

## Camouflage and chemical defence in a bolas spider, *Mastophora caesariata* sp. n. (Araneae, Araneidae)

**William G. Eberhard**

Smithsonian Tropical Research Institute, and  
Escuela de Biología, Universidad de Costa Rica,  
Ciudad Universitaria, Costa Rica

and

**Herbert W. Levi**

Museum of Comparative Zoology,  
Harvard University,  
Cambridge, MA 02138, USA

### Summary

The bolas spider *Mastophora caesariata* sp. n. and its egg sac are described from Costa Rica. It apparently captures moths at night using a typical bolas spider web. The daytime resting position and defensive behaviour are unusual: the spider rests on the lower rather than the upper sides of leaves and does not mimic bird droppings; and it lurches defensively when disturbed, exposing its bright red underside. When disturbed, the spider emits a disagreeable odour.

### Introduction

Bolas spiders of the genus *Mastophora* are diverse, but generally rare (Gertsch, 1955; Yeargan, 1988; Levi, 2003), so it seems worthwhile to report even brief observations made on a single mature female of a previously undescribed species. Many aspects of the natural history of *Mastophora* are unusual for spiders, including early maturity in males, camouflage, and chemical defences, as well as chemical attraction of their prey (Stowe *et al.*, 1987) (see excellent reviews by Gertsch, 1955, and Yeargan, 1994). Sexually mature males emerge from the egg sac of *M. cornigera* (Hentz) and of the related *Dicrostichus magnificus* Rainbow (Bristowe, 1938 in Gertsch, 1955), but emerging males are 1–2 moults from maturity in *M. hutchinsoni* Gertsch (Gertsch, 1955; Yeargan, 1988) and *M. dizzydeani* Eberhard (Eberhard, 1981). Apparently many species of *Mastophora*, as well as related genera such as *Cyrtarachne*, *Ordgarius* and *Dicrostichus*, rest on the upper surfaces of leaves, where they mimic bird droppings (Gertsch, 1947; Eberhard, 1981; Shinkai & Takano, 1984; Yeargan, 1994).

### Material and methods

A mature female of *Mastophora caesariata* sp. n. was collected on the undersurface of leaves just over 2 m above the ground on a small roadside *Ficus* sp. tree in secondary forest. On the same day it was collected, it was placed in a 30 × 100 × 30 cm screen cage hanging under a small tree at 1325 m, and behavioural observations were made on the four subsequent nights. Behaviour was recorded with a SONY DCR TRV50 digital video camera equipped with +7 close-up lenses. For taxonomic purposes, the author of this species is H. W. Levi.

### Taxonomy

*Mastophora caesariata* sp. n. (Figs. 1–15)

*Type*: Female holotype from c. 2 km S. of San Antonio de Escazu, 1600 m, San José, Costa Rica, July 2004 (W. G. Eberhard), deposited in MCZ.

*Etymology*: The specific name is a Latin adjective meaning covered with long hair.

*Diagnosis*: *Mastophora caesariata* sp. n. is unique in having two large brown spots on the dorsum of the abdomen, framed by white setae (Figs. 7, 10, 11). The epigynum is an indistinct structure (Figs. 1, 2). The spider is distinguished by its coloration and large dark spots on the abdomen.

*Description*: *Female* (holotype in alcohol): Sides of carapace orange, median area dark red brown. Endites, labium, sternum and coxae orange. Distal leg articles contrastingly ringed with dark brown and orange. Abdomen dorsally light orange with dark brown marks; large patches glossy, reddish brown, black margined (Figs. 6, 7); venter of abdomen orange (red in life). Tubercles relatively small, only in median dark brown area of carapace (Figs. 4, 5). Most of body, including legs, covered with long white setae (Figs. 9–12). Total length 10.5 mm. Carapace 4.5 mm long, 4.2 wide in thoracic region, 2.4 wide behind lateral eyes. Leg I femur 5.0 mm, patella+tibia 5.7, metatarsus 4.0, tarsus 1.4. Leg II patella+tibia 4.7 mm, III 2.8, IV 4.2

*Male*: Unknown.

*Biology*: The egg sac is about 8 mm wide and with the stalk is 16 mm long (Figs. 8, 13); the colour is dark bluish grey.

### Natural history

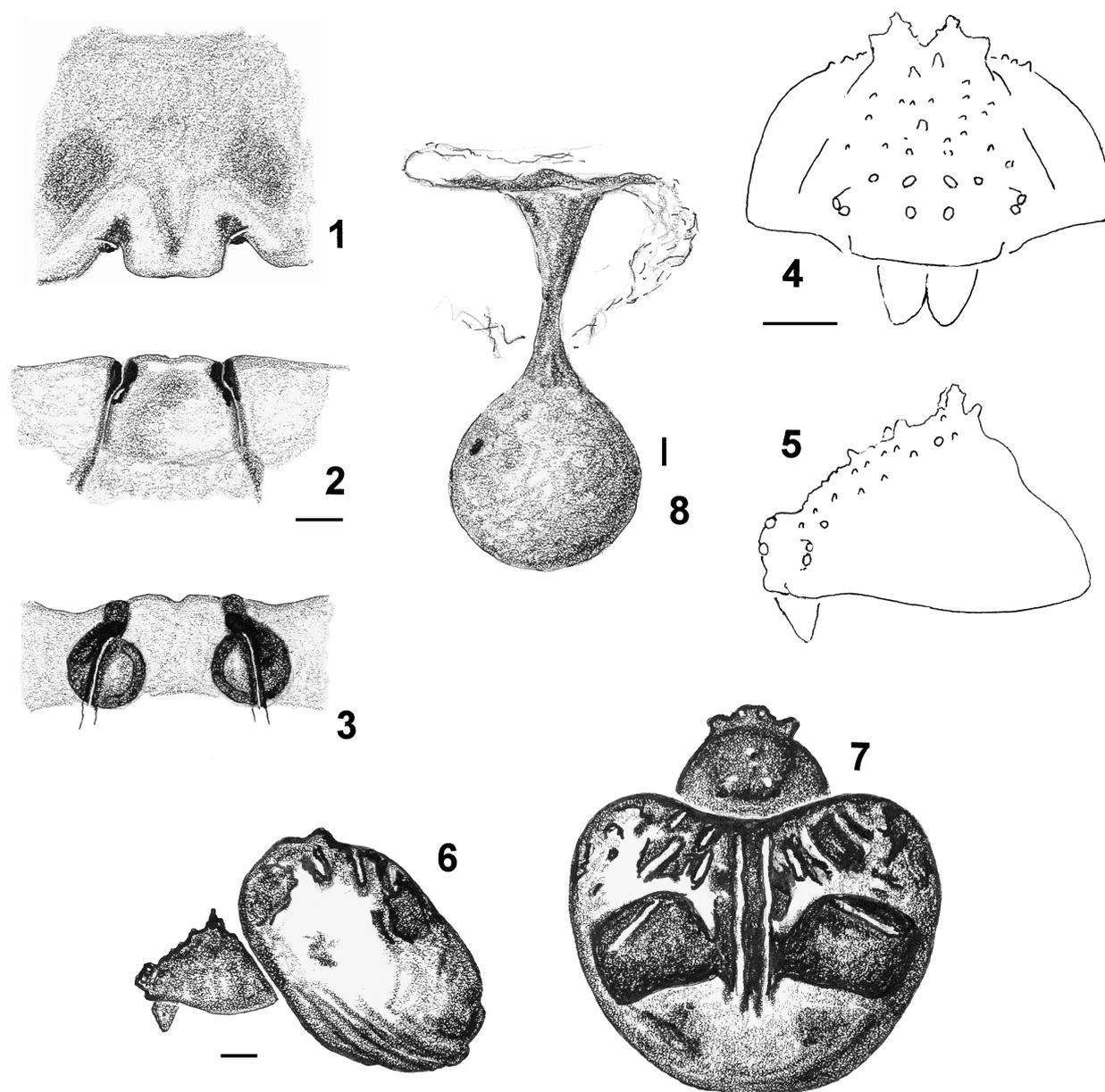
Several behavioural traits resembled those described in other *Mastophora* species. The spider's resting site had a thin pad of slightly yellowish silk (Fig. 13). Individual drag lines also had a yellowish tinge. On the first night in captivity, an egg sac was built using apparently the same behaviour as that described for *M. dizzydeani*. The sac was first noted soon after the eggs emerged from the female's abdomen (approximately the stage shown in Eberhard, 1981: fig. 16c), and subsequent stages of construction, which lasted about 2 h, were similar or identical. The final form of the sac (Figs. 8, 14), was a nearly perfect sphere containing the eggs, suspended from a thick stem which was flattened and widened at its upper end along a highly reinforced white horizontal line about 20 cm long in the midst of a loose mesh. The sac was similar to those of *M. cornigera* and *M. dizzydeani*, but differed in having a uniform dark brownish colour, and in being built approximately 45 cm from the spider's resting site; the egg sacs of *M. dizzydeani* are often within 15 cm of its resting site, as appears to also be the case in other *Mastophora* species (Gertsch, 1955) and in *Dicrostichus magnificus* (McKeown, 1936) (perhaps this difference was an artefact of captivity). At about 18.15 h (soon after dusk) on the second night in captivity, the spider produced a sticky "bolas" using behaviour that was also

indistinguishable from that described for *M. dizzydeani* and *M. hutchinsoni*. The ball of adhesive silk was made by pulling sticky material from the spinnerets with rhythmic movements of the hind legs. The finished ball hung at the free end of a vertical line, and the spider then grasped this line with one leg I and hung in the same hunting posture as that of *M. cornigera*, *M. dizzydeani* and *M. hutchinsoni* (Gertsch, 1947; Eberhard, 1981; Yeargan, 1988), with its ventral surface directed downwind.

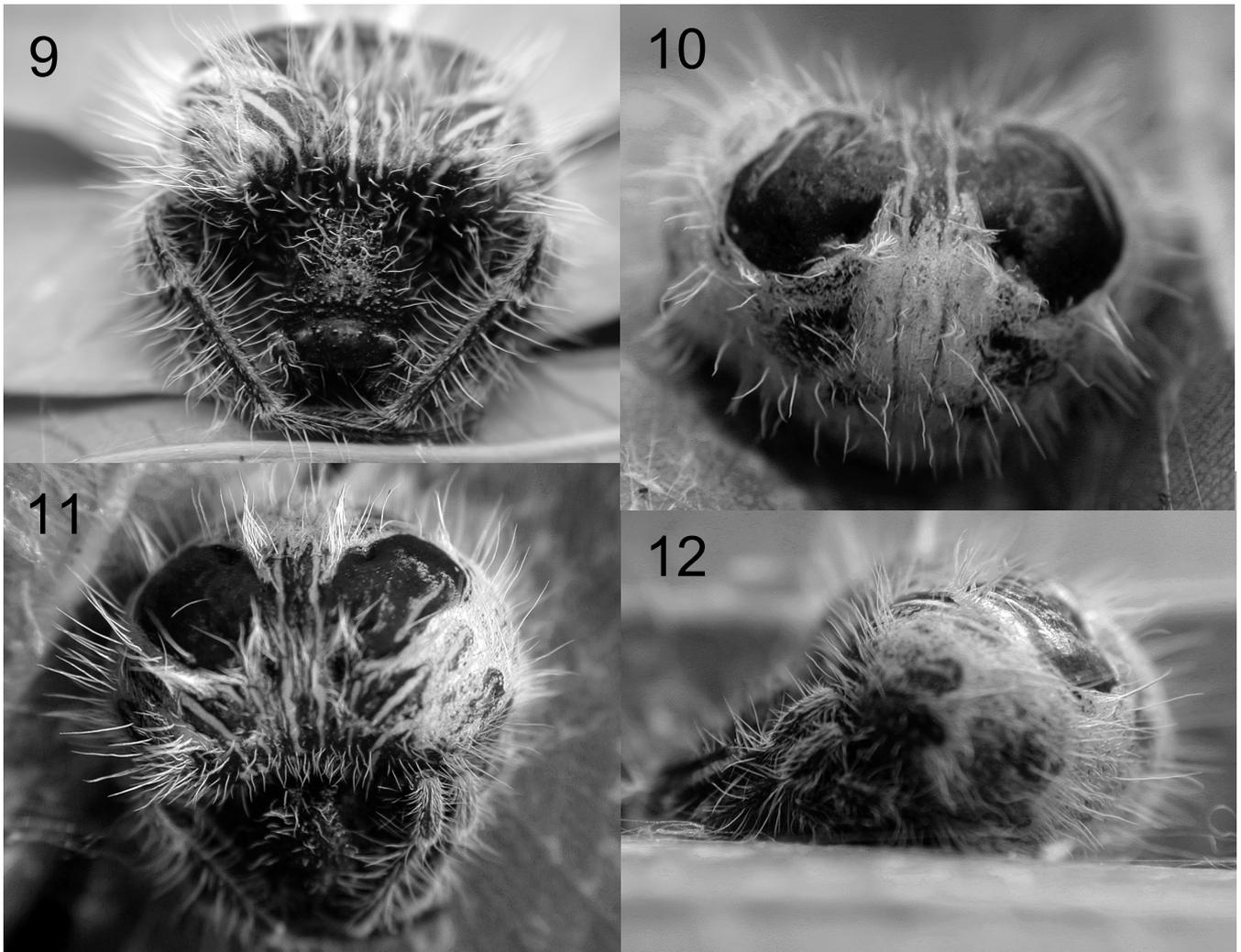
Unfortunately the spider soon ate this bolas, and did not build any others on this night or the following two nights. On three occasions the spider hung motionless on a silk line, with its front legs spread but without any sticky ball, as sometimes occurs in hunting *M. dizzydeani* (Eberhard, 1981), but no potential prey approached so it was not certain whether the spider was hunting. The spider partially withdrew its front legs and quivered rapidly when one of us (WGE) hummed loudly

nearby in an attempt to imitate the sound of an approaching moth. A search on the ground below the site where the spider was captured produced two bodies of moths wrapped in silk, suggesting that *M. caesariata* preys on moths as do other *Mastophora* species. The bodies, which were approximately the size of *Spodoptera frugiperda*, a common prey species of *M. dizzydeani*, were too decomposed to permit identification.

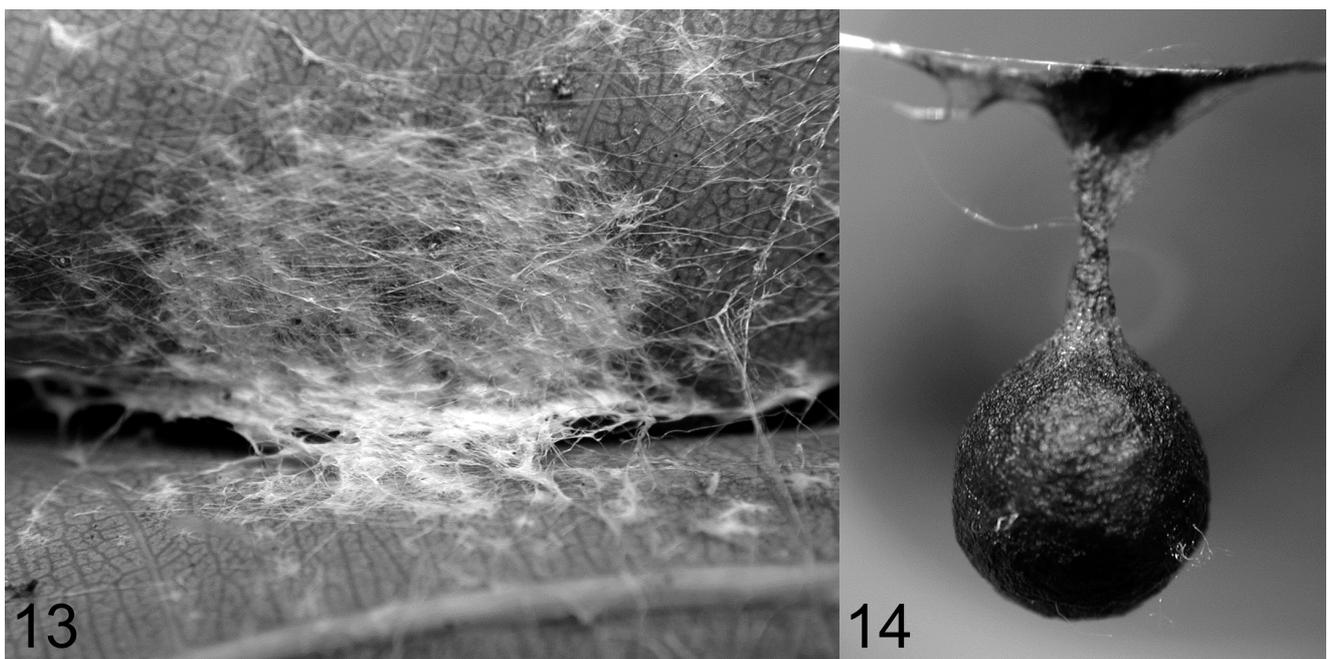
The behaviour of this species also differed in several respects from that of other *Mastophora* species. Instead of resting on the top of a leaf, the spider crouched on the underside of the leaf. It did not resemble a bird dropping, as do some other species of *Mastophora*. Instead the first impression on seeing the spider from the rear was that she was the tattered cocoon of a large caterpillar, with shiny dark pupal cuticle, or perhaps detritus covered with fungal growth; her appearance from different angles was quite different (Figs. 9–12). The long white setae on the abdomen and legs



Figs. 1–8: *Mastophora caesariata* sp. n., female. 1–3 Epigynum. 1 Ventral; 2 Posterior; 3 Posterior, cleared. 4, 5 Carapace and chelicerae. 4 Frontal; 5 Lateral. 6, 7 Carapace and abdomen. 6 Lateral; 7 Dorsal. 8 Egg sac. Scale lines=0.1 mm (1–3), 1.0 mm (4–8).



Figs. 9–12: *Mastophora caesariata* female in crouched position during the day. **9** Anterior; **10** Posterior; **11** Dorsal; **12** Lateral. The spider's abdomen is approximately 10 mm wide and 6.5 mm long.



Figs. 13–14: **13** Pad of silk at the resting site on the underside of a leaf; **14** Egg sac. The silk pad is approximately 10 cm across, and the egg sac is approximately 8 mm in diameter.

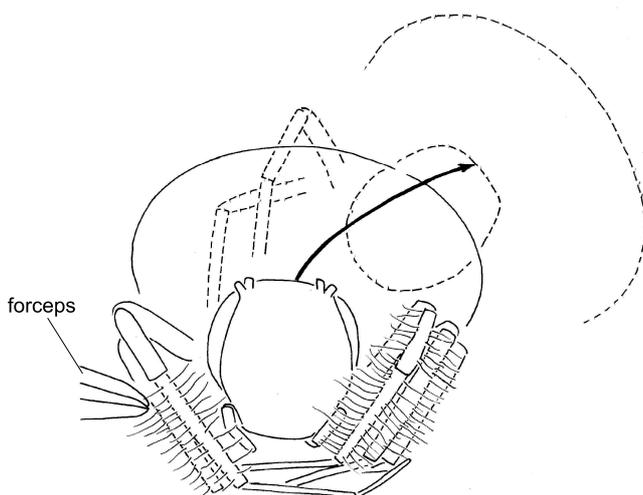


Fig. 15: Dorsal rocking motion of *M. caesariata* female in response to being touched with forceps, which exposed the spider's purple-red ventral surface (traced from video images). Position indicated by dashed lines occurred 0.13 s following that indicated by solid lines. The width of the spider's abdomen is approximately 10 mm.

contributed to the spider's dishevelled impression. A close relative, *Dicrostichus*, also differs in resting site, taking refuge during the day in "a rough shelter formed of silk-entangled leaves" (McKeown, 1936).

When disturbed with the tip of a pair of forceps, the spider first lurched or rocked dorsally, lifted her legs I slightly, and abruptly exposed her bright, slightly purplish red ventral surface (Fig. 15), then crouched again, carefully folding her legs against her body as before. When further disturbed, she rocked dorsally and at the same time kicked laterally against the forceps with legs II and III. When disturbed still further, the spider turned toward the forceps and lifted her front legs as if to strike, giving a clearer view of her red underside, and then resumed her folded resting position. When the

spider was grasped between the fingers, she emitted a disagreeable odour (as in *M. dizzydeani*).

Seventy-three spiderlings emerged from the egg sac, which was kept indoors, 65 days after the eggs were laid. Males and females could not be distinguished, and no mature males were seen. The spiderlings had rows of spines along the prolateral margins of their legs I and II, suggesting that they may hunt prey without making sticky balls, as do *M. dizzydeani* and *M. hutchinsoni* (Yeargan, 1988).

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