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BIOLOGICAL OBSERVATIONS ON ORTHOGNATHOUS SPIDERS IN NORTHERN THAILAND
(ARANEAE: MESOTHELAE, MYGALOMORPHAE)

Abstract: 35 species of orthognathous spiders were observed in Chiang Mai Province (Northern Thailand), genera: Liphistius (4 species), Atypus (2), Calommata (1), Phlogiellus (6), Chilobrachys (1), Cyriopagopus (1), Haplopelma (1), Damarchus (6), Cyrttauchenidae gen. (2), Conothele (7), Idiops (1), Macrothele (1) and Phyxioschema (2). Web and burrow structures are described, notes are given on habitat, distribution and annual cycle.

Introduction: Apart from extensive taxonomic studies by SIMON, THORELL, POCOCK and PLAINICK & SEDGWICK and various short descriptions of new species, very little is known about orthognathous spiders of southeast Asia. Information on the natural history of these animals is sparse, long term studies apparently have never been carried out. In the course of a research project at Chiang Mai University from Nov. 85 to Feb. 88 I had the opportunity to do extensive field work, with the intent to list the species composition and to collect biological and ecological information.

Study area: Chiang Mai Province (22,993 km²), a mountainous region in northern Thailand, rises from the alluvial plains of the Mae Ping River (285 m) to the highest elevation of the kingdom (Doi Inthanon, 2565 m). The climate is strongly seasonal; summer monsoon rains from May to Oct. bring most of the precipitation, whereas the other months are usually very dry. Mean temperature and annual rain fall in 1987: Chiang Mai (300 m) 26.6°C and 1,135 mm; Doi Suthep - Phuphing Palace (1400 m) 19.9°C and 1,855 mm. During winter, frost is not uncommon in altitudes above 2000 m.

Results

About 35 species of orthognathous spiders of 13 genera (9 families) were found. Identification and separation of some species is still uncertain;

genera were identified according to RAVEN 1985.

Liphistiidae: 4 species of Liphistius occur in altitudes between 1000 and 2000 m, apparently each confined to a few mountains. The spiders live on steep road- and path cuts, along stream banks, as well as on level forest floors and in soft, decaying wood (Figure 2); burrows long, slightly bent and equipped with trapdoor and signal threads. Their annual cycles run almost parallel: males matured from Sept. to Oct., remained in the burrow for a few weeks, mated until Dec. and then died. They did not feed after reaching maturity. In Dec./Jan. an egg sac was deposited in the floor at the bottom of the burrow. Depending on the size of the species, either about 80 or about 300 spiderlings hatched in March and left the egg sac in May to June. Very young spiders often construct sac-like webs with two doors on the soil surface. Females moulted in Feb. or March, whilst guarding the egg sac, one species in June.

Atypidae: Atypus is widely distributed in the mountains of northern Thailand between 1000 and 1700 m. The spiders live in vertical pursewebs, aerial tube erect as in Sphodros (Fig.3). There are either small colonies at road sides or single tubes in the forest floor, often close to burrows of Liphistius. 2 phenologically separate species are present. In the one species males matured in late May and mated in late June. The egg sac was suspended at the bottom of the tube in Aug., about 150 (max. 440) spiderlings hatched in early Oct. and dispersed from Dec. to Jan. Females moulted in Oct. In the other species the reproductive period was 4.5 months later. Few specimens of Calommata were found, at road sides and stream banks from 300 to 1200 m. Burrows long and bent, open at the top, filled with a dense tangle of adhesive, cotton-like silk during daytime (Fig.4 and 5). Very rare, no data on annual cycle available.

Theraphosidae are dominant in the area. Phlogiellus, in long, bent and irregularly branching tubes, is everywhere common. 4 species are highland spiders, each found on different mountains between 1000 and 2000 m. 2 syntopic species occur in the lowland, one widely distributed, the other found only at one locality. Males matured in Feb./ March, in May and in Aug. The syntopic species are separated in their phenology by 3 months. The egg sac was stored at the bottom of the tube 1 to 4 months after mating; about 50 spiderlings hatched one month later. Breeding females kept the burrow sealed with a soil plug and stopped feeding. - 3 large species were found widely distributed: Chilobrachys builds long, bent burrows in loose forest

humus or settles in crevices and mouseholes in altitudes between 1000 and 1600 m. Males matured from Oct. to Nov., eggs were laid at the beginning of May. The other 2 species are distinctly fossorial, fairly common between 300 and 1200 m. Males of Cyriopagopus matured from May to June and were collected until Sept.; no data on egg laying and breeding. Haplopelma predominates in low altitudes, it occurs at road sides, in the forest, as well as on cultivated land. Conspicuous in size of body and burrow (entrance 8 cm in diameter), the spiders are caught and eaten by the rural population. Males matured in late July and mated in early Aug.; eggs were laid in late Jan. At night, females carried the egg sac to the burrow entrance to expose it to the cool, humid atmosphere. About 100 to 150 spiderlings hatched in late March. During the mating period from late July to Feb. virginal females produced signals by periodically tapping the ground with their anterior legs to attract males. After mating these signals stopped immediately.

Nemesiidae: 6 species of Damarchus are present, 2 from low altitudes up to 1000 m, one up to 1600 m, the others between 1000 and 2000 m. Burrows always equipped with a side shaft, which is open or closed, either by a collapsible collar or by 2 opposing flaps. Main entrance open, level with the ground or raised on a turret, fringed with a collapsible collar (Fig.6) or closed by a functional trapdoor (upper entrance lining elongated and folded downwards). Males matured in Feb. and May or in Aug. to Oct. About 50 (max. 160) eggs were laid 3.5 to 5 months later; egg sac suspended in the side shaft. The offspring hatched after 1 to 2 months.

Cyrtachenidae: 2 species of a presumably new genus were found in the cloud forest of Doi Inthanon from 2300 to 2500 m. Males of the one species were trapped from April to May and of the other from July to Nov.

Ctenizidae: Conothele (7 species) occurs in all altitudes. 2 syntopic species of different size are widely distributed in low altitudes, the others confined to separate mountains. Burrows short and straight, strongly lined and tightly closed by a trapdoor (Fig.7), built in loamy soil and decaying wood. Males matured between Feb. and July. In one species 370 eggs were suspended in an egg sac at the bottom of the burrow about 3 months after mating.

Idiopidae: Idiops is widely distributed in the lowland but scarce. Burrows long and bent, lined with a thin tapetum. In addition to the trapdoor, the spiders build a movable soil pellet, which is attached to a sil-

ken collar and rests in a chamber in the side of the burrow. If disturbed, they pull the collar downwards and plug the passage (Fig.1). A similar mechanism is employed by Stanwellia nebulosa (RAINB. & FULL.) (Nemesiidae; Main 1976). Males matured at the beginning of June. Egg sacs suspended at the bottom of the burrow in late Feb., 30 spiderlings hatched in mid April.

Hexathelidae: Macrothele appears in 2 isolated populations between 800 and 1000 m. The spiders build a huge funnelweb, that is surrounded by an irregular mesh of silk and leads into a crevice. The retreat is often enlarged to a tube. Males matured in late March. Eggs were laid in mid June, at which time one male was found associated with a pregnant female. About 100 spiderlings hatched in early Aug.

Dipluridae: 2 species of Phyxioschema are widespread in the lowland and regionally separated. They live in small, irregular capture webs, connected with a tube-like retreat that runs into a crevice; fairly numerous at road sides and under leaf litter. Phenology remarkable: males matured in early Dec. and in early May; eggs were laid in Feb. to April and in June/July. Parallel generations or different species? Several broods of 12 to 24 eggs were produced per reproductive period and hatched 2 to 3 weeks later. Egg sacs were suspended in the web in the rainy season and stored inside the retreat in the dry months.

Discussion

All orthognathous spiders in the area are ground dwellers. Most of them dig burrows in the soil and in decaying wood, whereas web weavers settle in holes and crevices. Although usually scattered, in few places the spiders also occur in small clusters or colonies. A distinct altitudinal division was recognizable, most lowland and highland spiders separate at about 1000 m. Diversity is highest at about 900 to 1200 m, lowest above 2000 m. There appears to be no clear ecological separation as regards habitat but rather in phenology. The spiders ambush at the burrow entrance at night, but occasionally on clouded, humid days in the daytime as well. Juveniles tend to be more active during the daytime than adults. No food preferences were found, all prey of suitable size was accepted. The main part of prey remnants in spider burrows and webs consist of ants, beetles and millipedes. Centipedes are predacious on orthognathous spiders, flies and pompilid wasp larvae are parasitic. Jumping spiders (Portia sp.) and bugs (Anthocoridae)

are cleptoparasites in Macrothele webs; springtails and phoretic mites feed on the remains of prey inside the burrows.

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Literature cited: Main, B.Y.: Spiders. The Australian Naturalist Library. Collins: Sydney, London 1976.

Raven, R.J.: The spider infraorder Mygalomorphae (Araneae): Cladistics and Systematics. Bull. Amer. Mus. Nat. Hist. 182 (1), 1 - 180 (1985).

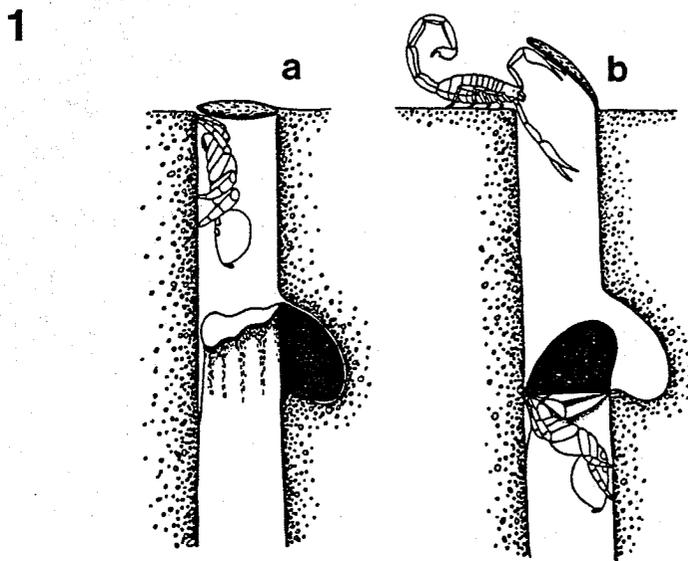
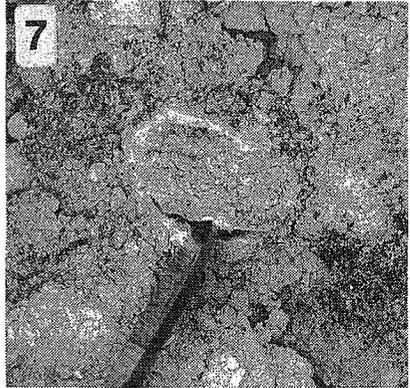
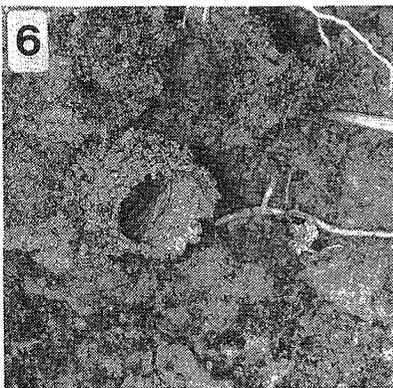
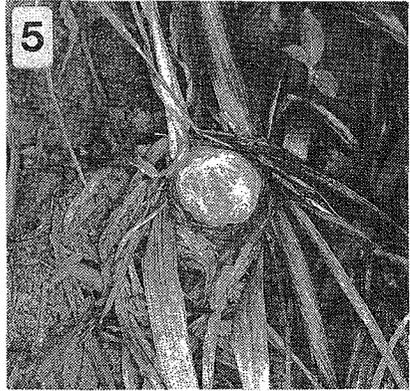
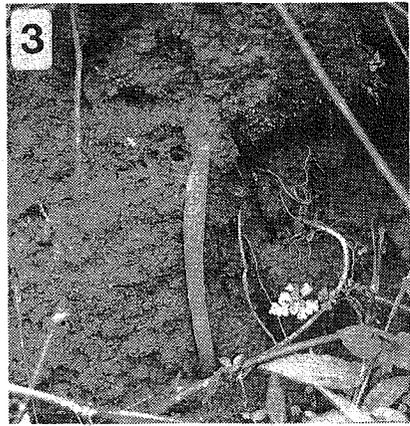
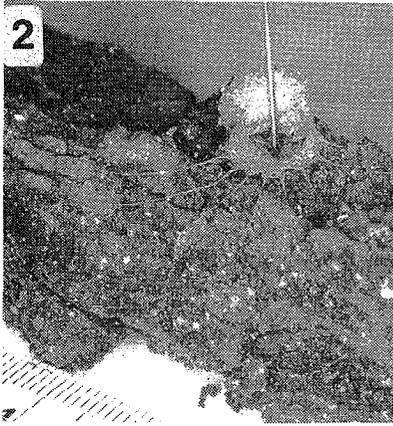


Fig.1 Idiops. Upper portion of the burrow; a collar in the open position and b folded downwards, plugging the passage with the pellet. Diameter of burrow 8 mm, body length of spider 9 mm, scorpion fictitious.

Fig.2-7. 2 Liphistius. Burrow built in rotten wood. 3 Atypus. Aerial tube. 4,5 Calommata. In ambush at the burrow entrance at night (4), burrow sealed during daytime (5). 6 Damarchus. Burrow entrance with open collar. 7 Conothele. Trapdoor drawn tight by the spider inside the burrow. Burrow diameters range from 15 to 20 mm.



Schmidt: Is it possible to distinguish the genera *Haplopelma* and *Cyriopagus* on the basis of their burrows and the shape of the tubes?

Schwendinger: There are some differences in the size and structure of the burrows but I would not consider them suitable for distinguishing both genera. This question could probably be answered when having more data on burrow measurements.

Jocqué: Have you developed a seventh sense to find this impressive number of burrowing spiders, or are there particular methods to find them?

Schwendinger: Once you are acquainted with the study area and have an idea which species can be found, you will develop an eye to detect their burrows and trapdoors. These are marked during the day and revisited at night for further study.