Poster presentation:

First record of a root community in Southeast Asia: cave-dwelling planthoppers from Maros karst, Sulawesi (Hemiptera: Fulgoromorpha: Cixiidae: Bennini)

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A systematic survey of Maros karst caves in summer 2009 revealed the first known terrestrial cave with roots in the dark zone and an associated fauna for Southeast Asia. Remarkably, this very first discovery of available resources for a root community in the region coincides with the finding of planthoppers as sap-sucking primary consumers. Planthoppers are common elements of root communities in different parts of the world. A total of more than 50 cave-dwelling species are known from Africa (incl. Madagascar), Australia, Latin America, and several oceanic islands. Two-thirds of the troglobiotic and troglophilic species belong to the Cixiidae as well as the newly discovered species from Sulawesi. The Maros cave planthoppers however, are the first representatives of the tribe Bennini ever recorded in a subterranean environment. The Bennini (about 100 species) are characterised by a unique feature – they possess very conspicuous lateral appendages each ending in a wax-covered sensillum. The precise function of these appendages and a possible role in orientation in the dark is unknown as in general the biology of this group is poorly studied. It is assumed that the ability of planthoppers to communicate by substrate vibrations is a prerequisite for the colonisation of cave environments. A well-studied example from Hawaii shows species-specific "song" patterns and revealed a complex pattern of subterranean speciation. The successful recording of vibrational signals from the Maros cave planthopper may open up a new model system for the study of the dynamics of subterranean evolution.

First record of a root community in Southeast Asia: troglophilic planthoppers from Maros karst, Sulawesi (Hemiptera: Fulgoromorpha: Cixiidae: Bennini)

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Fig. 1. Maros cave planthopper, *Gen. nov., spec. nov.* (Cixiidae: Bennini)

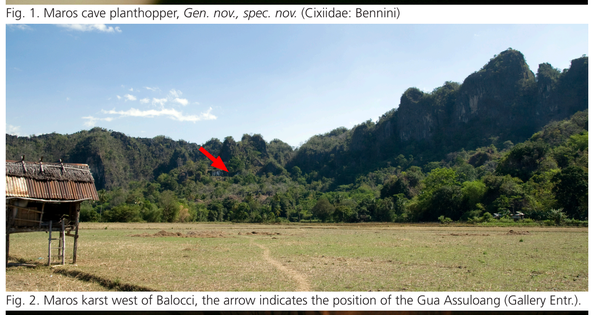


Fig. 2. Maros karst west of Balocci, the arrow indicates the position of the Gua Assuloang (Gallery Entr.).

Fig. 3. Roots in the cave: *locus typicus* Gua Assuloang. Inset: Bennini planthopper *in situ*.

Fig. 4. Reduviid bug, member of the accompanying fauna, collected in close vicinity of the Bennini.

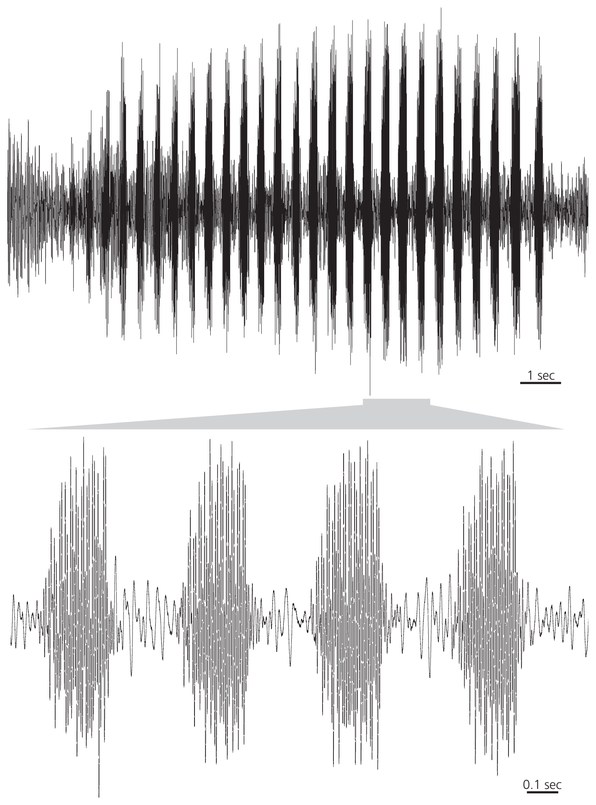
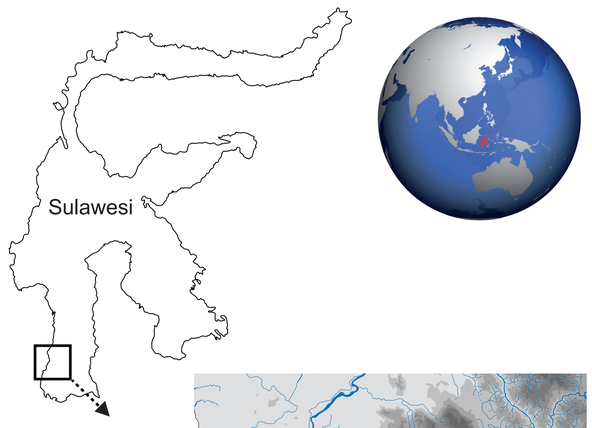


Fig. 5. Oscillograms of the vibrational signals of the Bennini planthoppers.



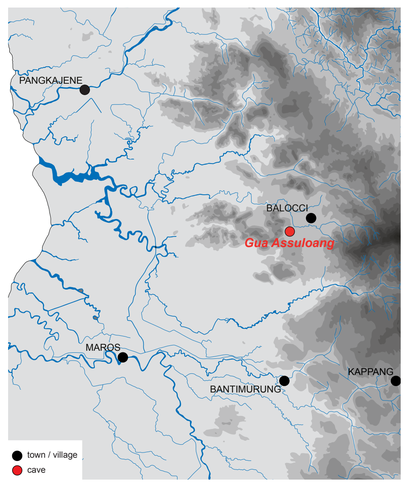


Fig. 6. Location of the Gua Assuloang, Maros Karst near Balocci, Kepulauan Pangkajene, Sulawesi Selatan / South Sulawesi, Indonesia.

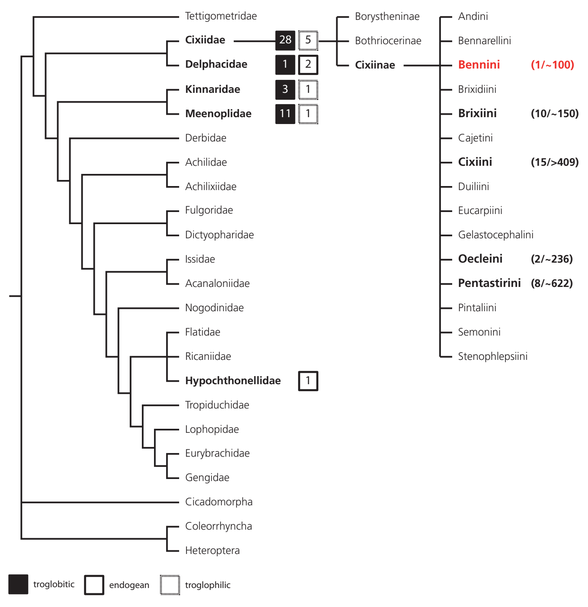


Fig. 7. Systematic distribution of subterranean taxa in the Fulgoromorpha. For the Cixiinae tribes the number of subterranean species of the total of known species is given in parentheses (modified from Hoch *et al.* 2006).

A systematic survey of **Maros karst** caves in summer 2009 revealed the first known **terrestrial cave with roots** in the dark zone and an associated fauna for Southeast Asia (cf. Deharveng & Bedos 2000). Remarkably, this very first discovery of available resources for a root community in the region coincides with the finding of **planthoppers as** sap-sucking **primary consumers**. (Fig. 1-4)

Planthoppers are common elements of root communities in different parts of the world. A total of more than 50 cave-dwelling species are known from Africa (incl. Madagascar), Australia, Latin America, and several oceanic islands. Two-thirds of the troglobitic and troglophilic species belong to the **Cixiidae**, as does the newly discovered species from Sulawesi. (Fig. 7, Hoch & Wessel 2006)

The Maros cave planthoppers, however, are the **first** representatives of the tribe **Bennini** ever recorded **in a subterranean environment**. The Bennini are characterised by a unique feature – they possess very conspicuous lateral appendages each ending in a wax-covered sensillum (Fig. 1 & 3, inset). The precise function of these appendages and a possible role in orientation in the dark is unknown as in general the biology of this group is poorly studied. Hitherto, about 20 Bennini species are described, but a current taxonomic revision will raise the number above 100 species (Hoch, in prep.). The Maros Bennini will be described as **new species** in a newly erected genus (Hoch *et al.*, in prep).

The animals reported here show no significant troglomorphies, however, they are also not known from epigean samples. Planthopper nymphs feed on roots and can be defined as **terrestrial epikarst fauna**. Wandering into caves, the emerging adults can survive and reproduce from the outset in the dark zone without further adaptation necessary and then develop troglomorphies in the course of an rapid **adaptive shift** (see Howarth & Hoch 2004, Wessel *et al.* 2007). We could describe them as **exapted eutroglophile accidentals** (cf. Sket 2008).

It is assumed that the ability of planthoppers to communicate by **substrate vibrations** is a prerequisite or exaptation for the colonisation of cave environments (Hoch & Wessel 2006). A well-studied example from Hawaii shows species-specific "song" patterns and revealed a complex pattern of subterranean speciation (Wessel & Hoch 1999, Wessel 2008). The successful **recording of vibrational signals** from the Maros cave planthopper (Fig. 5) may open up a new model system for the study of the dynamics of subterranean evolution.

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A recent survey reports Bennini planthoppers in a karst cave from the **Philippine** island Bohol. The animals belong to a known epigean species. This find is momentous, however, as the adults were accompanied by several 5th instar **nymphs**. These are the first larval stages of Bennini ever found, and will permit first insights into the developmental biology of the enigmatic "side organs"!

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