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An Updated List of the Mantodea of Trinidad and Tobago, with Three New Records for Trinidad

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ABSTRACT

The collections of the University of the West Indies Zoology Museum (UWIZM) were examined and the literature was searched in order to provide an updated list of the Mantodea of Trinidad and Tobago. 216 specimens were found, three species not previously recorded from Trinidad were identified and a key of the known species was produced.

INTRODUCTION

The order Mantodea is found in both temperate and tropical habitats and contains over 2400 species from around 446 genera (Ehrmann 2002; Otte *et al*. 2005). As they are fairly charismatic insects they have been well documented but there are still many questions to be answered concerning their taxonomy, life history and distribution. Over the last 100 years there have been several publications on the Mantodea of Trinidad, however the most recent paper was only published in 1953 and since then there have been numerous changes to the nomenclature at several taxonomic levels. This paper represents the results of cataloguing the collections currently housed in the University of the West Indies Zoology Museum (UWIZM) and updating the nomenclature of the species list for Trinidad and Tobago.

In most cases mantids are consummate opportunistic ambush predators, standing motionless until suitable prey passes at which point they use their raptorial front legs to ensnare their victim. However, some species, such as *Liturgusa trinidadensis,* will actively stalk cryptic conspecifics (Prete and Mahaffey 1993). Although they usually prey on other insects, they are known to occasionally take small vertebrates such as lizards, frogs and hummingbirds (Prete and Wolfe 1992). Their efficient hunting techniques mean that they play a potentially important role in the control of insect pests (Sampaio *et al*. 2008).

Mantids show considerable variation in their morphology to facilitate their ambush hunting behaviour and camouflaging abilities and in Trinidad and Tobago a wide variety of species can be found. They vary from the stick mantids of the Thespidae to the bark mantids of the Liturgusidae, and from the dead leaf mantids of Acanthopidae to the charismatic large green mantids of Stagmatopterinae.

History of the collection

The Mantodea collection in the UWIZM contains specimens dating back almost a century and came together from three main sources. The oldest part is from the University of the West Indies (UWI) collection that was inherited from the Imperial College of Tropical Agriculture (ICTA). The second part of the collection came to the UWIZM from CAB International (CABI) in 2012. The final part of the mantid collections came from the Caribbean Epidemiology Centre (CAREC), previously known as the Trinidad Regional Virus Laboratory, in 2013. In general the mantids in the museum were often collected when circumstances presented themselves rather than as part of specific studies.

METHODS

The UWIZM insect collections were examined and all Mantodea gathered together. The specimens were identified through the use of keys, literature and previously identified individuals. Each specimen was then photographed, accessioned and added to the museum database.

On-line databases from various natural history collections were searched for specimens from Trinidad and Tobago and enquiries were made to the relevant staff member for further information.

The literature was reviewed for any mention of Mantodea from Trinidad and/or Tobago and information regarding which museums contained specimens was sought.

The previous species lists were tabulated allowing the change of names over time to be shown. The literature was reviewed for reference to Trinidad or Tobago within lists of Neotropical Mantodea (Agudelo *et al*. 2013; Ehrmann 2002; Jantsch 1999). Species were then reviewed

as to their probability of being in Trinidad and Tobago, with some species being removed from the final list with notes on the reason for each removal.

RESULTS AND DISCUSSION

An updated list of the mantids of Trinidad and Tobago was prepared (Table 1). The accessioned specimens can be viewed online at http://sta.uwi.edu/fst/lifesciences/collections.asp by searching for Order Mantodea.

In the original UWI collection, the bulk of the mantid specimens were collected from the early 1920s to the mid-1940s by ICTA staff and were from in and around St. Augustine, Trinidad. Another significant contribution to the UWI collection was made by A.W. Hook who collected in the Northern Range, Trinidad in the 1990s. In total there are 126 specimens.

The CABI collection was assembled mainly from the 1950s to the 1980s and consists largely of mantids collected in and around Curepe, Trinidad. In total there were 84 specimens. From the CAREC collection there were only 6 specimens collected between 1957 and 1965, mainly from around Port of Spain.

A list of the species, locations and break down for each collection can be seen in Table 2.

The only foreign collection with specimens available on-line was the Staatliches Museum für Naturkunde Karlsruhe (SMNK) in Germany.

From the literature it was found that specimens from Trinidad and Tobago were stored at the Museu de Zoologia da Universidade de São Paulo, Brazil (Rodrigues and Cancello 2013), the Academy of Natural Sciences of Philadelphia, U.S.A., the American Museum of Natural History, New York, U.S.A., the University of Minnesota Insect Collection, U.S.A., the Natural History Museum, London, U.K. and the Muséum National d'Histoire Naturelle, Paris, France.

Species and name changes

Since the last species list for Trinidad was produced, the order Mantodea has had many taxonomic changes. Mantodea has relatively recently undergone modifications in the suprageneric organisation. This has resulted in several theories to the relationship of the Dictyopteran subgroups. Of the proposed hypotheses, the placement of Mantodea as being the sister group of Blattodea (including termites) has gained the strongest support from many morphological and molecular studies (e.g., Deitz *et al*. 2003; Svenson and Whiting 2004; Ware *et al*. 2008). Within Mantodea, Ehrmann (2002) categorised the group into 15 families with 48 subfamilies from the original 8 families with 28 subfamilies. Within Trinidad this re-categorised the previous 4 families and 9 subfamilies used in Kevan (1953) (as the most recent literature within Trinidad and Tobago) to 5 families and 10 subfamilies (Table 1). With the addition of the three new species, currently for Trinidad there are 5 families, 11 subfamilies, 19 genus and 19 species.

The group was first studied locally in 1906 as part of Lawrence Bruner's "Report on the Orthoptera of Trinidad, West Indies." It took almost 50 years before more research was conducted with two papers coming out in the early 1950s, Beebe *et al*. (1952) and Kevan (1953). Both papers add to the list of species found in Trinidad. Since 1953 there have been seven name changes to species mentioned, with three changes directly relating to Trinidad. *Acanthops falcata* within Trinidad has been reclassified as *A. parafalcata* and has created a new endemic species for Trinidad (Lombardo and Ippolito 2004). The *Liturgusa* genus within the Neotropics has very recently been revised and *L. maya* within Trinidad has been classified as a new species, *L. trinidadensis* (Svenson 2014). In addition, the species first described in Bruner (1906) *Parastagmatoptera vitrepennis* has been synonymised with *P. unipunctata* (Umbriaco 2011).

One missing specimen of *Pseudomiopteryx* sp. is recorded in the UWIZM collection from labels; this is a misidentification of *Bantiella trinitatis* and was included in Kevan (1953) under *B. fusca* and therefore is *B. trinitatis*.

During examination of the collections, three new species to Trinidad were identified: *Phyllovates tripunctata, Paraphotina reticulata* and *Brunneria subaptera* (see Table 1). *P. tripunctata* is also found in Brazil, Colombia, Ecuador, French Guiana, Mexico, Peru, Suriname, Jamaica and Venezuela (Agudelo *et al.* 2013). *P. reticulata* is also found in Brazil, Colombia and Venezuela (Agudelo *et al.* 2013). *B. subaptera* is also found in Argentina, Bolivia, Brazil, Paraguay and Venezuela (Agudelo *et al.* 2013). With each species also present in Venezuela, it is not surprising that they are also found in Trinidad.

Specimens of note include a *Stagmatoptera septentrionalis* collected by C.B. Williams in 1918 in San Fernando (UWIZM.2013.28.100) as it is the oldest specimen in the collection (Fig.1). There are also several figured specimens from Kevan's 1953 paper.

Fig. 1. *Stagmatoptera septentrionalis* collected in San Fernando in 1918.

As well as the taxonomic works mentioned previously, there have been several papers published documenting other aspects of mantids in Trinidad. Crane (1952) and Quesnel (1967) both conducted studies on the defensive behaviour of certain species and the mating and display behaviour of *Titthrone roseipennis* was studied by Barabás and Hancock (1999) and Thornham (2007).

CONCLUSION

Whilst a good body of work has been carried out on the mantids of Trinidad, similar studies in Tobago are very limited, with no comprehensive species list for the island and only three specimens representing two species within the UWIZM collection. Priorities for research include species lists for Tobago and the small offshore islands, further investigations on life history of the local mantids and study of their role in the ecosystem with regards to pest control. We hope that this paper helps to stimulate a resurgence in Mantodea studies in Trinidad and Tobago.

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We are grateful to the following curators for searching their collections for relevant specimens: George Beccaloni, Natural History Museum, London, UK; Reinhard Ehrmann and Alexander Riedel, Staatliches Museum für Naturkunde Karlsruhe, Germany; Geoff Hancock, Hunterian Museum, Glasgow, UK; Julio Rivera, Department of Ecology and Evolutionary Biology, University of Toronto, Canada.

Table 1. Species names as found in Bruner (1906), Beebe *et al*. (1952) and Kevan (1953), all species found in more recent literature listing Neotropical mantids, species realistically present in T&T with updated names and confirmed presence in Trinidad or Tobago.

Bruner, L. (1906)	Beebe, W., Crane, J. & Hughes-Schrader, S. (1952)	McE. Kevan, D.K. (1953)	Additions recorded from other literature	Current name and species	T'dad	T'bgo
	Mantoididae	**Mantoididae**	**Mantoididae**	**Mantoididae**		
	Mantoida sp. Newman 1838	*Mantoida* sp. aff. *M. fulgidipennis* Westwood 1889	*Mantoida fulgidipennis* Westwood 1889	*Mantoida fulgidipennis* Westwood 1889	Yes	
Mantidae	**Mantidae**	**Thespidae**	**Thespidae**	**Thespidae**		
		Thespinae	Thespinae	Thespinae		
Mionyx surinamus (Saussure 1869)	*Musonia surinama* (Saussure 1869)	*Musonia surinama* (Saussure 1869)	*Musonia surinama* (Saussure 1869)	*Musonia surinama* (Saussure 1869)	Yes	
	Catamusonia sp. Giglio-Tos 1927	*Catamusonia* sp. Giglio-Tos 1927	*Macromusonia* sp. Hebard 1923	*Macromusonia* sp. Hebard 1923	Yes	
		Thespis media (Giglio-Tos 1916)	*Thespis media* (Giglio-Tos 1916)	*Thespis media* (Giglio-Tos 1916)	Yes	
		Oligonicinae	Oligonicinae	Oligonicinae		
		Thesprotia macilenta Saussure & Zehntner 1894	*Thesprotia macilenta* Saussure & Zehntner 1894[1]			
		Thesprotia subhyalina (Saussure 1870)	*Thesprotia subhyalina* (Saussure 1870)[2]			
	Thesprotia filum (Lichtenstein 1796)	*Thesprotia filum* (Lichtenstein 1796)	*Thesprotia filum* (Lichtenstein 1796)	*Thesprotia filum* (Lichtenstein 1796)	Yes	
		Thesprotia sp. Stål 1877	*Thesprotia* sp. Stål 1877[3]			
		Pseudomyoptery-ginae	Pseudomyoptery-ginae	Pseudomyoptery-ginae		

Bruner, L. (1906)	**Beebe, W., Crane, J. & Hughes-Schrader, S. (1952)**	**McE. Kevan, D.K. (1953)**	**Additions recorded from other literature**	**Current name and species**	**T'dad**	**T'bgo**
		Bantiella trinitatis Giglio-Tos 1915	*Bantiella trinitatis* Giglio-Tos 1915	*Bantiella trinitatis* Giglio-Tos 1915	Yes	Yes
		Bantiella fusca Giglio-Tos 1915	*Bantiella fusca* Giglio-Tos 1915[4]			
			Miopteryginae			
	Promiopteryx granadensis (Saussure 1870)		*Promiopteryx granadensis* (Saussure 1870)[5]			
			Promiopteryx simplex Giglio-Tos 1915[6]			
		Oligonyx sp. Saussure 1869	*Oligonyx* sp. Saussure 1869[7]			
Hymenopodidae	**Hymenopodidae**	**Hymenopodidae**	**Acanthopidae**	**Acanthopidae**		
		Acontiothespinae	Acontiothespinae	Acontiothespinae		
Acontista multicolor Saussure 1870	*Acontiothespis multicolor* (Saussure 1870)	*Acontiothespis multicolor* (Saussure 1870)	*Acontista multicolor* Saussure 1870	*Acontista multicolor* Saussure 1870	Yes	
		Acontista minima Giglio-Tos 1915	*Acontista minima* Giglio-Tos 1915[8]			
Tithrone roseipennis (Saussure 1870)	*Tithrone roseipennis* (Saussure 1870)	*Tithrone roseipennis* (Saussure 1870)	*Tithrone roseipennis* (Saussure 1870)	*Tithrone roseipennis* (Saussure 1870)	Yes	
		Mantidae	**Acanthopidae**	**Acanthopidae**		
		Epaphroditinae	Acanthopinae	Acanthopinae		
Acanthops sp. Serville 1831	*Acanthops falcata* (Stål 1877)	*Acanthops falcata* (Stål 1877)	*Acanthops parafalcata* Lombardo & Ippolito 2004	*Acanthops parafalcata* Lombardo & Ippolito 2004	Yes	
Mantidae	**Mantidae**	**Mantidae**	**Mantidae**	**Mantidae**		
		Angelinae	Angelinae	Angelinae		
	Angela quinquemaculata (Olivier 1792)		*Angela quinquemaculata* (Olivier 1792)	*Angela quinquemaculata* (Olivier 1792)	Yes	
	Angela sp. Serville 1839	*Angela* sp. Serville 1839	*Angela* sp. Serville 1839[9]			
		Mantinae	Stagmomantinae	Stagmomantinae		
	Stagmomantis carolina (Johannson 1763)	*Stagmomantis polita* Giglio-Tos 1917	*Stagmomantis carolina* (Johannson 1763)	*Stagmomantis carolina* (Johannson 1763)	Yes	
			Stagmomantis theophila Rehn 1904[10]			
			Stagmomantis centralis Giglio-Tos 1917[11]			
		Stagmomantis sp. Saussure 1869	*Stagmomantis* sp. Saussure 1869[12]			

Bruner, L. (1906)	**Beebe, W., Crane, J. & Hughes-Schrader, S. (1952)**	**McE. Kevan, D.K. (1953)**	**Additions recorded from other literature**	**Current name and species**	**T'dad**	**T'bgo**
		Mantinae	Stagmatopterinae	Stagmatopterinae		
	Stagmatoptera septentrionalis Saussure & Zehntner 1900	*Stagmatoptera septentrionalis* Saussure & Zehntner 1894	*Stagmatoptera septentrionalis* Saussure & Zehntner 1894	*Stagmatoptera septentrionalis* Saussure & Zehntner 1894	Yes	Yes
			Stagmatoptera abdominalis (Olivier 1792)[13]			
Stagmatoptera praecaria (Linnaeus 1758)			*Stagmatoptera precaria* (Linnaeus 1758)[14]			
			Stagmatoptera supplicaria (Stoll 1813)[15]			
Parastagmatoptera vitrepennis Bruner 1906	*Parastagmatoptera vitrepennis* Bruner 1906	*Parastagmatoptera vitrepennis* Bruner 1906	*Parastagmatoptera unipunctata* (Burmeister 1838)	*Parastagmatoptera unipunctata* (Burmeister 1838)	Yes	
Oxyopsis rubicunda (Stoll 1813)	*Oxyopsis rubicunda* (Stoll 1813)	*Oxyopsis rubicunda* (Stoll 1813)	*Oxyopsis rubicunda* (Stoll 1813)	*Oxyopsis rubicunda* (Stoll 1813)	Yes	
		Oxyopsis sp. aff. *O. festai* Giglio-Tos 1914	*Oxyopsis festae* Giglio-Tos 1914[16]			
			Oxyopsis saussurei Giglio-Tos 1914[17]			
		Vatinae	Vatinae	Vatinae		
	Vates lobata (Fabricius 1798)	*Vates* sp. aff. *V. lobata* (Fabricius 1798)	*Vates lobata* (Fabricius 1798)	*Vates lobata* (Fabricius 1798)	Yes	
			Vates pectinicornis (Stål 1877)[18]			
			Vates serraticornis (Stål 1877)[19]			
				Phyllovates tripunctata (Burmeister 1838)	Yes	
				Photinainae		
				Paraphotina reticulata (Saussure 1871)	Yes	
				Brunneria subaptera Saussure 1869	Yes	
Mantidae	**Mantidae**	**Mantidae**	**Liturgusidae**	**Liturgusidae**		
			Liturgusinae	Liturgusinae		

Bruner, L. (1906)	Beebe, W., Crane, J. & Hughes-Schrader, S. (1952)	McE. Kevan, D.K. (1953)	Additions recorded from other literature	Current name and species	T'dad	T'bgo
	Liturgousa sp. Saussure 1869	*Liturgousa* sp. aff. *L. maya* Saussure & Zehntner 1894	*Liturgusa maya* (Saussure & Zehntner 1894)	*Liturgusa trinidadensis* Svenson 2014	Yes	
Liturgousa cayennensis Saussure 1869			*Liturgusa cayennensis* (Saussure 1869)[20]			

Notes:

1. Unlikely to be present in T&T as found in Bolivia, Paraguay and Brazil.
2. Found in Brazil and Kevan (1953) believes it was a misidentification of *T. filum*.
3. This refers to a nymph that was not identifiable to species.
4. This is a synonym of *B. trinitatis*.
5. *Promiopteryx granadensis* is not present in Trinidad.
6. *Promiopteryx simplex* is not present in Trinidad.
7. Only found in Central America and therefore unlikely to be present here. Expected to be a misidentification of *Thesprotia filum*.
8. Specimens in T&T are actually *A. multicolor* as *A. minima* has only been confirmed in Colombia (Agudelo 2013).
9. Was unsure if it was a female *A. quinquemaculata* or new species in Beebe *et al.* (1952) and Kevan (1953). Without sufficient specimens, we are unable to make the decision that this is a new species.
10. Unlikely to be in T&T as found in Central Southwestern America (Lombardo and Agabiti 2001).
11. Through examination of *Stagmomantis* within the collection and use of keys, along with doubt of presence within Venezuela, we do not expect them to be present.
12. This refers to a nymph that was not identifiable to species.
13. Only recorded from Suriname – Terra (1995) and Jantsch (1999) show in T&T. 2 specimens are recorded from Arima in the Dept. Ento. Uni. of Minnesota, however through examination of the *Stagmatoptera* within the collection and use of keys, we expect them to be misidentifications of *S. septentrionalis* and therefore not present.
14. Due to Bruner's (1906) paper, Kevan (1953) is certain that this is a misidentification of *S. septentrionalis*.
15. 2 specimens are recorded from Arima in the SMNK, however through examination of the *Stagmatoptera* within the collection and use of keys, we expect them to be misidentifications of *S. septentrionalis* and therefore not present.
16. Unlikely to be in T&T as only 1 specimen was previously found from Ecuador (Lombardo and Agabiti 2001).
17. Only recorded from Suriname.
18. Only recorded from Panama.
19. Only recorded from Colombia.
20. This is due to misidentification in Bruner (1906) and Rehn (1935) states that the specimens from Trinidad are *L. maya* and therefore *L. trinidadensis*.

Table 2. Composition of the UWIZM Mantodea collections split into UWIZM, CABI and CAREC collections showing number of specimens, range of date collected and collection site for each species.

Species	Collection								
	UWI			CABI			CAREC		
	Number in Collection	Date Range	Collection Site	Number in Collection	Date Range	Collection Site	Number in Collection	Date Range	Collection Site
Mantoida fulgidipennis Westwood 1889	4	1938 - 2014	St. Augustine	4	1967 - 1972	Curepe	1	1965	P.O.S.
Musonia surinama (Saussure 1869)	9	1941 - 2008	St. Augustine, Tunapuna	8	1954 - 1978	Curepe, P.O.S., Diego Martin			
Thespis media (Giglio-Tos 1916)	9	1923 - 2014	St. Augustine, Warren, Aripo Savanna	3	1971 - 1989	Curepe, Simla			
Thesprotia filum (Lichtenstein 1796)	4	1942	St. Augustine, Claxton Bay	2	1967	Curepe			
Bantiella trinitatis Giglio-Tos 1915	12	1941 - 2014	Maracas Valley, Mt. St. Benedict, Cumaca, Goldsborough, Mayaro, Arima Valley	2	1954 - 1967	Curepe, Diego Martin			
Acontista multicolor Saussure 1870	13	1923 - 1999	St. Augustine, Mt. St. Benedict, Wallerfield, Las Lomas, San Rafael	8	1946 - 1977	Curepe, Mayaro, St. Augustine, Tunapuna			
Tithrone roseipennis (Saussure 1870)	16	1929- 1999	Maracas Valley, Mt. St. Benedict, Morne Bleu, Blanchisseuse	5	1954 - 1989	Arima Valley, Aripo Savanna, Maracas Valley			
Acanthops parafalcata Lombardo & Ippolito 2004	18	1923 - 2010	St. Augustine, Simla, Trinity Hills, P.O.S., Maracas Valley	12	1953 - 1954	Curepe, Balandra, St. Augustine	5	1957 - 1964	P.O.S., Nariva Swamp
Angela quinquemaculata (Olivier 1792)	3	1959 - 1996	Mt. St. Benedict	3	1971	Curepe			
Stagmomantis carolina (Johannson 1763)	5	1942 - 1959	St. Augustine, Mt. St. Benedict	4	1968 - 1971	Curepe, Centeno			
Stagmatoptera septentrionalis Saussure & Zehntner 1894	21	1918 - 1990	St. Augustine, Maraval, Arima, San Fernando, Aripo Savanna, Crown Point	8	1967 - 1989	Curepe, Morne Bleu, Nariva Swamp			
Parastagmatoptera unipunctata (Burmeister 1838)	1	2013		13	1967 - 1979	Curepe			
Oxyopsis rubicunda (Stoll 1813)	2	1989	Maracas Valley						

Species	Collection								
	UWI			CABI			CAREC		
	Number in Collection	Date Range	Collection Site	Number in Collection	Date Range	Collection Site	Number in Collection	Date Range	Collection Site
Vates lobata (Fabricius 1798)	1	1959	St. Augustine	4	1981 - 1989	Curepe, Simla, Valencia			
Liturgusa trinidadensis Svenson 2014	11	1922 - 2004	St. Augustine, Lopinot Valley, Caura Valley, La Lune	4	1972 - 1979	Curepe			
Phyllovates tripunctata (Burmeister 1838)	1	1998	Trinity Hills	1	1967	Curepe			
Paraphotina reticulata (Saussure 1871)	1	1988	Mt. St. Benedict						
Brunneria subaptera Saussure 1869				1	1987	Aripo Savanna			

Taxonomic Key to the Mantodea of Trinidad

Mark S. Greener

The following is a dichotomous key that can be used to identify the mantids to species and is based upon work published by (Beier 1934, 1935, 1937; Giglio-Tos 1927; Terra 1995) as well as personal observations. See Figures 2, 3 and 4 for guide to terms used.

1. Pronotum as wide as long (Fig. 2a)……..……...***Mantoida fulgidipennis***
   Pronotum not as wide as long…….....……..…..**2**

2. Homochromy with dead leaves…….....……***Acanthops parafalcata***
   No homochromy with dead leaves…….....……**3**

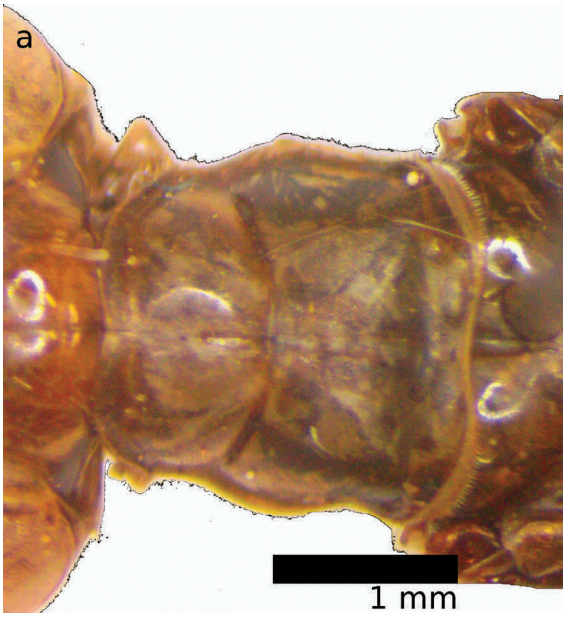
3. Homochromy with lichen…….....……***Liturgusa trinidadensis***
   No homochromy with lichen…….....……**4**

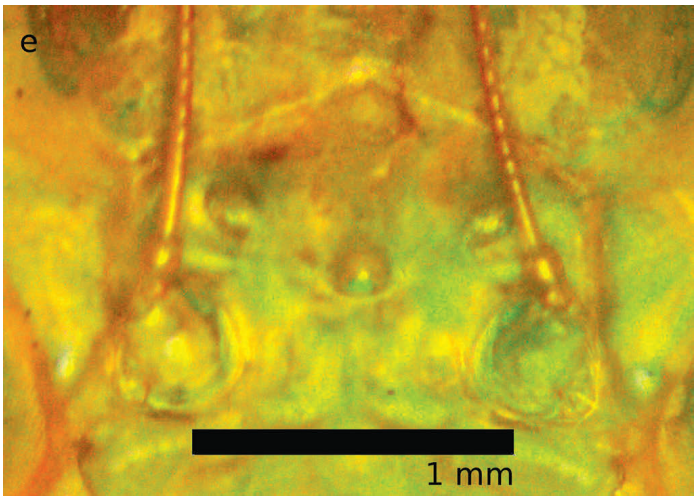
4. Anterior femur with 3 discoidal spines…….....……..**5**
   Anterior femur with 4 discoidal spines…….....……..**8**

5. Pronotum with granules at lateral margins (Fig. 2c)…….....……***Brunneria subaptera***
   Pronotum without granules at lateral margins (Fig. 2b)…….....…….....**6**

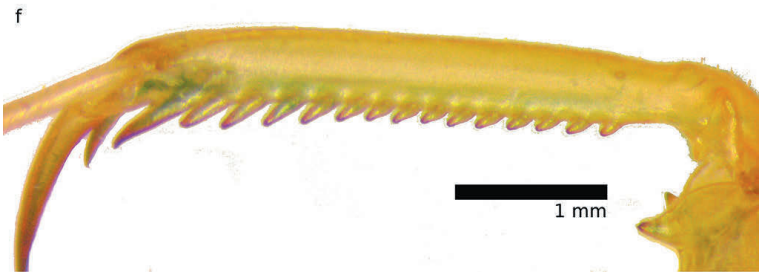
6. Ocelli prominent (Fig. 2d)……..…….....……..…***Paraphotina reticulata***
   Ocelli not very prominent (Fig. 2e)…….....……..**7**

7. External spines of anterior tibia straight and spaced. Has a green elytra covering wings which are red (Fig. 2f)……..…….....……....***Tithrone roseipennis***


a
1 mm


e
1 mm


b
1 mm


f
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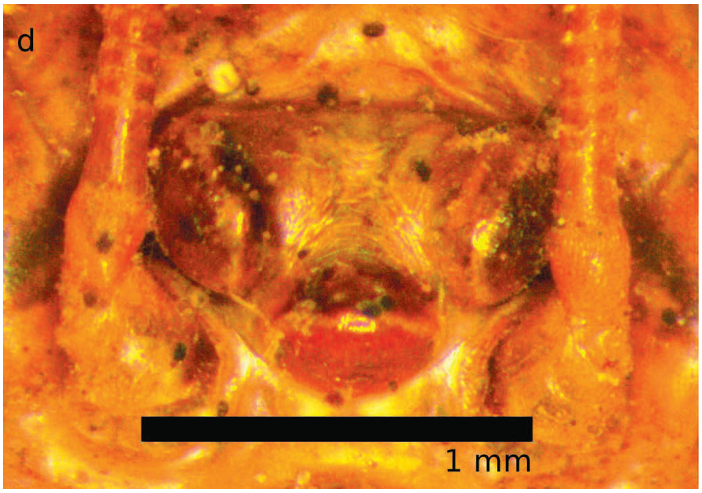
g
1 mm


c
1 mm


d
1 mm


h
1 mm


i
Keel
1 mm

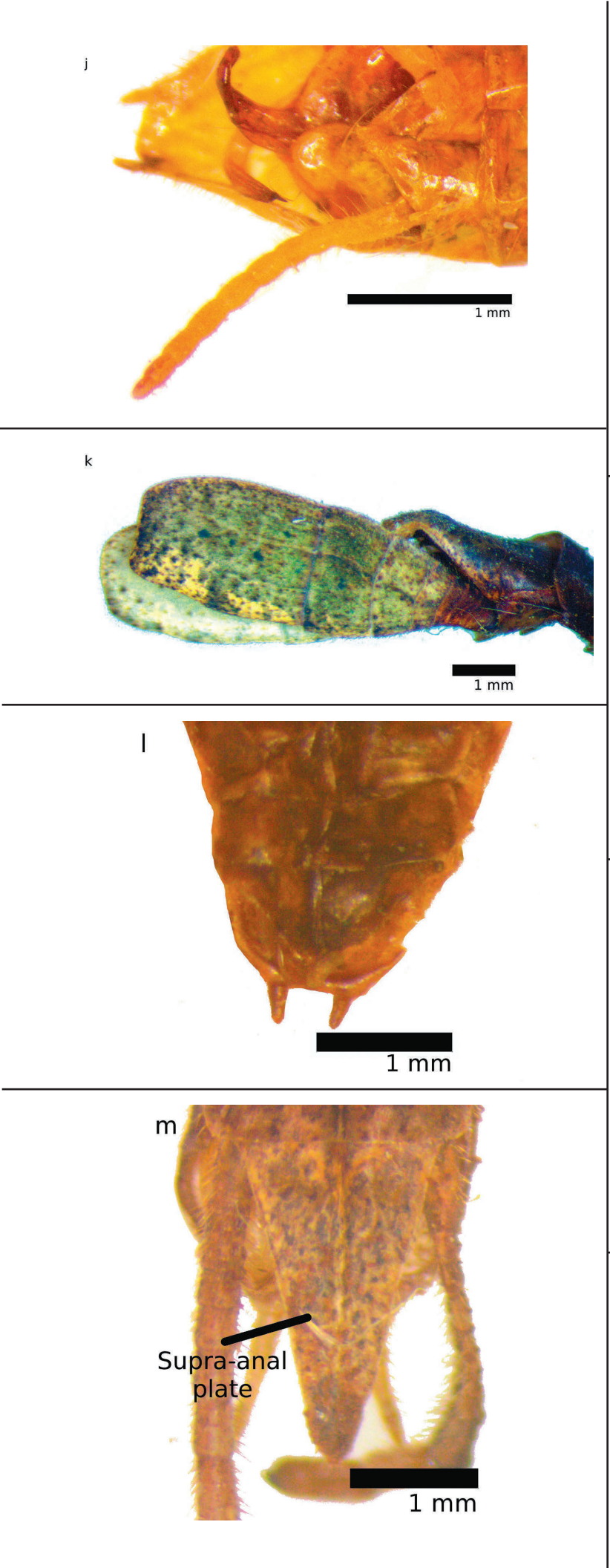


Fig. 2. Features mentioned in key.

External spines of anterior tibia closely packed and layered (Fig. 2g)…..*Acontista multicolor*

8. Posterior tibia fully round (Fig. 2h)……**9**
   Posterior tibia with dorsal keel (Fig. 2i)……**12**

9. Cerci expanded, flattened, foliaceous (Fig. 2k)…..*Angela quinquemaculata*
   Cerci rounded and not expanded (Fig. 2j) ……**10**

10. Supra-anal plate not as long as wide (Fig. 2l)……*Bantiella trinitatis*
    Supra-anal plate longer than wide (Fig. 2m)……**11**

11. Anterior tibia much less than half the length of femur……*Thesprotia filum*
    Anterior tibia half or more the length of femur……**12**

12. Anterior coxa as long as metazone of pronotum……*Musonia surinama*
    Anterior coxa shorter than metazone of pronotum……**13**

13. Juxtaocular bulges and top of vertex at same level (Fig. 2n)…..*Thespis media*
    Juxtaocular bulges significantly higher than top of vertex which appears concave…..……*Macromusonia* **sp.**

14. Ocellar tubercle with projection……**15**
    Ocellar tubercle without projection.....**16**

15. Lobes present on posterior legs……*Vates lobata*
    Lobes absent on posterior legs……*Phyllovates tripunctata*

16. Eyes tapered……*Oxyopsis rubicunda*
    Eyes rounded……**17**

17. Tegmina of females shorter than abdomen…..*Stagmomantis carolina*
    Tegmina of females longer than abdomen……**18**

18. Frontal shield a little broader than tall and has 2 vertical ridges (Fig. 2o).....*Stagmatoptera septentrionalis*
    Frontal shield narrowed transversely and has no ridges (Fig. 2p)..…..…*Parastagmatoptera unipunctata*

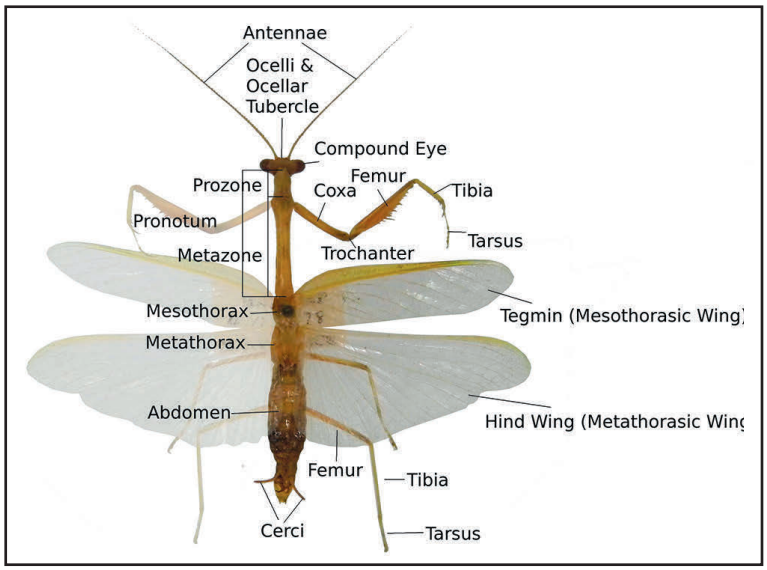


Fig. 3. Main anatomical features of mantid.

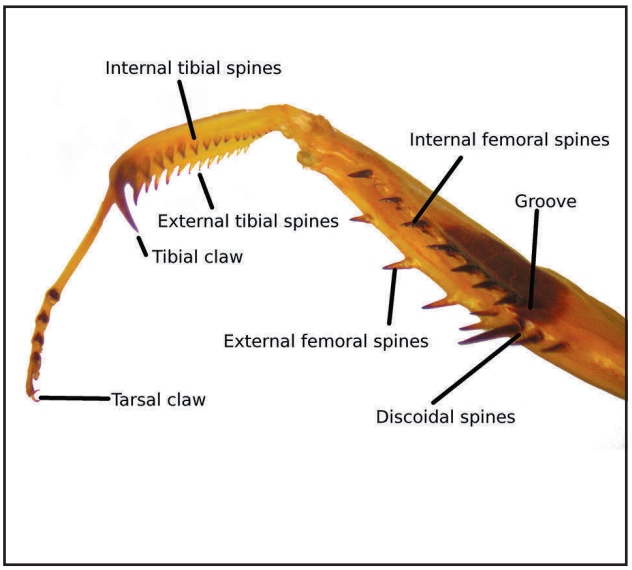


Fig. 4. Anatomical features of forehand.

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