

ON *ATRAx* *INFENSUS* SP. N. (ARANEIDA: DIPLURIDAE) ITS HABITS AND A METHOD OF TRAPPING THE MALES.

By

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(With 2 plates and 5 figures in the text.)

ABSTRACT

A key to the Australian spiders belonging to the genus *Atrax* O. P. Cambridge is provided and a new species, *Atrax infensus*, from Queensland described. An account of its nest, food and mating habits is also given. A trap employed in the capture of the males is figured and described.

INTRODUCTION

In January this year Mr. P. Walker of Too-woomba, Queensland, sent me three males and four females of a funnel-web spider for identification. All the specimens were mature and proved to belong to a new species in the genus *Atrax* O. P. Cambridge. Mr. Walker, who had made a careful study of the life of the spider, provided me with notes and photographs illustrating its habits. He also gave me a description of a trap, which he employed successfully in capturing the males. An account of the trap appears at the end of the present article.

It is well known that the venom of funnel-web spiders belonging to the genus *Atrax* may sometimes prove fatal to man. The nature of the venom of *Atrax robustus* O. P. Cambridge has been investigated by Dr. S. Wiener (1957, 1959 and 1961) and by Dr. G. H. Kaire (1963). The venom of the spider described in the present paper has also been studied by Dr. Kaire (1963).

The correct identification of the spiders belonging to the genus *Atrax* is obviously of considerable importance. However, much of the early systematic work is lacking in detail and of little help in determining species.

Cross-mating experiments, as carried out by Mr. Walker in the case of the spider from Too-woomba, are most desirable in order to determine whether males and females belong to the one species. Such experiments are very necessary where females of different species closely resemble one another.

Including the new species, *Atrax infensus*, described in the present paper, nine species of funnel-web spiders belonging to the genus *Atrax* are known. They are listed in Table 1.

TABLE 1.

Species	Sexes known	Distribution
<i>A. robustus</i> O. P. Cambridge 1877	♂, ♀	New South Wales, Victoria
<i>A. modestus</i> Simon 1891	♀	Melbourne (Museum)
<i>A. formidabilis</i> Rainbow 1914	♂, ♀	New South Wales, Queensland
<i>A. versutus</i> Rainbow 1914	♀	New South Wales
<i>A. bicolor</i> (Rainbow) 1914	♀	New South Wales
<i>A. validus</i> Rainbow & Puelleine 1918	♀	Queensland
<i>A. venenatus</i> Hickman 1927	♂, ♀	Tasmania, New South Wales
<i>A. pulvinator</i> Hickman 1927	♀	Tasmania
<i>A. infensus</i> sp. n.	♂, ♀	Queensland

Atrax bicolor was originally described under the name *Aname bicolor* by Rainbow in 1914 and transferred to the genus *Atrax* by him in 1918. In the original description the species is said to have "two basal combs" on the superior tarsal claws.

If this is correct the spider differs from all other known species of *Atrax*. The male of *Atrax robustus* Cambridge was described as a new species, *Euctimena tibialis*, by Rainbow (1914) and the synonymy established by Musgrave (1927).

It will be seen from Table 1 that, although females of all the species are known, males have been recorded in four cases only. A detailed account of the female of *A. formidabilis* does not appear to have been published, although McKeown (1963) gives a brief description of a specimen from the McPherson Range, New South Wales.

The distinctive features of a large female example of *Atrax formidabilis* from Dorrigo, N.S.W., given to me by Mr. N. L. Roberts and a co-type of *Atrax validus* on loan to me from the Australian Museum have been utilised in the following key.

front of AME and also behind them. The anterior margin is fringed with a few fine black hairs and bristles in front of the ocular region and for a short distance on each side of it. The margin of the carapace is yellowish brown and fringed with a few fine black hairs but without coarse bristles. A few short dark bristles form a middorsal row extending from the eye-group almost to the thoracic fovea. The surface of the carapace is clothed with a few short fine scattered dark hairs.

Chelicerae (Text-fig. 2) strong, without a rastellum, clothed on the dorsal surface with fine black bristles and short hairs. The bristles are

Family DIPLURIDAE

Genus ATRAX O. P. Cambridge

KEY TO FEMALES

- | | | |
|--|-------|---------------------------------|
| 1. Upper tarsal claws with two rows of teeth | ..... | <i>A. bicolor</i> (Rainb.). |
| Upper tarsal claws with one row of teeth | ..... | 2 |
| 2. Front row of eyes recurved | ..... | <i>A. versutus</i> Rainbow. |
| Front rows of eyes straight or procurved | ..... | 3 |
| 3. Patella of leg IV with spines | ..... | 4 |
| Patella of leg IV without spines | ..... | 5 |
| 4. Promargin of chelicerae with 5 teeth | ..... | <i>A. pulvinator</i> Hickman. |
| Promargin of chelicerae with 10-18 teeth | ..... | <i>A. robustus</i> O. P. Camb. |
| 5. Femur III with 4 prolateral spines | ..... | <i>A. formidabilis</i> Rainbow. |
| Femur III without spines | ..... | 6 |
| 6. Tibiae I and II without spines | ..... | <i>A. modestus</i> Simon. |
| Tibiae I and II with spines | ..... | 7 |
| 7. Tibia I with one spine | ..... | <i>A. venenatus</i> Hickman. |
| Tibia I with three spines | ..... | 8 |
| 8. Carapace brown with yellow hairs | ..... | <i>A. validus</i> Rainb. & P. |
| Carapace black with fine black hairs | ..... | <i>A. infensus</i> sp. n. |

KEY TO MALES

- | | | |
|---------------------------------------|-------|---------------------------------|
| 1. Tibia II with spur | ..... | 2 |
| Tibia II without spur | ..... | 3 |
| 2. Spur on Tibia III long and conical | ..... | <i>A. robustus</i> O. P. Camb. |
| Spur on Tibia III short and rounded | ..... | <i>A. formidabilis</i> Rainbow. |
| 3. Tibia of palp with spines | ..... | <i>A. venenatus</i> Hickman. |
| Tibia of palp without spines | ..... | <i>A. infensus</i> sp. n. |

Atrax infensus sp. n.

Male. Holotype.

Total length with chelicerae 27.0 mm. Carapace 12.0 mm. long, 9.0 mm. wide, convex, high anteriorly and sloping gently from the ocular area to the posterior margin, which is emarginate. The colour in life is black and shining. Thoracic fovea transverse, deep, procurved and situated about 3/10 from the posterior margin. Cephalothoracic sulci distinct. The sides of the head clearly delimited. Its posterior limit is somewhat in advance of the thoracic fovea. The eye tubercle low and marginal in front. The eye-group is transversely rectangular in ratio 41 : 20. The first row of eyes is almost straight (Text-fig. 1). Ratio of eyes AME : ALE : PME : PLE = 10 : 10 : 5 : 8. The pupil of AME has a diameter of 6/10 that of the whole eye. PME are somewhat irregular in outline and white. The ocular quadrangle is wider behind than in front in ratio 25 : 20, and wider than long in ratio 25 : 18. The laterals are separated by 4/10 of the diameter of ALE. A group of short bristles is present on the eye-tubercle in

larger and more numerous towards the front. Near the base the surface is almost bare. An elongate area towards the prolateral side of the dorsal surface is marked with a series of oblique ridges, which in conjunction with bristles on the palp may serve a stridulating function. The promargin of the furrow has a slight scopula and a row of 11 teeth. The retromargin has a denser scopula of reddish hairs and a row of 10 teeth. Between the two marginal rows there is an irregular intermediate row of about 25 very small teeth. The fang is dark reddish brown, long and well curved.

Labium is light reddish brown, convex, and wider than long in ratio 30 : 25. The entire ventral surface is covered with densely arranged cuspules. Long bristles are present in front, at the sides and behind.

Maxillae are light reddish brown and with parallel sides. The inner or prolateral side has a sharply produced distal angle. The entire promargin is furnished with a thick red scopula. Numerous cuspules form a group occupying a triangular area extending from the base for about

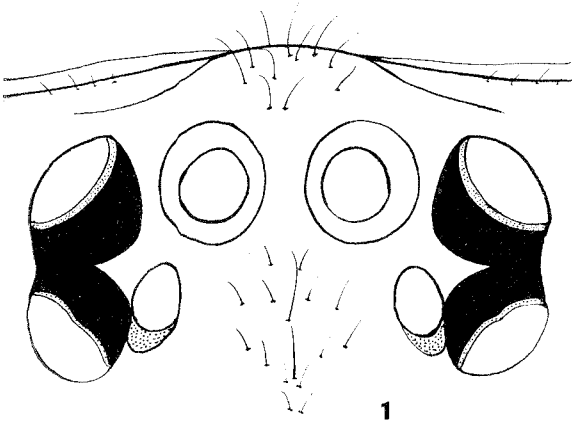


FIG. 1.—Eye-group of male.

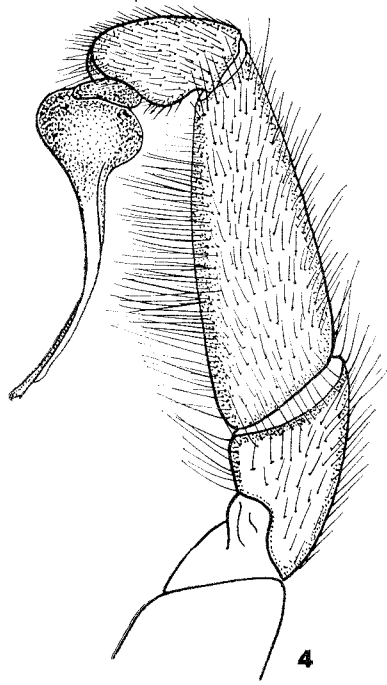


FIG. 4.—Retrolateral view of left palp of male.

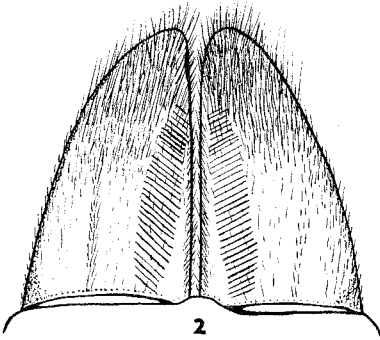


FIG. 2.—Dorsal view of chelicerae of male.

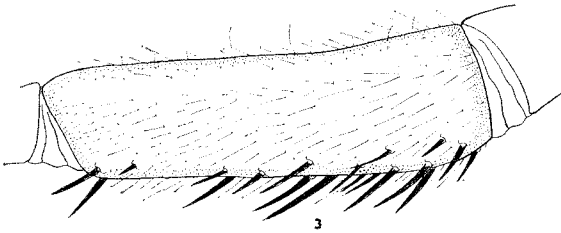


FIG. 3.—Retrolateral view of left tibia of second leg of male.

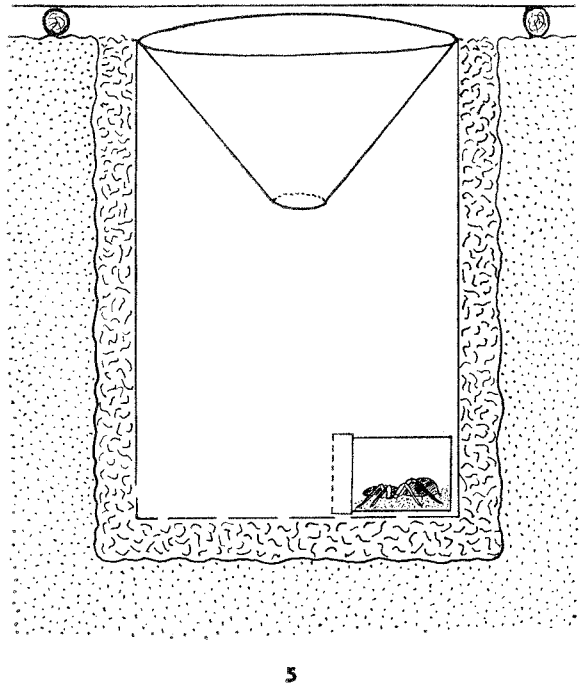


FIG. 5.—Diagram of trap used in capturing males of *Atrax infensus*.

5/7 of the length and situated on the proside of the diagonal from the distal inner angle to the basal outer angle. The surface is clothed with a few erect black bristles and fine reddish brown hair.

Sternum dark reddish brown with a yellowish margin, longer than wide in ratio 104 : 85. Lightly clothed with long erect black bristles and shorter erect hairs. Anteriorly the sternum is narrower and excavated round the base of the labium forming a procurved area devoid of hairs and bristles. Posteriorly the sternum ends in a point, behind which the fourth coxae are contiguous. Three pairs of sigilla are present and situated away from the margin, the posterior pair being large and elongate.

Legs 4. 1. 2. 3., concolorous with carapace and clothed with coarse hairs and bristles. Two longitudinal hairless bands are present on the dorsal surface of femora, patellae and tibiae. Femora of first pair of legs slightly bowed. Tibiae of second pair of legs devoid of a spur (Text-fig. 3). A dense pad of short hairs is present on the ventral surface of all tarsi and on the distal third of the ventral surface of the first, third and fourth metatarsi, but not on that of the second metatarsi. On the first and second tarsi the pad is bisected by a longitudinal row of short fine setae. Sensory hairs or trichobothria are present in a double row on all the tibiae and in a single row on metatarsi and tarsi. Three tarsal claws are present. The upper claws have about 11 teeth arranged in an oblique row; the lower claw about three. Measurements in millimetres of the segments of the legs and palpi are as follows:—

Leg	Femur	Patella	Tibia	Meta-tarsus	Tarsus	Total
1	8.5	4.7	6.0	5.9	4.2	29.3
2	8.0	4.6	5.7	6.2	3.7	28.2
3	7.0	4.0	4.6	5.7	3.5	24.8
4	9.0	4.5	6.0	7.4	4.2	31.1
Palp.	4.8	2.6	4.6	—	3.4	15.4

Spines. *First leg.* Femur 0. Patella: prolateral 1; elsewhere 0. Tibia: ventral 5 at apex and about 27 large spines arranged irregularly along the whole surface and towards the retrolateral side; elsewhere 0. Metatarsus: ventral 4 at apex and about 23 arranged irregularly over the surface but being more numerous and longer in the basal half; elsewhere 0. Tarsus: ventral about 15 short spines in a longitudinal row on each side; elsewhere 0. *Second leg.* Femur 0. Patella: prolateral 1 near apex; elsewhere 0. Tibia: ventral 4 at apex and about 16 arranged irregularly along the whole surface and towards the retrolateral side; elsewhere 0. Metatarsus: ventral 4 at apex and about 20 arranged irregularly along the whole surface and towards the retrolateral side; elsewhere 0. Tarsus: ventral about 15 small spines in a longitudinal row on each side; elsewhere 0. *Third leg.* Femur 0. Patella: prolateral 1-1-2; elsewhere 0. Tibia: dorsal 0, prolateral 2-2-1 at apex, retrolateral 1-1, ventral 2-2-2 at apex. Metatarsus: dorsal 2 near apex, prolateral 1-1, retrolateral 1-1-1-1, ventral 2-2-2-4 apical. Tarsus: dorsal 0, prolateral 1 in distal third, retrolateral 0, ventral about 14 spines in a longitudinal row on each side. *Fourth leg.* Femur 0. Patella 0. Tibia: dorsal

0, prolateral 0, retrolateral 1 in distal third, ventral 1-3-1-3 apical. Metatarsus: dorsal 0, prolateral 0, retrolateral 1-1-1-1, ventral 2-1-1-2-2-2-2-4 apical. Tarsus: dorsal 0, prolateral 0, retrolateral 0, ventral about 16 small spines in a longitudinal row on each side.

Palpi concolorous with the carapace except the extremity of the tarsus, which is whitish. Clothed with fine hairs and coarse bristles. Two longitudinal bare patches are present on the dorsal side of femur, patella and tibia. Femur is strongly bowed. Spines are absent on all segments, but a group of strong bristles is present on the prolateral side of the femur near the apex. Numerous long erect bristles clothe the ventral side of the tibia. The genital bulb is pyriform and produced into a long style, which is somewhat spatulate and twisted. The whole organ is about 4.3 mm. in length and almost as long as the tibia (Text-fig. 4).

Abdomen dull black with no visible pattern in the living spider. Clothed with fine erect black setae and recumbent hairs. Lung covers yellowish brown. The area on the ventral surface between the front pair of lung covers is light grey. Two pairs of spinnerets are present. They are brown above and grey below. The first pair are about 1.2 mm. long and separated from each other by a distance equal to their diameter. The second pair have three segments measuring 1.7, 0.9 and 1.8 mm. respectively. The whole abdomen is 12.0 mm. long and 9.0 mm. wide.

Female. Allotype.

Total length with chelicerae 33.0 mm. *Carapace* black and shining, 12.5 mm. long, 10.5 mm. wide, moderately high in front and sloping gradually from the eye region to the posterior margin. Thoracic fovea deep, transverse, procurved and slightly less than 1/3 from the posterior margin. Sides of head limited by the cephalothoracic sulci. Posterior limit of head not clearly marked, but appears to be slightly in advance of the thoracic fovea. Eye tubercle low and not sharply delimited. It is almost marginal in position. Eye-group transversely rectangular in ratio 45 : 22. First row of eyes almost straight, second row recurved. Ratio of eyes AME : ALE : PME : PLE = 9 : 11 : 7 : 8. Pupil of AME has a diameter 5/9 that of the eye. PME are somewhat irregular in outline and white. Ocular quadrangle wider behind than in front in ratio 30 : 20. Laterals separated by 5/11 of the diameter of ALE. A group of bristles is present in front of and behind AME. A few short setae on the front margin of carapace extend only a short distance on each side of the eye region, the greater part of the margin being bare. A middorsal row of long erect bristles extends from the eye region to the fovea. Surface of carapace has a light clothing of small recumbent hairs, which tend to be arranged in radial rows on the areas between the thoracic depressions.

Chelicerae black, powerful, without a rastellum, clothed with black bristles on the dorsal surface and with short hairs on the retrolateral surface. The oblique ridges present in the male are absent. Fang black, strong and well curved. The pro-marginal of furrow with a row of 12 large teeth, the

retromargin fringed with a reddish brown scopula and provided with a row of about 10 large teeth. Between the two rows of large teeth there are about 48 small teeth, which tend to form a double row near the base but are arranged irregularly in the distal third (Pl. 1, fig. 1).

Labium convex, truncate in front, wider than long in ratio 47 : 40. Fringed with long reddish brown hairs in front, shorter hairs at the side and behind. Most of the surface is covered with numerous small cuspules densely arranged.

Maxillae with parallel sides and a sharply produced inner distal angle. A strong reddish brown scopula is present on the promargin. Numerous small cuspules occupy a triangular area extending from base almost to apex on the proside of a diagonal from the basal outer angle to the distal inner angle. The rest of the surface is clothed with erect dark bristles.

Sternum longer than wide in ratio 114 : 100, dark brown, lightly clothed with erect black bristles. Sigilla elongate and removed from the margin. Anteriorly the sternum is excavated round the base of the labium. Posteriorly it ends in a point in front of the fourth coxae, which are almost contiguous.

Legs 4. 1. 2. 3. Similar in colour to the carapace. Clothed with dark bristles and hairs. A pair of longitudinal bare patches on dorsal side of femora, patellae and tibiae. Tarsi and metatarsi without scopula and also without the pad of short hairs present in the male. Femora of first pair of legs slightly bowed. Trichobothria in two rows on tibiae and in a single row on metatarsi and tarsi. Three tarsal claws are present. The upper claws have about 9 teeth in an oblique row. The lower claw has 3 teeth. The measurements in millimetres of the segments of the legs and palpi are as follows:—

Leg	Femur	Patella	Tibia	Meta-tarsus	Tarsus	Total
1	8.0	5.2	4.9	4.8	2.6	25.5
2	8.0	4.9	4.5	4.6	2.6	24.6
3	6.5	4.4	3.7	4.3	2.8	21.7
4	8.0	5.0	5.3	5.4	2.7	26.4
Palp	6.0	3.1	3.1	—	4.0	16.2

Spines. *First leg.* Femur 0. Patella 0. Tibia: dorsal 0, prolateral 0, retrolateral 0, ventral 1 near middle and towards the retromargin and 2 apical. Metatarsus: ventral 1-1 on promargin, 5 on retromargin, 1-1 midventral, 3 apical, elsewhere 0. Tarsus: a row of 5 on each side of ventral surface, elsewhere 0. *Second leg.* Femur 0. Patella 0. Tibia: dorsal 0, prolateral 1 in distal half, retrolateral 0, ventral 1 near middle and 2 apical. Metatarsus: ventral 5 along retromargin, 1-2 on promargin and 5 apical; elsewhere 0. Tarsus: a row of 4 on each side of ventral surface, elsewhere 0. *Third leg.* Femur 0. Patella: dorsal 0, prolateral 6, retrolateral 1, ventral 0. Tibia: dorsal 0, prolateral 1 apical, retrolateral 1-1, ventral 2 apical. Metatarsus: dorsal 0, prolateral 1-1-1, retrolateral 1-1, ventral 2-3-1r-4 apical. Tarsus: dorsal 1 in distal half, prolateral 1-1, retrolateral 0, ventral a row of three on each side. *Fourth leg.* Femur 0. Patella 0. Tibia: dorsal 0, prolateral 1 apical, retrolateral 1 in distal half, ventral 2

apical. Metatarsus: dorsal 0, prolateral 1-1-1 apical, retrolateral 0, ventral 2-2-2-2-4 apical. Tarsus: dorsal 0, prolateral 1 in distal half, retrolateral 0, ventral a row of 6 on each side.

Palpi similar in colour and clothing to the legs. Femur strongly bowed. Spines are arranged as follows:—Femur 0. Patella 0. Tibia: dorsal 0, prolateral 0, retrolateral 0, ventral 3 apical. Tarsus: dorsal 0, prolateral 5, retrolateral 4, ventral 2 near apex. Trichobothria are present on tibia and tarsus. The tarsal claw has about 6 teeth.

Locality. Toowoomba, Queensland. Specimens collected by Mr. P. Walker in January, 1963.

Affinities. *Atrax infensus* sp. n. is undoubtedly more closely related to the Tasmanian species *Atrax venenatus* than it is to *A. robustus* and *A. formidabilis*. In the two latter species the males possess a spur or apophysis on the ventral side of the tibiae of the second pair of legs. Such a structure is absent in the males of both *A. infensus* and *A. venenatus*, which bear a close resemblance to each other in general appearance. However, *A. infensus* differs from *A. venenatus* in (1) size, (2) relative length of genital style, (3) absence of spines on palpi of male, (4) arrangement of the spines below the tibiae of the second pair of legs of the male, and (5) relative proportions and spacing of the eyes.

NEST, HABITS AND EGG-SAC

The following notes are based mainly on observations made by Mr. P. Walker:—

The burrow made by females and immature males may be excavated to a depth of 62.0 cm. (2 feet). The spider seems to favour powdery red laterite soil in open forest country, but sometimes the nest is made in heavier soils. A silk lining, which is not attached to the walls but hangs freely in the burrow, extends for the full length of the nest. In the breeding season a brood chamber is excavated near the bottom of the burrow in order to accommodate the egg-sac. When the young spiders emerge from the egg-sac, a second brood chamber is made somewhat further down. In this second chamber the young ones congregate and remain with the mother for a considerable time. At the surface of the soil the silken tube which lines the burrow forms one or more funnel-like openings (Pl. 1, fig. 2). In most cases two such openings are made but in some cases four. A series of trap-lines radiate from the lower margin of each opening and tend to entangle the feet of ground roving insects. The upper part of the funnel lies flat against the lower part, thus closing the entrance.

After devouring its prey the spider generally removes any remnants from the burrows and deposits them in a heap near the funnel-like openings to the nest. One such heap, which I examined, contained remains of beetles, ants, bugs, spiders numerous millipedes, several land snails and a small lizard. There is no doubt that the spider had actually fed on the lizard, since the remnants, consisting of scales and broken bones, were in the form of a well masticated lump.

The mating season appears to be of short duration, probably about two months, usually November and December. The position adopted by the male and female during copulation resembles that of *Avicularia metallica* as described by Bonnet (1930). The pair face each other and the female leans back with the four front legs elevated (Pl. 2, fig. 3). She remains in this position during the process and for some time afterwards. Immediately after mating the male spends some time rubbing his body with his legs, as if going through an elaborate cleaning operation. On two occasions Mr. Walker witnessed the mating behaviour of specimens of *Atrax infensus* kept in captivity. The female made no attempt to attack the male although the two were kept in the same container for several days.

The egg-sac (Pl. 2, fig. 4) is white and more or less pillow-shaped. It measures about 40.0 mm. long and 35.0 mm. wide and is suspended by its corners from the silk lining of the first brood chamber in the burrow. The egg-sacs are made in December and January. One which I examined on 18th February contained 250 young, some of which were already emerging from the sac.

Some observations on the habits of *Atrax robustus* have been recorded by Wakefield (1958), Wiener (1959) and Levitt (1961) but little is known concerning the habits of other described species.

TRAP FOR CAPTURING MALES OF *ATRAX INFENSUS*

A trap designed by Mr. Walker and used successfully in capturing the males of *Atrax infensus* is shown in text-fig. 5. It consists of a tin about 21.0 cm. in diameter and 31.0 cm. deep. The lid is removed and replaced by a funnel, which is about one-third the depth of the tin. The funnel fits loosely into the tin and its lower opening is large enough to allow the male spider to enter. The bottom of the tin is perforated with a few holes for the escape of water and any small lizards that may happen to fall into the trap. A female of the species is enclosed in a small glass jar fitted with a wire gauze lid and containing some moist sand or earth. The jar is then placed in the tin, the funnel inserted and the tin let into the ground until the top is level with the surface of the soil. A loose packing of leaf litter holds the tin in position and also allows any small lizards that have passed through the holes in the bottom of the tin to escape. In order to exclude rain a piece of old galvanised iron is placed over the trap and supported on two sticks leaving sufficient space for the spiders to enter the funnel.

The trap has proved most effective. Males attracted by the female pass down the funnel into the tin, from which it is difficult for them to escape. On one occasion when the trap had not been

disturbed for five days eight males were found in it. All had spun flimsy silk coverings round the jar containing the female. Apparently no fighting between the males had occurred, since they were all in good condition and showed no signs of injury.

The use of the trap gives valuable information as to when the mating season begins and ends. Moreover, it helps in determining whether males and females belong to one and the same species.

ACKNOWLEDGMENTS

I wish to thank the Director of the Australian Museum for allowing me to examine co-types of *Atrax validus* Rainbow & Pülleine. My thanks are also due to Mr. N. L. Roberts for sending me a specimen of *Atrax formidabilis* Rainbow. I am indebted to Dr. G. Musgrave Parker and Dr. G. H. Kaire for articles from the Medical Journal of Australia dealing with the venom of spiders belonging to the genus *Atrax*.

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PLATE 1.
Atrax infensus sp. n.
(Photographs by P. Walker)

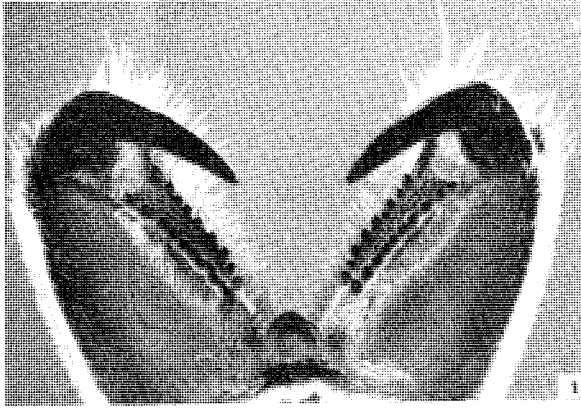


FIG. 1.—Chelicerae of female showing teeth.

PLATE 2.
Atrax infensus sp. n.
(Photographs by P. Walker)



FIG. 3.—Male and female mating.

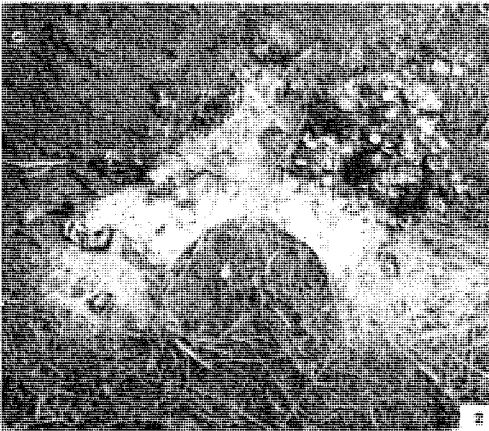


FIG. 2.—Surface view of nest showing three funnel-like entrances leading to the burrow. Remains of beetles and millepedes may also be seen.

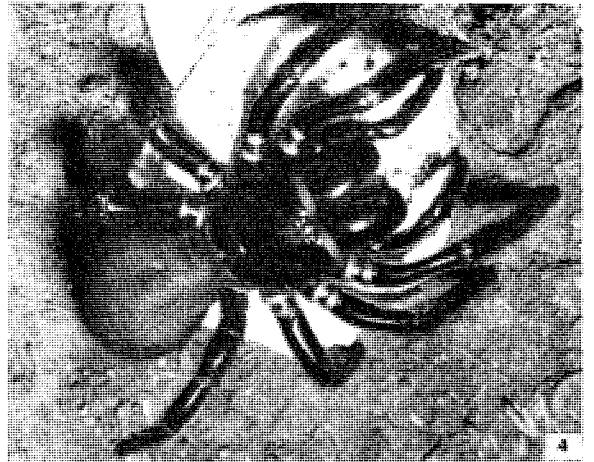


FIG. 4.—Female with egg-sac.

