The Mantodea (Insecta: Dictyoptera) of Rio Grande do Norte, Brazil: First List of Species and Geographical Records

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Abstract. This study presents a list of the mantis species from the Brazilian state of Rio Grande do Norte and their distribution within the state. The records are derived from specimens deposited in the “Adalberto Antonio Varela Freire” Entomological Collection at the Federal University of Rio Grande do Norte. This collection holds a total of 1,816 specimens, representing 30 species distributed in 16 genera distributed in 44 localities. There are two new records to Brazil, 10 to the Northeastern region of Brazil (and Caatinga biome) and 25 to the Rio Grande do Norte.

Keywords: Atlantic Forest; Caatinga; Entomology; Neotropics; Praying mantis.

Os Mantodea (Insecta: Dictyoptera) do Rio Grande do Norte, Brasil: Primeira Lista de Espécies e Ocorrências Geográficas

Resumo. Este trabalho apresenta a primeira lista de espécies de louva-a-deus do Rio Grande do Norte, bem como sua distribuição dentro do Estado. Os registros das espécies são oriundos de espécimes depositados na Coleção Entomológica “Adalberto Antonio Varela Freire”, localizada na Universidade Federal do Rio Grande do Norte. Essa coleção possui um total de 1,816 espécimes de Mantodea depositados, representando 30 espécies distribuídas em 16 gêneros.

Palavras-chave: Entomologia; Caatinga; Floresta Atlântica; louva-a-deus; Neotrópico.

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ists of species are extremely important for many different fields of biological research, such as conservation, ecology, and taxonomy. These lists can be used to plan collecting schedules and provide historical information on the local fauna and flora, as well as providing a baseline for future research. Despite recent efforts, the diversity of the Brazilian Mantodea is still poorly known. Only three species lists are available for the 26 Brazilian states – one for the state of Rio Grande do Sul (Dornelles et al. 2005), one that documents the mantids of the Museum of Zoology of the University of São Paulo (Rodrigues & Cancello 2013), and other for the Parque Nacional da Serra das Confusões, in Piauí (Menezes et al. 2013). Menezes & Bravo (2014) provided a list of Mantodea species of the semi-arid area of Brazil containing records from the States of Alagoas, Ceará, Paraíba Pernambuco, Piauí and Rio Grande do Norte. Menezes (2015) made a short list of the Reserva Biológica de Pedra Tallhada (ranging from the States of Alagoas and Pernambuco). More general lists of Neotropical mantises are provided by Agudelo et al. (2007) and Ehrmann & Koçak (2009).

The Brazilian state of Rio Grande do Norte encompasses two critically endangered biomes, the Brazilian Atlantic Forest and the Caatinga, although no species lists of any insect group are available for the Rio Grande do Norte, despite the importance of this information for the planning of conservation strategies. There are only few records available are from Bravo & Cador (2014). Given this situation, the present study aimed to provide a list of the species of Mantodea from the Rio Grande do Norte, using material deposited in the “Adalberto Antonio Varela Freire” Entomological Collection (CAAVF) of the Federal University of Rio Grande do Norte.

MATERIAL AND METHODS

The preserved specimens were all from the CAAVF, and were either pinned or stored in vials containing 70% alcohol. We also collected mantodean specimens in the field to increase the number of taxa recorded. These specimens were collected between November 2011 and October 2013 (24 hours per month) consecutively by active searching with a flashlight, together with one light trap composed of a vertical sheet illuminated by a 250 W mercury lamp. This light trap was set in clearings or near the edge of the forest to improve the range of the illumination, and was turned on at 17:00 h and then turned off at 05:00 h, coinciding with the crepuscular periods at the end and beginning of the day, respectively. At least two collectors were present at each collect expedition. The specimens collected were euthanized with 70% alcohol and stored in Falcon tubes with 90% alcohol, and then catalogued and deposited at the CAAVF.

Specimens were collected in the following municipalities (with GPS coordinates): Açu (05º34’36” S 36º54’31” W), Canguaretama (06º22’48” S 35º07’44” W), Ceará-Mirim (05º38’04” S, 35º25’32” W), Galinhos (05º05’28” S, 35º12’31” W), Nísia Floresta (06º22’48” S, 35º07’44” W), Pau dos Ferros (06º06’36” S, 38º12’16” W), Pau dos Ferros (06º06’36” S, 38º12’16” W).

The specimens were identified based on the descriptions and identification keys of Burmeister (1838); Giglio-Tos (1929); Beier (1942); LaGreca & Lombardo (1989); Terra (1995); Lombardo (2000); Agudelo & Chica (2003); Lombardo & Ippolito (2004).
and Roy & Ehrmann (2009). Identifications were based on the external morphology of the body and the genitalia. The genitalia were extracted using a featherweight tweezer, and treated with 10% KOH whenever necessary.

The geographic coordinates were acquired from Google Earth™ based on the data provided by the specimen labels, and maps were produced from these coordinates on the http://www.simplemappr.net website. All the specimens have a voucher code with prefix namely “MAN” and a suffix number ranging from 01 to 773 (Annex 1 - Metadata).

RESULTS

We analyzed a total of 1816 mantodean specimens, of which 1713 were deposited in the CAAVF and 103 were collected during fieldwork. Based on the analysis of these specimens, we identified 30 species distributed in 16 genera and eight families (Table 1). These specimens were recorded at 44 localities (Figure 1).

Table 1. List of the insect species of the order Mantodea recorded in Rio Grande do Norte, Brazil according to classification of Rivera & Svenson (2016).

| Taxon | Geographical Record |
|-------|---------------------|
| **ACANTHOPIDAE** | |
| Decimiana hebardi Lombardo, 2000 (♂9) | Ceará-Mirim (12); Monte Alegre (26); Natal (28); Serra Negra do Norte (41). |
| Decimiana rehni (Chopard, 1913) (♂1) | Macaíba (23). |
| *Accontistinae* | |
| Acontista sp. (♂304) | Alto Rodrigues (1); Mossoró (27); Pendências (34); Serra Negra do Norte (41). |
| **CHAETESSIDAE** | |
| Chaeteessa caudata Saussure, 1871 (♂19) | Açu (3); Macau (24); Mossoró (27); Natal (28); Serra Negra do Norte (41). |
| **COPTOPTERYGIDAE** | |
| Brunneria brasilensis Saussure, 1870 (♂58)(♀1) | Alto Rodrigues (1); Carnaubais (11); Jucurutú (20); Natal (28); Pedro Avelino (33); Serra Negra do Norte (41). |
| Brunneria gracilis Giglio-Tos, 1915 (♂58) | Goianinha; Jucurutú (20); Parnamirim (31); Pendências (34); Santa Maria (39); Serra Negra do Norte (41). |
| Brunneria subaptera Saussure, 1869 (♂11) | Caicó (8); Serra Negra do Norte (41). |
| **LITURGUSIDAE** | |
| Liturgusa annulipes (Serville, 1839) (♂7) | Ceará-Mirim (12); Nísia Floresta (29). |
| Liturgusa maya (Saussure & Zehntner, 1894) (♂1)(♀1) | Natal (29); Nísia Floresta (29). |
| Liturgusa parva Giglio-tos, 1915 (♂2) | Nísia Floresta (29). |
| **MANTIDAE** | |
| **Stagmatopterinae** | |
| Oxypsis sp. 1 | Barra de Cunhaú (5); Parnamirim (31). |
| Oxypsis sp. 2 | Ceará-Mirim (12). |
| Parastagmatoptera unipunctata (Burmeister, 1838) (♂57) | Alto Rodrigues (1); Ceará-Mirim (12); Extremoz (14); Macaíba (23); Martins (26); Mossoró (27); Natal (28); Serra Negra do Norte (41). |
| Stagmatoptera hyaloptera (Perty, 1832) (♂53)(♀3) | Carnaubais (11); Ceará-Mirim (12); Jucurutú (20); Lagoa Pintada (21); Macaíba (23); Natal (28); Nísia Floresta (29); Serra Negra do Norte (41). |
| Stagmatoptera pia Saussure & Zehntner, 1894 (♂11)(♀3) | Ceará-Mirim (12); Macaíba (23); Natal (28); Nísia Floresta (29); Parnamirim (31); São José de Mipibú (40); Serra Negra do Norte (41). |
| Stagmatoptera precaria Linneaus, 1758 (♂20)(♀5) | Ceará-Mirim (12); Macaíba (23); Mossoró (27); Natal (28) Nísia Floresta (29); Parnamirim (31); Santa Cruz (38); São José de Mipibú (40); Serra Negra do Norte (41). |
| **Vatiniae** | |
| Phyllovates brasilensis Piza, 1982 (♂3) | Carnaubais (11); Macaíba (23); Serra Negra do Norte (41). |
| Phyllovates stolli (Saussure & Zehntner, 1894) (♂16) | Carnaubais (11); Ceará-Mirim (12); Macaíba (23); Serra Negra do Norte (41). |
| Zoolea descampti Ehrmann & Roy (♂3) | Ceará-Mirim (12); Parnamirim (31); Santa Cruz (38). |
| **MANTOIDIDAE** | |
| Mantoida argentinae La Greca & Lombardo, 1989 (♂10)(♀1) | Macaíba (12); Mossoró (27); Natal (28); Serra Negra do Norte (41). |
| Mantoida brunneriana Saussure, 1871 (♂81)(♀2) | Alto Rodrigues (1); Açu (3); Carnaubais (11); Mossoró (27); Nísia Floresta (29); Parnamirim (31); Serra Negra do Norte (41). |
| Mantoidea lateola Westwood, 1889 (♂15) | Alto Rodrigues (1); Extremoz (14); Macaíba (23); Serra Negra do Norte (41). |
| **PHOTINAIDAE** | |
| Cardiopterinae | |
| Cardioptera brachyptera Burmeister, 1838 (♂424) | Açu; Alto Rodrigues (1); Arês (2); Baía Formosa (4); Bom Jesus (7); Ipuera (17); Macaíba (23); Martins (25); Mossoró (27); Natal (28); Nísia Floresta (29); Parnamirim (31); Pendências (34); Poço Branco (35); Santa Maria (39); Serra Negra do Norte (41); Upanema (43). |
| Cardioptera squalodon Werner, 1932 (♂6) | João Câmara (19); Serra Negra do Norte (41). |
DISCUSSION

The relatively small number of female specimens (38 of the total of 1816) found in the present study can be attributed to the principal methods using by the collectors of the specimens available in the CAAVF, i.e., light traps, which do not attract the females of many apterous or brachypterous species (Terre & Agüelo 2012). In this case, females can only be collected using active searches, which are hampered by the cryptic coloration of these insects.

The distribution patterns of the different mantodean taxa varied considerably in this study. The species of the genus Litturgursa, for example, were only found in fragments of Atlantic Forest in coastal areas. This is probably because of the microhabitat occupied by these insects – tree bark covered with lichen – from which their common name of “bark mantises” is derived (Svensson 2014). This type of microhabitat is common in the relatively humid interior of the Atlantic Forest, but not in the more arid Caatinga which has a prolonged dry season, when the lichen tends to disappear from the trees, together with the animals that occupy this substrate. However, there are humid areas in Caatinga, in example of the city of Martins (25), in Rio Grande do Norte, which probably have specimens of Liturgusidae living there, but so far were not found. The species of the genus Oxyopsis were also found exclusively in coastal area, not only in fragments of Atlantic forest, but also in environments dominated by dunes. Photiomantis planiceps (Rehn) is the most common and widespread species in the collection, being present in both humid and arid areas, and at all elevations, recorded in 23 areas.

Table 1. Geographical Record

| Taxon | Geographical Record |
|-------|---------------------|
| Photiomantinae | Alto Rodrigues (1); Arês (2); Açú (3); Caicó (8); Caraúbas (10); Carnaubais (11); Ceará-Mirim (12); Currais Novos (13); Extremoz (14); Jardim do Seridó (18); Lajes (22); Macau (24); Martins (25); Mossoró (27); Natal (28); Parelhas (30); Parnamirim (31); Pendências (34); Riacho de Santana (36); Riachuelo (37); Serra Negra do Norte (41); Severiano Melo (42); Vera Cruz (44).|
| Photinaeae (Orthoderellini) | Caicó (8); Ceará-Mirim (12); Mossoró (27); Serra Negra do Norte (41).|
| Musoniella brasiliensis Giglio-Tos, 1916 | Açú (3); Martins (25); Natal (28); Nísia Floresta (29); Serra Negra do Norte (41).|
| Musoniella chopardi Giglio-Tos, 1916 | Alto Rodrigues (1); Açú (3); Carnaubais (12); João Câmara (19); Lajes (22); Macaíba (23); Martins (25); Mossoró (27); Natal (28); Nísia Floresta (29); Parnamirim (31); Serra Negra do Norte (41).|
| Thespini | Mossoró (27); Natal (28); Nísia Floresta (29); Parelhas (30); Parnamirim (31); Serra Negra do Norte (41).|
| Thesprotia brevis Giglio-Tos, 1895 | Carnaubais (11); Lagoa Salgada (21); Serra Negra do Norte (41).|

Figure 1. Distribution of the collecting localities of Mantodea in Rio Grande do Norte, Brazil, registered in the Coleção Entomológica Adalberto Antonio Varela Freire. Figure made by authors. Black dots represents the city registered and the number on the left to the dot or following a line refers to name of the location. Numeration and naming in alphabetical order = 1: Alto Rodrigues; 2: Arês; 3: Açú; 4: Baía Formosa; 5: Barra de Cunhauá; 6: Boa Viagem; 7: Bom Jesus; 8: Caicó; 9: Canguaretama; 10: Caraúbas; 11: Carnaubais; 12: Ceará-Mirim; 13: Currais Novos; 14: Extremoz; 15: Galinhos; 16: Goianinha; 17: Ipueira; 18: Jardim do Seridó; 19: João Câmara; 20: Jucututu; 21: Lagoa Salgada; 22: Lajes; 23: Macaíba; 24: Macau; 25: Martins; 26: Monte Alegre; 27: Mossoró; 28: Natal; 29: Nísia Floresta; 30: Parelhas; 31: Parnamirim; 32: Pau dos Ferros; 33: Pedro Avelino; 34: Pendências; 35: Poço Branco; 36: Riacho de Santana; 37: Riachuelo; 38: Santa Cruz; 39: Santa Maria; 40: São José de Mipibú; 41: Serra Negra do Norte; 42: Severiano Melo; 43: Upanema; 44: Vera Cruz.
level and the state’s highlands, but only in humid habitats with a well-defined rainy season.

A very large proportion of all the specimens were collected at two localities, Natal and Serra Negra do Norte. Natal is the state capital of Rio Grande do Norte, and its federal university (UFRN) has an entomology course, for which students are continually collecting new insect specimens. The second site, Serra Negra do Norte, located in the semi-arid region in Caatinga biome, was the main area in which professor Adalberto Antonio Varella Freire (in memoriam) collected specimens over a 30-year period. The eastern portion of the state is the least well sampled. This area encompasses highlands with a number of waterfalls and a mosaic of Atlantic forest habitats. It seems likely that additional mantodean species adapted to different elevations will be found in this area, and in other parts of the state, and further research into the distribution of the mantises throughout the region is clearly needed.

Our list includes two new records for Brazil (Decimiana hebardi Lombardo, 2000, and Thesprotia brevis Giglio-Tos, 1915), and 10 for the country’s Northeast region, including the Caatinga biome (Brunneria subaptera Saussure, 1869, Brunneria gracillis Giglio-Tos, 1915, Liturgusa magna (Saussure and Zehntner, 1894); Liturgusa parva Giglio-Tos, 1915; Musoniella brasiliensis Giglio-Tos, 1916; Musoniella chopardi Giglio-Tos, 1916; Phyllovates brasiliensis Piza, 1982; Phyllovates stollii (Saussure and Zehntner, 1894) and Thesprotia infumata Audinet-Serville, 1839). With the exception Brunneria brasiliensis Saussure, 1870; C. brachyptera; Mantoida brunneriana Saussure, 1871; P. planicepspalla, and Stagmatoptera hyaloptera (Perty, 1832) the remaining 25 species are new records for Rio Grande do Norte. Menezes & Bravo (2014) identified specimens of C. brachyptera from CEAAV as Cardiopora parva Beier, 1942. However, by comparing these specimens with type specimens photos and through genitalia analyzes, we determined these specimens as C. brachyptera. We hope that this list will provide a useful database for the development of further ecological and zoogeographic research by students in Rio Grande do Norte, and further afield in Brazil, given the scarcity of data on the mantodeans of this country. A short term contribution of this list is to the Catalago Taxonomico da Fauna do Brasil, which is a catalog of all Brazilian animals’ species. This catalog currently lists 244 valid species of Mantodea to Brazil (Agudelo 2016).

Less than 15% of the original cover of the Atlantic Forest now remains (Ribeiro et al. 2009), although there is no reliable estimate of deforestation rates in the Caatinga. Worse still, less than 2% of the total area of the Caatinga is currently protected in conservation units (Tareelli et al. 2000). This facilitates deforestation in Rio Grande do Norte, and while are knowledge of the state’s mantodean diversity is still incipient, ongoing habitat clearance may result in the loss of species before they have even been identified. In this case, our species list is not only an important contribution to the understanding of the diversity of the order Mantodea, but also to the conservation of these biomes.

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REFERENCES

Agudelo, A., 2016. Catalgo Taxonomico da Funa do Brasil. Available on: <http://fauna.ibri.gov.br> [Accessed in: 14.viii.2016].

Agudelo, A. & L. Chica, 2003. Descripción del complejo fálico de Thesprotia brevis Giglio-Tos, 1915 (Insecta: Mantodea: Thespidae). Boletín Científico del Museo de Historia Natural Universidad de Caldas, 7: 209-213.

Agudelo, A., F. Lombardo & L.J. Jantsch, 2007. Checklist of the Neotropical mantids (Insecta, Dictyoptera, Mantodea). Biota Colombiana, 8: 105-158.

Beier, M., 1942. Neue Und Seltene Mantodeen aus Deutschen Kolonien, 52: 127-154.

Bulmeister, K.H.K., 1898. Handbuch der Entomologie. Vol. 2. Berlin, G. Reimer, 312 p. [Available on: https://archive.org/details/handbuchderentom222burm>.

Dorneles, A.L., F.C. Quadros, L.J. Jantsch & E. Corseuil, 2005. Mantódeos (Insecta, Mantodea) registrados no Rio Grande do Sul, Brasil. Biociências, 13: 221-225.

Ehrmann, R. & A.O. Koçak, 2009. The Neotropical Mantids (Insecta: Dictyoptera: Mantodea) (Ehrmann – 30. v. 2009). CESA News, 49: 1-18.

Giglio-Tos, E., 1929. Das tierreich. Orthoptera-Mantidae, Berlin, 50: 6-707.

La Greca, M. & F. Lombardo, 1989. Mantodei Neotropicali. I. Il genere Mantoida descrizione di due nuove specie. Animalia, 16: 55-67.

Lombardo, F., 2000. A review of the genus Decimiana Uvarov, 1940 (Insecta: Mantodea), with description of a new species. Proceedings of the Academy of Natural Sciences of Philadelphia, 150: 159-171.

Menezes, E.C., 2015. Louva-a-Deus (Mantodea) da Reserva Biológica de Pedra Talhada, p. 229-235. In: Studer, A., L. Nusbaumer & R. Spichiger (Eds.), Biodiversidade da Reserva Biológica de Pedra Talhada (Alagoas, Pernambuco – Brasil). Boissier, 68: 818 p.

Menezes, E.C., A.M. Silva Neto & F.R.B. Quijano, 2013. First Records of Mantodea (Insecta, Dictyoptera) from the Serra das Confusões National Park, Piauí State, Brazil. Entomobrasilis, 6: 210-213. doi: http://dx.doi.org/10.12741/ebrasilis.v6i3.315.

Menezes, E.C. & F. Bravo, 2014. Mantodea (Insecta) do Semiárido, p.111-115. In: Bravo, F. & F. Calor. Artrópodes do Semiárido: biodiversidade e conservação. Printmídia, Feira de Santana, 298 p.

Lombardo, F. & S. Ipollito 2004. Revision of the species of Acanthops Serville, 1831 (Mantodea, Mantidae, Acanthopinae) with comments on their Phylogeny. Annals of the Entomological Society of America, 97: 1076-1102. doi: http://dx.doi.org/10.1603/1013-8746(2004)097[1076:rotso a2.0.co;2.

Ribeiro, M.C., J.P. Metzger, A.C. Martensen, F.J. Ponzoni & M.M Hiroit, 2009. The Brazilian Atlantic Forest: How much is left, and how is the remaining forest distributed? Implications for conservations. Biological Conservation, 142: 1141-1153. doi: http://dx.doi.org/10.1016/j.biocon.2009.02.021.

Rivera, J. & G.J. Svenson, 2016. The Neotropic ‘polymorphic earless praying mantises’ – Part I: molecular phylogeny and revised higher-level systematics (Insecta: Mantodea, Acanthopoidae). Systematic Entomology, 41: 607-649. doi: http://dx.doi.org/10.1111/syen.12178.

Rodrigues, H.M. & E.M. Cancello, 2013. Mantodea (Insecta) collection in the Museu de Zoologia da Universidade de São Paulo: Taxonomic and geographical coverage. Check List, 9: 957–965. doi: http://dx.doi.org/10.15560/9.5.957.

Roy, R. & R. Ehrmann, 2009. Révision du Genre Zoolea AudinetServille [Mantodea, Mantidae, Vatinieae]. Revue française d’Entomologie, 31: 1-22.

Svenson, G.J., 2014. Revision of the Neotropical bark mantis genus Liturgusa Saussure, 1869 (Insecta, Mantodea,
Liturgusini). ZooKeys, 390: 1-214. doi: http://dx.doi.org/10.3897/zookeys.390.6661.

Tabarelli, M., J.M.C. Silva, A.M.M. Santos & A. Vicente, 2000. Análise de representatividade das unidades de conservação de uso direto e indireto na Caatinga: análise preliminar. In: J.M.C. Silva & M. Tabarelli, Workshop Avaliação e identificação de ações prioritárias para a conservação, utilização sustentável e repartição de benefícios da biodiversidade do bioma Caatinga. Petrolina, Pernambuco. Available on: <www.biodiversitas.org.br/caatinga> [Accessed in: 16.viii.2016].

Terra, P.S., 1995. Revisão sistemática dos gêneros de louva-a-deus da região Neotropical (Mantodea). Revista Brasileira de Entomologia, 39: 13-94.

Terra, P.S. & A. Agudelo, 2012. A Ordem Mantodea, p. 13-94. In: Rafael, J.A., G.A.R Melo, C.J.B. Carvalho, S.A. Casari & R. Constantino (Eds.), Insetos do Brasil: Diversidade e Taxonomia. Holos Editora, São Paulo, 296 p.

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