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**Description of *Microsibylla sechii* genus novum et species nova,
a peculiar taxon of Sibyllinae from the Crystal Mountains, Gabon**

(Mantodea: Hymenopodidae: Sibyllinae)

Abstract

The new genus and species of Sibyllinae (Hymenopodidae) *Microsibylla sechii* is described. It differs from other genera of Sibyllinae for the absence of an evident head apophysis, for the presence of a dorsal lobe at the base of metazone, for its simple, not dorsally sinuose, profemora, for the small apical spine on meso- and metafemora and for the unique shape of male genitalia. An updated key to currently known genera of Sibyllinae is provided.

Key words. *Microsibylla*, *sechii*, Mantodea, Hymenopodidae, Sibyllinae, new genus, new species, Crystal Mountains, Gabon, Africa, key to genera.

Riassunto

[*Descrizione di Microsibylla sechii* genus novum et species nova, interessante Sibyllinae dei Monti di Cristallo, Gabon]

Si descrive il nuovo genere e la nuova specie di Sibyllinae (Hymenopodidae) *Microsibylla sechii*. Questo differisce dagli altri generi di Sibyllinae per l'assenza di una evidente apofisi cefalica, per la presenza di un lobo dorsale alla base della metazona, per i profemori semplici, non sinuosi dorsalmente, per la spina apicale dei meso- e metafemori piccola e per la forma unica dei genitali maschili. Si fornisce una chiave aggiornata ai generi attualmente noti di Sibyllinae.

Parole chiave. *Microsibylla*, *sechii*, Mantodea, Hymenopodidae, Sibyllinae, nuovo genere, nuova specie, Monti di Cristallo, Gabon, Africa, chiavi ai generi.

Introduction

The subfamily Sibyllinae Giglio-Tos, 1915, according to the last revisions, is included within Hymenopodidae (SVENSON et alii, 2015; SCHWARZ et ROY, 2019) and includes 3 genera, widespread in the sub-Saharan Africa (ROY, 1996): *Sibylla* Stål, 1877, *Presibylla* Bolívar, 1908 and *Leptosibylla* Roy, 1996.

According to ROY (1996) this subfamily is characterized by the following features: head with an elongated and bilobated process; pronotum with angled supra-coxal dilatations and a pair of paramedian tubercles; profemora sinuate, with 4 external and 4 discoidal spines; protibiae generally with 6 external spines, of which the first

is spaced apart and the second (or the third) is the larger one; meso- and metafemora with a pre-basal and a pre-apical lobe and always with an apical internal spine; flying organs well developed, with pterostigma of tegmina elongated and quite distinct and wings hyaline; supra-anal plate with simple, cylindrical cerci; subgenital plate large, with well developed styles; male genitalia without pointed processes; distal process with a granulate lobe; phalloid apophysis simple and large, titillator not distinct.

Recently I received for study a collection of Mantodea from Gabon, collected by Daniele Sechi during a scientific expedition to the Crystal Mountains. Among these, I was lucky to find an interesting specimen that I was not able to attribute to any known genus. Some morphological features lead me to include it in a new genus of Sibyllinae although it shows some unique traits inside this subfamily.

Results

Microsibylla genus novum

Type species. *Microsibylla sechii* species nova.

Diagnosis. Medium-small sized Sibyllinae with green-marbled colour and slender aspect, without a distinct head apophysis and expansions on meso- and metafemora. General appearance quite similar to *Presibylla* and *Leptosibylla* but smaller and without head apophysis and femoral lobes.

Differential diagnosis. *Microsibylla* differs from other genera of Sibyllinae for the following features: head without a distinct apophysis; pronotum with a basal foliaceous lobe; profemora not sinuate, simple; apical internal spine of meso- and metafemora normally sized; male genitalia with distal process not granulate, strongly curved and jointed with the margin of ventral phallomere by a membrane; phalloid apophysis bacilliform, with an apical spine; apical process of left phallomere a bit twisted, less simplified. The total absence of lobes on meso- and metafemora is a feature shared with *Leptosibylla*.

Remarks. The new genus is very far from the previously known genera of Sibyllinae, but it was included in this group due to the following features: clypeus bulgy, elevated in the middle, as observed in *Presibylla*; pronotum with the typical Sibyllinae shape, with angled supra-coxal dilatations and paramedian bulges; protibiae with the III external spine a bit larger than the IV; colouration similar to that of other Sibyllinae, especially *Presibylla*.

Derivatio nominis. I call the new genus *Microsibylla* due to its very small size in respect to other known Sibyllinae, and for its very slender and simple aspect, without head apophysis and foliaceous expansions on legs.

Microsibylla sechii species nova

Examined material. Holotype male: Gabon, Parc National des Monts de Cristal,

Kinguélé, m 230 a.s.l., 0°26'25"N 10°16'26"E (at light) // 19-30.XI.2019 // legit Daniele Sechi. The Holotype will be deposited in the Museo di Storia Naturale del Salento (Calimera, Lecce), MSNS.

Further material. 1 juvenile (sub-adult), photographed but not collected: Gabon, Komo department, 0°28'05.5"N 10°16'28.4"E (0.4681800, 10.2745630), on a tree trunk covered by mosses and epiphytic ferns (Hymenophyllaceae) in a hyper-umid forest near a stream // 22.X.2020 // photographed by Ehoarn Bidault.

Diagnosis. Medium-small sized Sibyllinae with green-marbled colour and gracile and simple aspect, without a distinct head apophysis and expansions on meso- and metafemora.

Description (Holotypus male). *Head* roughly triangular and transverse. *Vertex* almost straight, with well marked furrows (especially the lateral ones) that delimitate 5 sections, of which the lateral ones are more bulgy; lower part of vertex, above the ocelli, with a small triangular section delimited by an angled carina (remnants of the head apophysis). *Ocelli* quite small; the lateral ones elliptical, the central one circular. *Lower frons* transverse, about 3 times wider than high, with truncated/rounded upper angle and with smooth surface. *Clypeus* trapezoidal, transverse and bulgy in the middle, with a transversal carina that divide it into an anti-clypeus and a barely smaller post-clypeus. *Labrum* roughly pentagonal, higher than the clypeus. *Palpi* thin and apically pointed and darkened. *Eyes* large, rounded and globose. *Antennae* filiform, with the first segment larger, the second about 1/2 of the first and the following segments about 1/2 of the second and covered by some short hairs. First 2 segments pale, the following blackish.

Pronotum slender, 3.32 times longer than its maximum width. *Prozone* with sub-parallel sides, barely widened apically. *Metazone* thinned in the middle and with semi-circular section; base barely widened; median carina scarcely visible but basally elevated in a small rounded lobe; with two lateral conical bulges behind the typic sulcus. *Flying organs* well developed, covering the abdomen. *Tegmina* quite slender, with relatively large cells between the veins; costal field quite thin; sub-hyaline, with greenish veins and some large irregular spots; stigma small and smooth, transparent. *Hind wings* large and apically rounded; with hyaline colouration, except for the apex, which is a bit greenish with some small brownish spots. *Procoxae* slender; anterior margin with some small teeth, of which the largest 6 are darkened; longitudinal carina well marked; genicular lobes basally contiguous but apically divergent and rounded; upper genicular lobe larger than the lower one. *Profemora* slender, about 6.6 times longer than their maximum width, with straight and finely denticulated upper margin; with 4 external, 4 discoidal and 14 (left femur) or 13 (right femur) internal spines; external spines well developed, almost equal in size; discoidal spines well developed, with the III (from the base) clearly longer than the others; internal spines brownish, apically darkened and disposed as follows:



Figure 1. Habitus of *Microsibylla sechii* (holotypus) in dorsal and ventral view. Photos by Augusto Degiovanni.

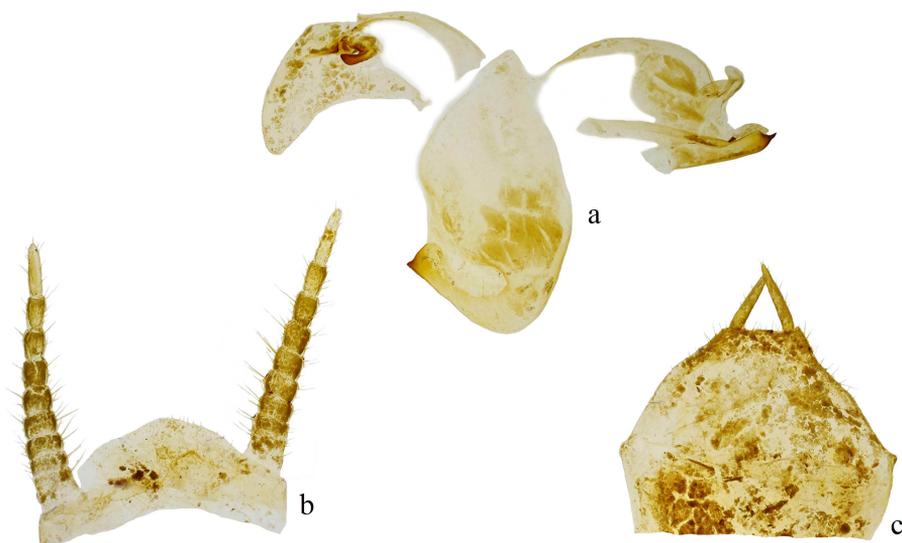


Figure 2. Male terminalia and genitalia of *Microsibylla sechii* (holotypus): **a** – genitalia; **b** – supra-anal plate and cerci; **c** – sub-genital plate and styli. Photo by Augusto Degiovanni.

iiiiiiiI (left femur) or iiiiI (right femur); apical internal spine larger than the others; genicular spines small but distinct and pointed; posterior margin of the femora with some rounded tubercles in the basal half. *Protibiae* slender, about 1/2 of the length of profemora; with 7 (left femur) or 6 (right femur) external and 11 internal spines; the III (left femur) or II (right femur) external spine larger than the previous one and barely larger than the following one; internal spines increasing their size toward the apex. *Protarsi* slender, with the first segment about as long as the others taken together and about twice longer than the second segment. *Meso- and metafemora* long and very thin, roughly cylindrical; genicular lobes small and rounded; genicular spine small. *Meso- and metatibiae* long and very thin (thinner than the corresponding femora), cylindrical. *Meso- and metatarsi* very elongated and thin, about as long as the corresponding tibiae; first segment 3.3 times longer than the second and 1.7 times longer than the following segments taken together. *Abdomen* quite short and slender. *Tergites* wider than long. *Sternites* wider than long, without ventral lobes. *Supra-anal plate* sub-triangular and transverse, about thrice wider than long. *Cerci* quite short, cylindrical, made up of 10 segments; basal segments transverse; last segment longer and thinner than the others. *Sub-genital plate* quite large, roughly trapezoidal, apically truncated. *Styli* relatively long, thin, cylindrical. *Male genitalia* lightly sclerotized. *Ventral phallomere* roughly elliptical, with an elongated and curved distal process separated by the

right margin by a deep incision but jointed to it by a membranose tissue; distal process strongly curved upward (anteriorly), preapically constricted and apically enlarged, truncated and darkened. *Right phallomere* normally shaped, apically rounded. *Left phallomere* with small and strongly curved titillator; phalloid apophysis relatively large and sclerotized, bacilliform, apically rounded but with an apically conical spine; membranose lobe inserted on a deep incision of the titillator toward the pre-apical portion of the phalloid apophysis.

Colouration greenish, with irregular brownish spots; tegmina pale green with irregular brownish spots (possibly dark green in fresh specimens); meso- and metafemora with 3 gradient brownish transversal stripes; meso- and metatibiae with 3 distinct brownish transversal stripes.

Measurements. Total body length: 23.5 mm. Pronotum length: 8.0 mm. Pronotum maximum width: 2.5 mm. Metazone length: 5.9 mm. Tegmina length: 16.1 mm. Profemora length: 6.6 mm. Mesofemora length: 8.0 mm. Mesotibiae length: 7.0 mm. Mesotarsi length: 6.5 mm. Metafemora length: 8.9 mm. Metatibiae length: 8.6 mm. Metatarsi length: 8.6 mm.

Derivatio nominis. The new species is dedicated to Daniele Sechi who kindly gave me the opportunity to study his collection of Gabonese Mantodea, which included the holotype of *Microsibylla sechii*.

Immature stages. In addition to the holotype male, another specimen of this species has been found and photographed near the type locality. It is a sub-adult nymph, probably a male, close to its last molt (the pterotechae are swollen). It is similar to the adult male, but the mesonotum, the metanotum and the tergites have a median dorsal lobe similar to that at the base of the pronotum. These processes are probably lost during the last molt due to the necessity of keeping the flying organs over the body. The abdomen has also some small lateral lobes. The specimen photographed keeps the abdomen lying down, near the surface of the bark, on contrary to other Sibyllidae that tend to keep the abdomen curved upwards in the immature stage.

Ecology. The holotype male of this species has been collected attracted at night by an artificial light inside the rainforest, so it is hard to understand its originary micro-habitat. However, it is very likely a sort of “moss-dwelling” species, living on tree barks covered by mosses, due to some morphological adaptaments, such as the presence of a dorsal lobe at the apex of metazone, the elongation and thinning of meso- and metatarsi and for the green mottled colouration. All these traits are shared by other Mantodea with a “moss-dwelling” lifestyle like *Astape*, *Haania*, *Pogonogaster* and *Pseudopogonogaster*. The lobe on pronotum and the moss-like colouration is engaged in a moss-mimicking mimetism while the slender tarsi are a typical adaptation to the bark dwelling lifestyle, observed in many genera (for example *Liturgusa*, *Stenomantis*, *Gimantis*). The hypothesis of a “moss-dwelling” lifestyle is also corroborated by the finding of a sub-adult specimen

of *Microsibylla sechii*, photographed by the botanist and photographer Ehoarn Bidault on a trunk covered by mosses and epiphytic ferns (Hymenophyllaceae) (BIDAULT, in litteris).

Microsibylla sechii has been collected together with many other species of Mantodea, including some members of other Sibyllinae genera (*Presibylla speciosa*, *Sibylla* (*Sibylla*) *dolosa*, *Sibylla* (*Sibyllopsis*) *griffinii*, *Sibylla* (*Sibyllopsis*) *pannulata* and an unidentified female of *Sibylla* (*Sibylla*), possibly a new species). The Mantodea fauna of the Crystal Mountains will be discussed in a further work.

Observations and conclusions

The new genus *Microsibylla* is very different from any other known Sybillinae. The absence of head apophysis is a very rare exception inside Hymenopodidae, previously observed only in Anaxarchini (Hymenopodinae), *Congoharpax* (Hymenopodinae, Hymenopodini) and *Astylasula* (Oxypilinae, Hestiasulini). The reduction of the head apophysis in *Microsibylla* is an apomorphy developed from the condition observed in other Sibyllinae. Another apomorphic trait of the new genus is the development of a dorsal lobe at the base of metazone. Other features of the new genus are typically plesiomorphic, such as the normally shaped profemora, the scarcely oversized III external spine on protibiae, the normally sized apical internal spine of meso- and metafemora. Male genitalia are of a unique type, quite far from any other known Hymenopodidae, especially for the shape of the apical lobe of left phallomere. The latter is a bit twisted, in a way similar to non-Hymenopodidae genera. In Hymenopodidae (and other Hymenopodoidea) it is generally more simple, flat. However in *Microsibylla* it is short and robust, showing an intermediate morphology between the Hymenopodid-type and the non-Hymenopodid-type. It could be interpreted as an independently developed apomorphy, curiously similar to the situation observed in genera outside Hymenopodoidea.

Some morphological traits of *Microsibylla sechii* are probably developed due to a moss-mimicking camouflage, such as the development of a dorsal lobe at the base of metazone, the elongation and thinning of meso- and metatarsi and a green-marbled colouration, observed in other Mantodea with a similar lifestyle, like *Astape*, *Haania*, *Pogonogaster* and *Pseudopogonogaster*. A similar pattern is found also in *Presibylla* and partially in *Leptosibylla*.

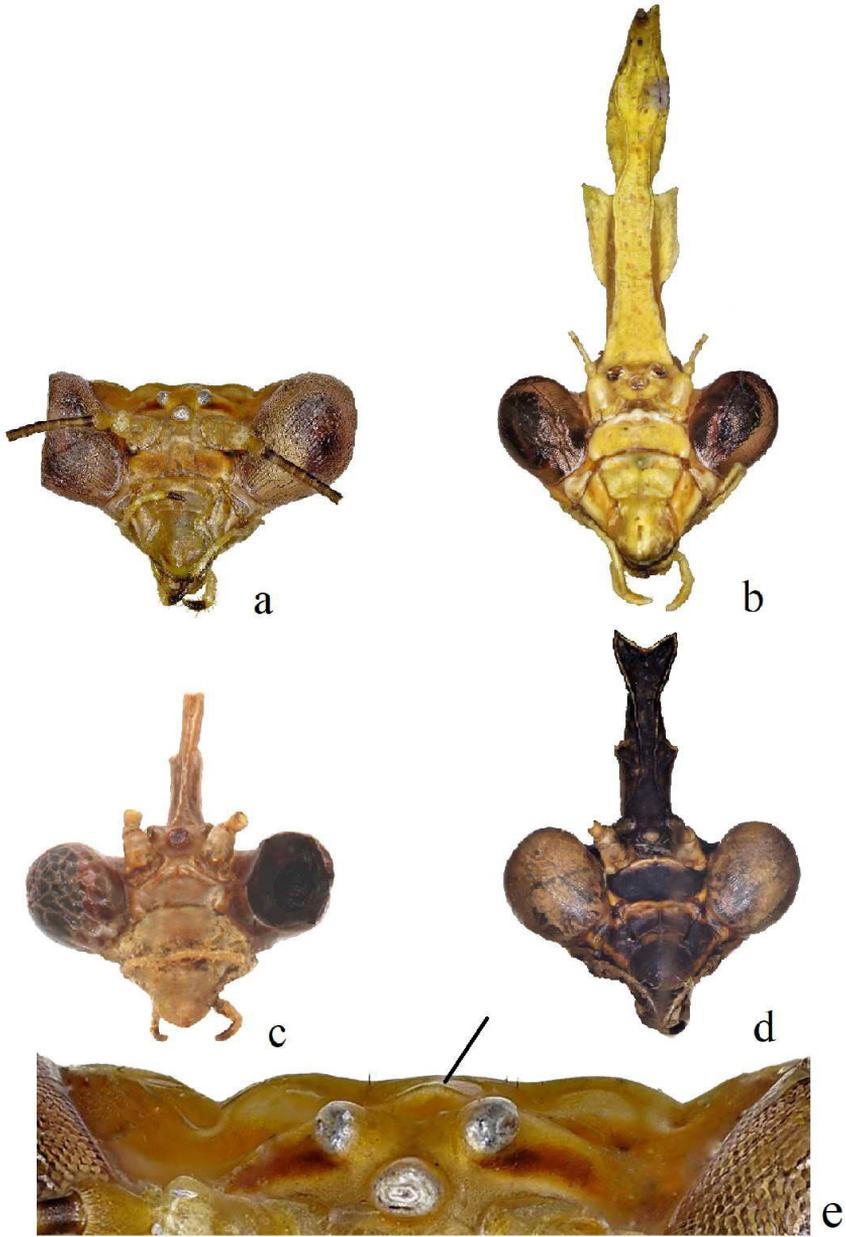


Figure 3. Head in frontal view of different Sibyllinae genera: **a** – *Microsibylla sechii* (holotypus); **b** – *Presibylla speciosa* (from Gabon, Crystal Mountains); **c** – *Leptosibylla gracilis* (paratypus); **d** – *Sibylla (Sibyllopsis) pannulata* (from Gabon, Crystal Mountains); **e** – particular of the vertex of *Microsibylla sechii* showing a small protuberance above the ocelli, probably the remnants of the typical head apophysis of Sibyllinae.

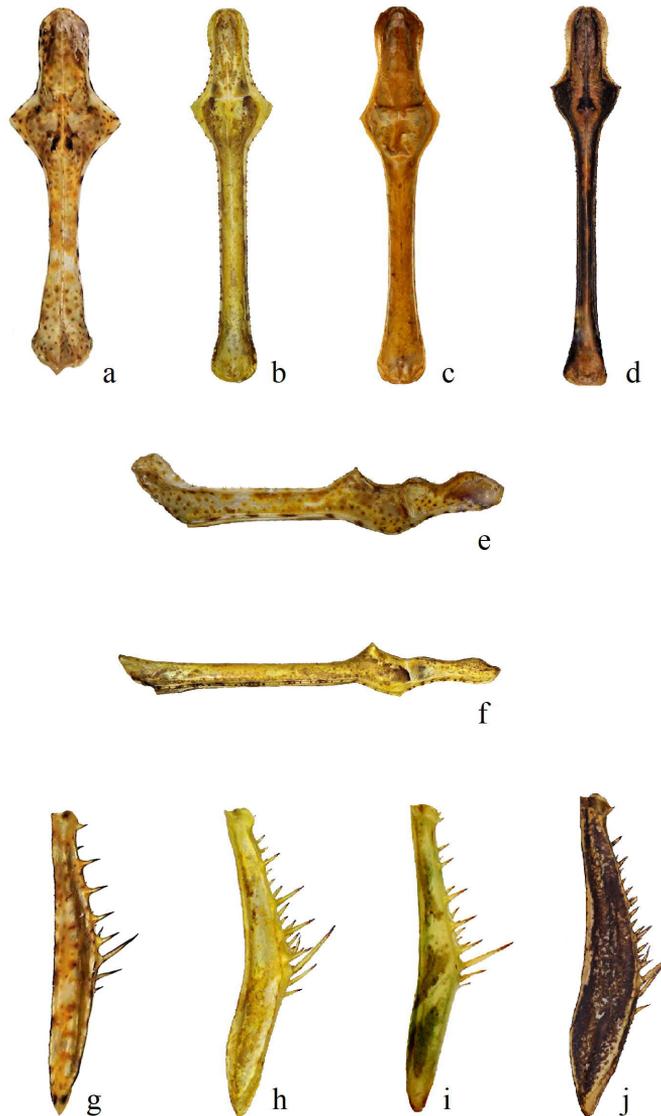


Figure 4. **a-d** – Pronota in dorsal view of different Sibyllinae genera: **a** – *Microsibylla sechii* (holotypus); **b** – *Presibylla speciosa* (from Gabon, Crystal Mountains); **c** – *Leptosibylla gracilis* (paratypus); **d** – *Sibylla (Sibyllopsis) pannulata* (from Gabon, Crystal Mountains). **e-f** – Pronota in lateral view of: **e** – *Microsibylla sechii*; **f** – *Presibylla speciosa*. **g-j** – Profemora in dorsal view of different Sibyllinae genera: **g** – *Microsibylla sechii*; **h** – *Presibylla speciosa*; **i** – *Leptosibylla gracilis*; **j** – *Sibylla (Sibyllopsis) pannulata*.

The simple shape of profemora and the unique type of male genitalia suggests a basal position of *Microsibylla* within Sibyllinae, as a sister-group of the remaining genera. Other differences in respect to other members of this subfamily must be interpreted as apomorphies, in contrast to the basal condition of Hyemenopodoidea (head without apophysis, meso- and metafemora without lobes, male genitalia with twisted apical lobe). Genetic studies are needed to test the above hypotheses. I provide the following key to distinguish the current genera of Sibyllinae, modified from Roy (1996).

- 1** Head with a distinct vertex apophysis (Figure 3: b, c, d); pronotum without a dorsal foliaceous lobe at the base of metazone (Figure 4: f); profemora sinuate, with concave anterior margin (Figure 4: h, i, j); meso- and metafemora with apical internal spine big.**2**.
 – Head without a distinct vertex apophysis (Figure 3: a, e); pronotum with a dorsal foliaceous lobe at the base of metazone (Figure 4: e); profemora not sinuate, with straight anterior margin (Figure 4: g); meso- and metafemora with apical internal spine small.*Microsibylla* genus novum.
- 2** Vertex apophysis larger, with distinct lateral lobes (Figure 3: b, d); paramedian bulges of pronotum well marked and angled (Figure 4: f); meso- and metafemora with pre-basal and pre-apical lobes on the posterior margin.**3**.
 – Vertex apophysis thin, with reduced lateral lobes (Figure 3: c); paramedian bulges of metazone obtuse and blunt; meso- and metafemora without pre-basal and pre-apical lobes on the posterior margin.*Leptosibylla* Roy, 1996.
- 3** Vertex apophysis with lateral lobes about as long as wide (Figure 3: d); abdomen with barely distinguishable lateral lobes and without mid-ventral lobes; cerci pale, with the penultimate and antepenult segment dark.
*Sibylla* Stål, 1877.
 – Vertex apophysis with lateral lobes clearly longer than wide (Figure 3: b); abdomen with lateral and medio-ventral large and flattened lobes; cerci with more or less dark spotted segments.*Presibylla* Bolívar, 1908.

As shown in the key, *Microsibylla* is widely separated from the other genera of Sibyllinae. The high number of differences could justify the placement inside a new tribe within this subfamily but for the moment I decided to keep it together with the other genera, waiting to study additional material of *Microsibylla*. For the moment I cannot exclude the existence of other undescribed Sibyllinae with an intermediate morphological condition between *Microsibylla* and the other genera of the subfamily.

Further investigations are needed to find other specimens of *Microsibylla sechii*, which is actually known for only one collected male and for the photographs

of a juvenile. The occurrence of a single male at light during the entomological researches could be caused by its rarity, by the wrong collecting period or by the wrong collecting habitat. It is also possible that this species is not frequently attracted by light: in fact the ocelli are quite small. Females of Mantodea generally are not attracted by light and the research of the females of the new species should be made by eye, looking at the tree trunks.

This discovery demonstrates once again the biological richness of the forests of central Africa. The permanence of suitable condition and of a relatively large wooded surface even during the last Ice Period, when the extension of the African rainforest has been dramatically reduced by the biomes shifting, permitted the survival of species obligatorily linked to that environment. In particular, *Microsibylla sechii* is probably linked to very humid rainforests where tree trunks are widely covered by mosses, as suggested by the moss mimicking camouflage of the species.

The Mantodea fauna of Gabon is quite well studied and two checklists have been published: ROY (1973) and MOULIN (2018). 112 species of this order were reported for Gabon but recent discoveries in the Crystal Mountains will increase this list. This restricted mountain area probably allows the survival of some exclusive species, absent or rare in other Gabonese locations, due to its peculiar climate conditions. The finding of this interesting new genus in the Crystal Mountains of Gabon suggests the occurrence of other undescribed taxa of Mantodea in that area.

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Figure 5. Alive specimen (sub-adult) of *Microsibylla sechii* in its natural habitat. Photos by Ehoarn Bidault.



Figure 6. Natural habitat of *Microsibylla sechii* in the Crystal Mountains. Photo by Daniele Sechi.

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