SOME NEW RECORDS OF PARASITES OF RICE STEM-BORERS IN INDIA*

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Abstract

The authors have recorded several parasites of paddy stem-borers in India, some of which were not known previously from this country while many others were known earlier only from other hosts. Some species of parasites recorded here are new to science.

The new records mentioned include, *Goniozus indicus* and *Perisierola* sp. (Hym.: Bethylidae); *Elasmus* sp. and *E. albopictus* (Hym.: Elasmidæ); *Tetrastichus ayyari* (Hym.: Eulophidae); ? *Dicopulus* sp. (Hym.: Mymaridae); Gen. nr. *Habrocytus* (Hym.: Pteromalidae); *Trichogramma japonicum*, *T.* sp. (not *minutum*), *Trichogramma* sp. (Hym.: Trichogrammatidae); *Chelonus* sp. 1, *Chelonus* sp. 2, *Meteorus* ? *unicolor*, *Orgilus* sp., *Rhaconotus schoenobivorus*, *R. signipennis* (Hym. : Braconidae); *Amauromorpha accepta accepta*, *A.* ? *metathoracica*, *Apsilops* sp., *Isotima* sp., Gen. *et* sp. indet. (Phaeogenini), Gen. *et* sp. indet. (Pimplini), *Temelucha pestifer*, *T.* sp. nr. *pestifer*, *Temelucha* sp. 1 and *Temelucha* sp. 2 (Hym.: Ichneumonidæ); *Telenomus dignus*, *T. rowani*, *T.* sp. nr. *rowani* and *T.* (*Aholcus*) sp. (Hym.: Scelionidae) on *Tryporyza incertulas*; *Trichospilus diatraeae* (Hym. : Eulophidae), *Apanteles pallipes* and *Tropobracon schoenobii* (Hym.: Braconidae); *Anilastus* sp., Gen. *et* sp. indet. (Campoplegini), *Coccygomimus laothoë* and *Devorgilla* sp. (Hym.: Ichneumonidae) on *Sesamia inferens*; *Apanteles baoris*, *R. signipennis* and *T. schoenobii* (Hym.: Braconidae); *A. a. schoenobii*, *Centeterus alternecoloratus* var. ?, Gen. *et* sp. indet. (Pimplinae), *Pristomerus* sp. and *Temelucha* sp. nr. *basimacula* (Hym.: Ichneumonidae) on *Chilotraea auricilia*; *Apanteles flavipes* and *T. schoenobii* (Hym.: Braconidae) on *Chilotraea polychrysa* and *Apanteles* sp. (group F) and *R. schoenobivorus* (Hym.: Braconidae) on *Chilo suppressalis*.

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New records of nematode parasites were: *Agamermis* sp. on *T. incertulas*, 5 new species of *Hexamermis* on *T. incertulas* and unidentified nematode species on *C. auricilia*, *C. partellus*, *C. suppressalis* and *S. inferens*.

INTRODUCTION

INDIA is the largest rice growing country in the world and has a third of the world acreage under rice. Paddy is a very important food crop in India, and is grown from almost sea-level to elevations of about 6,000 feet though the cultivation is concentrated in the river valleys, deltas and in the low-lying coastal areas of North-East and South India. Among the wide variety of insects that cause heavy damage to paddy, the stem-borers are the most important. Over 20 species of borers are known to attack paddy, but only 10 occur in India (Rao, 1964).

Comprehensive accounts of the indigenous natural enemy fauna of rice stem-borers are wanting for many countries. Among the early records mention may be made of the work of Shiraki (1917) from Taiwan, Gahan (1925) from the Philippines, Pang Hwa Tsai (1932) from China, Pagden (1934) from Malaya, Chiu (1937, 1942) from China and Van der Goot (1948) from Java. In 1959 Walker compiled a list of parasites of insect pests of rice. Subba Rao and Chawla (1964) catalogued the Hymenopterous parasites of rice stem-borers, while Nickel (1964) has studied the feasibility of biological control of rice stem-borers. Cendaña and Calora (1964) have dealt with the natural enemy fauna of rice stem-borers in the Philippines. Rao (1965) has discussed the importance of natural enemies of rice stem-borers and allied species in various parts of the world, and suggested their use in the biological control of rice stem-borers in Asia. Recently, Jordan (1966) has investigated into the presence and prevalence of rice stem-borers and their parasites in Sierra Leone.

In India work on the natural enemies of rice borers has hitherto been negligible; Ayyar and Anantanarayanan (1937), Nair (1958) and Sastry and Appanna (1959) have recorded parasites of paddy stem-borers. During the present study made on a country-wide basis a large number of parasites were recorded; some of these are new species, while others are either reported for the first time from India or are new records on rice stem-borers. A brief account of the new records made is given in the following pages.

HYMENOPTEROUS PARASITES

Bethyloidea

Bethylidae

Goniozus indicus Muesebeck.—This species was originally described by Ashmead from India, but was redescribed by Muesebeck (1940) from specimens reared from sugarcane borers in India (Cherian and Subramaniam, 1938 and 1942). It is a gregarious ectoparasite, and was reared from larva of *Tryporyza incertulas* (Walker) at Bhubaneswar (Orissa) in 1963 and at Baidyabati (West Bengal) in March 1964. *T. incertulas* is a new host record from India, the only other record on the same host being from the Philippines as listed by Nickel (1964).

Perisierola sp..—This was reared from larvae of *T. incertulas* only once at Baidyabati in March 1964 along with above species on one and the same host, which indicated multiple parasitism. This is the first record of *Perisierola* sp. on *T. incertulas.*

Chalcidoidea

Elasmidae

Elasmus albopictus Crawford (Fig. 1).—This is also a gregarious ectoparasite, and was reared from larvae of *T. incertulas.* It was first obtained at Chalakkudy (Kerala) in April 1962 and thereafter at other localities in Kerala, Kudikalpalayam (Madras State) and in localities around Chandannagar (West Bengal). *E. albopictus,* described by Crawford (1910) from a female specimen collected in the Philippines, was hitherto known to parasitise *T. incertulas* in China (Chiu, 1937) and the Philippines (Cendaña and Calora, 1964) only. Therefore it is a first record for India.

Elasmus sp. (Fig. 2).—This was reared from larvae of *T. incertulas* at Kudikalpalayam in 1962. This species is striking in having a greater portion of the postero-dorsal region of abdomen black instead of only the apex of abdomen as in the above species. The head also has a more blackish appearance due to bigger areas of black pigmentation. This is a new record.

Eulophidae

Tetrastichus ayyari Rohwer.—This was obtained from pupae of *T. incertulas* at Bhubaneswar in November 1962. It was described by Rohwer (1921) from specimens reared from *Chilo* sp. infesting sugarcane in India. It also parasitises many other species of Pyralid borers of sugarcane in India

(Cherian and Subramaniam, 1940). Subba Rao and Chawla (1964) have listed it as a parasite of *Chilo suppressalis* (Walker) in India. *T. incertulas* is, however, a new host record.

Trichospilus diatraeae Cherian and Margabandhu.—This was recorded on the pupae of *Sesamia inferens* (Walker) at Kalimpong (West Bengal) in 1962 and 1963. This species was described by Cherian and Margabandhu (1942) from specimens reared from pupae of *Proceras indicus* Kapur in South India (Cherian and Subramaniam, 1942), but there is no previous record of the parasite attacking *S. inferens.*

Mymaridae

? *Dicopulus* sp.—A few specimens were reared from the eggs of *T. incertulas* at Kottapuram (Kerala) in March 1963. This is a new record, the only other record of a Mymarid parasite of *T. incertulas* is that of *Gonatocerus* sp. from Malaya (Pagden, 1934).

Pteromalidae

Genus near *Habrocytus.*—This was reared from the larvae of *T. incertulas* at Chalakkudy in April 1962, and is a new record.

Trichogrammatidae

Trichogramma japonicum Ashmead.—This was recorded on the eggs of *T. incertulas* at Baidyabati in October 1963. It has previously been recorded on the same host from Taiwan (Shiraki, 1917), Japan (Kuwana, 1929) and Malaya (Pagden, 1934). Chiu and Hsia report it from China and Rowan from the Philippines (Thompson, 1947). There is a doubtful record of this species made by Sastry and Appanna (1959) from Mysore State in India on the same host. The present record of the parasite is, however, the first authentic one from India.

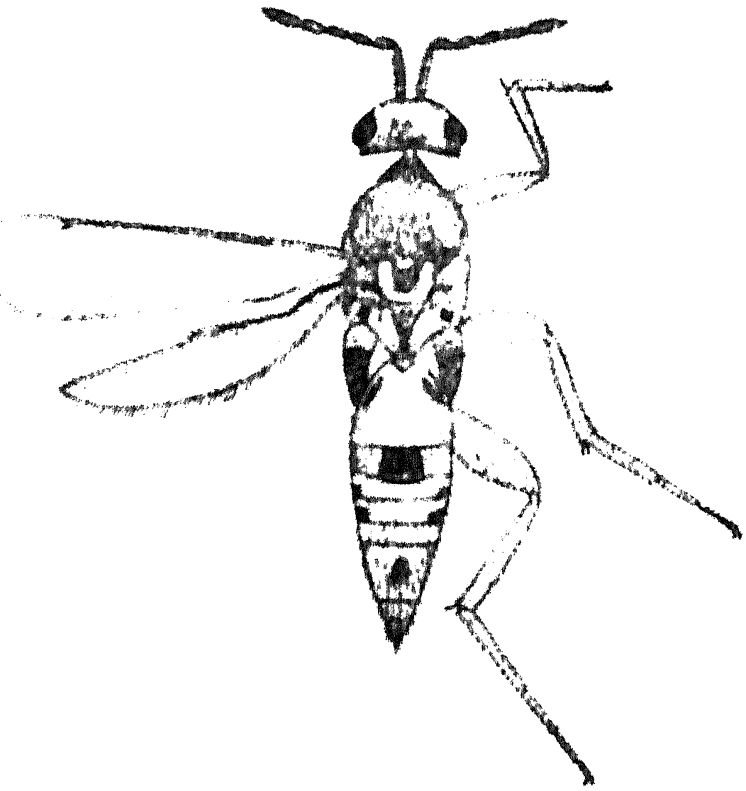
Trichogramma sp. (not *minutum* Riley).—This was obtained from the eggs of *T. incertulas* at Khatua (Jammu and Kashmir) in 1963, and subsequently at Mandya (Mysore State). This is a new record.

Trichogramma sp.—This parasite was reared from eggs of *T. incertulas* at Triveni (West Bengal) in 1963. This is also a new record.

Ichneumonoidea

Braconidae

Apanteles baoris Wilkinson.—This was reared from the larvae of *Chilotraea auricilia* (Dudgeon) at Bhubaneswar in September 1962. Wilkin-



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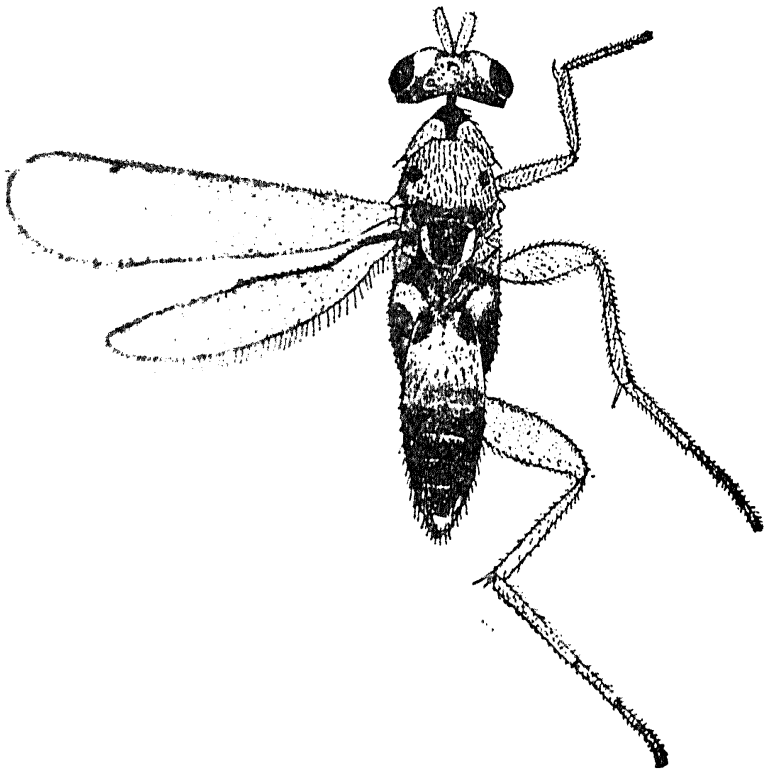

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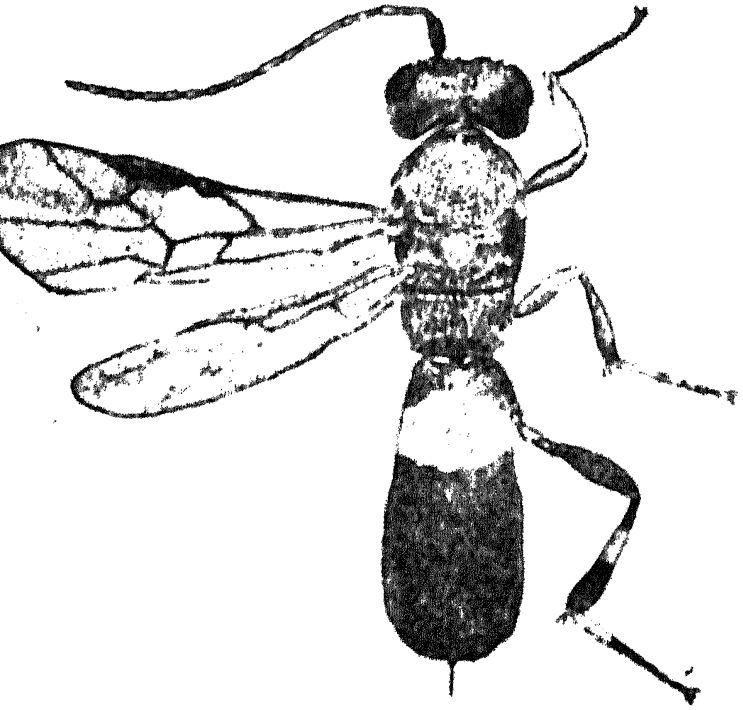

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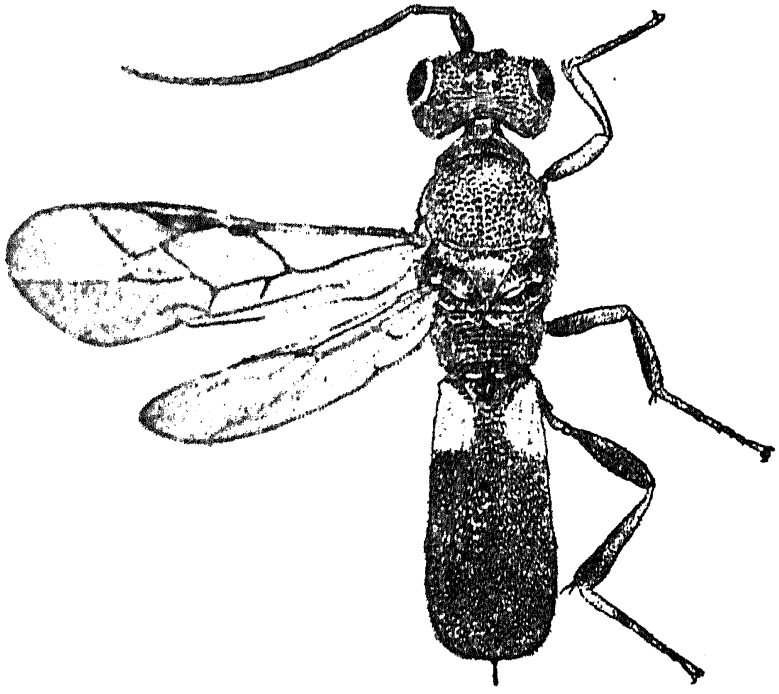

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FIGS. 1-4

son (1930) has described *A. baoris* from a specimen reared from larva of *Pelopidas mathias* (Fabricius) in Malaya. Bhatnagar (1948) has listed

A. baoris as a parasite on *P. mathias* in India. *C. auricilia* is a new host record for *A. baoris.*

Apanteles flavipes Cameron.—This parasite was reared from the larvae of *Chilotraea polychrysa* (Meyrick) at Baidyabati in April 1963 and 1964. Corbett and Miller (1933) listed it on the same host in Malaya. The present record is the first record of this parasite on *C. polychrysa* in India.

Apanteles pallipes Cameron.—This was reared from the larvae of *S. inferens* at Palghat (Kerala) in January 1963, and is being reported for the first time on this host.

Apanteles sp. (Group F).—At Kamalpur (Assam) this parasite was reared from the larvae of *C. suppressalis* in November and December 1963. This is a new record.

Chelonus sp. 1 (Fig. 3).—This parasite was reared from the larvae of *T. incertulas* at Baidyabati and other localities around Chandannagar during the summer of 1963 and 1964 and this is the first record on this host. The female of this species bears a single, large white patch on the anterior region of the dorsum of the abdomen. The middle region of the hind tibia is white and the head is finely wrinkled.

Chelonus sp. 2 (Fig. 4).—This species of *Chelonus* also was reared from the larvae of *T. incertulas* at Baidyabati and other localities around Chandannagar in the summer of 1963 and 1964 and is also the first record on this host. The female of this species differs from the above species in having a pair of lateral white patches instead of a single patch on the abdomen, the hind tibia is without a white area and the head is strongly wrinkled and punctured. *Chelonus munakatae* Munakata was reported on the larvae of *T. incertulas* and *C. suppressalis* from Japan by Kondo (1917) and from China by Parg Hwa Tsai (1932). Carl (1961) reported *Chelonus* sp. from West Pakistan on the same host.

Meteorus? *unicolor* Wesm. (Fig. 5).—A few specimens were reared from larvae of *T. incertulas* at Mandya in 1963. This species is yellow ochre, measures about 5 mm. from head to the end of the abdomen with ovipositor of another 1·5 mm. length. This is a new record.

Orgilus n. sp. (Fig. 6).—This species was reared from larvae of *T. incertulas* at Achanpally (Andhra Pradesh) in March 1964. This is the first record on *T. incertulas.*

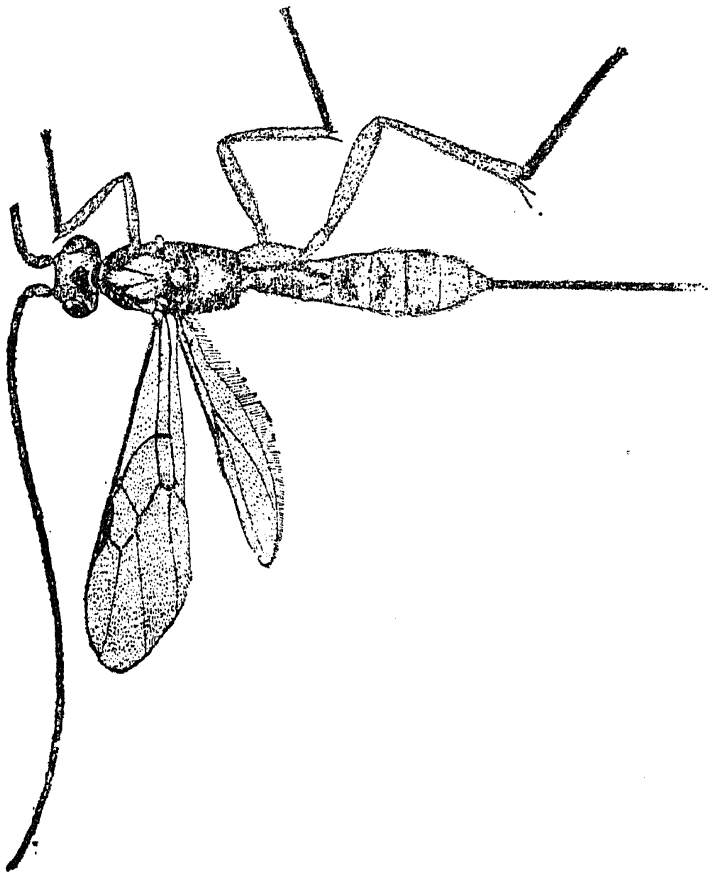
Rhaconotus schoenobivorus (Rohwer) (Fig. 7).—This is a gregarious ectoparasite and was reared mainly from stubble-inhabiting larvae of *T. incertulas* at Mahadanapuram (Madras State) in March 1962, and thereafter at Bodhan (Andhra Pradesh), Tiruvarur (Madras State), Mandya and Chandannagar. This was also reared from larvae of *C. suppressalis* at Kamalpur in April 1962. This Braconid was described by Rohwer (1918) as *Horniopterus schoenobivorus* reared from pupae of *T. incertulas* in Java. Later Cendaña and Calora (1964) reported it on the same host from the Philippines. It is being reported for the first time from India.

Rhaconotus signipennis Walker.—This was reared from larvae of *C. auricilia* at Gauhati (Assam), and larvae of *T. incertulas* at Mahadanapuram in February 1962. *R.* sp. nr. *signipennis* has been recorded recently on *P. indicus* infesting sugarcane in South India (Raja Rao, 1964). The specimens reared from *T. incertulas* at Mahadanapuram appear to be *R.* sp. nr. *signipennis* (Fig. 8). *C. auricilia* and *T. incertulas* are new host records.

Tropobracon schoenobii (Viereck) (Fig. 9).—This was reared from larvae of *S. inferens* at Bardoli (Gujarat) in October 1962, and later at Lucknow (Uttar Pradesh) and Baidyabati. At Baidyabati it was fairly active in April 1964, parasitising about 6% of *S. inferens*. It was also obtained from larvae of *C. auricilia* at Gauhati in January 1962 and at Bhubaneswar in 1963, from larvae of *C. suppressalis* at Gauhati in December 1963 and once from a larva of *C. polychrysa* at Baidyabati in March 1964. *T. schoenobii* is known from a number of countries under different names, such as *Shirakia dorsalis* Matsumara, *Shirakia schoenobii* Viereck, *Tropobracon luteus* Cameron and *Tropobracon luteus indicus* (Ayyar, 1928; Subba Rao and Chawla, 1964; Nickel, 1964). It has been recorded on *S. inferens* infesting sugarcane in Taiwan (Watanabe, 1932) and Japan (Yanagihara, 1934). Cendaña and Calora (1964) reported it from the Philippines on *S. inferens* infesting paddy, while Thompson (1953) listed it as a parasite of *C. suppressalis* in Japan and Taiwan. In India, Ayyar and Anantanarayanan (1937) recorded it from *T. incertulas*. Thus, while *S. inferens* and *C. suppressalis* are new host records for India, *C. auricilia* and *C. polychrysa* are altogether new host records.

Ichneumonidae

Amauromorpha accepta accepta (Tosquinet).—This parasite was reared from larvae of *T. incertulas* at Trivandrum (Kerala) in April 1962, and later at Tiruvarur. According to Townes *et al.* (1961) this was described by Tosquinet in 1903 as *Ischnoceros acceptus* from Java and was later redescribed



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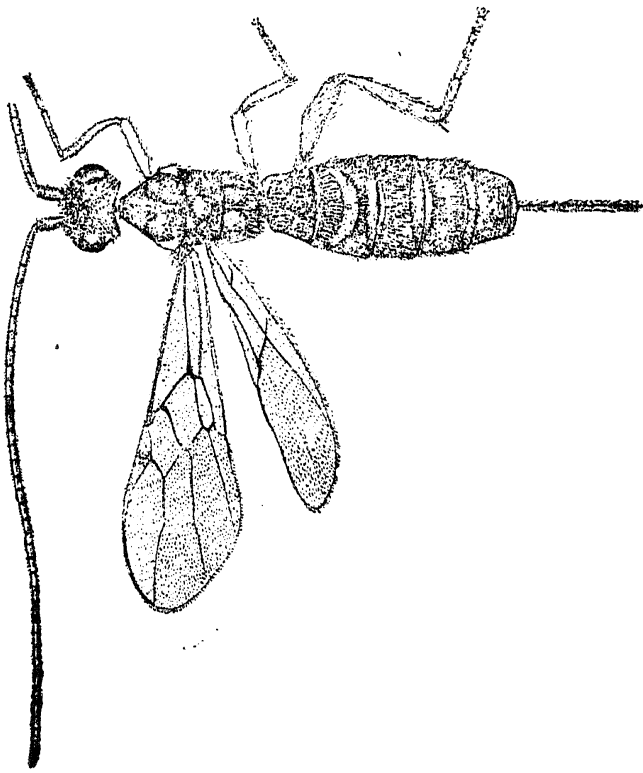

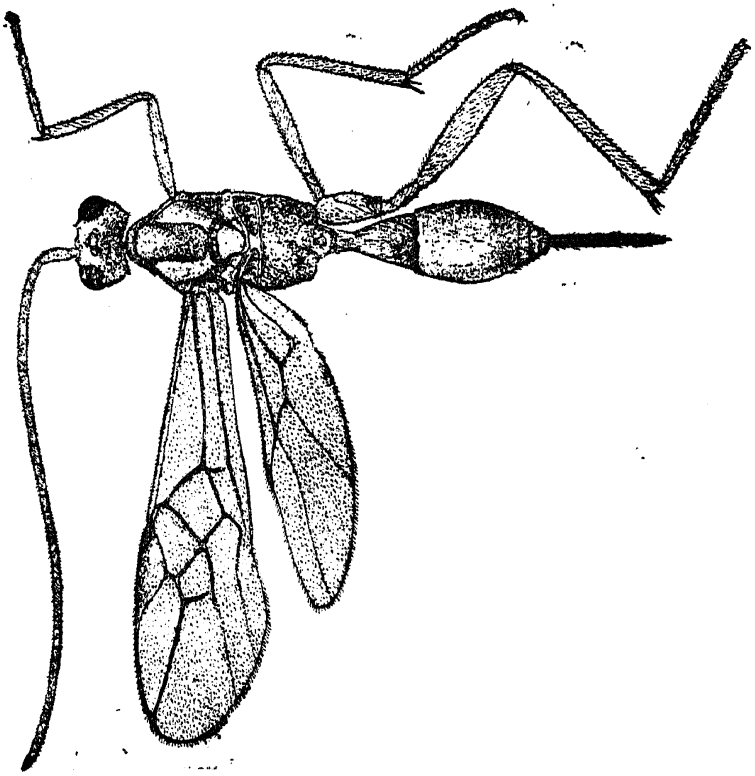

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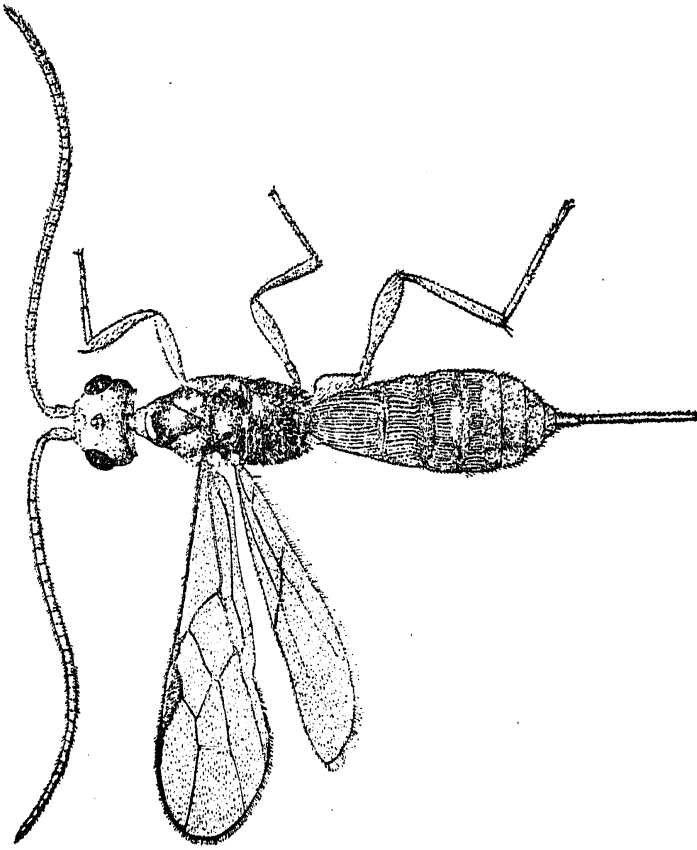


by Rohwer under the name *Eripternimorpha scirpophagae* from specimens reared from *Scirpophaga innotata* Walker in Java. This is the first record of this parasite for India and on *T. incertulas.*

Amauromorpha accepta schoenobii Viereck.—This was obtained from larvae of *C. auricilia* at Gauhati in April 1962 and is the first record for India and on this host. Townes *et al.* (1961) consider *Amauromorpha schoenobii* Sonan and *Eripternimorpha schoenobii* Viereck as synonyms of *A. a. schoenobii,* which was described from Taiwan in 1913, and list *T. incertulas, C. suppressalis* and *S. inferens* as its hosts. Rao *et al.* (in press) recorded this parasite on *Melanitis ismene* Cramer (Lepidoptera: Satyridae) from India.

Amauromorpha ? *metathoracica* Ashmead.—This was observed as a larval parasite of *T. incertulas* at Tiruvarur in 1962, and at Ernakulam (Kerala) in 1963, and is a new record for India. *A. metathoracica* has been reported on *T. incertulas* from China (Chiu, 1942).

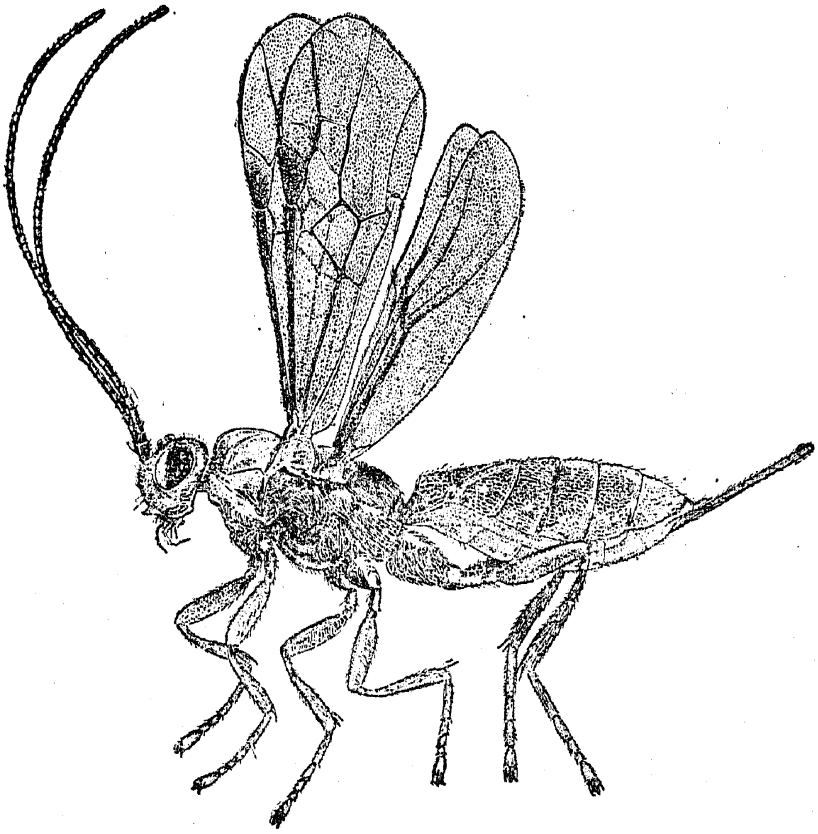
Anilastus sp. (Fig. 10)—This was reared from larvae of *S. inferens* at Kalimpong in October 1962. This parasite measures 8 mm., and is black with the first two pairs of legs, hind femur and middle region of hind tibia ochre. This is the first record of *Anilastus* sp. as a parasite of *S. inferens.*

Apsilops sp. (Fig. 11).—Specimens of this species were reared from *T. incertulas* larvae collected at Lucknow in 1963. There is no previous record of *Apsilops* sp. attacking *T. incertulas.*

Campoplegini (Gen. *et* sp. indet.) (Fig. 12).—This was reared from larvae of *S. inferens* at Kotgarh (Himachal Pradesh) in August and September 1963. This species is black and measures about 5 mm. First two pairs of legs ochre, second segment of hind trochanter yellow. Abdomen is yellow ventrally with faint orange bands postero-dorsally. This is also a new record.

Centeterus alternecoloratus Cushman ? var.—This was reared from pupae of *C. auricilia* at Shillong from August to September in 1962 and 1963. About 28% parasitism was observed in September. *C. alternecoloratus* was originally described from China as a parasite of *C. suppressalis* (Townes *et al.*, 1961). Pang Hwa Tsai (1932) recorded it on *T. incertulas* from China. A detailed account of this parasite has been published by Chacko and Rao (1966).

Coccygomimus laothoë Cameron (Fig. 13).—It was recorded as a pupal parasite of *S. inferens* at Chowki (Assam) in January 1963, and later at



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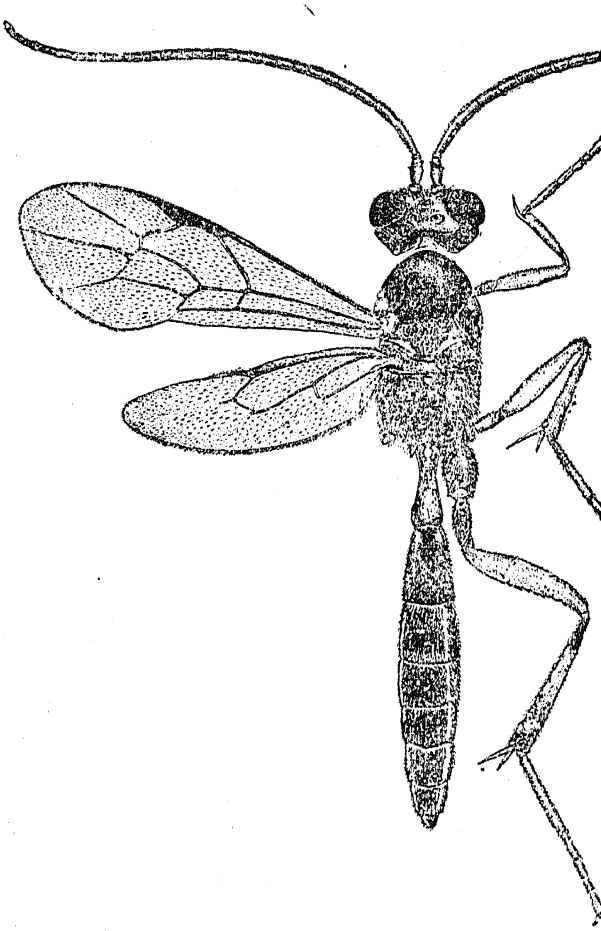

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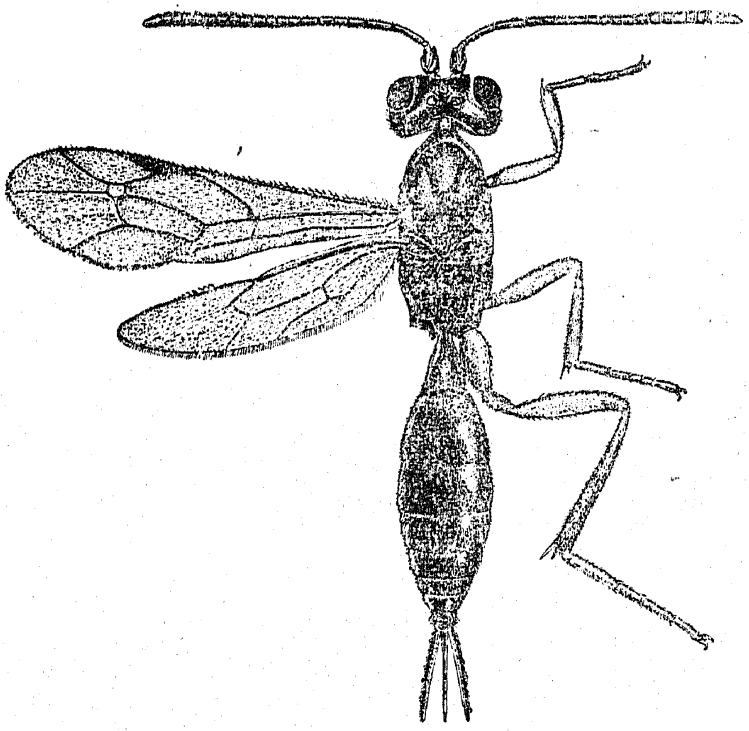

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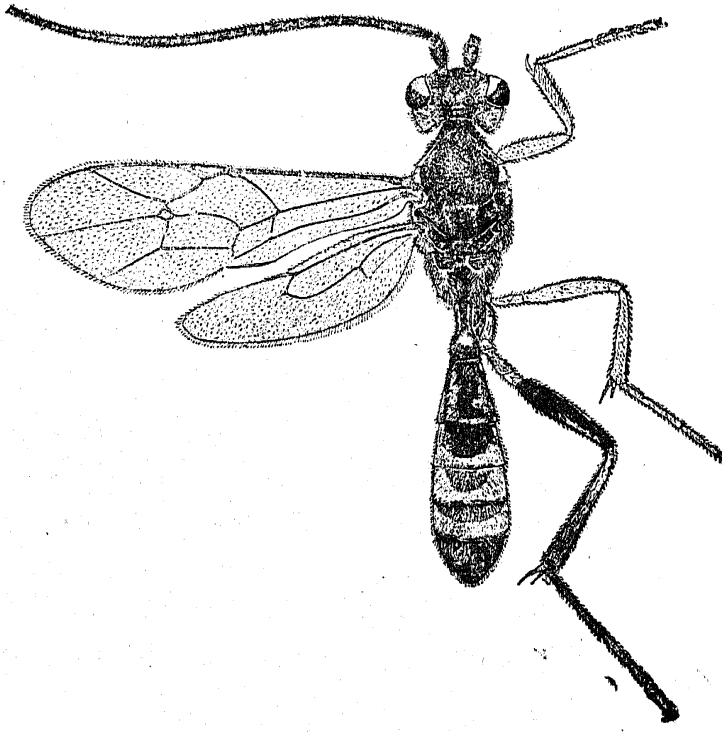

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FIGS. 9–12

Shillong. Rao *et al.* (in press) recorded this parasite on *M. ismene* from Mysore State, India, but it is the first record on *S. inferens*. According to Townes *et al.* (1961), *C. laothoë* was originally described as *Pimpla laothoë* Cameron in 1897 and later under different names such as *P. instigator*, *P. nepe* and *P. poesia* by various authors from India. It also occurs in Ceylon and Siberia.

Devorgilla sp. (Fig. 14).—This was obtained from larvae of *S. inferens* at Kotgarh in September 1963. This black species measures about 4–4·5 mm. In the female, posterior half of the abdomen is orange while in the male there are alternate bands of orange and black dorsally. First two pairs of legs are yellow. *Devorgilla* sp. is being reported for the first time on *S. inferens*.

Isotima sp.—This was reared from larvae of *T. incertulas* at Gobichettypalayam (Madras State) in January 1962 (parasitism 6·4%), and subsequently at other localities in the same State, Kamalpur, Mandya and around Chandannagar. This is the first record of *Isotima* sp. on *T. incertulas* in India.

Phaeogenini (Gen. *et* sp. indet.).—A few specimens of this species were reared from the larvae of *T. incertulas* collected in Mandya in 1963. This is a new record.

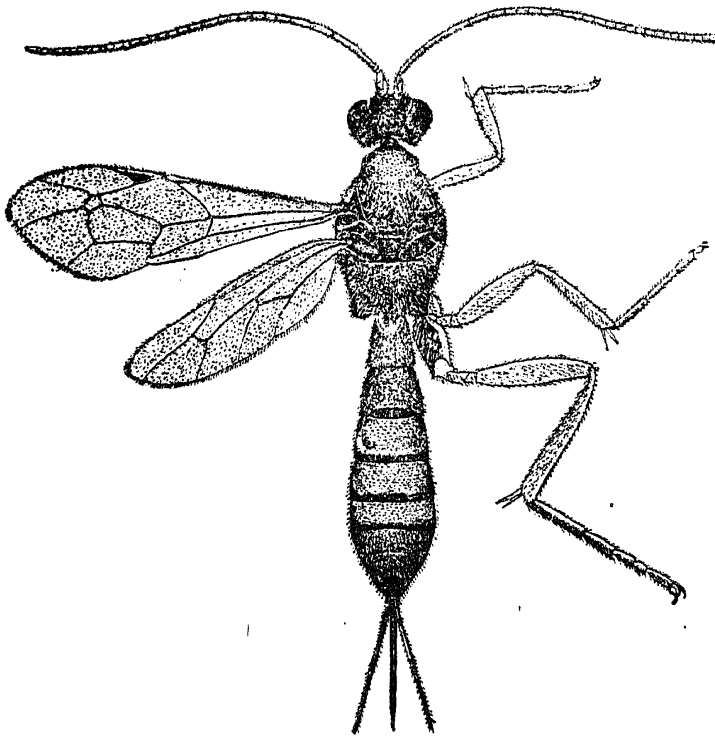
Pimplinae (Gen. *et* sp. indet.).—This species was reared from larvae of *T. incertulas* at Gauhati in September 1962. This is also a new record.

Pimplinae (Gen. *et* sp. indet.) (Fig. 15).—Individuals of this species were reared from larvae of *C. auricilia* collected at Kamalpur in March 1962. This is also a new record.

Pristomerus sp. (Fig. 16).—This was reared from larvae of *C. auricilia* at Kalimpong in February 1963, and at Shillong in October 1963. Head and thorax of this species are black while legs and abdomen are orange. It measures 8 mm. excluding the ovipositor which is another 3·5 mm. in length. This is a new record.

Temelucha sp. nr. *basimacula* Cameron (Fig. 17).—This was found as a larval parasite of *C. auricilia* at Jagmara (Orissa) in 1963, and is the first record.

Temelucha pestifer Morley.—This was reared from pupae of *T. incertulas* at Rudrur (Andhra Pradesh) in October 1963. It was described by Morley



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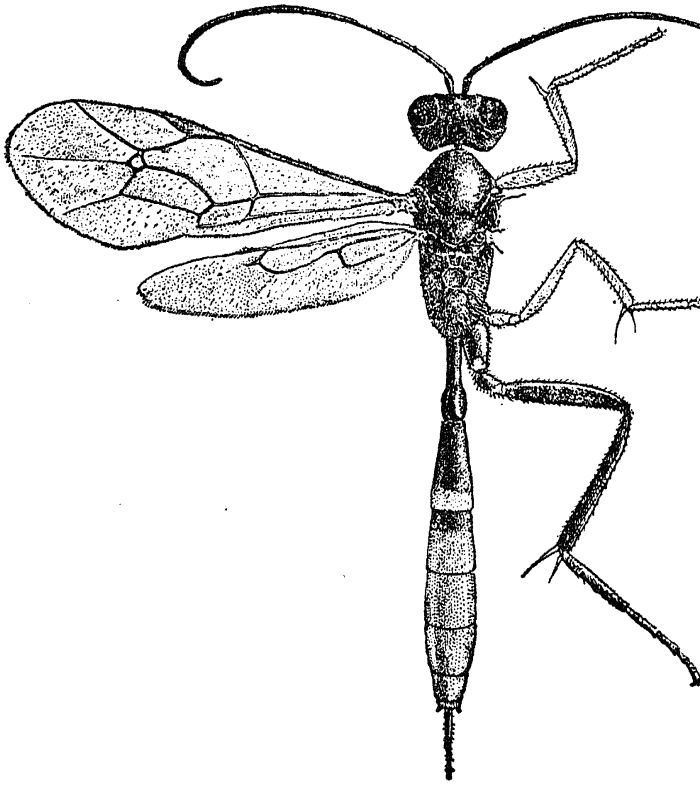

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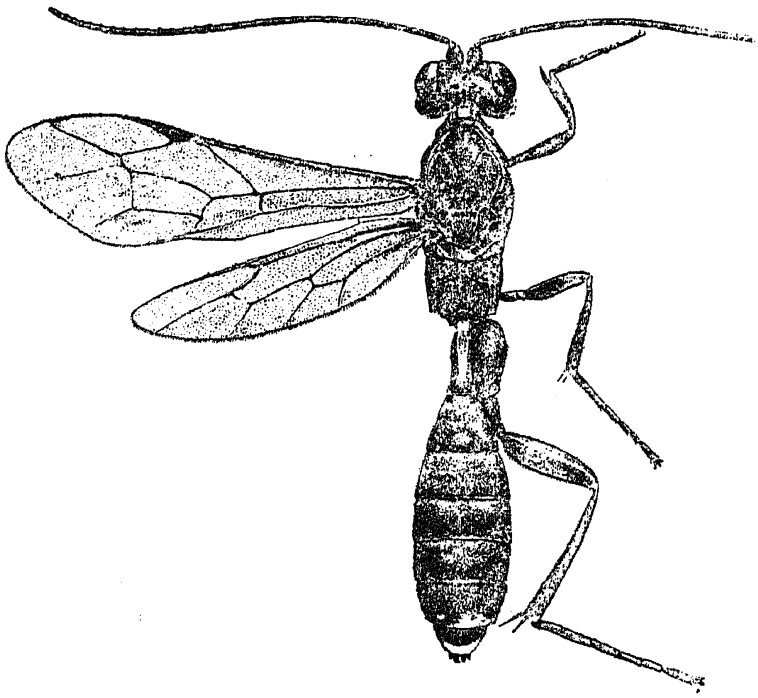

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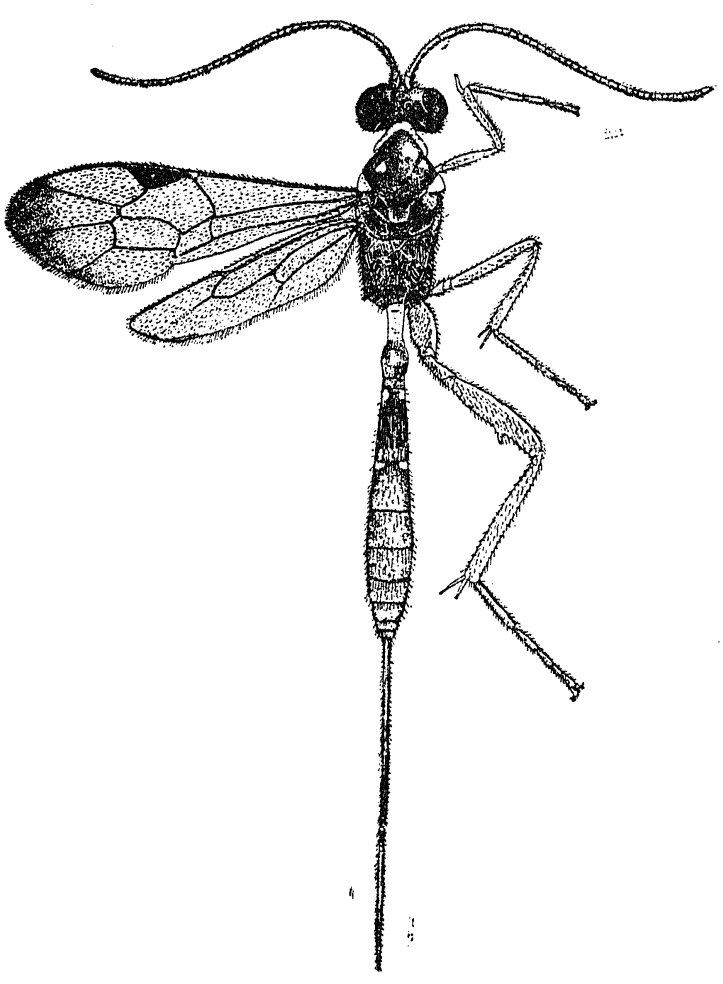
FIGS. 13-15

(1913) from Ceylon as *Cremastus pestifer* (Townes *et al.*, 1961). This is the first record of the parasite for India and on *T. incertulas*.

Temelucha sp. nr. *pestifer* Morley (Fig. 18). — This was reared from larvae of *T. incertulas* at Kudikalpalayam in April 1962, and thereafter at Chauvara and other localities in Kerala, Mandya and Baidyabati. This is a new record.

Temelucha sp. 1 (Fig. 19).—This species was reared from prepupa of *T. incertulas* in localities around Chandannagar in 1963. The female of this species is 9 mm. long excluding the ovipositor which measures about 2 mm. The male is about 7–7·5 mm. long. General colour of the species is black with alternate bands of black and brown on the abdomen. This is a new record.

Temelucha sp. 2.—This species of *Temelucha* was reared from larvae of *T. incertulas* at Trivandrum in 1962 and subsequently at Bandel, Bhubaneswar, Bodhan, Ernakulam, Mandya and Tiruvarur. This ochre yellow species measures 9–10 mm. in length excluding the ovipositor which is about 3 mm. long.



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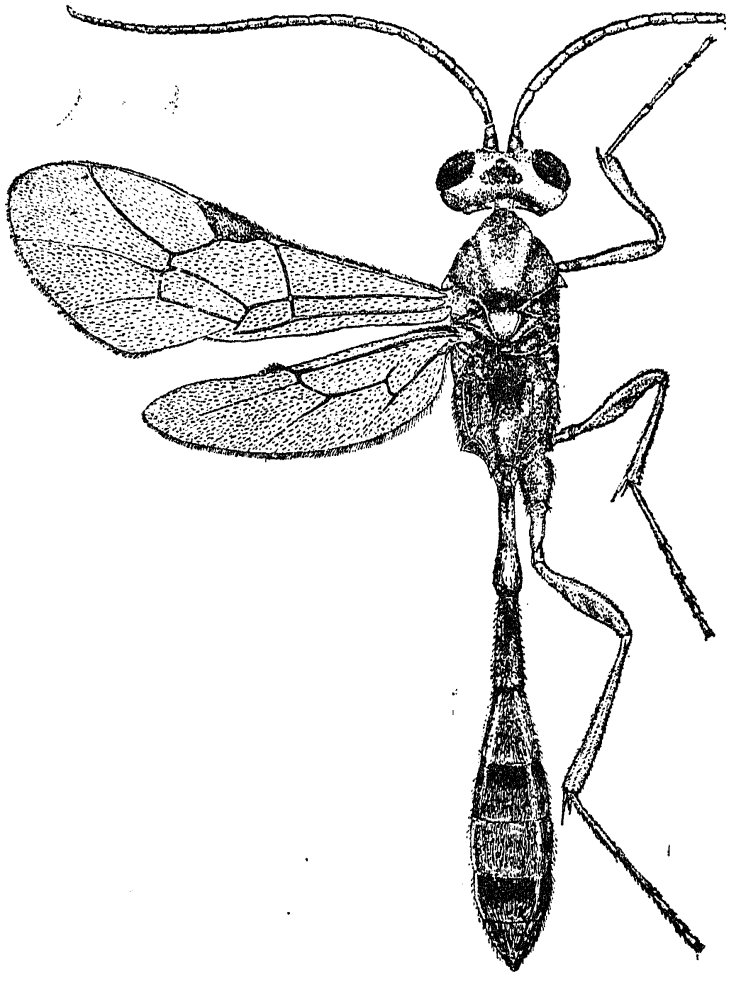

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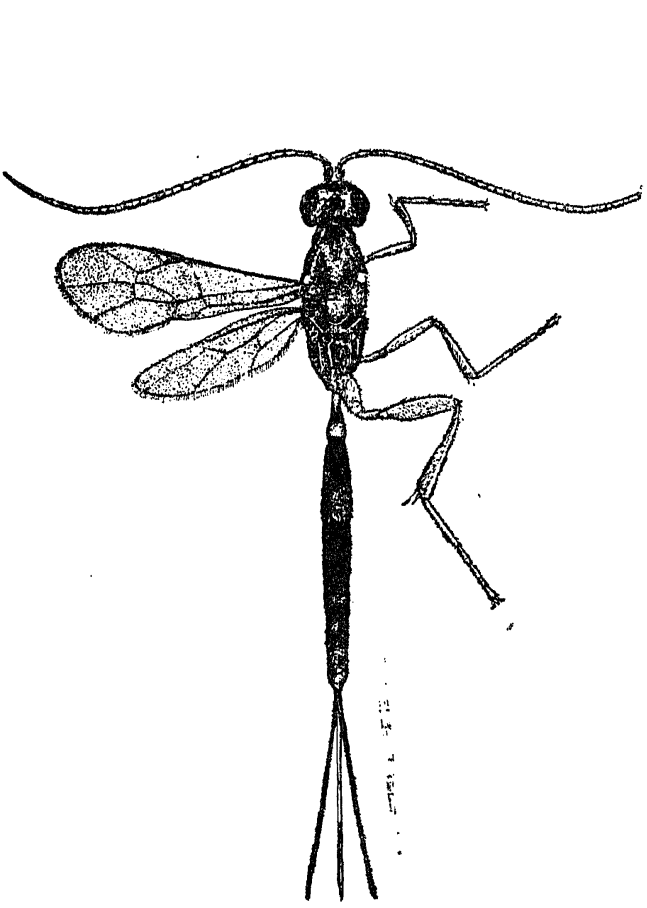
FIGS. 16–17

Scelionidae

Telenomus dignus (Gahan).—This was observed as an egg parasite of *T. incertulas* at Bhubaneswar in April 1962, and thereafter at Ernakulam, Kunniyur (Madras State) and Vanduvancheri (Madras State), Mandya, Basuaghai (Orissa) and Triveni. This is the first record of *T. dignus* on *T. incertulas* in India. This parasite was described by Gahan (1925) as *Phanurus dignus* from specimens reared from the same host in the Philippines. It is also known to parasitise *T. incertulas* in China (Chiu, 1942), Japan (Otake, 1960), East Pakistan (Alam, 1962) and Ceylon (Fernando, 1964). Rao (1963) has reported *T. dignus* as an egg parasite of *Scirpophaga nivella* F. in India.

Telenomus rowani (Gahan).—This was reared from eggs of *T. incertulas* at Baidyabati in October 1963; although parasitism was heavy, only a few eggs in each egg mass were parasitised. This is a new host record for the parasite in India. *T. rowani* was described by Gahan (1925) as *Phanurus rowani* which was recorded as a parasite of *T. incertulas* in the Philippines.



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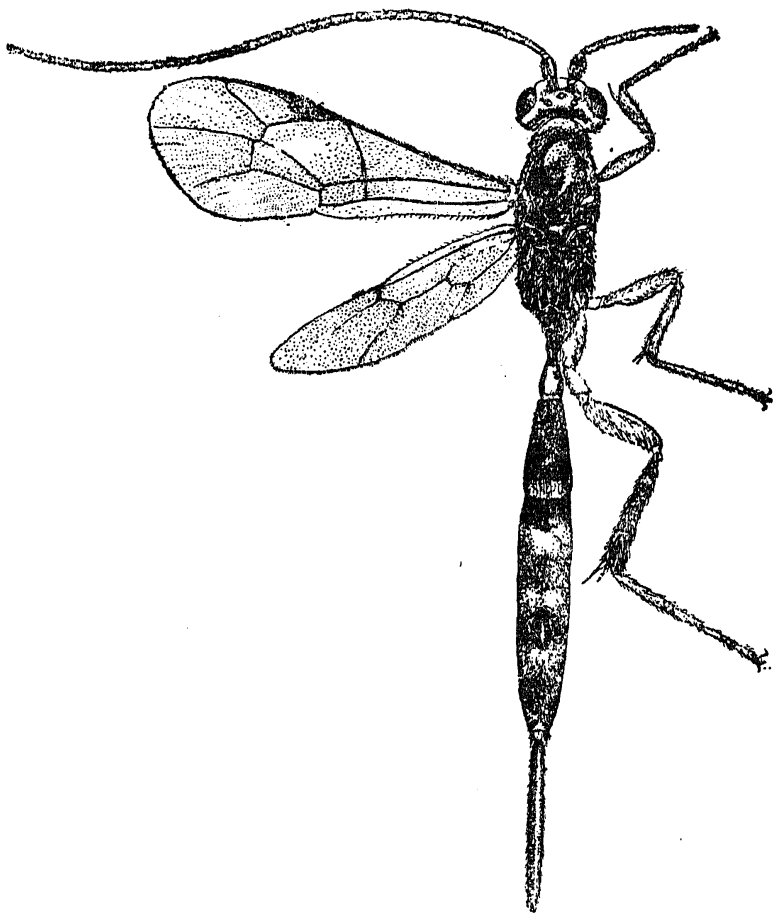

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FIGS. 18–19

Nixon (1937) redescribed it under *Telenomus*. It is also known as a parasite of *T. incertulas* from China (Chiu, 1937). Cherian and Subramaniam (1938) reported it from eggs of *Scirpophaga rhodoproctalis* Hamps. infesting sugarcane in Madras State.

Telenomus sp. nr. *rowani* (Gahan).—This parasite was obtained from the eggs of *T. incertulas* at Bhubaneswar in 1963, and is a new record.

Telenomus (*Aholcus*) sp. n.—This was reared from eggs of *T. incertulas* at Aduthurai (Madras State) in May 1964, and is a new record.

Nematode Parasites

Agamermis sp.—This nematode was reared from the larvae of *T. incertulas* at Khatua in September 1963. Walker (1959) listed an unidentified species of *Agamermis* as a parasite of *C. suppressalis* in Japan. This is the first record of *Agamermis* sp. on *T. incertulas*.

Hexamermis spp.—At least five new species of *Hexamermis* were reared from larvae of *T. incertulas* in most of the localities in the States of Andhra Pradesh, Kerala, Orissa and West Bengal in 1962 and 1963. They were also occasionally reared at Gauhati (Assam) in September 1962 and November 1963 and at Tiruvarur (Madras State) in January 1963. Nematodes were in general most active during the rainy season, and 16% parasitism has been recorded in Kerala in 1962 and upto 17% parasitism was noticed in areas around Chandannagar in 1963. This is the first record of *Hexamermis* spp. on *T. incertulas*, the only other records of nematodes on larval stages of *T. incertulas* being those of *Amphimermis zuimushi* Kaburaki from Japan (Kaburaki and Imamura, 1932), an unidentified Mermithid from India (Khan *et al.*, 1956) and an unidentified species from East Pakistan reported by Alam in 1961 (Ghani, 1964).

Unidentified species of nematodes.—These were reared from larvae of *S. inferens* at Kotgarh in August 1963, from larvae of *C. auricilia* at Jorhat (Assam) in November 1962 and once at Chandannagar in November 1963, from larvae of *C. partellus* at Bhubaneswar in 1963, and from larvae of *C. suppressalis* at Gauhati in October 1963. There is no previous record of any nematode which is parasitic on *S. inferens*, *C. auricilia* and *C. partellus* infesting paddy. The record of the nematode on *C. suppressalis* is the first for India, the only other record of a nematode on this host being that of *A. zuimushi* from Japan (Kaburaki and Imamura, 1932).

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* Originals not seen.

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