

**ON SOME AUSTRALIAN COSSIDAE  
INCLUDING THE MOTH OF THE WITJUTI (WITCHETY) GRUB**

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**SUMMARY**

The hitherto unknown female of *Xyleutes leucomochla* Turner 1915 is described, also its life-history on the roots of one of the witjuti (witchety) bushes (*Acacia ligulata*). Larvae have become known as aboriginal articles of food but had never been reared to maturity.

Brachypterous females of a new species, *Xyleutes biarpili*, are described; also its life-history on the roots of *Zygophyllum fruticulosum*.

The previously undescribed brachypterous females of two other Cossids, *Xyleutes amphiplecta* Turner, and *Catoxophylla cyanauges* Turner are recorded with some life-history details.

The value of these insects as foods for aborigines is noted and the conclusion stated that they provide an almost essential element in their diet.

**INTRODUCTION**

Between June and September, the time when most field workers visit the Western Desert, only immature stages of various Cossid larvae are present. Hence several species which feed on the roots of shrubs and annuals, and which are used as food by the aborigines, are known as larvae, but have not been bred to maturity and identified with the moth.

In April 1951 a fortunate and, for this writer, a rare opportunity to visit Ooldea, on the Trans-Australian Railway line, came earlier than usual in the season. This enabled him, with the aid of aboriginal children, to find adult larvae and pupae of two species, and to rear them to maturity. He was able to confirm that at least three species of Cossids in arid Australia have brachypterous females, incapable of flight.

**XYLEUTES LEUCOMOCHLA Turner 1915**

*Female*—Head dark brown with a tuft of white scales at base of antennae; palpi black, short, terminal segments moderate, ovoid and smooth-scaled; antennae relatively long, tapering to a fine point, minutely bepectinate; thorax brown with some white scales; an inverted black V-mark on thorax, tufts on tegulae white, abdomen brown with some white scales more evident laterally; thorax below brown, legs brown, base of abdomen white. Forewings with costa slightly sinuate, apex not well rounded, termen rather straight, obtuse-angled at inner margin, brown with a base of obscurely delimited white reticulate markings, outlined with blackish-brown scales from apex to lower margin of cell; a larger white area near apex of cell partly margined with black; towards inner margin white scales are scattered among the brown ones. Hindwings with costal third white, rest of wing pale brown with traces of reticulate markings near termen. Wing length 60 mm.; expanse 135 mm.

*Locality*—South Australia, Ooldea Soak, 27 April 1951, N. B. Tindale (allotype female, I. 19094, in South Australian Museum); Woomera, 12 March 1950, another female, found by a survey party.

\* South Australian Museum.

The second female specimen is much larger. It is rather worn but, even with the tips of the forewing wanting, exceeds 170 mm. in expanse. The inner margin of the forewing is somewhat more concave than in the figured specimen.

These two females appear unquestionably to be the other sex of *Xyleutes leucomochla* Turner, which was previously known only from male examples

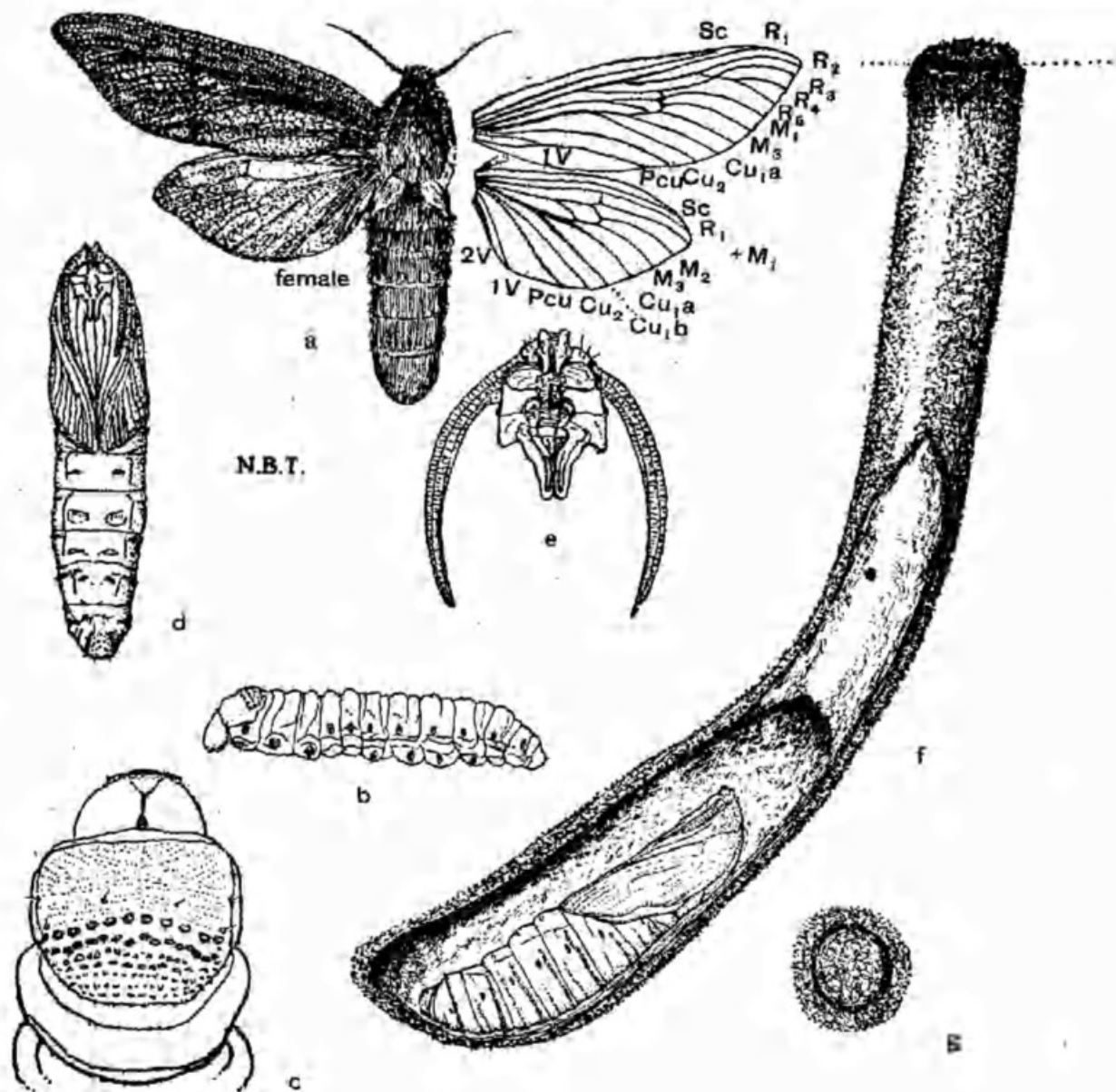


Fig. 1

*Xyleutes leucomochla* Turner. a, allotype female, Oldea Soak, South Australia; b, larva; c, head and thorax of larva; d, pupa of allotype female; e, pupal mask; f, pupa in silken pupal tunnel; g, unopened lid of tunnel from above.

taken at Nhill in Victoria, and at Cunderdin and Lake Darlot in Western Australia, and of which the life-history was unknown.

It is to be noted that Turner's type of *X. leucomochla*, so labelled by him, is from Cunderdin, Western Australia, and is in the South Australian Museum collection, No. I. 14331, and not in the National Museum Melbourne, as stated seemingly in error, in the original description; it was a specimen taken by the late Mr. R. Illidge. There is another male in the South Australian Museum collection from Murray Bridge, South Australia.

Males are more noticeably brown in colour than the described females but the markings are similar.

**Occurrence**—Many empty pupal shells were found among leaf debris. They were standing up from silk-lined vertical tunnels placed within a foot or so of the butts of tall *Acacia ligulata* shrubs. Native boys indicated that most of the moths already had emerged. After digging near the butts they secured numbers of larvae, ranging from 42-80 mm. in length, and one pupa almost ready to emerge. The pupal chamber in which it was found is a curved cylinder of silk in the sand, its lower extremity placed close against the butt of the shrub. The chamber is closed at the bottom and 230 mm. in length (fig. 1 f). The lower 100 mm. is wider (25 mm.) than the 18 mm. diameter of the upper part which at the top appears as if it has been coated with a sealing substance, darker than the normal silk of the tunnel. It has a sealing cap of silk coated in a similar manner. In the pupal tunnels of emerged moths this cap has been neatly cut around and thrust to one side. The silk lining the tunnel is smooth and grey in colour.

The larvae feed externally on the roots of *Acacia ligulata* shrubs, remaining in a silken chamber against the root. This chamber afterwards is remodelled to serve as the pupal shelter; the part of the root being eaten is incorporated into the walls of the chamber. The bulk of wood eaten is relatively small and it would seem that, to an extent, the larva relies on the flow of sap for food, the jaws principally being used to keep the wounds in the root active and fresh.

A larva placed in a glass-topped box with an apple and sand quickly formed a chamber and settled down for some weeks in its strange environment, so that some of its habits could be observed. Unfortunately it succumbed without pupating after having been disturbed when renewing the food. It had eaten the apple until this had begun to decay.

The Cossids emerge in the early autumn. It seems probable that the insect passes at least two years in the larval state. Partly-grown larvae of around 40 mm., as well as a full-grown larva, of 80 mm., a ready-to-emerge pupa, and newly-vacated pupal shells were taken at the one season.

The pupa found while the boys were digging emerged in the late evening of the same day, just before 9 p.m., and despite the mishandling it may have received while being unearthed, made a tolerable specimen.

**Larva**—An apparently adult larva was 80 mm. in length, cylindrical, and 15 mm. in diameter; another, measured after preservation in alcohol, was 57 mm. in length in the contracted position and weighed 6.5 grams; two half-grown larvae measured 46 and 42 mm. (39 and 36 mm. in alcohol), diameter 12 mm. They weighed 3.0 and 2.6 grams. Larvae are creamy-white in colour with the head, prothorax, the spiracles and the appendages some shade of chestnut brown. The brown is usually paler on the posterior half of the prothorax. The form (fig. 1, b and c) is that generally characteristic of the family, and the larvae are naked, save for the inconspicuous primitive hairs. The ultimate segment of the abdomen bears two short, up-turned spines, one on each side of the midline, which appear to serve as anchor when the larva is thrusting itself forward in its burrow.

**Pupa**—That of a female was 74 mm. in length, 16 mm. in diameter, smooth, chestnut brown with darker brown chitinized extremities (fig. 1, d, e and f). The form of the facial mask is shown in the figure.

The oft-used Austral-English term *witjuti* or *witchety* applied to the grubs originally was taken from the Arabana native language by the late Sir Edward Stirling and put into print, with the spelling *witchety*, in a paper before the Royal Society of South Australia (Transactions 14, 189, 159). The occasion was the description of attempts made by a Mr. Benham, at Idracowra, to feed



"witchety grubs" to the then newly discovered marsupial mole (*Notoryctes typhlops*). Lydekker (Marsupialia, 1894, 191) misquoted the word as "witchetty" and this spelling was followed by Spencer and Gillen and others writing about the aborigines. The true name and Geographic II spelling of the Arabana term is *mako witjuti*, pronounced with stress on the initial syllables. *Witjuti* refers to the shrub, not to the grub, and must be prefixed by the word *mako*, meaning grub.

Most of the aborigines present at Ooldea during the time of the present writer's visit were Ngalca people from North-west of Ooldea, together with some displaced Jangkundjara tribes-people who had migrated from the Everard Ranges after the great drought of 1914. Their name for the larvae of the present species was *mako wardaruka*, meaning grubs of the *wardaruka* (*Acacia ligulata*) shrubs. The pupae they term *mako miring wardaruka*, or simply *mako miring*, while the adults are *kinta-kinta wardaruka* or moths of the *wardaruka*. They are stated to appear only at the beginning of the cold season. The empty pupal shells are said to be *ilungu* or "dead."

The time of the year when pupae rise to the surface in their burrows is important to the aborigines, since numbers can often be gathered, just before they emerge, without the labour of digging deeply for them. Particularly at the end of summer the Pitjandjara sing a song about this anticipated event, "*Wardaruka miring tjare!*" "Acacia trees pupae are carrying." The song is one popular at evening dances in which women and children are present and take part. The Pintubi people at the northern edge of the Western Desert call the same or similar pupae *wanman-mbiri* or *wanman-mbiring*. The Ngalia (not Ngalea) people of Yuendumu, Central Australia, sing a similar song about *wanman-mbiring*. Among the Pitjandjara, Pintubi and other tribes of the central part of the Western Desert the grubs from *Acacia ligulata* and the similar ones, called *mako ilkoara* by the Pitjandjara, from *Acacia kempeana* (not yet reared or identified) furnish a not inconsiderable daily part of their diet. Women and children spend much time digging for them and a healthy baby seems often to have one dangling from its mouth in much the same way that one of our children would be satisfied with a baby comforter.

The larvae may be eaten raw, and are cooked by gently rolling in warm ashes raked from a fire. When cooked they taste like pork rind, when raw they are like scalded cream, or butter. It is probable that, for natives, they provide that portion of a healthy diet which civilised man obtains from butter. Aborigines with access to *witjuti* grubs usually are healthy and properly nourished. At Ooldea the larvae were still present in such abundance that it was possible, in less than an hour, for half-a-dozen aboriginal boys to gather an estimated half-pound weight of larvae of two species, all within a few hundred yards of a soakage well where up to 400 aborigines are artificially concentrated near a Mission Station. [The Mission is being disbanded in favour of one further south near the coast.] Before the days of the Station the area had been, probably for many centuries, a stand-by water for aborigines, yet the *Acacia* shrubs and the larvae have still thrived, an indication of their regenerative capacity and permanent value as a food source. The present author, when in the Mann and Musgrave Ranges in 1933, while observing nomadic Pitjandjara aborigines, in company with Dr. C. J. Hackett, over a period of several months, noted that part of nearly every day's diet consisted of these larvae. Even grown men did not neglect to dig up and eat some, and afterwards might carry one or more pinched under their headband or in their belt, as tit-bits, either for themselves or for their children. Plate v, fig. 1, shows aboriginal children digging out such Cossid grubs from the roots of *Acacia kempeana* in the Musgrave Ranges. They also find Buprestid beetle larvae. Plate v, fig. 2, shows a Pitjandjara young man who, noticing

some evidence of the presence of a grub, is digging in sandy ground near Arukalanda in the Western Musgrave Range. On such sandy flats *Salsola kali* often has Cossid grubs in its roots.

The weaning of aboriginal children is an often violently noisy and tearful process when, as happens, it has been delayed until the infant is three or more years of age; the children are pacified by being given grubs to suck and to eat; often they may be seen with one dangling from the mouth while they play. It may not be too much to assume that the aborigines' ability to rear healthy children in the harsh environment of the Western Desert is based to no inconsiderable degree on the wide presence and availability of these larvae. Their time of great hardship comes when droughts and the absence of summer monsoonal rains hampers the emergence of the moths and the establishment locally of new generations of larvae.

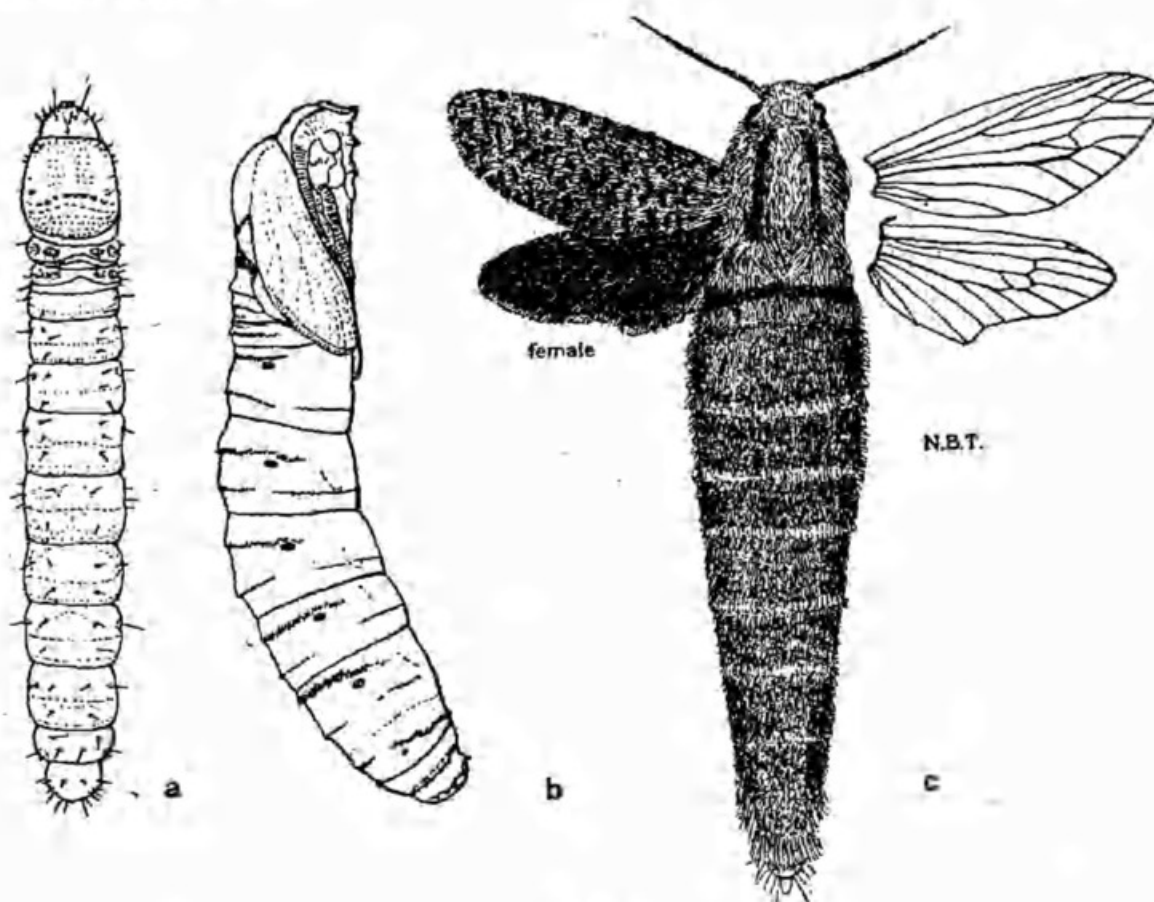


Fig. 2

*Xyleutes biarpiti* Tindale. Ooldea Soak, South Australia. a, larva; b, pupa; c, holotype female.

It seems probable, from statements of natives and the observed presence of part-grown larvae in the roots at the same time as adult larvae and pupae, that the life cycle is spread over more than one season.

***Xyleutes biarpiti* sp. nov.**

*Female*.—Head uniformly dull ochreous; palpi short, only terminal segment projecting from face; antennae short tapering simple, about one-half length of wing; thorax with patagia and tegulae ochreous, an inverted U-shaped black mark; abdomen brown with mixed black and ochreous scales, posterior margin of each segment with longer ochreous rough hairy scales. Forewings very short,

with costa convex, apex evenly rounded, termen rounded, ochreous with a reticulate pattern of black spots; hindwings short, apex rounded, slightly concave at inner angle, brownish-black with ochreous fringes. Wing length 14 mm.; expanse 33 mm.; total body length 36 mm.

*Locality*—South Australia: Ooldea Soak, 27 April 1951, N. B. Tindale (Holotype a female, I. 19095, and paratype females in South Australian Museum); Western Australia: Balladonia, a paratype female, taken by Mrs. Crocker.

The Balladonia example is slightly brighter in colour than Ooldea ones and shows a patch of reticulate dark-orange pattern on the termen of hindwing as well as on the costa; there is more orange scaling on the distal half of each abdominal segment.

The females are entirely incapable of flight and progress by crawling rapidly along the ground while vibrating their wings. Unfortunately only this sex is available for study, since an alert native mouse pounced on and successfully escaped with the only reared male while it was still resting and drying its wings. Only a casual examination of it had been made. It was very small, fully winged, with the antennae broadly pectinate in the basal half.

This species seems not to be very close to any other described form. Females differ from the equally small-winged females of *X. amphiplecta* Turner in the dull ochreous to bright orange-yellow ground colour against the slate-grey of that species. The rather regular reticulate black pattern of the forewings is similar in both forms. The larvae show differences in habit, those of *X. biarpiti* being borers in the roots of *Zygophyllum* whereas those of *X. amphiplecta* are relatively free-living earth or root-crown dwellers which are capable of shifting from one food plant to another.

The foodplant is *Zygophyllum fruticulosum* A-P de Candolle. According to Prof. J. B. Cleland, to whom I am indebted for the identification, the plant at Ooldea almost certainly is the variety *eremaeum* Diels. It is a four-petalled yellow- (sometimes white-) flowered perennial shrub with slender, rigid stems and linear leaflets.

Native children, by digging with short sticks at the bases of the shrubs, found plentiful supplies of the larvae and discovered also a few pupae. Seemingly they are able to detect the presence of larvae by subtle differences in the state of growth of the plants as compared with shrubs free of infestation. In some areas nearly every second shrub had a grub or grubs boring in its roots. The bulk of food yielded by each larva is small, no more than 2.2 grams for a full-grown female larva, but children spend much time gathering them. The larvae from the roots of the *Zygophyllum* bushes or *biarpiti* are called by them *mako biarpiti*, i.e., *mako* or grubs of the *biarpiti*. The pupae are *miring biarpiti* or simply *miring*.

The larvae and pupae are in chambers within the main root-stock of the shrubs; the pupa has an escape tunnel sealed with silk extending towards the surface of the sand. One female was just emerging at about 4 p.m. when dug out on 27 April. It proved to be brachypterous, as were the other subsequently reared female examples. These also emerged at about dusk.

*Life Stages*—The egg has not been examined. The larva is of normal Cossid form (fig. 2a), rather slender, with the ridged spines on the thorax rather slight. The head and thorax are of the palest chestnut-brown with the mouth parts and the thoracic processes dark chestnut; the body is white, smooth, and save for the inconspicuous primitive setae is naked; length of an apparently full-grown larva 51 mm.

Pupa (fig. 2b) pale chestnut-brown with head parts, thorax, wing cases, and posterior margin of each abdominal segment darker, the last-named giving a



generally banded appearance to the pupa; the series of body spines are finely and irregularly serrate, two rows to each body segment, with the anterior row more prominent than the posterior one; there is an almost complete ring of spines at the apex of abdomen with ventral traces of a second circle of them. Length of pupa of a female 43 mm., of a male 23 mm.

#### XYLEUTES AMPHIPLECTA Turner

*Male*—Head grey, palpi not projecting beyond frons; antennae strongly bipectinate to two-thirds, then filamentous. Thorax grey with an inverted U-shaped black mark inwardly edged with white; abdomen dark grey with white on the posterior margins of the segments. Forewings light grey with black markings; ground colour generally lighter in outer third, near termen, and near inner margin. Hindwings grey with dark brown reticulate markings, generally paler near termen. Forewing length 21 mm.; expanse 49 mm.

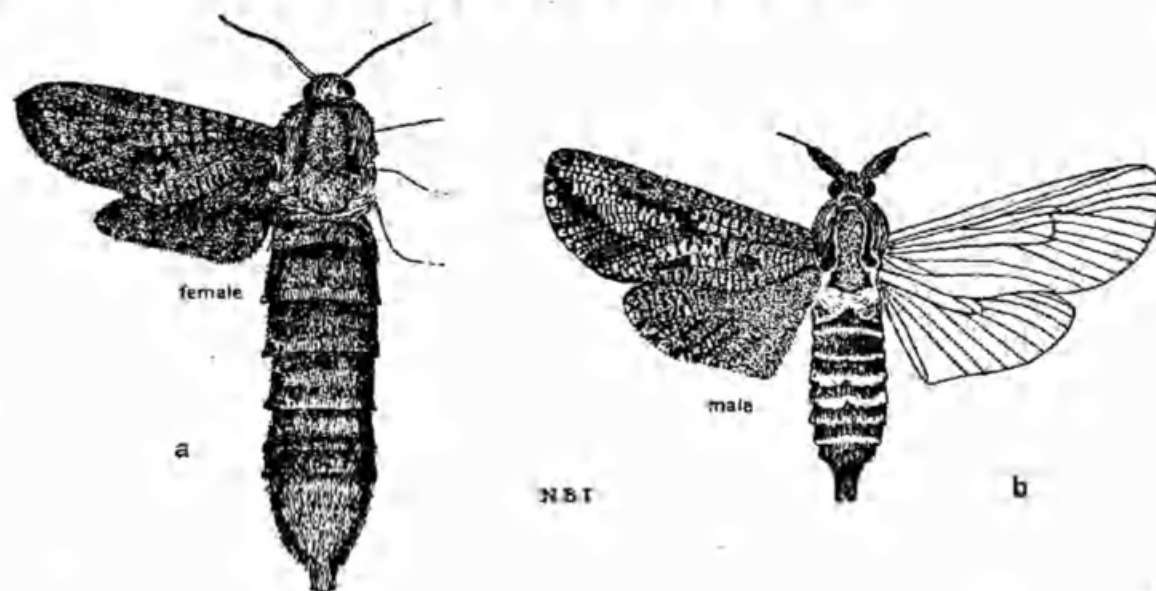


Fig. 3

*Xyleutes amphiplecta* Turner. Renmark, South Australia, L. O. Humphries.  
a, allotype female; b, male.

*Female*—Head and thorax grey with an inverted U-shaped black mark; thorax from some angles displaying a purplish-blue sheen; abdomen grey with obscure darker transverse bandings. Brachypterous; forewings greyish-fawn with numerous transverse black strigulae; hindwings darker, with strigulae obscurely indicated in distal half. Forewing length 22 mm.; expanse 51 mm.

*Locality*—South Australia: Renmark (November to February), Mr. L. O. Humphries (allotype female, December 1945, I. 19096 in South Australian Museum); Loxton (March), Mr. and Mrs. R. George.

Presence of a purplish-blue sheen on the thorax is reminiscent of that seen in *Catoxophylla cyanauges*.

The elucidation of the life-history of this interesting species with its brachypterous female has been due to the interest of Mr. L. O. Humphries, who has passed to us a long series of specimens taken between 1941 and 1952.

The male which was very briefly described in these Transactions (1932, p. 195) has been taken at Dalby, Milmerran, Injune, Charleville, Goondiwindi, Talwood and Cunnamulla in Queensland; Brewarrina in New South Wales, and Birchip in Victoria. There are five paratypes in the South Australian Museum. It is far smaller in bulk than the female and very active on the wing.

According to an identification made by the late Dr. A. Jefferis Turner, the larvae in Queensland feed on *Bassia*. However, in South Australia the food plant is *Pachycornia triandra* (samphire).

Fishermen along the Murray River use the larvae as bait. They scrape the earth just below the level of the ground with a spade. Nearly vertical holes suggest the presence of larvae; unbroached lids to the shelters confirm this. Aborigines scrape the ground with digging scoops and smell the holes, thus detecting the high humidity maintained in occupied burrows; a conveniently hooked stick retrieves the grub.

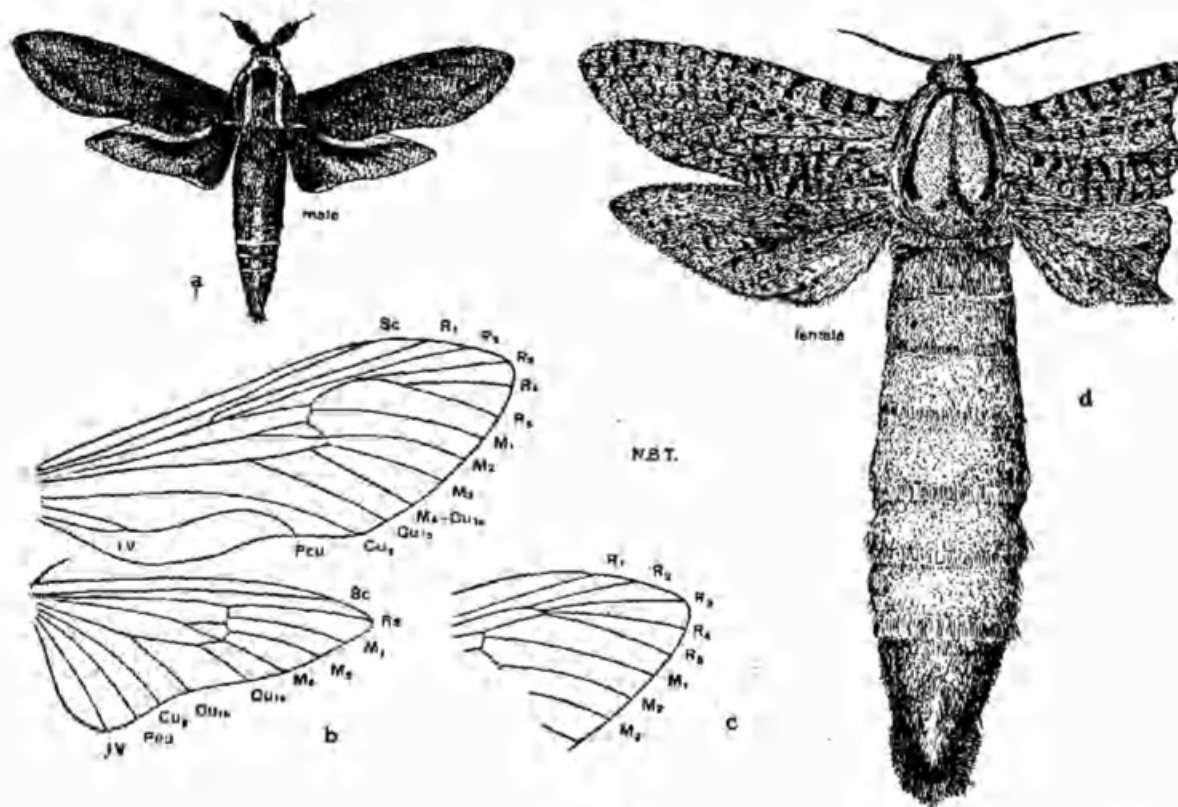


Fig. 4

*Catoxophylla cyanauges* Turner. Central Australia, Capt. S. A. White. a, male; b, male venation; c, variation in male venation; d, allotype female drawn to larger scale than male.

Unlike many others of the family the larvae are relatively free-living in that they can migrate from one shrub to another. They are usually to be found in or near the crown of the foodplant. Between late November and February the larvae are of large enough size for use as bait and are then taken in numbers.

The completely flightless females crawl actively over the ground, often with their wings folded against the body. They emerge in late summer when the air is humid or there is rain.

Mr. Humphries tells me that when digging for bait near *Pachycornia* roots at Renmark in late 1941 he found a female pupa ready to emerge. Having been disturbed it did so while he continued digging. Almost as soon as it had freed itself from the pupal case several males appeared fluttering about it, although it was broad daylight.

On this or another occasion he rested a newly emerged female on his coat lapel while taking it home; several males appeared and made futile advances to his coat which he had left outside his house when he took the moth inside. There were no *Pachycornia* plants within half a mile. By keeping larvae he was able to satisfy himself that the life-history extends over two years.



Mr. and Mrs. R. George took males flying about at night near Loxton on a rainy night in March.

*CATOPHYLLA CYANAUGES* Turner

*Male*—Head and thorax smooth-scaled, dark fuscous, with a dark blue sheen; thorax with collar, inner half of tegulae, and lateral parts white; antennae strongly bipectinate with short filamentous tip. Abdomen greyish-black; posterior margins of segments and a dorsal longitudinal band white. Forewings fuscous with short transverse black strigulae, ground colour paler near apex and near termen. Hindwings dark fuscous, darkest near base and tornus; a wide white costal streak. Forewings length 36 mm.; expanse 83 mm.

*Female*—Head small, fuscous; frons rounded, palpi just evident from above, antennae short, cylindrical, tapering; thorax fuscous with a deep blue sheen from some angles; an inverted U-shaped black mark; abdomen dark fuscous with some white scales near posterior extremity.

*Brachypterous*—Forewings dark fuscous with black strigulae, largest on basal half of costa and near inner margin. Hindwings darker with obscure traces of strigulae.

Estimated wing length 37 mm.; estimated expanse 90 mm.; total body length 84 mm.

*Locality*—Western Australia: Toodyay, Bencubbin. (Type, a male in Turner collection at Entomological Division, C.S.I.R.O., Canberra.) South Australia: Blinman, 4 March 1907 (female), Miller Creek (female), Barmera, January 1935 (female). Central Australia: locality not stated but probably near Everard Range. (Male described above and the allotype female I. 19097 in South Australian Museum.) New South Wales: Broken Hill.

The female of this species has not previously been described, although specimens have been held in collections for some years. Researchers seemingly have been reluctant to regard them as more than defective specimens in which the wings have not expanded. With greater knowledge of their life-history it is clear that the brachypterous condition is normal in the females of some members of at least two Australian genera, *Catophylla* and *Xyleutes*.

The mating pair described above as from Central Australia were taken together by Capt. S. A. White in the general vicinity of the Everard Ranges. There is great disparity in the bulk of the two sexes, although this is exaggerated in the figure by the differences in scale of the drawings shown. The female had newly emerged from the ground in the vicinity of an *Acacia* shrub, the species of which is not indicated. Wings of the females are very brittle and tend to break off transversely during life, so that it is exceptional to find an example with more than the basal halves of the wings present. In the drawing (fig. 4 d) one wing is shown as often found and the other as if perfect; it must be remembered that the latter condition is exceptional and untrue save at the time of emergence and it is only by pooling data on the several available female specimens that it has been possible to prepare the restored wing condition as shown. The males are of powerful flight. Their wings are not brittle. The genus has been separated from *Xyleutes* on the basis of the narrow pointed wings and the relatively smooth clothing of the thorax and abdomen.

There is great range in size in the females. The Blinman example is much smaller with a wing expanse of 20 mm. and total body length of 55 mm. The broken-off wings had been retrieved and are preserved with it. The Broken Hill female was found mating in the vicinity of *Acacia* shrubs, but the male was not preserved.

Among the Wailpi tribes people of the Northern Flinders Ranges the female moths are known as *ango* and when they appear in March and April are relished as food.



Fig. 1 Children digging grubs from roots of a witjuti (or witchety) bush (*Acacia kempeana*) in the Musgrave Ranges, South Australia.



Fig 2 Young man digging for Cossid grubs of the rolypoly bush (*Salsola kali*), near Arukalanda, Western Musgrave Range, South Australia.



Tindale, Norman B. 1954. "On some Australian Cossidae including the moth of the witjuti (witchety) grub." *Transactions of the Royal Society of South Australia, Incorporated* 76, 56–65.

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