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Nesiophasma sobesonbairi n. sp. – a new giant stick insect from the island of Timor, Indonesia (Insecta: Phasmatodea)

FRANK H. HENNEMANN (1), GARDA BAGUS DAMASTRA (2), DAVIS MARTHIN DAMALEDO (3), ROYCE T. CUMMING (4, 5, 6) & STÉPHANE LE TIRANT (7, *)

(1) Associate researcher for the Montréal Insectarium, 4581 rue Sherbrooke, Montréal, Québec, Canada, H1X 2B2.

- E-mail: fhennemann@hotmail.de - Orcid: <https://orcid.org/0000-0002-6547-4704>

- ZooBank: <http://zoobank.org/651FCCFA-271B-48A3-A58E-A30FDC739493>

(2) Yogyakarta, Java, Indonesia.

- ZooBank: <http://zoobank.org/98B03D5D-A8B5-48D9-860D-84196B40D1B6>

(3) Kupang, East Nusa Tenggara, Indonesia

- ZooBank: <http://zoobank.org/D6B7C7CA-B633-43FD-8DA9-4A5B7A820A90>

(4) Associate researcher for the Montréal Insectarium, 4581 rue Sherbrooke, Montréal, Québec, Canada, H1X 2B2.

- E-mail: phylliidae.walkingleaf@gmail.com - Orcid: <https://orcid.org/0000-0001-7930-1292>

- ZooBank: <http://zoobank.org/6CA8501F-10BA-4E07-9BF4-65CFCE4E9E92>

(5) Richard Gilder Graduate School, American Museum of Natural History, New York, NY 10024, USA.

(6) Biology, Graduate Center, City University of New York, NY, USA.

(7) Collection manager, Montréal Insectarium, 4581 rue Sherbrooke, Montréal, Québec, Canada, H1X 2B2.

- E-mail: stephane.letirant@montreal.ca - Orcid: <https://orcid.org/0000-0001-7463-5621>

- ZooBank: <http://zoobank.org/A9391F8A-15D7-4D3B-9E3F-7123BA27EA2E>

* Corresponding author

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Abstract. – The new stick insect *Nesiophasma sobesonbairi* n. sp. from the island of Timor is described and illustrated from both sexes and eggs. It is the first species of the genus *Nesiophasma* Günther, 1934 to be recorded from Timor and the second species of Phasmatodea known from the island. Information on its habitat, host plants, biology and captive breeding are provided. Updated keys to the species of *Nesiophasma* are presented.

Hennemann F. H., Damastra G.B., Damaledo D.M., Cumming R.T. & Le Tirant S., 2023. – *Nesiophasma sobesonbairi* n. sp. – a new giant stick insect from the island of Timor, Indonesia (Insecta: Phasmatodea). *Faunitaxys*, 11(20): 1 – 13.

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Introduction

The phasmid fauna of the Lesser Sunda Islands, of southern Wallacea, is particularly under-explored and, although the diversity of biota is notably lower than that of the main Maluku Islands, a more detailed prospection is likely to reveal undescribed taxa. The few recent studies on Wallacean Phasmatodea have exclusively dealt with taxa of the Maluku islands (e. g. Hennemann et al., 2015) or of certain islands or island groups such as Sulawesi, Peleng and the Sula archipelago (Hennemann, 1998; Hennemann, 2021) or Pulau Morotai north off Halmahera (Hennemann & Le Tirant, in press). The phasmids of the Lesser Sunda Islands, however, have so far widely been neglected. Recent searches throughout Timor by the third author have revealed a large wingless stick insect that has proven to belong in the Wallacean

genus *Nesiophasma* Günther, 1934, recently revised by Hennemann (2021), who described two huge new species from the islands of Peleng and Sanana. The species from Peleng, *N. giganteum* Hennemann et al., 2021, has been shown to be the longest known insect of the entire Wallacea subregion and demonstrated that even such impressive new species can be found if proper prospection is conducted. Examination of the newly discovered species by the first author and captive breeding has shown this to be a presently undescribed species of *Nesiophasma*, herein described. The only other *Nesiophasma* species from the Lesser Sunda Islands, *N. kuehni* (Brunner v. Wattenwyl, 1907), is only known from Pulau Romang, a small island northeast of Timor. It is hoped that future research efforts throughout these islands will reveal further Phasmatodea and can contribute to the fractional knowledge of the Lesser Sunda Island phasmid fauna.

Reviewer :

Paul D. Brock (Natural History Museum, UK) - <https://orcid.org/0000-0003-0590-0414> - <http://zoobank.org/126C353D-97B2-426E-9059-A7A688E73FB9>



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Notes on the Phasmatodea of Timor

The Lesser Sunda Islands are a group of islands south of the Maluku Islands, east of Java (and Bali), west of the Banda Islands and north of Australia. Together with Sumba, Babar and associated smaller islands, Timor forms the southern archipelago of the Lesser Sunda Islands with the islands of Flores, Alor, and Wetar to the north. With an area of 33,850 km², Timor is the largest of the Lesser Sunda Islands and the principal island of the Outer Banda Arc. Timor is approximately 476 km in length and 102 km wide with the highest mountain (Tatamailau) reaching 2,963 metres. Politically, the island is divided into the Indonesian West-Timor (Timor Barat) and the independent country of East-Timor (Timor-Leste). Although Timor has a relatively tropical climate, there is a distinct dry season between May and November. During the dry season occasional precipitation only occurs in the mountainous central regions, which harbour the last areas of primary tropical rainforest. The remainder of the vegetation is mostly dominated by dry savannas with scattered tropical dry tree populations of sandalwood, acacias, candlenut, and skunk tree, also referred to as the Timor and Wetar deciduous forests.

The phasmid fauna of the island is poorly known, and the only species previously recorded from Timor is the well-known *Eurycnema versirubra* (Serville, 1838) (Brock, 1998: 62; Hennemann *et al.*, 2015: 31). This colourful and winged giant insect has been recorded from Kefamenanu, Western Timor, where it is found on feral guava-trees (*Psidium guajava*, Myrtaceae) and *Acacia* spp. (Fabaceae), the latter of which is the natural host plant. The third author has however found at least one further species of the subfamily Necrosiinae, which will hopefully become available for further study soon. Other species are likely to occur throughout Timor and certainly await discovery once more detailed investigations of the Island's vegetation and different ecozones have been conducted.

Material and methods

Specimens reviewed for this study are dried and pinned. The colouration is described from pictures of live wild and captive reared specimens. Eggs examined and illustrated were laid (not gutted from specimens) and thus are fully developed. Examination of the insects and eggs were carried out using an entomological lens with 4x magnification and a Russian MBC-10 binocular microscope. Eggs were examined at 10x magnification. Measurements were taken using a long ruler or digital callipers, and are given to 0.1 mm. The terminology used for the descriptions of external egg structure follows that of Clark-Sellick (1997). Photographs of specimens in the first author's collection were taken using a Nikon D7000 camera equipped with a Nikon DX AF-S Micro 40mm lens and a wireless Nikon SU-800 dual speed light system. Background lighting was provided by a 18w 6000K LED panel light plate. Corel Photo Paint X3 was used as post processing software.

Abbreviations

The following abbreviations are used for the depositories of type-specimens.

- **IMQC**: Insectarium de Montréal, Montréal, Québec / Canada.
- **FH**: Personal collection of Frank H. Hennemann / Germany.

The following are abbreviations used for morphological features utilised within figures 1-3.

- ADC** = anterodorsal carina
- AVC** = anteroventral carina
- Cer** = cercus
- Ep** = epiproct
- Gap8** = gonapophysis 8
- Gap9** = gonapophysis 9
- Gpl** = gonoplac
- Gu** = gula
- MVC** = medioventral carina
- Pa** = paraprot
- Po** = poculum
- PDC** = posterodorsal carina
- PrOrg** = preopercular organ
- PVC** = posteroventral carina
- S7, S8, ...** = sternum 7, sternum 8, ...
- SgPl** = subgenital plate
- T7, T8, ...** = tergum 7, tergum 8
- TP** = thorn pads
- Vo** = vomer

Nesiophasma Günther, 1934

Type species. – *Nesiophasma eremothocus* Günther, 1934a: 5 [= *Myronides spinulosus* Brunner v. Wattenwyl, 1907: 254], by original designation of Günther, 1934a: 5.

Nesiophasma Günther, 1934a: 5;

Günther, 1935b: 139;

Günther, 1935b: 29;

Günther, 1953: 555;

Bradley & Galil, 1977: 193;

Hennemann, 1998: 124;

Hennemann, 1999: 213, Fig. 1-2;

Zompro, 2005: 314; Otte & Brock, 2005: 227;

Hennemann & Conle, 2008: 57, Fig. 61a-b;

Hennemann, 2020: 174;

Hennemann, 2021: 103, Fig. 40-47;

Brock & Büscher, 2002: 559.

= *Mylothrus* Günther, 1935a: 18 [Synonymised by Günther, 1935a: 29 (Nachtrag 3)].

Phryganistria, Günther 1934b: 78, Fig. 1-2.

Remarks. – Hennemann (2021: 103) provided a review and detailed diagnosis of the genus along with the descriptions of two new gigantic species from the islands of Peleng (Banggai Islands) and Sanana (Sula Islands). *Nesiophasma* Günther, 1934 are medium to large exclusively apterous stick insects that comprise the longest of all known insects of the Wallacea region. The genus is distributed throughout Wallacea west of Weber's line of faunal balance. Only one species has been recorded from New Guinea but this distribution was regarded as doubtful (Hennemann, 2021: 123). Most of the species are rather uncommon and rarely encountered despite their impressive size. As stated by Hennemann (2021) the morphologically most similar and presumably most closely related genera are *Sadyattes* Stål, 1875 and *Eucarcharus* Brunner v. Wattenwyl, 1907.

Distribution. – Wallacea west of Weber's Line: Sulawesi, Peleng Island, Selayar Island, Kalaotoa Island, Sanana Island, Romang Island, Timor Island, Sangihe Island and Talaud Islands. New Guinea with doubt.

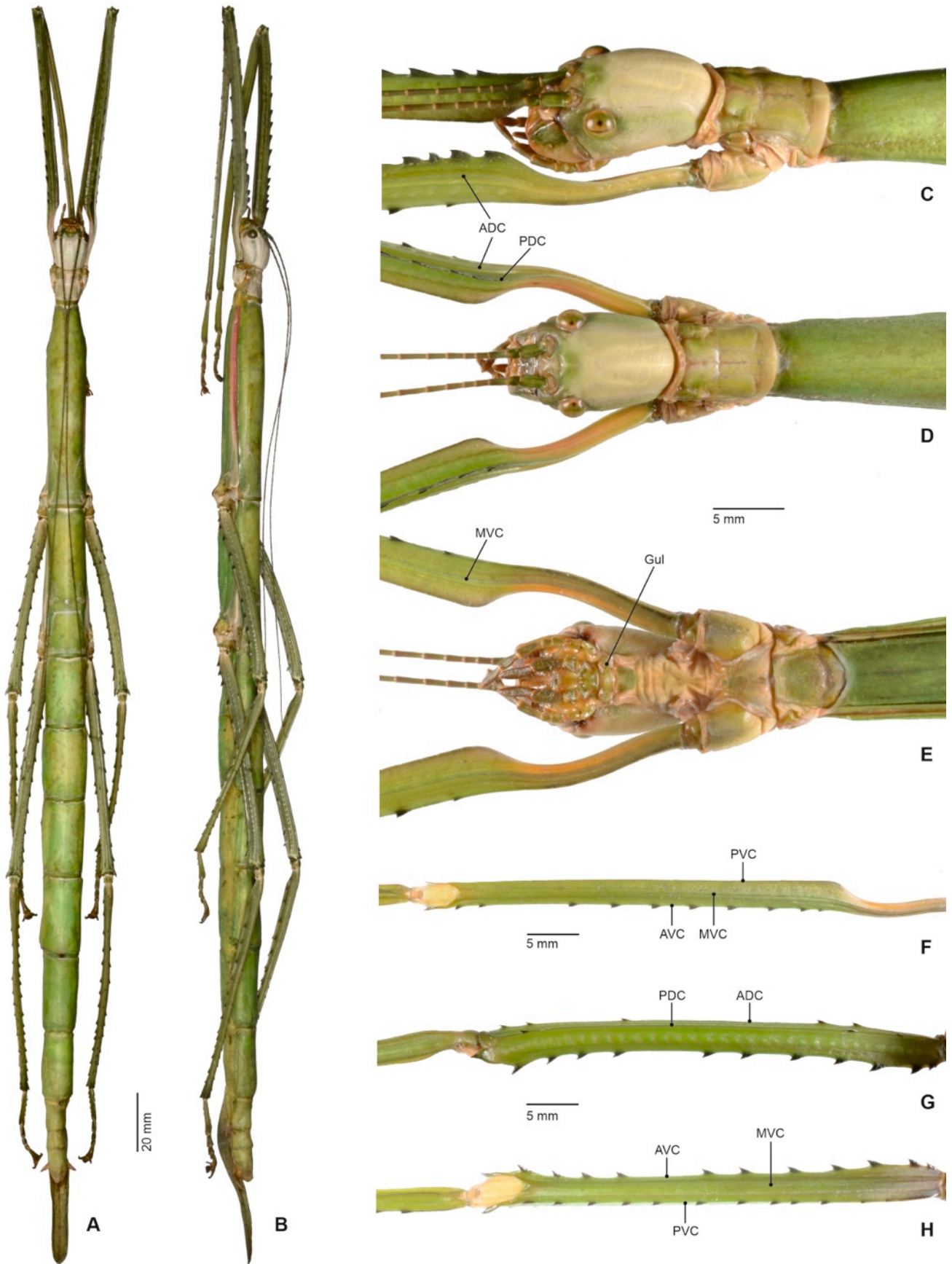


Fig. 1. Female of *Nesiophasma sobesonbii* n. sp.

A. HT, dorsal view [IMQC, ex coll. FH]. **B.** HT, lateral view [IMQC, ex coll. FH]. **C.** Head and prothorax in dorsolateral view [FH]. **D.** Head and prothorax in dorsal view [FH]. **E.** Head and prothorax in ventral view [FH]. **F.** Right profemur in ventral view [FH]. **G.** Left mesofemur in posterolateral view [FH]. **H.** Left mesofemur in ventral view [FH].

List of known species of *Nesiophasma*

1. *Nesiophasma giganteum* Hennemann, Le Tirant & Purwanto, 2021: 106, Fig.

Distribution: Banggai Islands (Peleng).

2. *Nesiophasma kuehni* (Brunner v. Wattenwyl, 1907: 185).

Distribution: Romang Island.

3. *Nesiophasma oligarches* (Günther, 1935: 18, pl. 2: 12).

Distribution: S-Sulawesi.

4. *Nesiophasma plateni* (Dohrn, 1910: 404).

Distribution: Sangihe Islands & Talaud Islands.

5. *Nesiophasma sananaense* Hennemann, 2021: 117, Fig.

Distribution: Sula Islands (Sanana Island).

6. *Nesiophasma sobesonbairi* n. sp.

Distribution: Timor Island.

7. *Nesiophasma spinulosum* (Brunner v. Wattenwyl, 1907: 254).

= *Nesiophasma eremothocus* Günther, 1934: 6, Fig. 1.

Distribution: Pulau Selayar & Pulau Kalaotoa.

8. *Nesiophasma turbans* (Brunner v. Wattenwyl, 1907: 186).

Distribution: Sulawesi.

9. *Nesiophasma zanum* Hennemann, 1999: 213, Fig. 1-2.

Distribution: New Guinea (?).

***Nesiophasma sobesonbairi* n. sp.**

(Fig. 1-7)

ZooBank: <http://zoobank.org/45EBF9BB-7B35-4D9E-BD4D-4512443B14DB>

Holotype, ♀, ex Zucht F. Hennemann 2022 (F1-Gen.), Herkunft: Indonesien, West Timor, Provinz East Nusa Tenggara, Nekamese Dist., Desa Oemasi SE of Kupang, 14.IV.2021, leg. Davis Marthin Damaledo [IMQC, ex coll. FH].

Paratype, ♂, Indonesia, West Timor, Prov. East Nusa Tenggara, District Nekamese, Oemasi, Desa Oemasi SE of Kupang, 7.III.2021, leg. Davis Marthin Damaledo [IMQC].

Paratype, ♀, Indonesia, West Timor, Prov. East Nusa Tenggara, District Nekamese, Oemasi, Desa Oemasi SE of Kupang, 7.III.2021, leg. Davis Marthin Damaledo [IMQC].

Paratypes, 36 eggs, Indonesia, West Timor, Prov. East Nusa Tenggara, District Nekamese, Oemasi, Desa Oemasi SE of Kupang, 14.IV.2021, leg. Davis Marthin Damaledo [coll. FH, No. 1311-E].

Paratypes, 3 ♂♂, 6 ♀♀, 30 eggs: ex Zucht F. Hennemann 2022 (F1-Gen.), Herkunft: Indonesien, West Timor, Provinz East Nusa Tenggara, Nekamese Dist., Desa Oemasi SE of Kupang, 14.IV.2021, leg. Davis Marthin Damaledo [coll. FH, No's 1311-1 to 19 & E1].

Paratypes, 2 ♂♂, 6 ♀♀: ex Zucht F. Hennemann 2023 (F2-Gen.) 2023, Herkunft: Indonesien, West Timor, Provinz East Nusa Tenggara, Nekamese Dist., Desa Oemasi SE of Kupang, 14.IV.2021, leg. Davis Marthin Damaledo [coll. FH, No's 1311-10 to 17].

Etymology. – This large new species is named in honour of king Sobe Sonbai III. Sobe Sonbai III was a king (keizer) from Timor Island who opposed the Dutch East Indies colonial government until he was arrested in 1907. Sobe Sonbai III was a descendant of Keizer Laurai of the Molo or Oenam Kingdom referred to as the Sonbai or Sonbay. Following the death of Keizer Sonbai in 1885, however, the 'empire' collapsed. Several states strove to assert their independence and no less than 17 pretenders vied for the keizer's crown. The eventual winner of that struggle was Sobe Sonbai III, and although he was not accepted by all other Timorese rulers, he was viewed by the Dutch as a serious threat to their authority (Van Hulstijn 1926:129; Lamster 1945:168; Farram, 2009: 194).

Differentiation. – Females of this new species most closely resemble those of *N. sananaense* Hennemann, 2021 but differ by the smaller size (body length including subgenital plate < 220.0 mm), slightly shorter body segments, fewer but more pronounced teeth of the limbs, shape of the praeopercular organ, and much shorter gonapophyses VIII, that hardly project beyond the apex of the anal segment (projecting by notably more than the length of the anal segment in *sananaense*). Males may be separated from all congeners by the unique colouration, with bodies that are light cream to moderate brown, a head that is mostly white with a faint ochre postocular streak, and the limbs green. Their general morphology resembles *N. spinulosum* (Brunner v. Wattenwyl, 1907) but differs in the chromatic traits and by a slightly longer median segment which is more than half the length of the metanotum, less numerous but more pronounced teeth on the limbs, and characters of the terminalia such as apically in-curved and hook-like cerci, more broadened anal segment, and a narrower vomer. From the three other known eggs of the genus, *Nesiophasma sobesonbairi* n. sp. are most similar to *N. kuehni* (Brunner v. Wattenwyl, 1907) but differ by the somewhat smaller dimensions, comparatively more pronounced ridges and bulges of the capsule surface, more bulging opercular collar, broader micropylar plate that has the outer margin more strongly swollen, as well as the more slender and higher, peg-like capitulum.

Description of ♀ (Fig. 1, 3A-D, 6, 7C-D)

Moderately large (body length including subgenital plate 180.0-212.0 mm) and slender for the genus with a long and lanceolate subgenital plate.

Colouration. – General colouration mostly uniformly green (Fig. 1A-B, 6D-E, 7C), rarely with drab, brown dorsal mottling on meso- and metanotum and abdominal terga (Fig. 6A-C, 7D). Upper portion of mesopleurae yellow to light orange with a bright red longitudinal line running along the upper margin (Fig. 6E); upper margin of metapleurae yellow to orange with a short red line anteriorly. Pronotum mostly yellowish (greyish in older specimens). Head pale greyish yellow with a faint and washed green postocular streak (Fig. 6E). Eyes green with a fine brown longitudinal median line. In green specimens the basal three antennomeres are dark green (drab in brown specimens), the following antennomeres are creamish brown and gradually become reddish brown towards the apex; each antennomere has the apical portion somewhat darkened. Lateral inter-segmental membranes of abdominal segments II-VII whitish yellow to pale green (or light cream-coloured in brown specimens). Praeopercular organ with a large dark brown marking close to the posterior margin of abdominal sternum VII. Cerci reddish brown. Gonapophyses and basal inner portion of subgenital plate rusty red (Fig. 3D). Basal portion of coxae orange (Fig. 6C). Legs a slightly darker green than the body in green specimens, or drab to ochre with a slight orange hue in brown specimens. Bases of profemora rosy red interiorly (Fig. 1F), bases of meso- and metafemora dull yellow to buff or occasionally blackish (Fig. 6C). Dentations of the front legs dark green, those of the mid and hind legs dark green and tipped with black (Fig. 1G-H).

Head (Fig. 1C-E). – Elongate-ovoid, with vertex gently rounded and smooth, broadest slightly behind the eyes and gradually narrowing towards the posterior; almost 1.5x longer than wide. Between the bases of antennae are two small impressions that are connected by a shallow furrow. Eyes small, subcircular, their diameter contained about 2.5x in the length of the genae. Antennae reaching to posterior margin of abdominal segment II. Scapus compressed dorsoventrally gently arched towards the exterior and almost 2x longer than wide, pedicellus cylindrical, III narrowing towards apex and almost 2x longer than pedicellus.

Thorax. – Pronotum noticeably shorter and somewhat narrower than head, roughly rectangular with the lateral margins weakly concave and the anterior margin distinctly concave (Fig. 1C); a fine longitudinal median furrow throughout the entire length; transverse median sulcus shallow, short and almost straight (Fig. 1D). Mesothorax about 5.7x longer than prothorax, about 5.3x longer than wide, constricted anteriorly and gently swollen pre-medially. Metanotum slightly more than half as long as

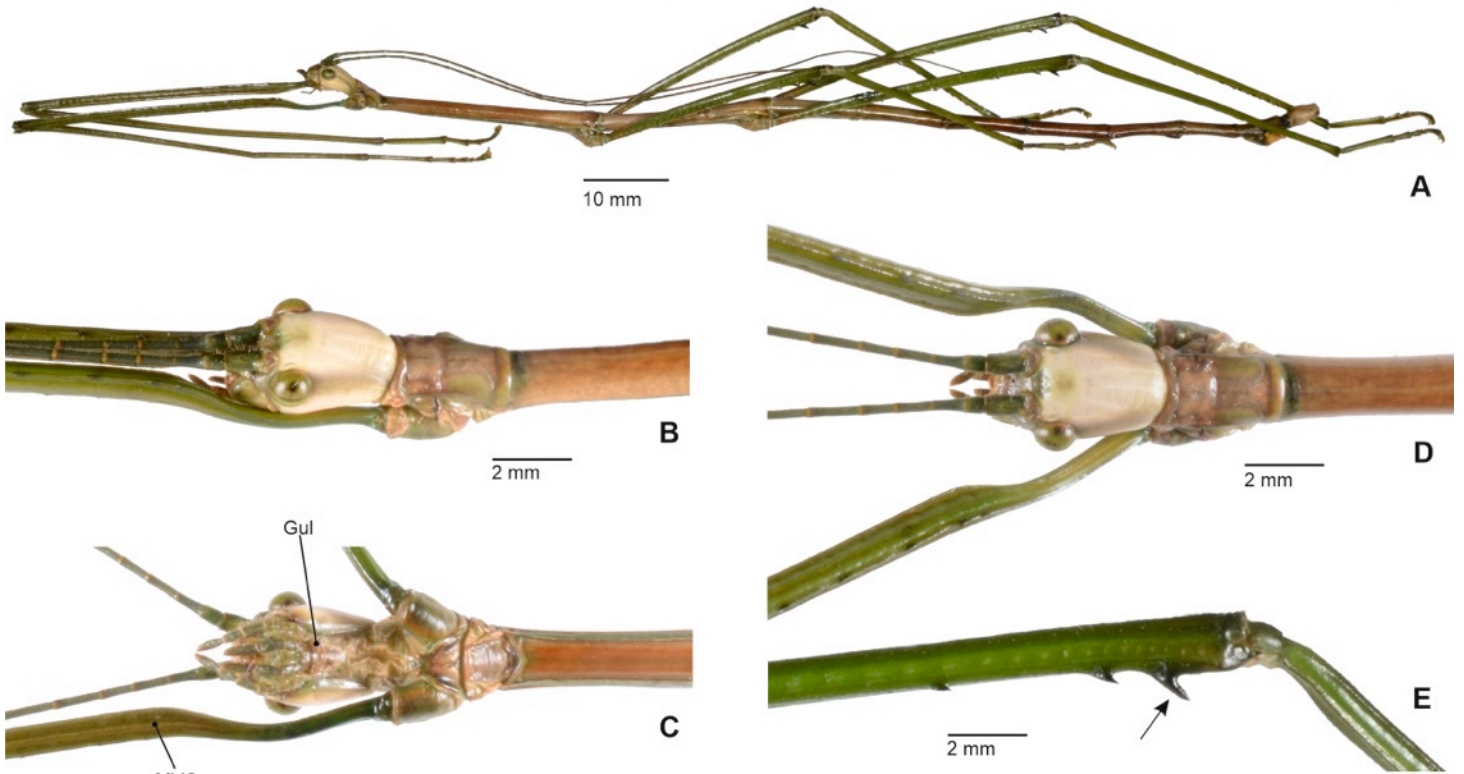


Fig. 2. Male of *Nesiophasma sobesonbairi* n. sp.

A. PT, dorsolateral view [FH, No. 1311-8]. B. PT, head and prothorax in dorsolateral view [FH]. C. Head and prothorax in dorsal view [FH]. D. Head and prothorax in ventral view [FH]. E. Apical portion of right mesofemur in posterolateral view [FH].

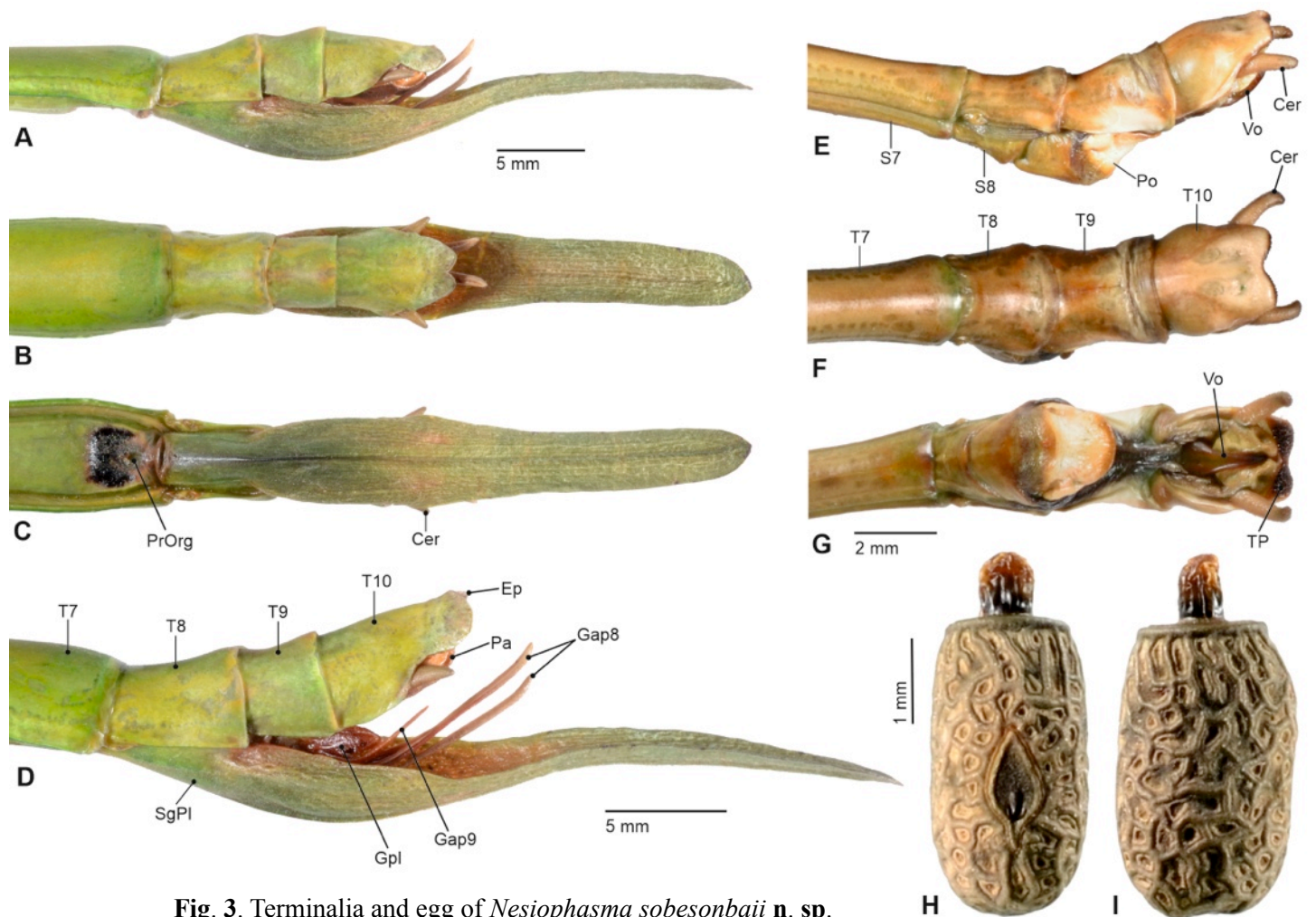


Fig. 3. Terminalia and egg of *Nesiophasma sobesonbairi* n. sp.

A. Terminalia of ♀ in lateral view [FH]. B. P Terminalia of ♀ in dorsal view [FH]. C. Terminalia of ♀ in ventral view [FH]. D. Terminalia of ♀ in lateral view, showing details of inner genitalia [FH]. E. Terminalia of ♂ in lateral view [FH]. F. P Terminalia of ♂ in dorsal view [FH]. G. Terminalia of ♂ in ventral view [FH]. H. Egg in dorsal view [FH, No. 1311-E]. I. Egg in lateral view [FH, No. 1311-E].

mesonotum, rectangular and 4.5x longer than wide. Meso- and metasternum with a weak longitudinal median keel.

Abdomen (Fig. 3A-D). – Abdomen considerably longer than head and thorax combined. Median segment slightly trapezoidal and about half the length of metanotum. Abdominal segments II-V slightly increasing in length, V and VI roughly equal in length and VII about as long as II; II 1.6x and VI almost 2x longer than wide. III is the broadest segment with the following segments gently but gradually narrowing. Terga III-VII somewhat deflexed with lateral margins gently convex. Praecopercular organ formed by a blunt pale purple median swelling near the posterior margin of sternum VII with a wide and weakly indented, granulose area in front, which is marked by a dark reddish-brown marking (Fig. 3C). Tergum VIII slightly longer than wide and less than half the length of VII, IX transverse. Anal segment (= tergum X) with the lateral margins roundly excavated near the base of the cerci (Fig. 3A, D), the posterior margin distinctly bi-lobed with a deep and narrow median indentation (Fig. 3B). Cerci conical and strongly tapered towards a narrow tip and not reaching the apex of the anal segment. Gonapophyses VIII rather short for the genus and just slightly projecting beyond the anal segment (Fig. 3B); gently up-curved and inner surface with a deep longitudinal furrow. Subgenital plate long, lanceolate, with basal portion slightly bulging, weakly down-curved in the apical half (Fig. 3A, D) and gradually narrowing towards a narrow but blunt tip (Fig. 3B-C); projecting over apex of abdomen by about the combined lengths of abdominal terga VII-X.

Legs. – All moderately long and stocky, profemora almost as long as head, pro- and mesothorax combined, mesofemora notably longer than metathorax, metafemora projecting over posterior margin of abdominal segment IV and metatarsi roughly reaching the tip of the abdomen. All carinae coarsely dentate; teeth of tibiae smaller than those of femora but more numerous and mid and hind legs with dorsal teeth smaller than ventral teeth. The two apical

teeth of the two exterior ventral carinae of meso- and metafemora slightly enlarged. Posterodorsal carina of profemora rather serrate with the teeth slightly decreasing in size towards the apex. Medioventral carina of all femora indistinct and unarmed (Fig. 1F, H). Basitarsi slender. Probasitarsus as long as tarsomeres, meso- and metabasitarsus somewhat shorter than remaining tarsomeres combined; the latter two with all carinae minutely dentate.

Description of ♂ (Fig. 2, 3E-G, 7A-B)

Medium sized (body length 106.0-110.0 mm) for the genus, shape moderately slender. Entire body smooth and shiny.

Colouration. – General colour of body light creamish to moderate brown or ochre, posterior margin of abdominal terga chestnut brown. Pronotum with a greenish hue and upper portions of meso- and metapleurae medium green. Meso- and metasternum with a faint dark green marking posteriorly. Head mostly white to light cream and with a faint greenish ochre postocular streak (Fig. 7B). Eyes light olive with a fine brown longitudinal median line. Basal three antennomeres dark green, the following dark greyish olive and from the median portion of the antennae onwards gradually transition to reddish brown. Anal segment somewhat lighter colour than preceding terga and with a slight greyish hue. Vomer greyish dark green and with the apex brown. Legs plain green with the outer basal portion of the profemora dark green and the bases of the meso- and metafemora dark orange to brown. All dentations dark brown.

Head (Fig. 2B-D). – Elongate-ovoid, almost 1.6x longer than wide and broadest at the eyes, genae narrowing and vertex gently rounded and wholly smooth. Frons between the bases of antennae with two small but distinct impressions and a small, shallow pit near each compound eye. Eyes large, circular in outline and strongly projecting, their diameter



Fig. 4. Distribution and records of *Nesiophasma sobesonbii* n. sp. (Copyright Wikimedia Creative Commons (GFDL, CC-BY, PD). Mats Halldin, CC BY-SA 3.0 (original file slightly adjusted): https://de.m.wikipedia.org/wiki/Datei:East_Timor_map_mhn.jpg)



Fig. 5. A-B. Natural habitat of *Nesiophasma sobesonbaii* n. sp. at Desa Oemasi SE of Kupang (400 m), Nekamese District, Province East Nusa Tenggara.

contained a little less than 1.7x in length of genae. Antennae long and filiform, reaching to the anterior of abdominal segment V. Basal three segments similar to the ♀♀ but scapus straight.

Thorax. – Pronotum basically as in ♀♀ and roughly 1.4x longer than wide (Fig. 2D). Mesothorax slender and elongate, slightly widened posteriorly, about 7.25x longer than pronotum and almost 12x longer than wide. Metanotum approximately half the length of mesothorax with anterior and posterior portion weakly widened and roughly 5.6x longer than wide. Mesosternum weakly tectate medio-longitudinally. Tegmina vestigial (length < 1.0 mm).

Abdomen. – Abdomen excluding median segment longer than head and thorax combined. Median segment noticeably narrowed medially with posterior margin notably wider than anterior margin, about 3x longer than wide and somewhat less than half the length of metanotum. Segments II-VII gradually decreasing in length, II about 1.8x longer than median segment and 5x longer than wide, VII less than three-fifths the length of II and roughly 3.5x longer than wide. All slightly constricted medially. Sterna II-VII smooth. Tergum VIII about half as long as VII and gradually widened towards posterior, dorsal distinctly trapezoidal. IX slightly shorter, much narrowed medially and with anterior margin somewhat broader than posterior margin. Anal segment (= tergum X) scarcely longer than wide, about as long as IX with the lateral surfaces slightly convex sub-basally; the posterior margin is broadly concave, and the outer corners obtusely rounded (Fig. 3E-F). Ventrally the posterior margin is densely set with small reddish brown denticles (= thorn pads; Fig. 3G). Poculum small and moderately convex, cucullate (Fig. 3E) with the posterior margin broadly rounded and somewhat labiate; reaching about two-thirds the way along tergum IX (Fig. 3G). Vomer slender and gradually narrowing towards a pointed and gently dorsally-curving terminal hook; the ventral surface is smooth and with a shallow medio-longitudinal furrow on the basal portion, the base otherwise is biglobose (Fig. 3G). Cerci obtuse, somewhat compressed laterally, gently incurved with the apex acute and distinctly in-curved and hook-like; notably projecting over the posterior margin of the anal segment (Fig. 3E-F).

Legs. – All long and slender, with all carinae dentate; teeth less distinct but more numerous on the tibiae and those of the meso- and metafemora somewhat increase in size towards the apex of femur with the most apical tooth the largest and slightly arched (Fig. 2E). Profemora longer than head, pro- and mesothorax combined, mesofemora slightly longer than pro- and mesothorax combined, metafemora reaching to posterior margin of abdominal segment V and metatibiae projecting considerably over apex of

abdomen. Medioventral carina of all femora weakly developed and unarmed. Tarsi elongate and slender (probasitarsus in particular), probasitarsus longer than remaining tarsomeres, meso- and metabasitarsi longer than following three tarsomeres combined and with a few small teeth on the two exterior ventral carinae.

Variability. – Both sexes show only slight variability in size as well as the development and number of teeth on the extremities. While ♂♂ show no chromatic variation, ♀♀ occur in a green and a drab or light brown colour form. Among specimens observed in their natural habitats in Timor, only the ♀ from Mainina, Lautem District was brown (fig. 6A), while all other encountered specimens were green. Captive breeding corroborated that drab or brown specimens are notably rarer than the usual green form. In captivity in Europe all seven ♀♀ of the F1-generation were green and only two of the six ♀♀ of the F2-generation were brown. One specimen had the body fawn dorsally, greenish ventrally and the legs green, thus representing an intermediate between the green and brown colour forms.

Description of nymphs

Newly emerged nymphs have a body length of 18 mm. Their body is yellowish to moderate green in colour with only the anal segment and lateral portions of the pronotum brown. The head bears a fine brown postocular streak. The front legs are mostly brown with small dark yellow speckles while the mid and hind legs are rather light apple green with three brown transverse bands on each femur and tibia. Eyes dark brown. Antennae brown with some faint lighter annuli. Later instars of both sexes are moderate to dark green throughout the entire nymphal development with only the subgenital plate brownish. It is interesting to note that from 2nd instar onwards ♀♀ have a transverse, brown swelling on posterior margin of abdominal tergum V, which disappears with the final ecdysis. The sexes can be distinguished from the 3rd instar on.

Description of egg (Fig. 3H-I)

Fairly small, general colour light greyish to mid brown; the raised portions are somewhat darker and greyer than the pale ochre indented

	HT - ♀ [IMQC]	PT - ♂♂	PT - ♀♀
Body (incl. subgenital plate)	204.0	-	180.0 - 212.0
Body	188.0	106.0 - 110.0	170.0 - 201.0
Pronotum	5.9	2.9 - 3.2	5.5 - 7.0
Mesonotum	38.8	22.5 - 23.5	35.8 - 40.6
Metanotum	19.7	11.0 - 11.4	18.2 - 20.3
Median segment	8.6	5.5 - 6.1	7.6 - 9.2
Profemora	48.7	33.0 - 33.5	46.7 - 53.0
Mesofemora	35.0	24.8 - 25.4	32.3 - 37.0
Metafemora	42.6	30.3 - 32.0	39.0 - 45.5
Protibiae	55.6	37.2 - 37.5	49.0 - 57.6
Mesotibiae	35.3	23.8 - 25.0	34.4 - 38.0
Metatibiae	46.2	32.0 - 33.9	44.3 - 50.5
Antennae	98.0	74.0 - 76.0	85.0 - 100.0

Table 1. Measurements of *Nesiophasma sobesonbairi* n. sp. [mm]

Keys to the known species of *Nesiophasma*

♀♀ *

1. Abdominal terga II-VI with lateral margins at best gently rounded 2
— Abdominal terga II-VI strongly laterally deflexed and convex; Pulau Romang *kuehni*
2. Gonapophysis VIII short and not or at best scarcely projecting over posterior margin of anal segment 3
— Gonapophysis VIII long and projecting over posterior margin of anal segment by at least the length of that segment length 5
3. Long (body length incl. subgenital plate < 230.0 mm); median segment at least half as long as metanotum 4
— Very long (body length incl. subgenital plate > 250.0 mm); median segment only one-quarter the length of metanotum; Sangihe & Talaud Islands *plateni*
4. Median segment > two-thirds the length of metanotum; abdominal terga VII-IX each with a slender posterior directed posterolateral lobe; subgenital plate short and projecting beyond apex of abdomen by no more than length of anal segment; New Guinea (?) *zanum*
— Median segment about half as long as metanotum; abdominal terga VIII-X not lobed laterally; subgenital plate elongate and projecting beyond tip of abdomen by about the length of abdominal terga VIII-X combined (Fig. 3A-D); Timor *sobesonbairi* n. sp.
5. Slender and very elongate insects; mesonotum at least 4.5x longer than wide; basitarsi slender 6
— Stockier; mesonotum 4x longer than wide and expanded pre-medially; basitarsi with dorsal carinae raised and rounded; Pulau Selayar & Pulau Kalaotoa *spinulosum*
6. Mesonotum 6x longer than wide and slender; antennae reaching to median segment; Pulau Sanana (Sula Islands) *sananaense*
— Mesonotum 4.5x longer than wide and gently swollen pre-medially; antennae reaching to abdominal segment II; Peleng (Banggai Islands) *giganteum*

* ♀♀ of *N. oligarches* (Günther) and *N. turbans* (Brunner v. Wattenwyl, 1907) are not known

♂♂ *

1. Body length > 100.0 mm; abdominal terga II-VI > 3x longer than wide 2
— Smaller; abdominal terga II-VI 2.5x longer than wide; Sulawesi *oligarches*
2. Head of same colour as remainder parts of body; body ± uniform in colour 4
— Head chromatically contrasting 3
3. Head and pronotum blackish; dark streak along entire lateral surfaces of body; cerci dilated apically and weakly arched; Pulau Selayar & Pulau Kalaotoa *spinulosum*
— Head light whitish cream; body ochre with meso- and metapleurae green; cerci with apex acute in-curving and hook-like (Fig. 3F-G); Timor *sobesonbairi* n. sp.
4. Body length < 160.0 mm; colouration more or less uniform 5
— Body length > 160.0 mm; bases of all femora and knees contrasting black; Sangihe Islands & Talaud Islands *plateni*
5. Very slender species; median segment very short and only one-sixth the length of metanotum; Sulawesi *turbans*
— Stockier; median segment < one-third the length of metanotum; Peleng *giganteum*

* ♂♂ of *N. kuehni* (Brunner v. Wattenwyl, 1907), *N. zanum* Hennemann, 1999 and *N. sananaense* Hennemann, 2021 are not known.

areas. Capsule elongate-ovoid, barrel-shaped about 2x longer than wide, the ventral surface and lower region of dorsal surface with an indistinct and obtuse longitudinal bulge. Capsule surface minutely granulose and covered with an irregular wide-meshed network of broad obtuse ridges. The lowered interjacent areas each have a distinct central impression. Opercular collar strongly swollen. Polar area weakly indented and dark grey in colour. Micropylar plate spearhead-shaped, notably less than half the length of capsule with lower portion strongly narrowed, the inner portion dark greyish brown. Outer portion of the plate is bulging and the outer margin dark orange. Micropylar cup small, bowl-shaped, and placed just above the constricted posterior portion of the capsule. Median line impressed, almost reaching to the polar area and on both sides bordered by an unevenly shaped longitudinal bulge. Operculum

almost circular, flat and with the outer margin weakly swollen; greyish/mid brown. Capitulum an irregularly shaped, elongate and peg-like projection, that projects by about one-fifth the length of the capsule; colour dark blackish brown basally and turning to dark orange towards the apex. Measurements [mm]: Overall length 4.2-4.3, length 3.5-3.6, width 1.8-1.9, height 2.1-2.2, length of micropylar plate 1.5.

Remarks & biology. – A captive reared F1 generation ♀ is chosen as the holotype because the two wild specimens are damaged and incomplete.

This species was found in dry semi-forested areas mixed with grassland and tall bushes in Nekamese, Oemasi Village, East Nusa Tenggara Province (Fig. 5). In the Lautem and Oecussi-Ambeno

districts of Timor-Leste however, it was found in primary forest with lush and varied vegetation lower vegetation and trees that reach 45 m in height. This latter habitat is considerably more humid with annual rainfall of 2000-4000 mm. In its natural habitat feral guava-trees (*Psidium guajava*, Myrtaceae) appear to be the most common host plant although this is not a native plant species in Timor. However, until *N. sobesonbairi* is found on any other native plant species the true native host plant remains unknown. At present, the species is known to also feed on mango (*Mangifera indica*, Anacardiaceae) and magenta cherry (*Syzygium paniculatum*, Myrtaceae).

In captivity in Europe, oak (*Quercus* spp., Fagaceae), bramble (*Rubus fruticosus*, Rosaceae) and eucalyptus (*Eucalyptus* spp. Myrtaceae) were readily accepted as alternative food plants by newly hatched nymphs and throughout the entire life cycle. Also, elm (*Ulmus minor*, Ulmaceae), robinia (*Robinia pseudoacacia*, Fabaceae), and hazel (*Corylus avellana*, Betulaceae) have been accepted by nymphs but long-term use has not been conducted (pers. comm. with Daniele Canali, Rome, Italy). Newly hatched nymphs feed very well on St. John's Wort (*Hypericum patulum*, Hypericaceae) which apparently improves the survival rates during the first instar (pers. comm. with Tim Bollens). Eggs are flicked away singularly by the adult ♀♀ and an average of 3-5 eggs is produced per day per ♀. At temperatures of 22-25°C eggs hatch after about four months. Nymphs are fast growing, sturdy and at the temperatures mentioned reach maturity after no more than four months, ♂♂ usually developing slightly faster than ♀♀. A large and well-ventilated cage and medium humidity of 60-80% with a daily spray of water have proven to provide appropriate climatic conditions for a good nymphal development and successful ecdysis. While the F1-generation was very sturdy with few losses among the nymphs, the F2-generation has proven very difficult to maintain with immense losses during the first nymphal instar and frequent losses of nymphs throughout the proceeding stages. This might relate to the use of alternative foodplants in captivity but this hypothesis cannot be evaluated, since too little guava was available for experimental series in breeding conditions in Europe. It has also been observed that every kind of change of the climatic circumstances or breeding cage directly resulted in losses of 30-50% of the nymphs.

Adults and nymphs are very difficult to handle. If disturbed they will frequently drop to the ground and behave extremely hectically, rolling on the ground and after a while of maintaining this awkward behaviour walking away quickly to climb the next host plant. Nymphs especially shed limbs easily if a leg is grasped by a predator or the uncareful breeder.

Distribution (Fig. 4). – Endemic to the Island of Timor and apparently widespread throughout the island. So far recorded from the following three localities: 1) SW-Timor, Prov. East Nusa Tenggara, District Nekamese, Oemasi, Desa Oemasi SE of Kupang, 400 m. 2) NE-Timor Timor Leste, District Lautem, Malahara, Mainina, 500 m. 3) NE-Timor, Timor Leste, District Oecussi-Ambeno, Nibesi, 500 m.

Discussion

The new giant stick insect *Nesiophasma sobesonbairi* n. sp. from the island of Timor is described and is the second known phasmid species from the island. The presence of *Nesiophasma* Günther, 1943 on Timor is a range extension for the genus to the Lesser Sunda Islands. Only one other species, *N. kuehni* (Brunner v. Wattenwyl, 1907), is known from the nearby Romang island, which is the westernmost island of the adjacent Banda Islands. All other species are distributed throughout the Maluku Islands with only one doubtful record from New Guinea (*N. zanam* Hennemann, 1999). As with *N. giganteum* Hennemann et al., 2001, the longest of all known Wallacean insects, the discovery of a large stick insect like *N. sobesonbairi* n. sp. on the island of Timor

demonstrates the poor degree of exploration of the phasmatodean fauna of this and other Wallacean islands. It is estimated that more detailed searching throughout Timor will reveal further phasmid species and may even bring to light further undescribed, endemic species. Thus, it is hoped that the present discovery and description sparks more interest in the study of Timorese Phasmatoidea in the future.

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Fig. 6. Live *Nesiophasma sobesonbairi* n. sp.

- A. ♀ (brown form) at Kupang on guava (*Psidium guajava* (Myrtaceae)). B. ♀ (brown form) with mating ♂ on its back (captive reared). C. Ventral view of metathorax of brown captive reared ♀ showing the orange coxae. D. Typical green ♀ (captive reared). E. Lateral view of head, pro- and mesothorax of green ♀ showing the red stripe of the mesopleurae (captive reared).



Fig. 7. Live *Nesiophasma sobesonbaii* n. sp.

A. ♂ (captive reared). **B.** Closeup of head and prothorax of ♂ (captive reared). **C.** Green ♀, closeup of head and thorax (Captive reared). **D.** ♀ brown colour form (captive reared).

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Résumé

Hennemann F. H., Damastra G.B., Damaledo D.M., Cumming R.T. & Le Tirant S., 2023. – *Nesiophasma sobesonbaii* n. sp. – une nouvelle espèce de phasme de l’île de Timor, Indonésie (Insecta: Phasmatodea). *Faunitaxys*, 11(20): 1 – 13.

Une nouvelle espèce de phasme *Nesiophasma sobesonbaii* n. sp. est décrite et illustrée de l’île de Timor.

Mots-clés. – Phasmida, phasme, *Nesiophasma*, description, espèce nouvelle, clé, taxonomie, Indonésie, Wallace, Timor.

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SOMMAIRE

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