SPIXIANA	43	1	137–145	München, Oktober 2020	ISSN 0341–8391

Pterotopteryx taoa sp. nov. from Lanyu Island, Taiwan

(Lepidoptera, Alucitidae)

Contribution to the moths of Taiwan 16*

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Buchsbaum, U., Chen, M.-Y. & Chen, D.-J. 2020. *Pterotopteryx taoa* sp. nov. from Lanyu Island, Taiwan (Lepidoptera, Alucitidae). Contribution to the moths of Taiwan 16. Spixiana 43 (1): 137–145.

The species *Pterotopteryx taoa* sp. n. is described from Lanyu Island (Taiwan) and figured. With this species, the third Alucitidae species is recoded from Taiwan. Male holotype and a female paratype are figured and a photo of a living specimen on the screen is also attached. The new species differs from *P. spilodesma* (Meyrick, 1908) in the wing markings as well as in the genital structures. The biotope around the light trap is a natural rainforest on a hill beside the coast.

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Introduction

Lanyu Island, also called Orchid Island, is a small Island east of the southern tip of Taiwan and north from the Philippines. It is a small island with about 45 km² of which ⅔ are natural forests. It has a special biogeographical situation. Lanyu Island is situated about 65 km south-east of Taiwan and north of Luzon and so it has faunistic elements from Taiwan and also a few from the Philippines. Moreover, the island has a unique flora and several endemic species live there (e. g. Hsieh 2002, Chao et al. 2010, Siler et al. 2014). Also, it is an area on the priority list of ecoregions for global conservation (Myers et al. 2000, Brooks et al. 2002, Olson & Dinerstein 2002, Sodhi et al. 2004, Kier et al. 2009, Wondroff 2010).

More than 15 years ago, the authors started to work about the insect fauna of Taiwan with special focus on Lepidoptera beginning with the DAAD project no. ID D/0039914 PPP-Taiwan together with the National Chung Hsing University Taichung (CHU) in the year 2001. From this time on, many more excursions in cooperation e. g. with the Highland Experimental Farm Meifeng, National Taiwan University (NTU) and the Da-Yeh University in Changhua were undertaken. Already many papers were published on the fauna of Taiwan (e. g. Buchsbaum & Miller 2002, Buchsbaum et al. 2006, Chen et al. 2013, Buchsbaum & Chen 2013, 2018, Buchsbaum et al. 2018, Schacht et al. 2010).

* Contribution to the moths of Taiwan 15: Buchsbaum, U. & Chen, M.-Y. 2019. A new Alucitidae species from Taiwan (Lepidoptera, Alucitidae). Spixiana 42 (2): 285–290.

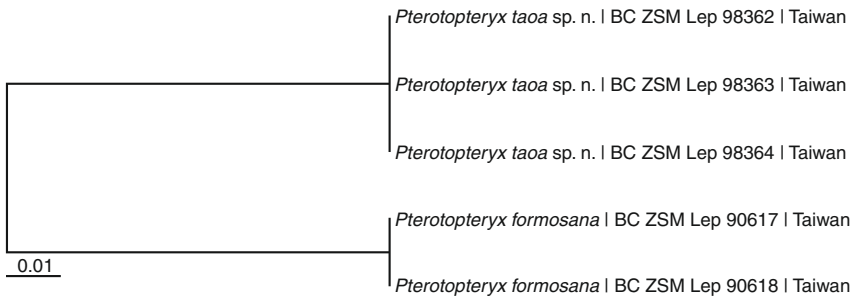


Fig. 1. *Pterotopteryx* sp., MEGA 6.0 tree modified.

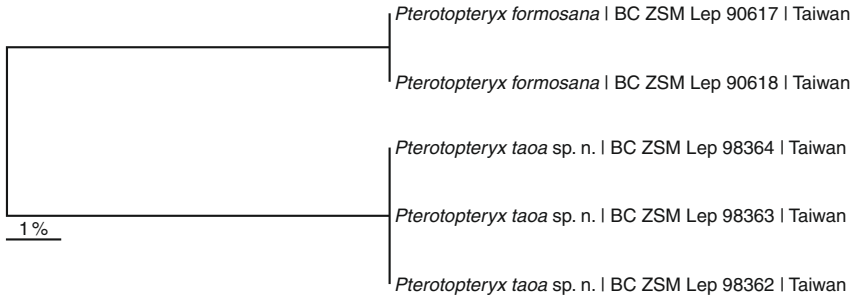


Fig. 2. *Pterotopteryx* sp., BOLD tree modified.

Material and methods

All specimens, except one female from the Taiwan Endemic Species Research Institute (TESRI), were collected by 250 W mixed light lamp in front of a white screen. The lamp was placed at an exposed position on a small hill beside the weather station of Lanyu Island with an overview to the forest around (Fig. 4). The specimens were put in poison glasses and after they died were pinned and later spread on a normal spreading board.

Genitalia preparation was done with 10 % KOH and the genitalia mounted in Euparal.

Alucitidae

210 species in 9 genera of Alucitidae are known all over the world (Hannemann 1959, Gielis 2003, 2009, Ustjuzhanin & Kovtunovich 2014, Ustjuzhanin et al. 2016). Only two species, *Pterotopteryx spilodesma* (Meyrick, 1908) and *P. formosana* Buchsbaum & Chen, 2018 are known from Taiwan (Heppner & Inoue 1992, Heppner 2012, Buchsbaum & Chen 2018). Gilies (2003) listed 6 species of *Pterotopteryx* Hannemann, 1959. They all are recoded in the Palaearctic region and in Far East Russia. Only few data are known about the biology of the Asian Alucitidae (Sutter 1990, Byun 2006).

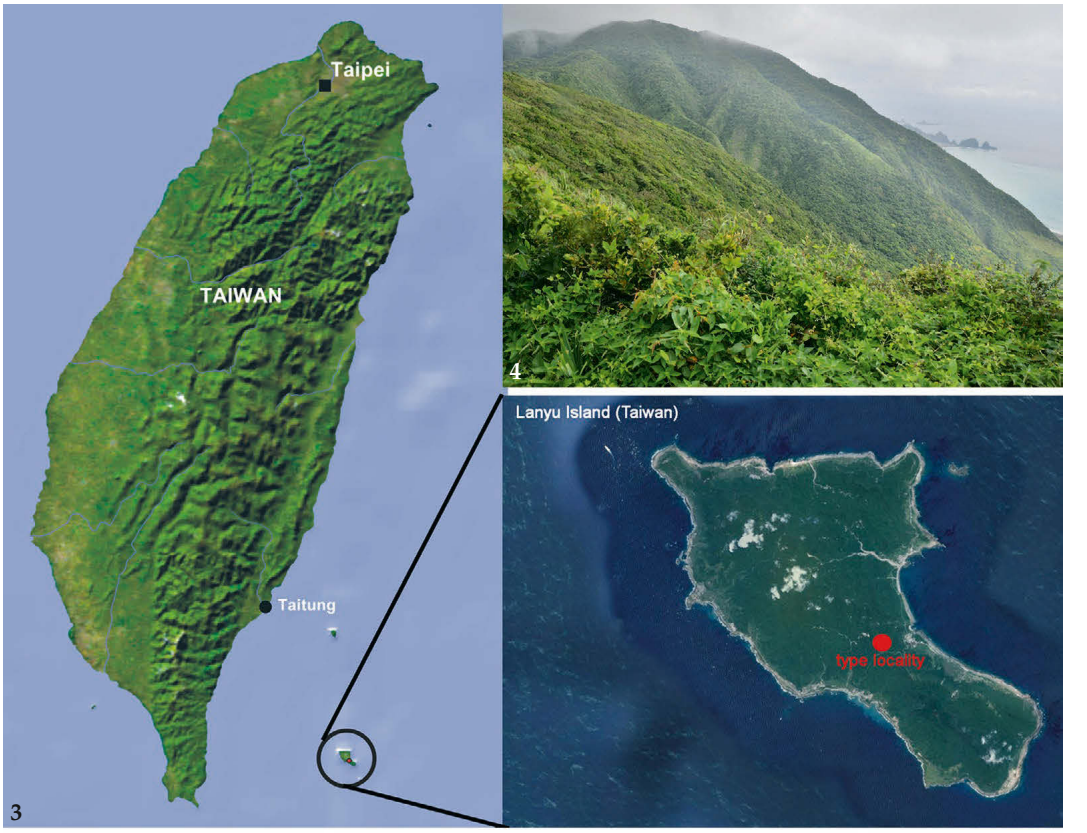
Pterotopteryx taoa sp. nov.

Figs 6–12

Types. Holotype: ♂, May 07, 2017, Taiwan, Lanyu Island, Weather Station, 310 m NN, 121°33'29" E / 22°02'15" N, leg. M.-Y. Chen & U. Buchsbaum, in Coll. Zoologische Staatssammlung München (ZSM) later to deposited in the National Museum of Nature Science (NMNS) Taichung. – Paratypes: 4 ♂, 12 ♀, May 07, 2017, Taiwan, Lanyu Island, Weather Station, 310 m NN, 121°33'29" E/ 22°02'15" N, leg. M.-Y. Chen & U. Buchsbaum; 3 ♀, May 06, 2017, Taiwan, Lanyu Island, Weather Station, 310 m NN, 121°33'29" E / 22°02'15" N, leg. M.-Y. Chen & U. Buchsbaum; 3 ♀, same date and location, leg. D.-J. Chen; 1 ♀, April 15, 2015, on label: "A51-20150416 – 054; UV; Lanyu Weather Station trap 310 m; Taitung County, Taiwan; L. C. Shih leg." (1 paratype ♀ in Coll. TESRI, 12 paratypes in Coll. ZSM, 6 paratypes in Coll. NMNS, 1 paratype ♀ in Coll. D.-J. Chen, Taichung).

Etymology. The new species is called *P. taoa* after the aboriginal tribe on Lanyu Island, the Tao (also called Yami). This is an Austronesian ethnic group which arrived on Lanyu Island about 800 years ago from the Batan Archipelago.

Figs 3–8. *Pterotopteryx taoa* sp. nov. **3.** map of Taiwan ▷ with type locality on Lanyu Island; **4.** habitat at type locality; **5.** ♂ holotype, with hairbrush at costa; **6.** ♀ paratype; **7.** ♀ paratype alive, resting on screen; **8.** ♂ paratype with corenata hairbrush organ.


Taipei
TAIWAN
Taitung
3
4
Lanyu Island (Taiwan)
type locality


5
6
7
8

Description and differential diagnoses

♂ wingspan: 10–10.5 mm, ∅: 10.25 mm, right forewing length: 5 mm, ∅: 5 mm. ♀ wingspan: 9.5–12 mm, ∅: 10.55 mm, right forewing length: 4.5–6 mm, ∅: 5.1 mm.

Head body and abdomen white. Abdomen with orange-brown marks. Labial palpus white with black rings and lager than eye size, yellow with two brown rings on each segment. In *P. spilodesma* the labial palpus is more than double as long than eye size (Figs 13–15).

Forewing with six and hindwing divided in six lobes. Ground colour white with orange marks surrounded by small black lines. First lobe with two large orange and two brown spots. This is a unique pattern and coloration in the family Alucitidae. Male on the most similar species with yellow greyish brown wing colour is *P. spilodesma*, but it is much larger (1/3) with a wingspan of 16 mm and forewing length with 7.5 mm. Male forewings with hairbrushes as androconial scent organ on costa (Fig. 5). Hindwings with same coloration and markings like forewings. Male between 8 and 9 segment corenata intersegmental membrane hair brush organ (Figs 8, 12). So far known it is not published from any other Alucitidae species.

Male genitalia: Uncus slim, rounded, having 1/3 of the length as the whole genitalia. In *P. spilodesma* short, wider and more squat. Valva short and wide. Aedeagus is slim, rounded coecum, larger than whole genitalia, with few small cornuti inside. *P. spilodesma* is provided with many small cornuti on vesica.

Two large hairbrushes between genitalia and last abdominal segment inserted on intersegmental membrane.

Female genitalia: Papillae anales narrow, tapering. Apophyses posteriores as long as ductus bursae. Apophyses anteriores of same length. In *P. spilodesma* both apophyses are short. Corpus bursae rounded, *P. spilodesma* ovate with signum. Ductus seminalis slim and bulla seminalis rounded, less sclerotizied.

DNA analyses

The following sequences were obtained for the COI gene and were processed according to the methods of the BOLD system.

***Pterotoperyx formosana* Buchsbaum & Chen 2018**

Sample ID: BC ZSM Lep 90617; process ID: GWORL 1308-16; BIN: BOLD:ADA9320

Sequence: 658 bp

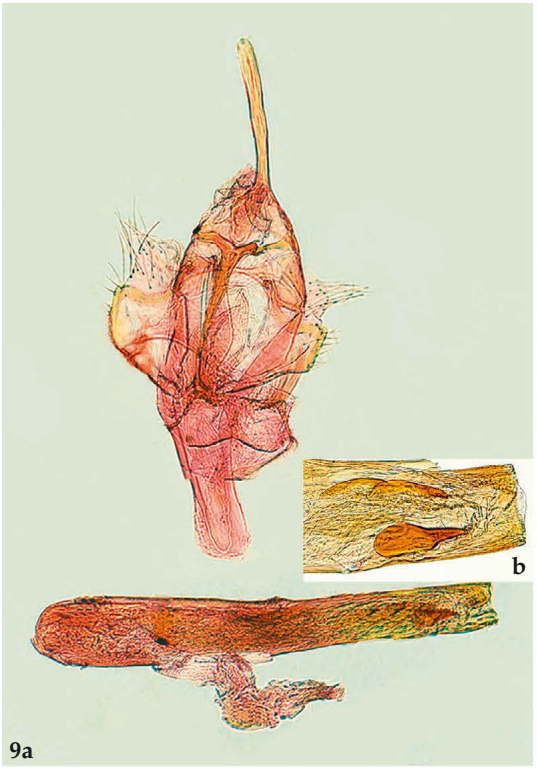
Nucleotide sequence
AACTTTATATTTTATTTTTGGGATTTGAGC
AGGATTATTGGGTACATCTTTAAGATTAT
TAATTCGGGCTGAATTAGGTAATCCAG
GTTCATTAATTGGGGACGATCAAATT
TATAATACAATTGTCACTGCCCATGCTTT
TATTATAATTTTTTTTATAGTTATACCTAT
TATAATTGGAGGATTTGGGAATTGATT
AGTGCCTTTAATATTAGGGGCTCCCGA
TATAGCTTTCCCGCGAATAAATAACATAA
GATTTTGATTATTACCACCTTCAATTTTAT
TATTAATTTTTAGTATAATTGTTGAAAATG
GTGCAGGAACAGGTTGAACAGTGTACCCC
CCACTTTCATCTAATATTGCACATAGAGGTA
GATCTGTTGATTTAACAATTTTTTCTTTACAT
TTAGCTGGAATTTCTTCTATTTTAGGTGCAA
TTAATTTTATTACAACAGTTATTAATATAAA
AATTAATGGATTAATATTTGATCAAATACCAT
TATTCGTTTGAGCGGTTAGTATTACAGCATT
ATTATTATTATTATCATTACCTGTGCTAGCAG
GTGCTATCACTATATTATTAACTGATCGAAATT
TAAATACTTCATTTTTTGACCCTGCTG
GTGGGGGCGATCCAATTTTATATCAACACT
TATTT

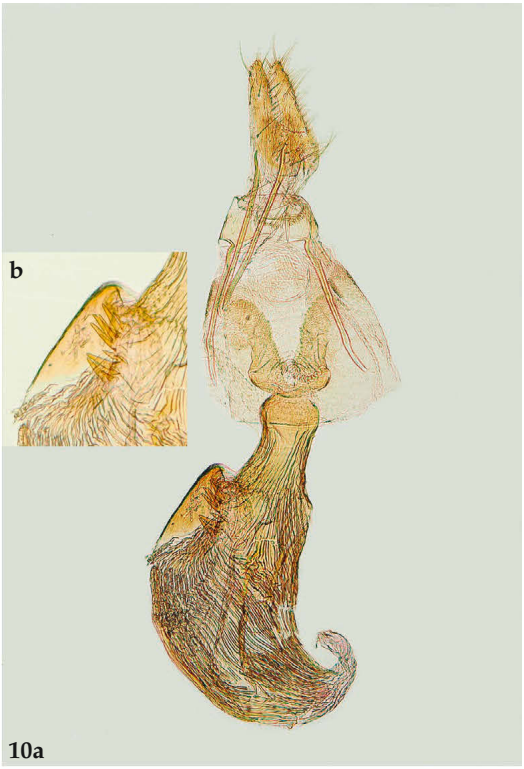
Amino acid sequence
TLYFIFGIWAGLLGTSLSLLIRAELGNPGSLIGD
DQIYNTIVTAHAFIMIFFMVMPIMIGGFGNWLV
PLMLGAPDMAFPRMNNMSFWLLPPSILLLIF
SMIVENGAGTGWTVYPPLSSNIAHSGSSVDLTIF
SLHLAGISSILGAINFITTVINMKINGLMFDQM
PLFVWAVSITALLLLLSLPVLAGAITMLLTDRN
LNTSFFDPAGGGDPILYQHLF

Sample ID: BC ZSM Lep 90618; process ID: GWORL 1309-16; BIN: BOLD:ADA9320

Sequence: 658 bp

Nucleotide sequence
AACTTTATATTTTATTTTTGGGATTTGAGCAG
GATTATTGGGTACATCTTTAAGATTAT
TAATTCGGGCTGAATTAGGTAATCCAG
GTTCATTAATTGGGGACGATCAAATT
TATAATACAATTGTCACTGCCCATGCTTT
TATTATAATTTTTTTTATAGTTATACCTAT
TATAATTGGAGGATTTGGGAATTGATT
AGTGCCTTTAATATTAGGGGCTCCCGA
TATAGCTTTCCCGCGAATAAATAACATAA
GATTTTGATTATTACCACCTTCAATTTTAT
TATTAATTTTTAGTATAATTGTTGAAAATG
GTGCAGGAACAGGTTGAACAGTGTACCCC
CCACTTTCATCTAATATTGCACATAGAGGTA
GATCTGTTGATTTAACAATTTTTTCTTTACAT
TTAGCTGGAATTTCTTCTATTTTAGGTGCAA





Figs 9–12. *Pterotopteryx taoa* sp. nov. **9.** male genitalia; **b,** enlarged part of aedeagus with cornuti; **10.** paratype, female genitalia; **b,** enlarged part of bursa copulatrix with signa; **11.** male abdomen with genitalia and corenata inside; **12**. male abdomen with corenata in everted position.

TTAATTTTATTACAACAGTTATTAATATAAA
AATTAATGGATTAATATTTGATCAAATACCAT-
TATTCGTTTGAGCGGTTAGTATTACAGCATT
ATTATTATTATTATCATTACCTGTGCTAGCAG
GTGCTATCACTATATTATTAACTGATCGAAATT
TAAATACTTCATTTTTTGACCCTGCTG
GTGGGGGCGATCCAATTTTATATCAACACT
TATTT

Amino acid sequence
TLYFIFGIWAGLLGTSLSLLIRAELGNPGSLIGD
DQIYNTIVTAHAFIMIFFMVMPIMIGGFGNWLV
PLMLGAPDMAFPRMNNMSFWLLPPSILLLIF
SMIVENGAGTGWTVYPPLSSNIAHSGSSVDLTIF
SLHLAGISSILGAINFITTVINMKINGLMFDQM
PLFVWAVSITALLLLLSLPVLAGAITMLLTDRN
LNTSFFDPAGGGDPILYQHLF

***Pterotoperyx taoa* sp. nov.**

Sample ID: BC ZSM Lep 98362; process ID: GWOTR1361-17

Sequence: 658 bp

Nucleotide sequence
AACTTTATATTTCATTTTTGGGATTTGAGCTG
GATTAGTAGGGACATCTTTAAGATTAT
TAATTCGTGCTGAATTAGGAACTCCTG
GATCTTTAATTGGAGATGATCAAATT
TATAATACAATTGTAACTGCACATGCTTT
TATTATAATTTTTTTCATAGTTATACCAAT
TATAATTGGAGGATTTGGAAATTGATTAGTCC
CCCTAATATTAGGGGCACCAGATATAGCCTTC
CCACGAATAAATAATATAAGATTCTGAATAC
TACCCCCTTCAATTATATTATTAATTTCTAGAA
GAATTGTAGAAAATGGAGCAGGAACAGGAT
GAACAGTTTACCCTCCTTTATCCTCTAATATT
GCTCATAGAGGAAGATCTGTTGATTTAG
CAATTTTTTCATTACATCTTGCAGGAATTTCAT
CAATTTTAGGAGCTATTAATTTTATTACTACT
GTTATTAATATAAAAATTAATAATTTAATATTT
GATCAAATACCTTTATTCATTTGAGCTGTTAG
TATTACTGCTTTATTATTATTACTTTCTTTAC
CTGTTTTAGCTGGAGCAATTACTATACTAT
TAACAGACCGAAATTTAAACACTTCATTTTTT
GATCCTGCAGGAGGAGGAGACCCTATTTTA
TATCAACATTTATTT

Amino acid sequence
TLYFIFGIWAGLVGTSLSLLIRAELGTPGSLIGD
DQIYNTIVTAHAFIMIFFMVMPIMIGGFGNWLV
PLMLGAPDMAFPRMNNMSFWMLPPSIMLLISS
SIVENGAGTGWTVYPPLSSNIAHSGSSVDLAIFSL
HLAGISSILGAINFITTVINMKINNLMFDQMPLFI
WAVSITALLLLLSLPVLAGAITMLLTDRNLNTS
FFDPAGGGDPILYQHLF

Sample ID: BC ZSM Lep 98363; Process ID: GWOTR 1362-17

Sequence: 658 bp

Nucleotide sequence
AACTTTATATTTCATTTTTGGGATTTGAGCTG
GATTAGTAGGGACATCTTTAAGATTAT
TAATTCGTGCTGAATTAGGAACTCCTG
GATCTTTAATTGGAGATGATCAAATT
TATAATACAATTGTAACTGCACATGCTTT
TATTATAATTTTTTTCATAGTTATACCAAT
TATAATTGGAGGATTTGGAAATTGATTAGTCC
CCCTAATATTAGGGGCACCAGATATAGCCTTC
CCACGAATAAATAATATAAGATTCTGAATAC
TACCCCCTTCAATTATATTATTAATTTCTAGAA
GAATTGTAGAAAATGGAGCAGGAACAGGAT
GAACAGTTTACCCTCCTTTATCCTCTAATATT
GCTCATAGAGGAAGATCTGTTGATTTAG
CAATTTTTTCATTACATCTTGCAGGAATTTCAT
TATCAACATTTATTT

Amino acid sequence
TLYFIFGIWAGLVGTSLSLLIRAELGTPGSLIGD
DQIYNTIVTAHAFIMIFFMVMPIMIGGFGNWLV
PLMLGAPDMAFPRMNNMSFWMLPPSIMLLISS
SIVENGAGTGWTVYPPLSSNIAHSGSSVDLAIFSL
HLAGISSILGAINFITTVINMKINNLMFDQMPLFI
WAVSITALLLLLSLPVLAGAITMLLTDRNLNTS
FFDPAGGGDPILYQHLF

Sample ID: BC ZSM Lep 98364; process ID: GWOTR 1363-17

Sequence: 658 bp

Nucleotide sequence
AACTTTATATTTCATTTTTGGGATTTGAGCTG
GATTAGTAGGGACATCTTTAAGATTAT
TAATTCGTGCTGAATTAGGAACTCCTG
GATCTTTAATTGGAGATGATCAAATT
TATAATACAATTGTAACTGCACATGCTTT
TATTATAATTTTTTTCATAGTTATACCAAT
TATAATTGGAGGATTTGGAAATTGATTAGTCC
CCCTAATATTAGGGGCACCAGATATAGCCTTC
CCACGAATAAATAATATAAGATTCTGAATAC
TACCCCCTTCAATTATATTATTAATTTCTAGAA
GAATTGTAGAAAATGGAGCAGGAACAGGAT
GAACAGTTTACCCTCCTTTATCCTCTAATATT
GCTCATAGAGGAAGATCTGTTGATTTAG
CAATTTTTTCATTACATCTTGCAGGAATTTCAT

Figs 13–15. 13. *Pterotopteryx taoa* sp. nov., head lateral and from front, labial palp length 0.8 mm; **14.** *P. formosana* Buchsbaum & Chen, 2018, head lateral and from front, labial palp length 0.6 mm; **15.** *P. spilodesma* (Meyrick, 1908), head lateral and from front, labial palp length 1 mm.

CAATTTTAGGAGCTATTAATTTTATTACTACT
GTTATTAATATAAAAATTAATAATTTAATATTT
GATCAAATACCTTTATTCATTTGAGCTGTTAG
TATTACTGCTTTATTATTATTACTTTCTTTAC
CTGTTTTAGCTGGAGCAATTACTATACTAT
TAACAGACCGAAATTTAAACACTTCATTTTTT
GATCCTGCAGGAGGAGGAGACCCTATTTTA
TATCAACATTTATTT

Amino acid sequence
TLYFIFGIWAGLVGTSLSLLIRAELGTPGSLIGD
DQIYNTIVTAHAFIMIFFMVMPIMIGGFGNWLV
PLMLGAPDMAFPRMNNMSFWMLPPSIMLLISS
SIVENGAGTGWTVYPPLSSNIAHSGSSVDLAIFSL
HLAGISSILGAINFITTVINMKINNLMFDQMPLFI
WAVSITALLLLLSLPVLAGAITMLLTDRNLNTS
FFDPAGGGDPILYQHLF

Discussion

Lanyu Island, also called Orchid Island or Botel Tobago, was formed by volcanic activity in the Tertiary and is situated in the Bashi Channel between the Philippines and Taiwan (Chen et al. 1993, Shen & Tsai 2002). The flora and fauna on this island is a mixture between subtropical part of Taiwan and tropical part of the Philippines (Su & Ho 1982, Liu 1989, Turner et al. 2001, Shen & Tsai 2002, Schintlmeister 2003). A lot of endemic species and subspecies from the flora and fauna are already known and described (e. g. Chao et al. 2010, Hsieh 2002, Shen & Tsai 2002, Yen et al. 2003, Siler et al. 2012, 2014, Hsu et al. 2017).

Biogeographical aspects, e. g. in birds and insects, lead Kano (1932a, b, c, d) to suggest that the Wallace line should be placed between Lanyu Island and Taiwan (Shen & Tsai 2002). Lanyu has very unique flora and fauna (e. g. Shen & Tsai 2002). For this reason, it is not surprising that in recent years new endemic species are found on this island. Also, it is fact that in the past there were only restricted entomological activities on the island. The habitat at the collection site is a tropical rainforest on a hillside beside the coast (Fig. 4).

The authors were surprised that more than 20 specimens of *Pterotopteryx taoa* sp. nov. could be collected because only one specimen was known before in the collection of the Taiwan Endemic Species Research Institute (TESRI).

Acknowledgements

Many thanks to Prof. Li-Peng Hsu (Da-Yeh University) for permits and for joint excursion. Moreover, we thank Paul D. N. Hebert and the team of the Genome Centre for DNA barcoding based at the Biodiversity Institute of Ontario at the University of Guelph, Canada. Furthermore many heartfelt thanks to Hsu-Hong Lin and Li-Cheng Sinh (TESRI) to allow us to check their collection, to Wolfgang Speidel for discussion about the manuscript and also heartfelt thanks to Da-Shan Shi and his colleagues from the Lanyu Island Weather station for enabling us to collect at their wonderful nature place with the great surrounding nature.

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