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Male and female *Diolenius* Thorell 1870 (Araneae: Salticidae) from Pulau Kri, Raja Ampat, West Papua, Indonesia[1]

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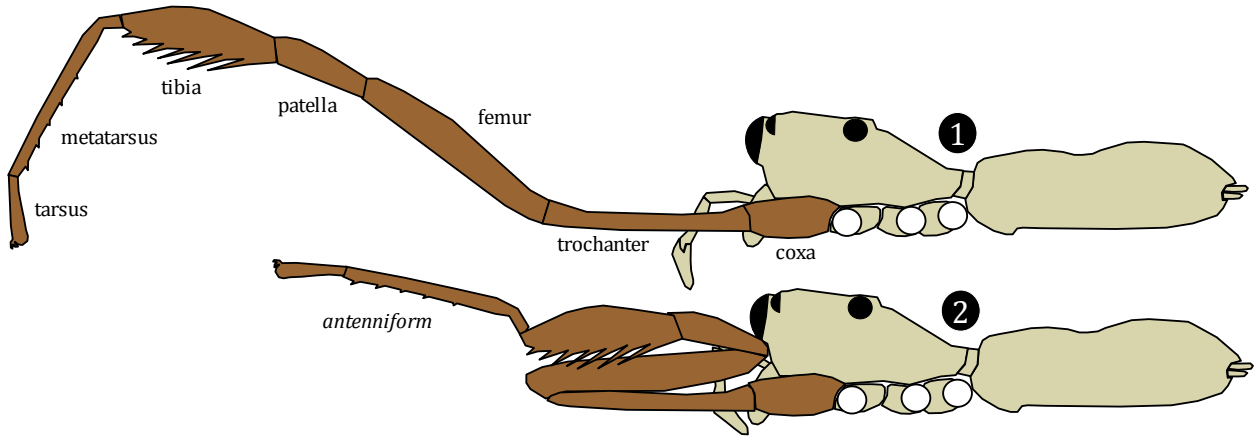
The Dioleniae is a clade of jumping spiders that includes three closely related genera, all largely endemic to tropical Australasia, or the northern reaches of Sahul (Gardzińska and Żabka 2005, 2006, Gardzińska 2006, Hill 2010). Gardzińska (2006) published a very useful key to distinguish *Diolenius* Thorell 1870 from the related genera *Ohilimia* Strand 1911 and *Chalcolecta* Simon 1884. *Ohilimia* (2 species), like *Diolenius* (14 species), have extremely long trochanters associated with leg I, particularly in the males, and the two genera appear to be more closely related to each other than to *Chalcolecta* (3 species), which has much shorter trochanters for leg I. The major distinction between *Ohilimia* and *Diolenius* is that the latter consistenly bears 5 to 7 pairs of ventral spines on the metatarsi of legs I.

Photographs taken recently by Guido Bohne, as presented here, may be the first published images of living *Diolenius*. The males have been identified, at least tentatively, as *Diolenius phrynoides* (Walckenaer 1837), the type species for *Diolenius*, as they agree closely with the key, detailed description, and range maps published by Gardzińska and Żabka (2006) as part of their recent revision of that genus.

Among the Salticidae, the Dioleniae represent one extreme of raptor-like development of legs I (Figure 1), but nothing is known of the feeding habits associated with this unusual armature. The appearance of these legs suggests that predation by grasping, rather than by jumping, is the norm. At the same time, the extreme elongation and attenuation of the trochanters of legs I in the males of *Diolenius* (Simon 1901: *le trochanter, fin et cylindrique, égale le fémur*) is problematic, as this condition would seem to reduce their strength and effectiveness.

Figure 1. Extreme elongation and movement potential in a vertical plane of the leg I of *Diolenius* (after Gardzińska and Żabka 2006). Preserved specimens have usually been drawn in an extended position (1), wheras living animals flex these legs as shown in (2) as they walk, allowing the distal segments (tarsus and metatarsus) to be held upright in a position that may mimic an insect antenna. Note the bent proximal metatarsus.



The last two segments of legs I are decidedly antenniform, and appear to be marked distally with bright white to draw attention to the movement of these legs. It is quite possible that the iridescence on the anterior surface of the trochanter and femur of leg I of male *D. phrynoides* plays a role in the courtship display of these spiders, as those legs are moved laterally. It is also possible that the extreme elongation of legs I has evolved, at least in part, to increase the effective range of the male's courtship display. In the salticid species *Maevia inclemens*, for example, studies have shown strong female preference for the first male to attract the female's attention (Clark and Uetz 1993), thus giving males with a wider visual presence an advantage at longer courtship distances (Clark and Morjan 2001). Given the unusual raptorial form of their *swollen* tibiae I, any observations related to either the prey choice or the predatory behavior of *D. phrynoides* would be of great interest.

Little is presently known about the ecology or behavior of the Dioleniae. Żabka (pers. comm.) has collected *Diolenius* from vegetation (often the leaves of ginger, *Zingiber* sp.), where they would rest with legs I held in a mantis-like manner. When it walks backwards, the first legs of the related *Ohilimia scutellata* (Kritscher 1959) are said to resemble the wings of a fly (Davies and Żabka 1989: *O. scutellata* identified as *Diolenius* sp.).

D. phrynoides resembles a number of different, but perhaps unrelated, salticids that mimic ants. It is one of the members of the genus *Diolenius* with a marked transverse constriction of the opisthosoma in males. Both males and females have a white transverse band on the opisthosoma that may contribute to this visual effect. As noted by Simon (1901) the body, and particularly the cephalothorax, of *D. phrynoides* is very similar in shape to a *Myrmarachne* Macleay 1839, and it is tempting to think that it may even be a mimic of that ant-like genus. In a lateral view, the unusual trochanter and tibia of the male *D. phrynoides* look much like the elongated chelicerae borne by some male *Mymarachne*. Although not reported from New Guinea, *Myrmarachne* have in fact been sighted there (Hill 2010). *D. phrynoides* may also be a mimic of ants or predatory wasps.

The relationship of the Dioleniae to other salticids is uncertain, and it has not been included in the more definitive recent work on the molecular phylogeny of the group (*e. g.*, Maddison and Hedin 2003, Maddison *et al.* 2008), although Maddison *et al.* (2008) suggested that it might be included in the Astioda, a large Australasian clade of salticoids. Based on its tropical Australasian distribution (Gardzińska and Żabka 2006, Hill 2010), this would be a strong possibility. Simon (1901) placed the Dioleniae in his *Salticidae Pluridentati.* Some later authors have included the Dioleniae, with *Agorius* Thorell 1877, *Bristowia* Reimoser 1934, *Synagelides* Strand 1906 and other genera, in a subfamily called the Agoriinae. Recently, Prószyński (2011) grouped *Chalcolecta*, *Diolenius* and *Ohilimia* into the subfamily Dioleninae, along with *Efate* Berland 1938, *Furculattus* Balogh 1980, *Sobasina* Simon 1898, *Tarodes* Pocock 1899 and *Udvardya* Prószyński 1992. All of the Dioleninae are endemic to tropical Australasia (Sahul), or nearby islands of the southwest Pacific. They are characterized by elongated and/or raptorial legs I.

The photographs of *Diolenius* that are presented here were taken 23—30 December, 2010 on Pulau Kri, near Pulau Mansuar, Raja Ampat, Sorong, West Papua, Indonesia (Figures 2—4). Like other islands that comprise Raja Ampat, Pulau Kri and nearby Pulau Mansuar have karst topography, characterized by high rainfall, little soil, and rapid drainage through pervious limestone bedrock. Rainforest is stunted (most stems less than 20 cm in diameter) and open with a normally dry appearance. However, at the time that these *Diolenius* were photographed (December 2010) the area was exceptionally wet due to *La Niña*. This contrasts with the *El Niño* drought that periodically devastates this area. On Pulau Kri, different palm trees (*e. g. Pandanus*), *Cycas*, other trees (some appeared to be *Ficus*), and climbers (probably including *Cassytha filiformis*, a pale-orange parasite) were abundant, but there were no Dipterocarps. Coconut palms and *Casuarina* were restricted to the coast. No *Nepenthes* were seen on the island. Webb (2005) has produced a well-illustrated guide to the vegetation of Raja Ampat, and describes the occurence of xerophyllic vegetation and natural fires during dry seasons in association with karst islands. Raja Ampat

is viewed as an area of very high endemism, with intact communities in limestone areas not subject to logging. Highly eroded karst formations can be very steep and diffcult to traverse, and this can be associated with the poor representation of this area in collections. In general the flora is considered to be much less diverse than it is in the larger islands to the east and west (Takeguchi 2003).

Figure 2. Location of Pulau Kri (Kri Island, S 0° 33' 39.9" E 130° 40' 34.1"). 1, Pulau Gaman (Pulau Gam) and nearby islands (red rectangle) in the vicinity of Sorong on the Bird's Head Peninsula (Kepala Burung or Vogelkop, lower right) of West Papua, Indonesia. 2—3, Two detailed views of the area highlighted in (1), showing the position of Pulau Kri or Kri Island (red arrows) to the northeast of Pulau Mansuar, south of Pulau Gaman. Map (1), part of the Ambon quadrangle, was compiled by the U. S. Army Map Service in 1968. Map (2) is from an earlier version (1942), reflecting English names for localities as well as less knowledge of the terrain. Map (3) is from a *Topography of the Raja Ampat District* map released recently (2010) by the Badan Nasional Penanggulangan Bencana (BNPB, National Agency for Disaster Management), Jakarta, Indonesia.

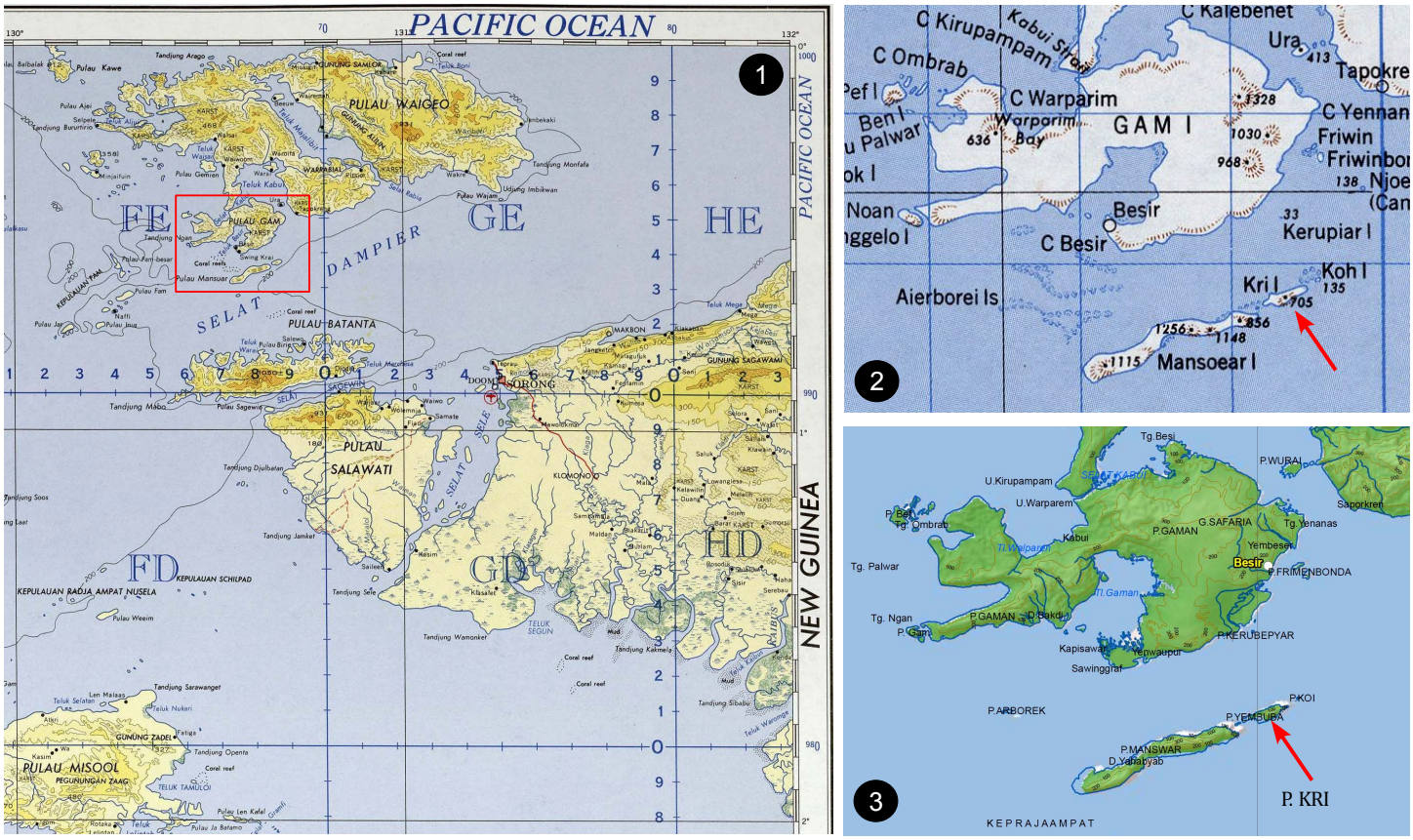
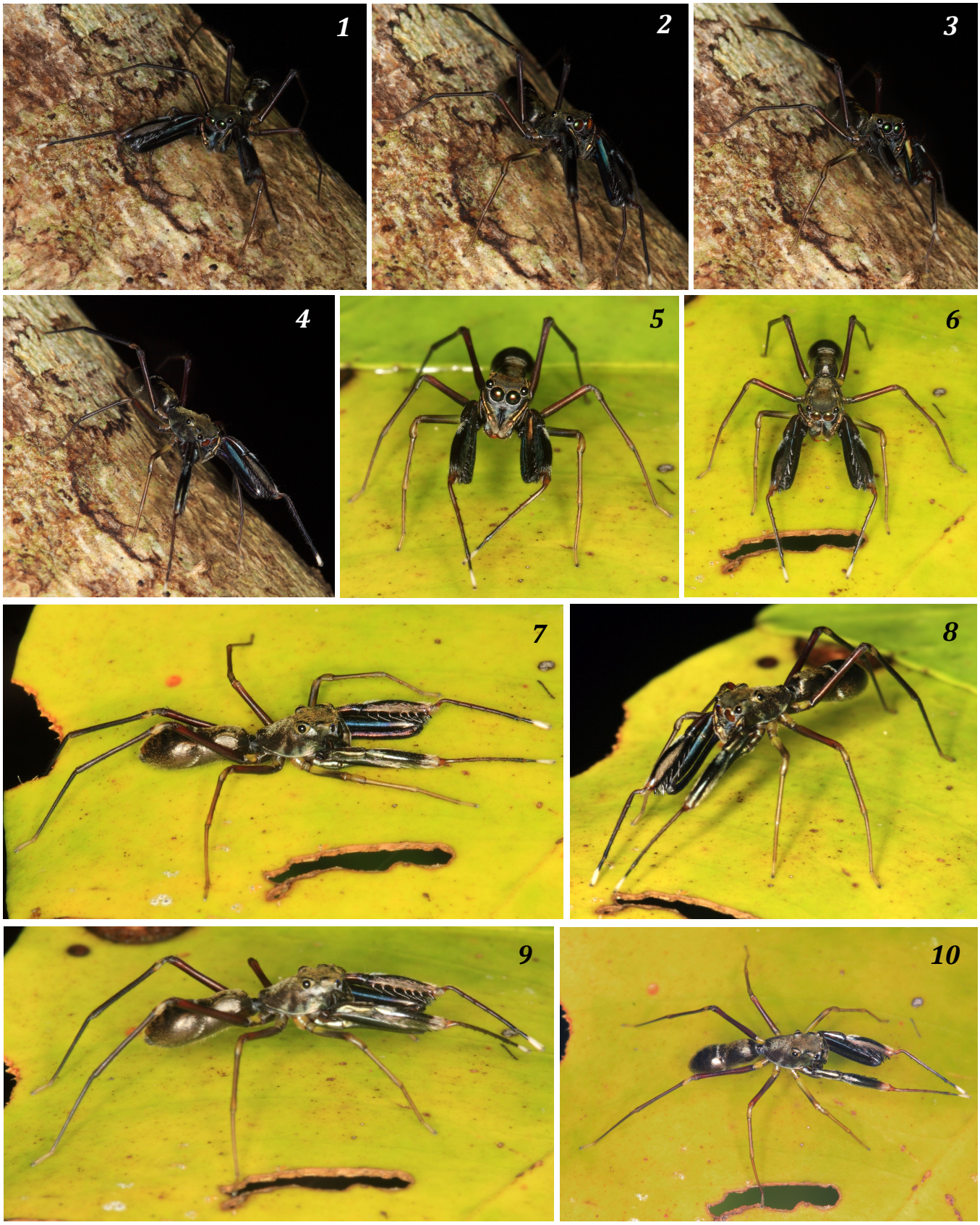


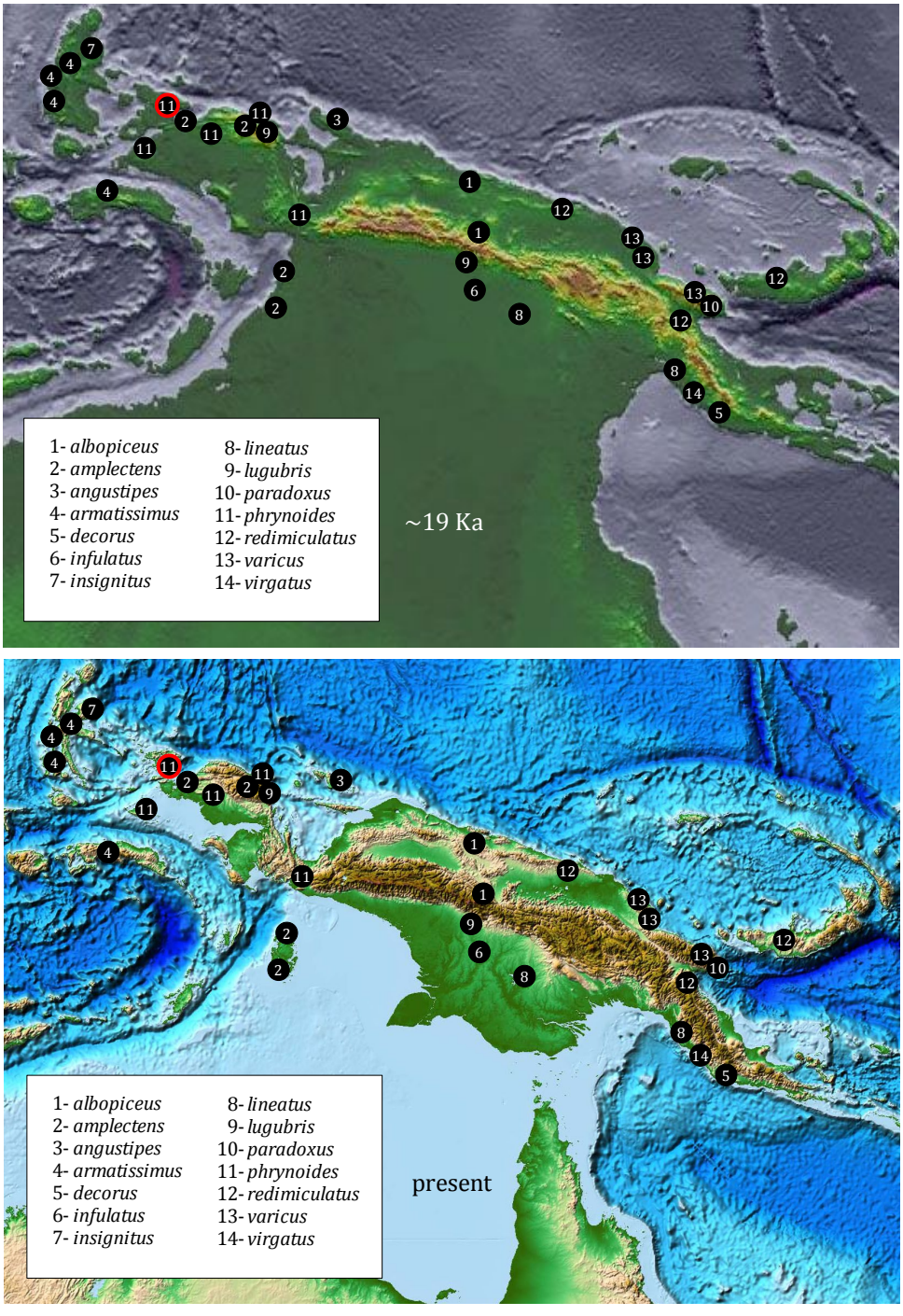
Figure 3. Female *Diolenius* sp. from Pulau Kri, Indonesia. Based on the key of Gardzińska and Żabka (2006), it is possible that this is *D. phrynoides*, but there appear to be 7 pairs of spines on the metatarsus. *D. phrynoides* has only 5. *D. armatissimus* Thorell 1881, with 7 pairs of spines, is also reported from islands to the northwest of New Guinea. Spines on the metatarsus I of the female are considerably longer than those of the male, and the abdomen, also bearing a transverse band, may be slightly but not noticeably constricted. The light-colored distal tarsus is a good field mark for identification of these female *Diolenius*. Photograph © by Guido Bohne.

Figure 4. Male *Diolenius phrynoides* from Pulau Kri, Indonesia. As shown in (7), the anterior surface of the trochanter and femur of leg I is iridescent. The wavelength of structurally reflected color varies according to the relative angle of reflection (compare 2 to 3), and the spider can expose these to view by spreading legs I laterally (1 and 4). The small pedipalps of the male are also brassy, and the chelicerae are dark iridescent blue. In several images (7-9) you can count the 7 antero-ventral spines of the swollen tibia of the male. The metatarsus is bent proximally, probably to support its antenniform elevation, displaying a bright white area of the distal tarsus. Some images (5, 10) show the tendency of these spiders to cross these "antennae." Photographs © by Guido Bohne.



For reference, the known distribution of *Diolenius* species is shown in Figure 5. Many species or populations presently isolated on islands were not so isolated during the last glacial maximum (~19 Ka), when these islands were part of the greater Australasian (Sahulian) landmass. *D. phrynoides* is thus a continental species. At the same time, the complex topography of New Guinea supports a high degree of species diversity and local endemism, particularly in tropical lowland areas (Polhemus *et al.* 2004). Most species of *Diolenius* have non-overlapping, or allopatric, geographical ranges.

Figure 5. Range of known species of *Diolenius* (Gardzińska and Żabka 2006, and one new record) across New Guinea. At top, localities are overlaid on a map depicting continental areas during the last glacial maximum (LGM, ~19 Ka). Below, a present day map is shown. The Pulau Kri locality associated with the spiders shown in this report is circled in red (upper left, near other *phrynoides* localities). Background data and imaging courtesy of the NOAA National Geophysical Data Center (top), and the NOAA Satellite and Information Service (Amante and Eakins 2009).



Acknowledgments

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