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ON THE EGGS AND FIRST-INSTAR LARVAE OF TWO SPECIES OF MANTISPIDAE*

BY

Hiroshi Kuroko

Brauer **(1855)** was the first who showed the drawings of the egg and the first instar larva of the Mantispidae and the species concerned was *Mantispa pagana* Fabricius. In 1869, he further exposed every fact of its life history. Since then, observations on the eggs of this family have been made by Smith (1934), Hoffmann (1936) and Hungerford (1936). The last mentioned author succeeded in taking the photograph of the larva (1936). In 1953, Peterson described and illustrated the larva of *M.interrupta* Say, but he confused antennae with labial palpi. The number of eggs deposited by a female Mantispid varies with the species. For example, Hungerford (1936) gave the figures of 3,464 to 8,385 eggs in the case of ***M. interrupta***, while Hoffmann (1936) showed 1,028 eggs laid by a female of ***Climaciella brunnea*** var. *occidentalis* Banks.

In Japan Nawa (1902) first gave the picture of the Mantispid eggs and the species concerned was *Eumantispa harmandi* Navás. In the next year, he illustrated the first instar larva of the same species, but his drawing was incomplete. According to Nawa, the eggs then laid were amounted to 5,600 and the incubation period lasted for about two weeks. In 1949, Esaki published the description and figure of the eggs of *Mantispa japonica* MacLachlan and recorded the number of eggs laid as 908 and 338 and the duration of egg period as 10 days.

The following table gives the incubation periods extracted from the above-mentioned sources.

Unfortunately, however, I have found no literature giving a detailed morphological observation on the first instar larva of the Mantispidae. Since the year 1953, I have been engaged in making observations on the Mantispidae on Mt. Hikosan. This is my first report on the eggs and first instar larvae of the

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Authors	Species	Incubation periods (in days)
Brauer (1869)	*Mantispa pagana* Fabricius	21
Smith (1934)	***M. sayi*** Banks	9-11
	Climaciella brvnnea (Say)	11
Hundgerford (1936)	***M.interrupta*** Say	17.3 (14-21)
Hoff mann (1936)	C. ***brunnea*** var. *occidentalis* Banks	26
Nawa (1902)	***Eumantispa harmandi*** Navás	About 14
Esaki (1947)	***M. japonica*** MacLachlan	10

two species of the Mantispidae, ***Climaciella magna*** (Miyake) and *Mantispa **japonica*** MacLachlan, which are commonly found on Mt. Hikosan.

I wish to express my sincere gratitude to the late Prof. T. Esaki and Prof. **K.** Yasumatsu for their kind guidance and constant encouragement.

Climaciella magna (Miyake)

Egg

Freshly deposited egg elongate oval; ivory in colour, smooth with faint pearly luster, but later it turns dark purplish brown, and a longitudinal fold is made on each lateral side; with a micropylar knob at upper end and a stalk at lower end ; size of egg 0.474 mm. (0.466-0.483 mm.) in length, 0.239 mm. (0.229 – 0.246 mm.) in width. Micropylar knob rounded and flattened; chalky white ; 0.037 mm. in diameter; opening 0.009 mm. in diameter. Stalk colorless, rarely tinged with pale brown, transparent; 0.08-O 63 mm. (usually 0.25 – 0.45 mm.) in length, 0.017-0.030 mm, in diameter; vertical or nearly so to its support. Egg-breaker pale brown; sickle-shaped, feebly curved and its tip pointed, with several shallow teeth on blade; about 0.150 mm. in length. Number of eggs deposited by each female was observed as follows : 3,273 eggs (1,350 & 1,923 eggs) ; * 4,379 eggs (2,127 & 2,252 eggs) ; 8,121 eggs; 2,406 eggs; 1,791 eggs. Egg-laying

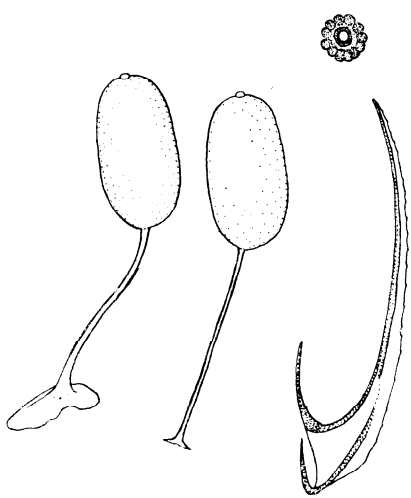


Fig. 1. Eggs, egg-braeker and micropylar knob of *Climaciella **magna*** (Miyake).

* Number put in parentheses showing number of eggs of each batch.

area 520 mm.^{2} for 2,127 eggs; 712 mm.^{2} for 2,252 eggs ; 554 mm.2 for 2,406 eggs. Density of eggs 3-28 eggs/mm.^{2}, but usually 10–20 eggs/mm?

No report with regard to the oviposition of the Mantispidae in the field has hitherto been published. Fortunately, I could observe this on Sept. 1, 1954, from 8.25 A.M. to 3.55 P.M. in the field. The eggs were deposited on the lower side of the leaf of *Quercus acutissima* Carruthers at about 2.30 m. high, in the campus of Hikosan Biological Laboratory, Kyushu University.

The incubation period is influenced by temperature of the environment where eggs are placed. The following table shows that the incubation period is 25-45 days under natural conditions but 15– 16 days under constant temperature of 27°C.

Table 1. Records of incubation period.

No.	Date of egg-laying	Date of hatching	Incubation period (days)	Temperature
1	Sept. I, 1954	Sept. 26, 10 A.M. –28, 9 A.M.	25-27	Average temp. 21.2% Maximum temp. 28.7°C Minimum temp. 10.4°C
2	Sept. 13, 1955	Oct. 28.	45	Under a natural temperature condition
3	Aug. 24, 1960	Sept. 8	15	27°C (in constant)
4	Aug. 29, 1960	Sept. 13-14	15-16	

First-instar larva

Campodeiform and slightly flattened, 2nd abdominal segment about 0.13 mm. thick. Average length 1.01 mm. (0.98-1.04 mm.) from tips of maxillae to anal extremity, but shortened to 0.90 mm. under dry condition. Second and 3rd abdominal segments the widest, about 0.18 mm. in width, and tapering towards caudal end. Pale yellowish brown, semitransparent, patterned with dark purplish brown on dorsal side as shown in Pl. 10, fig. 3. Peculiar truncated setae placed from head to 9th abdominal segments as shown in Pl. 10, fig. 9 and in Table 2.

Head semicircular in outline, rather flattened dorso-ventrally, central portion slightly concave on dorsal side, without suture, with 2 pairs of truncated setae near lateral margin and 1 pair near posterior margin; 0.14 mm. in length (exclusive of maxillae), 0.16 mm. in width and 0.08 mm. in thickness. Eyes placed antero-laterad, consist of three ocelli each; ocellar area black, with two short setae on dorsal and ventral margins of eye spot, dorsal one longer than the ventral. Clypeo-labral suture discernible. Antenna four-jointed, basal joint rather short and quadrate, 2nd joint elongated and clavate, with two short setae, 3rd joint spindle-shaped and feebly annulated, bearing five short setae,

half the length of 2nd joint, terminal joint flagelliform and as long as lst-3rd joints combined. Mandible narrow lanceolate, feebly curved outwardly, broadened at basal portion outwardly, inner edge thin, without tooth, apex pointed, carving a longitudinal groove near inner edge on ventral side. Maxilla nearly triangular, without maxillary palpus, swollen at basal half outwardly, with several setae placed on outer edge; inner and outer edges sclerotized and carving a longitudinal groove along inner edge on dorsal side. This groove may be applied for sucking. Labial palpus four-jointed, basal joints of each side contact with each other, 2nd joint the shortest, 3rd joint somewhat broadened towards apex and slightly shorter than basal joint, terminal joint slender and moniliform, with an apical sensory organ. Each thoracic segment transverse elliptical. Thoracic legs well developed, with a tarsus consisting of two subsegments each, and terminal part nearly conical in shape; from tip of tarsus issued a triangular, well-developed empodium, with a blackish sclerotized band beyond middle, without claw ;* empodium, in lateral aspect, spoon-shaped ; tip of empodium bearing cilia which is extensible fanwise at the time of movement. Tenth abdominal segment subcylindrical, slightly tapering towards extremity, with a bifurcated membranous eversible process which is protruding from extremity, and this process serves to support its own body at the time of movement and rising.

Truncated setae pale brown and rather stout, about 0.2 μ in diameter; subspiracular truncated setae of 2nd abdominal segment 0.05 mm. in length, spiracular truncated setae of the same segment 0.062 mm. and subdorsal ones 0.078 mm. Arrangement of the truncated setae are shown in Table 2.

Table 2. Arrangement of truncated setae on thorax and abdomen.

Number of segments / Division of body	Thorax		Abdomen			
	1	2 - 3	1—6	7—8	9	10
Subdorsal area	1	1	1	1	1	0
Spiracular area	0	1	1	0	0	0
Subspiracular area	0	0	1	1	0	0

Mantispa japonica MacLachlan

Egg

Freshly deposited egg elongate oval, narrower than that of the preceding species ; creamy white in color, smooth with faint luster, but later it turns brown ; 0.430 mm. (0.40 – 0.45 mm.) in length ; 0.194 mm. (0.19 – 0.20 mm.) in width. Micropylar knob chalky white ; 0.030 mm. in diameter, 0.016 mm. in thickness;

* Such character has never seen in the old reports on the Mantispidae.

opening 0.009 mm. in diameter. Stalk colorless, transparent; length variable from 0.08 to 1.2 mm., but usually about 0.6 mm., 0.007 mm. (0.005-0.01 mm.) in diameter; more slender than that of *Climaciella magna,* therefore most eggs lying on the support. Egg-breaker more slender and weakly sclerotized than that of the preceding species; 0.14 mm. in length. Number of eggs deposited by each female were observed as follows : 1,493 eggs (695 & 798 eggs) ; 1,125 eggs (885 & 240 eggs); 1,414 eggs (901 & 513 eggs); 1,402 eggs (502, 375, 186 & 339 eggs); 1,533 eggs (801 & 732 eggs); 1,007 eggs (420, 447 & 140 eggs); 2,140 eggs (552,685 & 903 eggs) ; 956 eggs (399, 313, 181 & 63 eggs). Egg-laying area 264 mm.2 for 901 eggs; 103 mm.2 for 513 eggs; 101 mm.2 for 420 eggs; 145 mm.2 for 447 eggs; 46 mm? for 140 eggs; 426 mm.2 for 552 eggs. Density of eggs much sparser than that of the preceding species, usually 2.29-4.93 eggs/mm.2

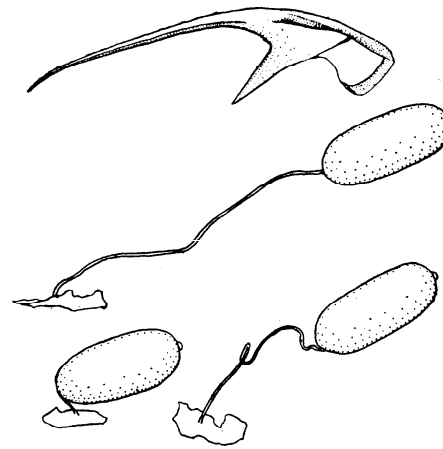


Fig. 2. Eggs and eggs-breaker of *Mantispa japonica* MacLachlan.

Incubation periods are shown in the following table. It indicates that the incubation period is 13-28 days under natural conditions but 7-9 days under a constant temperature of 27°C.

Table 3. Records of incubation period

No.	Date of egg-laying	Date of hatching	Incubation period (days)	Temperature
1	Aug. 18, 1957	Aug. 31	13	Under a natural temperature condition
2	Sept. 2, 1957	Sept. 30	28	
3	Sept. 5, 1959	Sept. 19	14	
4	Sept. 12, 1959	Sept. 28	16	
5	Aug. 28, 1960	Sept. 4	7	27°C (in constant)
6	Aug. 30, 1960	Sept. 7	7	
7	Sept. 1, 1960	Sept. 9-10	8— 9	

First-instar larva

Campodeiform and slightly flattened, thorax about 0.09 mm. in thickness. Average length 1.05 mm. (0.94-1.12 mm.) from tips of maxillae to anal ex-

tremity ; 2nd abdominal segment the widest, about 0.16 mm. in width, and tapering towards caudal end. Creamy white, tinged with faint brown, semi-transparent, patterned with dark purplish brown on dorsal side as shown in Plate 11, fig. 10. Truncated setae absent.

Head nearly rectangular, rather flattened, without suture; 0.10-0.11 mm. in length (exclusive of maxillae), 0.14-0.15 mm. in width and 0.08 mm. in thickness. Eye consists of three ocelli just like the preceding species but ocelli and eye spot larger, and bearing two rather long setae at dorsal margin and near ventral margin of eye spot. Clypeo-labral suture discernible. Antenna four-jointed, similar to that of the preceding species, but basal joint longer than wide, 2nd joint more broadened and freebly annulated. Mandible narrow lanceolate, broadened at basal portion outwardly, inner edge thin, with several irregular shallow teeth near the middle, carving a longitudinal groove along outer edge on ventral side. Maxilla nearly triangular, apical 1/3 narrowed and tapering, basal swelling not conspicuous as that of the preceding species, inner edge and 1/3 of outer apical edge sclerotized and carving a longitudinal groove near inner edge on dorsal side, and with two spines on inner edge. Labial palpus four-jointed, basal joints of each side contact with each other, 2nd joint longer than that of the preceding species and nearly quadrate, 3rd joint oblong and freebly annulated, with two long setae at inner apical portion, terminal joint as long as 2nd-3rd combined and broadened at basal 1/3, tapering towards apex, annulated. Thoracic segments nearly rectangular; comparison of size of both species is shown in Table 4.

Table 4. Size of thoracic segments of *Climaciella magna* (Miyake) and *Mantispa japonica* MacLachlan.

	Climaciella magna		*Mantispa japonica*	
	Length (mm.)	Width (mm.)	Length (mm.)	Width (mm.)
Prothorax	0.058	0.157	0.090	0.135
Mesothorax	***0.054***	***0.153***	***0.090***	***0.144***
Metathorax	0.054	0.157	***0.090***	0.162

Thoracic leg with a tarsus consisting of two subsegments, and terminal part elliptical in shape ; empodium well-developed and broadened towards tip, bearing an extensible fringe of cilia. Tenth abdominal segment with a bifurcated membranous eversible process just like the preceding species. Chaetotaxy is shown in Plate 11, fig. 11.

References

Brauer, F. 1855, Beiträge zur Kenntniss der Verwandlung der Neuropteren. Verh. zool.-bot. Gesell. Wien, 5: 479-484.

———— , 1869, Beschreibung der Verwandlungsgeschichte der *Mantispa styriaca* Poda und Betrachtungen über die sogennante Hypermetamorphose Fabre's. Verh. zool.-bot. Gesell. Wien, 19: 831-840.

Esaki, T. ***1947,*** カマキリモドキの観察. Collecting and Breeding, 9 (2): **25-33.**

Hoffmann, C. H. 1936, Notes on *Climaciella brunnea* var. *occidentalis* Banks (Mantispidae-Neuroptera). Bull. Brooklyn Ent. Soc., 31: 202-203.

Hungerford, H. B. 1936, The Mantispidae of the Douglas Lake, Michigan Region, with some biological observations (Neuropt.). Ent. News, **47: 69-72** & **85-88.**

————, **1939, A** note on Mantispidae. Bull. Brooklyn Ent. Soc., **34: 265.**

Main, H. 1931, A preliminary note on *Mantispa*. Proc. Ent. Soc. London, 6: 26.

[Nawa, Y.] ***1902,*** Explanation of a frontispiece. The Insect World, 6: 301, pl. 7.

[———-] 1903, 擬蠍蛔蜻蛉の幼虫. The Insect World, 7 : 520.

Peterson, A. 1953, Larvae of Insects, Part ***2: 356, fig. N2,*** Columbus, Ohio.

Smith, R. C. 1934, Notes on the Neuroptera and Mecoptera of Kansas with keys for the identification of species. Journ. Kansas Ent. Soc., 7: 120—145.

Withycombe, C. L. ***1922,*** Notes on the biology of some British Neuroptera (Planipennia). Trans. Ent. Soc. London, 1922: 501-595.

————, **1924,** Some aspects of the biology and morphology of the Neuroptera. Trans. Ent. Soc. London, 1924: 303-411.

Explanation of Plates

Plate 10

First instar larva of *Climaciella magna* (Miyake)

Fig. 3. Dorsal view of larva.
Fig. 4. Dorsal view of head.
Fig. 5. Ventral view of prothoracic leg.
Fig. 6. Ventral view of maxillae and labium.
Fig. 7. Ventral view of mandibles.
Fig. 8. Dorsal view of 9th and 10th abdominal segments.
Fig. 9. Chaetotaxy, the left in dorsal view and the right in ventral view.

Plate 11

First instar larva of *Mantispa japonica* MacLachlan

Fig. 10. Dorsal view of larva.
Fig. 11. Chaetotaxy, the left in dorsal view and the right in ventral view.
Fig. 12. Ventral view of maxillae and labium.
Fig. 13. Dorsal view of head.
Fig. 14. Ventral view of mandibles.
Fig. 15. Ventral view of prothoracic leg.

Plate 12

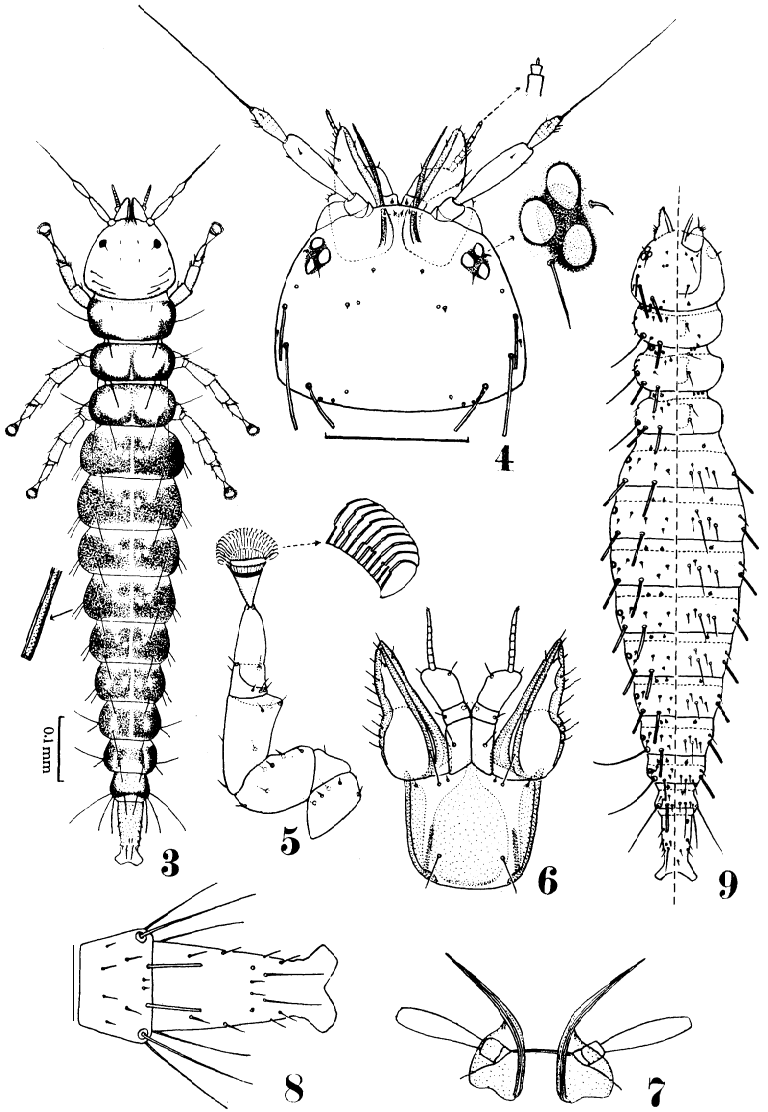
Figs. 16-17. *Climaciella magna* (Miyake)
(16) Egg batch. *(17)* Eggs, highly magnified.

Plate 13

Fig. 18. A mass of 1st instar larvae of *Climaciella magna* (Miyake).
Figs. 19. A female of *Mantispa japonica* MacLachlan laying her eggs on the lower surface of the leaf.

Plate 14

Figs. 20-21. *Mantispa japonica* MacLachlan
(20) Egg batch. (21) Eggs, highly magnified.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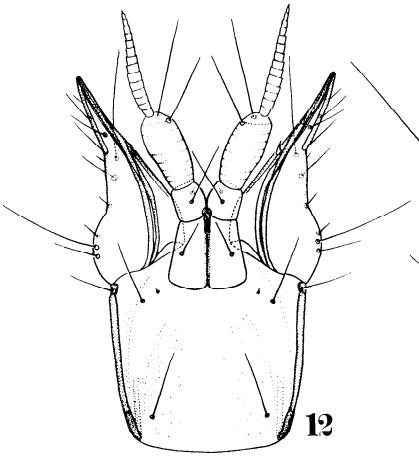

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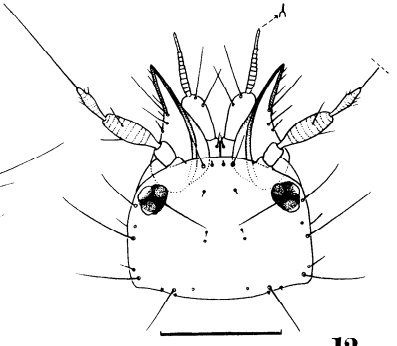

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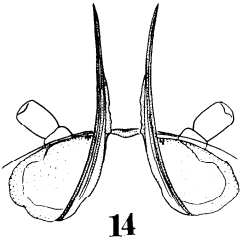

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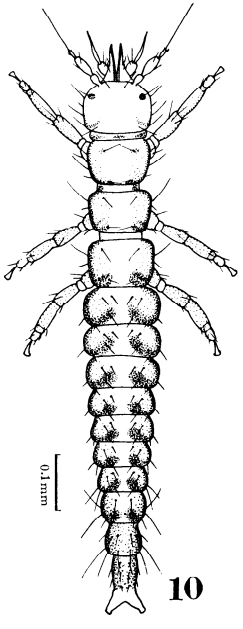

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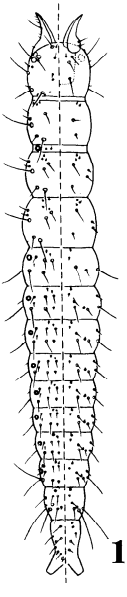

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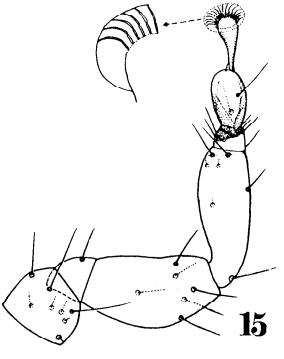

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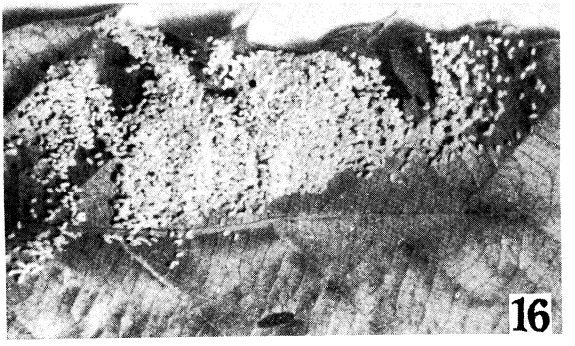
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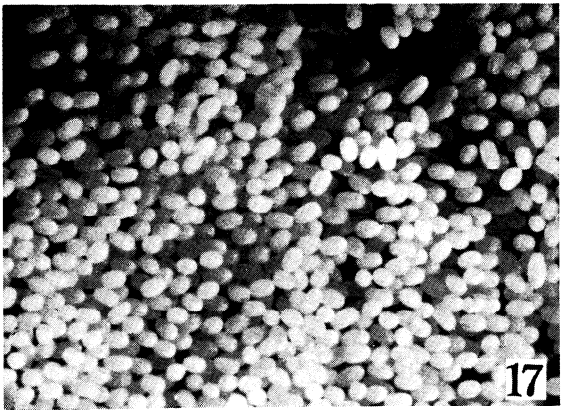
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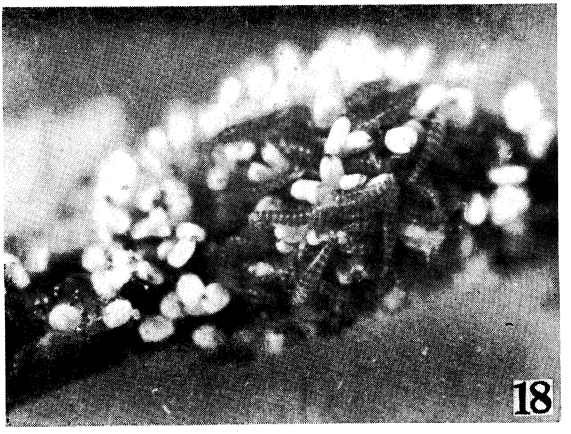
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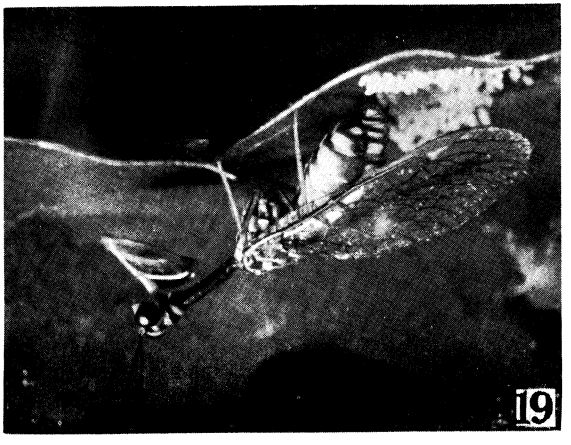
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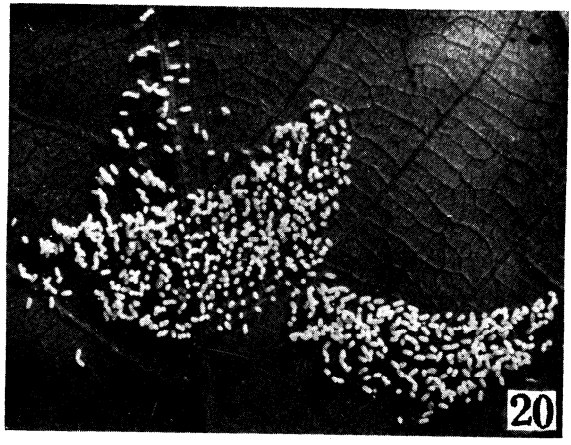
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