

Notes on genital stridulation in male hawkmoths in South East Asia (Lep., Sphingidae)

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Zusammenfassung: Aufgrund eigener Beobachtungen in Südostasien (Sumatra, Malaya und Nordthailand) wird auf das Phänomen der Genitalstridulation bei männlichen Schwärmern hingewiesen. Diese Art der Lauterzeugung ist scharf zu unterscheiden von der (wahrscheinlich pharyngealen) Lauterzeugung beider Geschlechter bei der Gattung *Acherontia* [LASPEYRES]. Es konnten Stridulationslaute bei *Psilogamma menephron* (CRAMER) — bei dieser Art war es bereits bekannt — sowie bei *Meganoton analis sumatranus* CLARK (Neunachweis) und bei *Amplypterus* sp. (ähnlich *panopus* CRAMER *sensu* DIEHL 1980) belegt werden. Schallerzeugung bei nachtaktiven Lepidopteren verschiedener Familien ist in den Tropen gar nicht so selten festzustellen; auf die Notwendigkeit, dieses Phänomen genauer zu dokumentieren (welche Art erzeugt unter welchen Umständen auf welche Art und Weise — mit welchen Organen — welche Art von Lauten?) und dafür Erklärungshinweise zu finden, wird hingewiesen.

Introduction

During two trips to South East Asia (Indonesia: North and West Sumatra; peninsular Malaysia; and North Thailand) in 1984 and 1986, the senior author while collecting at light repeatedly noticed sound production in sphingid moths. The males of some species produced clearly audible stridulation after being injected with a killing liquid (solution of ammonia and nicotine in water) in the thorax, a behavior previously described by DOESBURG (1966). Similar stridulation was often also audible during flight after irritation of the moths. These sounds were produced with the caudal end of the abdomen. The moths moved their genitalia (valves) mainly laterally, and each movement produced a sound.

This method of sound production has been observed repeatedly by lepidopterists (for a literature review see DOESBURG 1966). Only male moths are capable of genital stridulation. Hawkmoths of the genus *Acherontia* [LASPEYRES], in contrast, apparently produce sound in their pharyngeal tract. In this genus, both sexes are capable of sound production. Recently ROESLER & KÜPPERS (1977) reported sound emission by sphingids in Sumatra but did not differentiate between the "squeaking" sound of *Acherontia* and the stridulation of *Psilogamma menephron* (CRAMER).

DOESBURG (1966) and ROBINSON & ROBINSON (1972) made detailed studies on the morphology of the sound producing apparatus. Stridulation is caused by rubbing specialized scales on the dorsal edge of the valves against spines on the posterior edge of the 8th tergite of the abdomen. Genital stridulation seems to be fairly widespread in male sphingids; possibly, however, it is not loud enough (or consists of ultrasonic sound?) in most species to be heard by man. ROBINSON & ROBINSON interpreted the sound production to have a double function: basically it seems to be part of the courtship behavior, but in some species, in addition, it serves a defensive function. LLOYD (1974) added some other aspects in the discussion of the stridulation.

Results

Loud genital (or valvular) stridulation has been observed by the senior author in the following species (the moths are now in the collection of the junior author, unless stated otherwise).

1. *Psilogamma menephron* (CRAMER)

Stridulation in this species has long been known; it might be a character of the whole genus (compare ROBINSON & ROBINSON 1972). *P. menephron* is a fairly common species at least on Sumatra, and it is therefore the usual exemplar of sound production apart from *Acherontia* (ROESLER & KÜPPERS 1977).

2. *Meganoton analis sumatranus* CLARK

To our knowledge this is the first report of sound production in this species; the senior author collected it repeatedly in Sumatra in 1984. There was no noticeable difference in stridulation between this species and *P. menephron*. It should be checked in future whether other members of the genus *Meganoton* also use stridulatory sound as a defensive reaction.

3. *Amplipterus* sp. near *panopus* (CRAMER)

(*sensu* DIEHL 1980 [as *Compsogene panopus*], det. H. BÄNZIGER; compare opinion 275 of ICZN for the use of the generic name *Amplipterus* HUBNER, [1819] instead of *Compsogene* ROTHSCHILD & JORDAN, 1903)

During a collecting evening with H. BÄNZIGER on 12 March 1986 in North Thailand, Chiang Mai province, Doi Saket distr., below Doi San Yao, ca. 1250 m, we found a male sphingid closely related to or identical with the species figured by DIEHL (1980) as *Amplipterus panopus*; the specimen is now in the collection of H. BÄNZIGER. Sound production in this specimen was not as loud as in the other two species, but quite similar and well perceptible.

In addition to these three species, where the stridulation was loud enough to draw the collector's attention at light, a few other individuals with very weak sounds were noticed. Regrettably none of these could be marked or identified.

Conclusive remarks

Generally sound production seems to be more widespread in tropical lepidoptera than usually expected. Another example is the family Noctuidae. During good collecting nights it is not unusual to notice some sound production in noctuid moths. This phenomenon deserves more attention. Animals producing sound should be collected, and a note on their sound production should be included with the collecting data. It should as far as possible be reported *how* and *under what circumstances* they produce *which kind* of sound. Later, hopefully, some causal explanations *why* these animals produce sound may be arrived at.

Generally nocturnal lepidoptera more often tend to produce ultrasonic sound than a "normal" sound perceptible to man; this is usually connected with bat-specific defensive strategies or derived from such. For more recent publications on this subject, refer to, e. g., SURLYKKE & GOGALA (1986) and the references therein.

We hope that our remarks here will motivate more people collecting at light in tropical areas to pay attention to sound production in lepidoptera.

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References:

- DIEHL, E. W. (1980): Sphingidae/Die Sphingiden Sumatras. — Heteroc. Sumatran. **1**, vii + 97 pp., ill.
- DOESBURG, P. H. VAN jr. (1966): Über valväre Stridulation bei Schwärmer [sic] (Lepidoptera Sphingidae). — Zool. Meded., Leiden, **41** (10): 161–170.
- LLOYD, J. E. (1974): Genital stridulation in *Psilogramma menephron* (Sphingidae). — J. Lepid. Soc. **28**: 349–351.
- ROBINSON, G. S., & H. S. ROBINSON (1972): Genital stridulation in male *Psilogramma jordana* BETHUNE-BAKER (Lepidoptera, Sphingidae). — Ent. Rec. J. Var. **84**: 213–215 + 1 pl.
- ROESLER, R.-U., & P. V. KÜPPERS (1977): Beiträge zur Kenntnis der Insektenfauna Sumatras: Zur Ethologie und Geobiologie der Schwärmer Sumatras (Lepidoptera: Sphingidae). — Bonner Zool. Beitr. **28** (1/2): 160–197.
- SURLYKKE, A., & M. GOGALA (1986): Stridulation and hearing in the noctuid moth *Thecophora fovea* (Tr.). — J. Comp. Physiol. **A 159**: 267–273.

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