigation.

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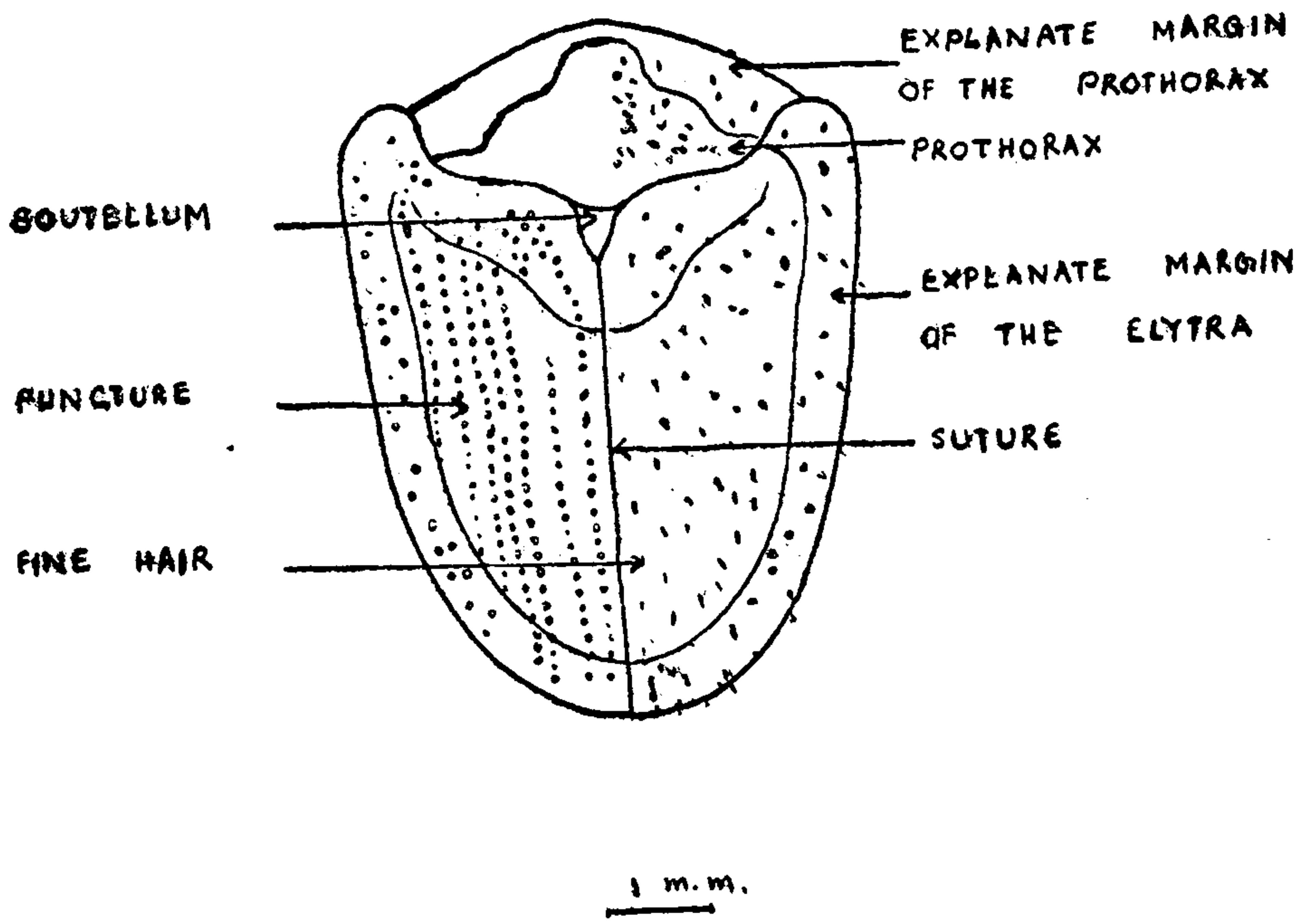


Fig. 1 *Silana Farinosa* – Adult (dorsal view)

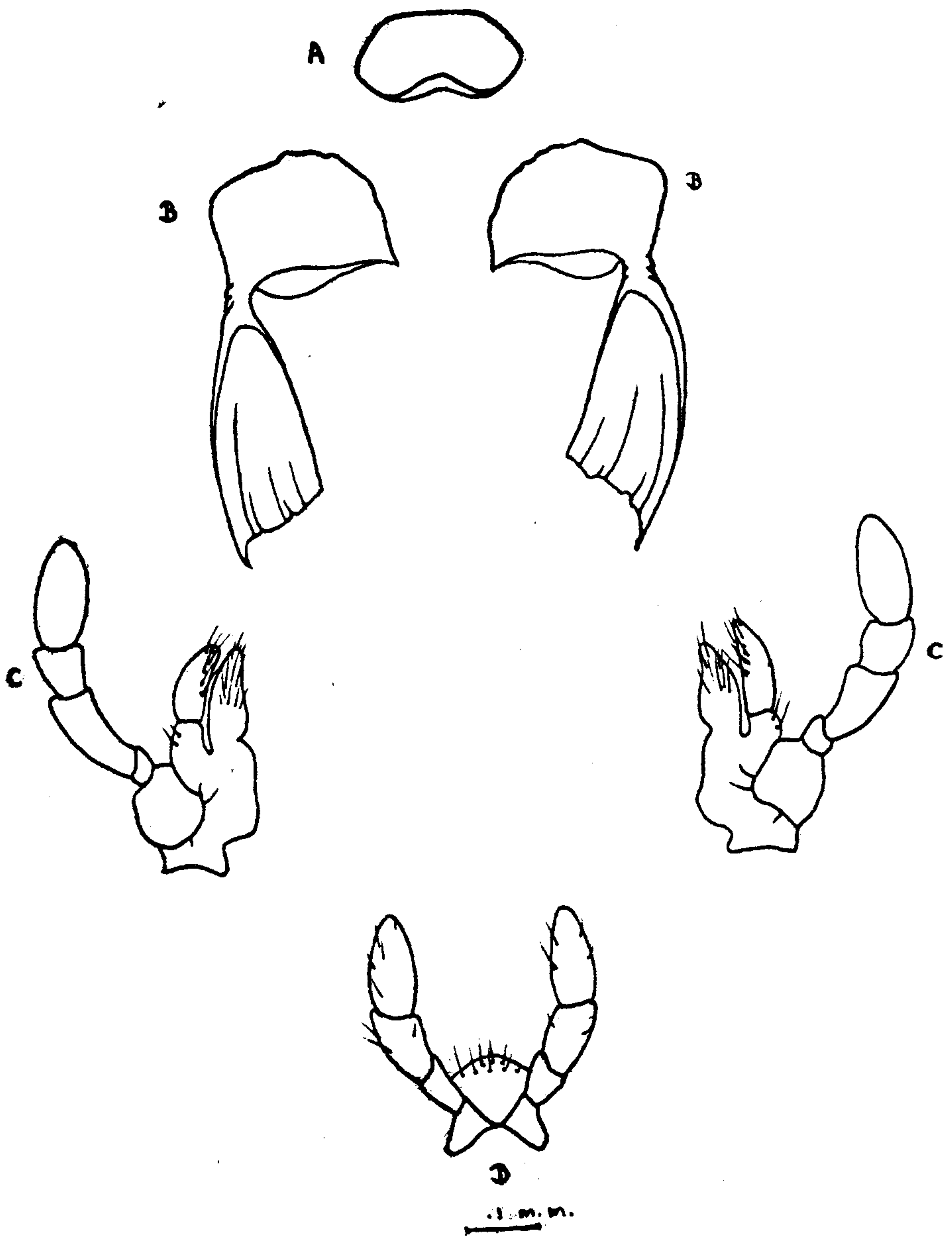


Fig. 2 *Silana farinosa* – adult mouth parts.

- A – labrum
- B – mandibles
- C – maxillae
- D – labium

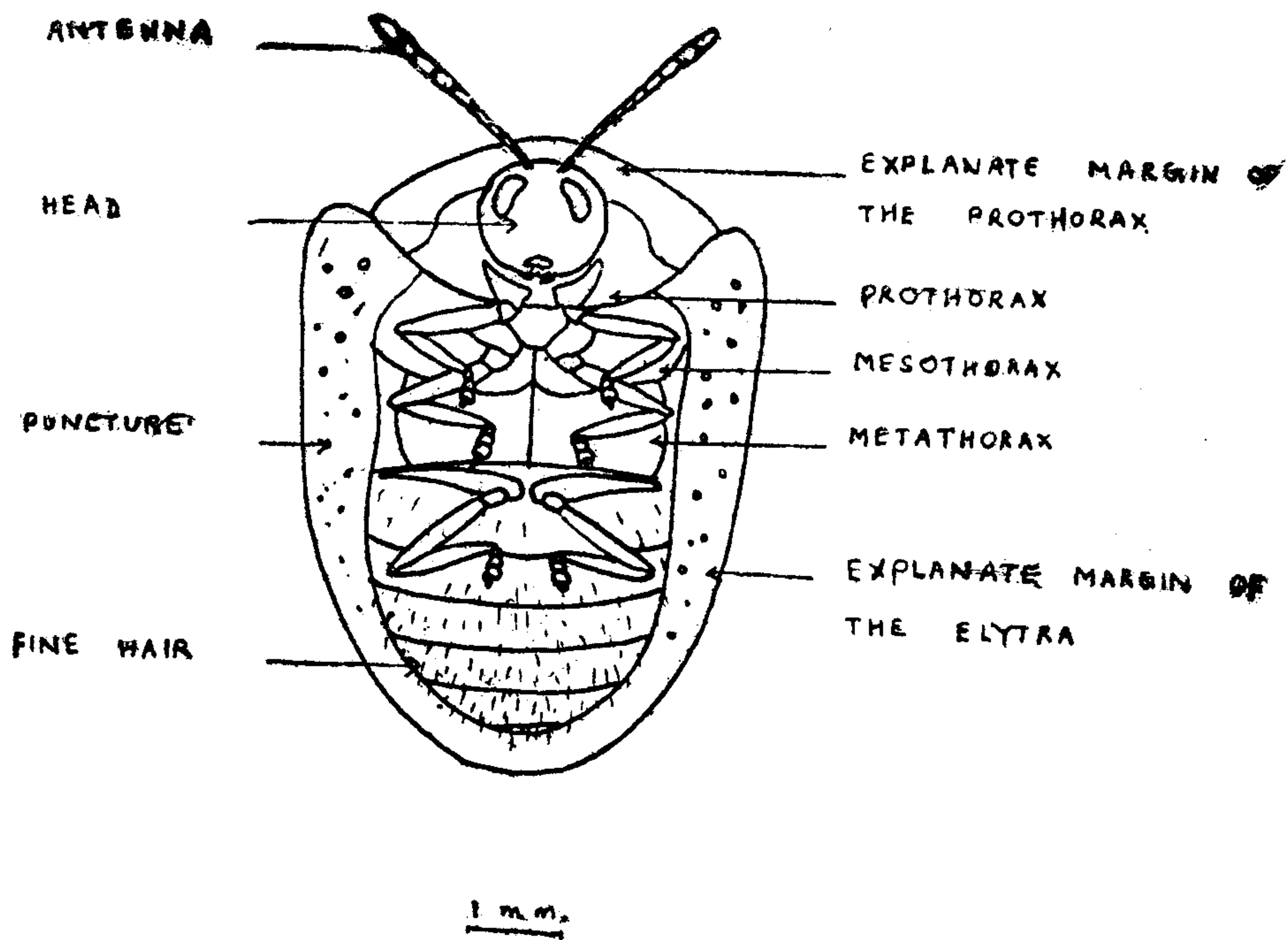


Fig. 3 *Silana farinosa* – adult (ventral view)

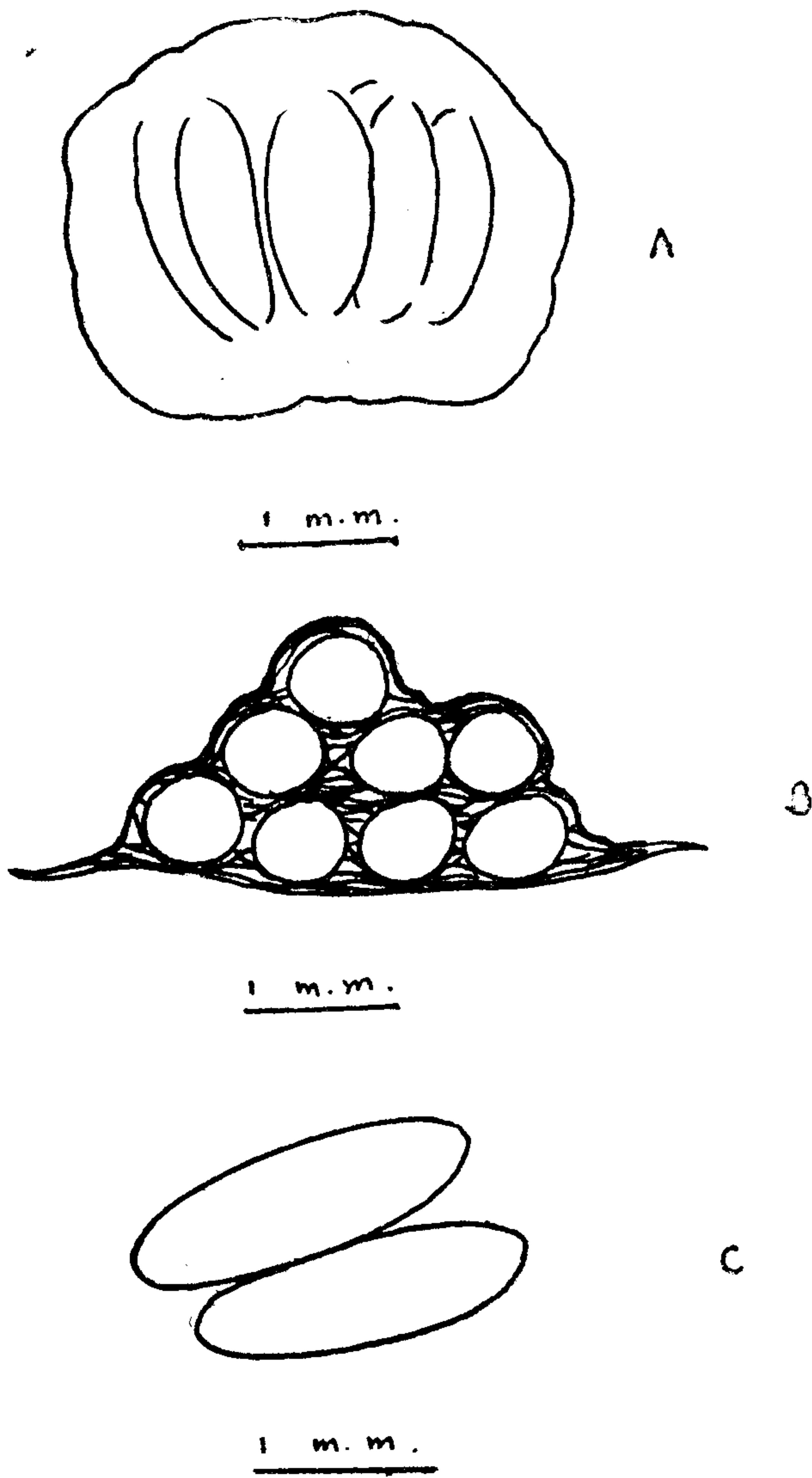


Fig. 4 *Silana farinosa* - ootheca
A - dorsal view
B - cross section
C - eggs

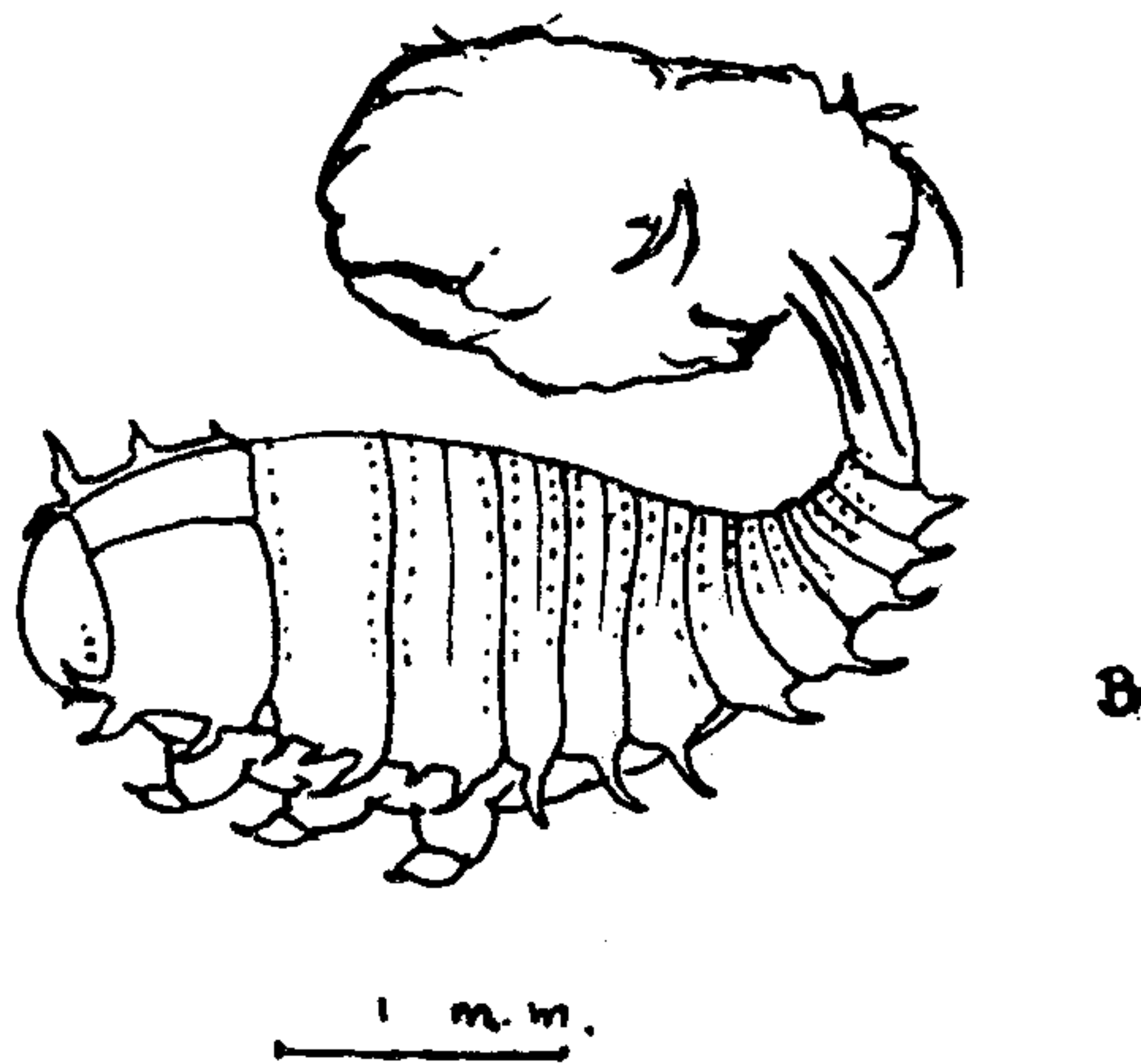
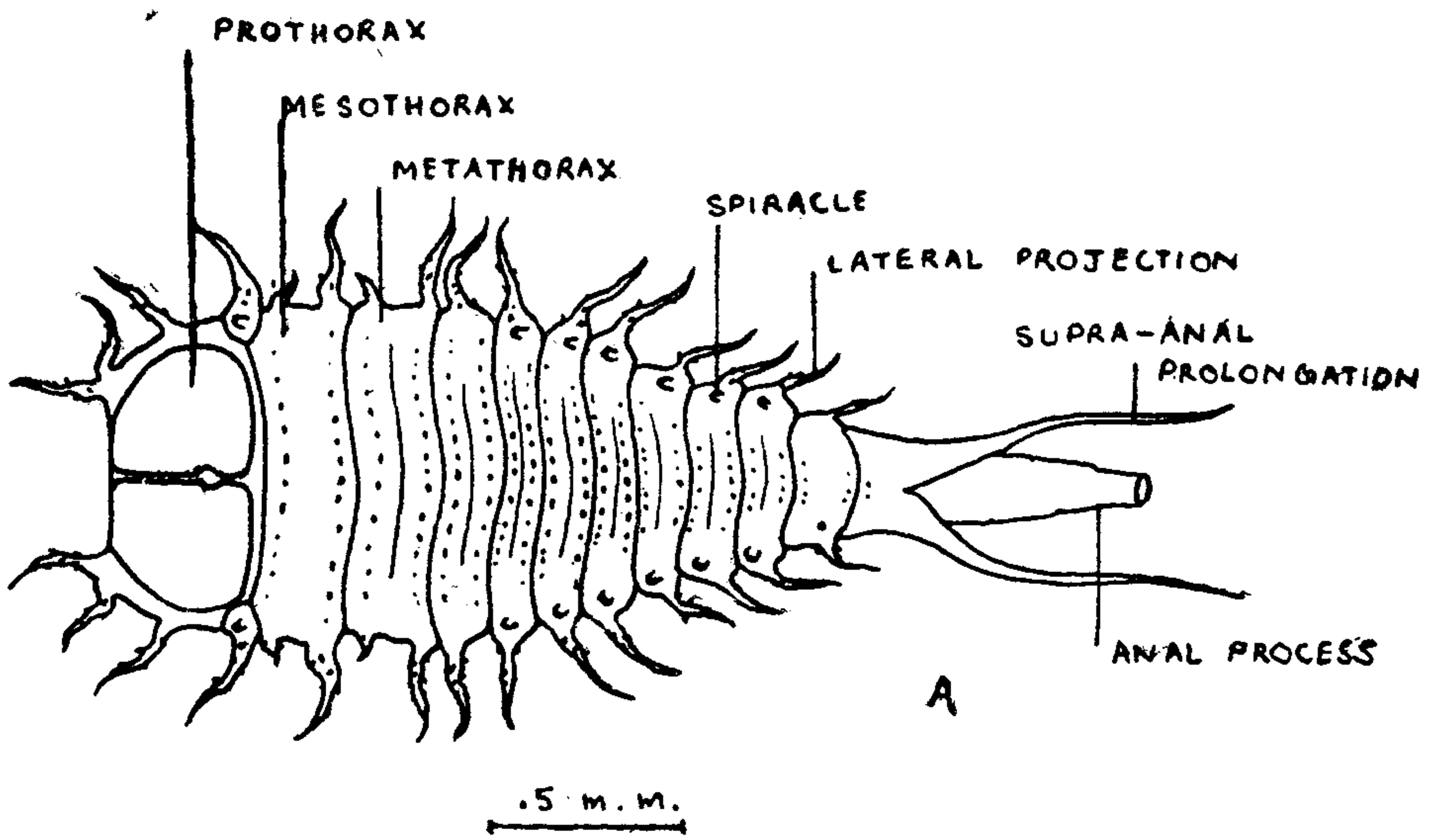


Fig. 5 *Silana farinosa* - Larva
A - dorsal view
B - lateral view

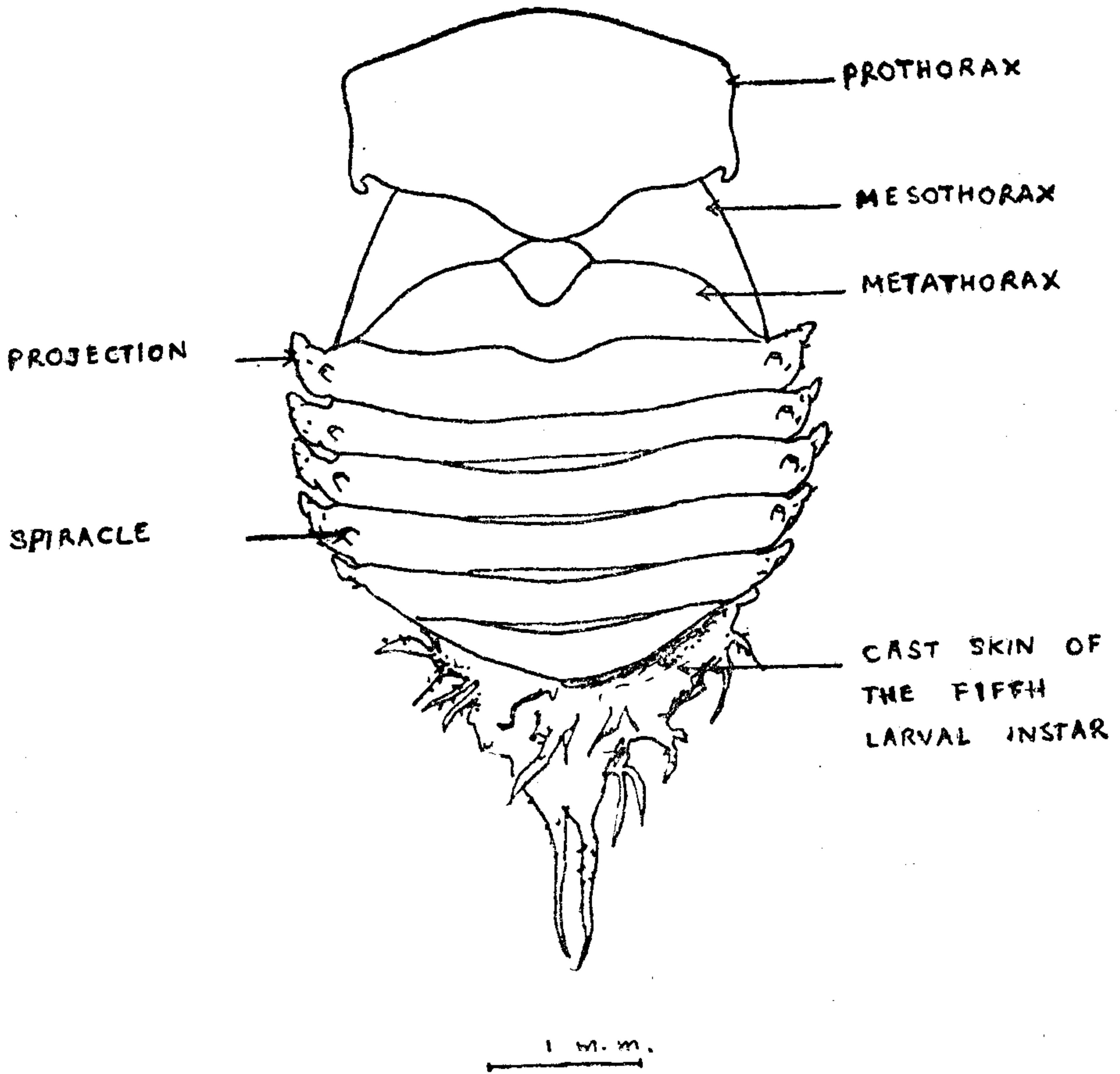


Fig. 6 *Silana farinosa* - Pupa (dorsal view)