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FLEXIBILITY IN FORAGING TACTICS OF *BUTHUS OCCITANUS* SCORPIONS AS A RESPONSE TO ABOVE-GROUND ACTIVITY OF TERMITES

Foraging modes are known to be generally fixed within a species, and flexibility of foraging tactics is often restricted by physiological and morphological traits, or by predation pressure (Huey & Pianka 1981). However, models and empirical evidence suggest that individuals may change foraging tactics as a response to variations in prey abundance (Schoener 1971; Stephens & Krebs 1986; Formanowicz & Bradley 1987). During research in the Negev desert of southern Israel in summer 1993, I observed scorpions of the species *Buthus occitanus israelis* switching foraging tactics as a response to sporadic above-ground activity of termites.

Buthus occitanus israelis is a burrowing scorpion found in arid zones of Israel and Sinai (adult body length 5–7 cm) (Levy & Amitai 1980). Like many other species of scorpions (Polis 1990), these are nocturnal, sit-and-wait predators that stand in ambush position some distance away from their burrows and locate prey by sensing air and soil vibrations. However, active foraging was observed as well and may constitute an alternative foraging tactic. Of all the individuals that were observed foraging on 30 nights (120 hours of observation), only 20% of the males and 12.5% of the females were moving, while most were motionless in ambush positions. When approached, these cryptic scorpions usually remained motionless, attempting to escape only if they were within 10 cm of their burrows.

Buthus occitanus scorpions are opportunistic, generalist foragers. Foraging scorpions in the field and in the laboratory accept various types of prey – including crickets, Neuroptera, moths, bugs and various arachnids. However, in field observations, 70% of the scorpions consuming prey that could still be identified ($n = 27$), ate the wingless worker and soldier castes of harvester termites, *Anacanthotermes* sp. (specimens have been deposited at the National Collection in Tel-Aviv University).

These termites live underground and forage on the surface only in the vicinity of their burrows (usually within 70 cm of the entrance). When they encounter a predator they retreat into their nest within seconds. Observations revealed that widely-foraging *B. occitanus* scorpions approach the active termites and swiftly sting as many as possible before the termites disappear into the shelter of their burrow. The scorpion then moves around the area and collects the dead and dying termites with its pedipalps and chelicera. This foraging tactic was used by scorpions of all ages. On three occasions young scorpions were seen catching 1–2 termites at once, while on three other occasions large adult scorpions succeeded in collecting up to eight termites in a single attack.

In this unique foraging tactic *B.occitanus* scorpions exhibit a number of specialized behaviors that enhance the profitability of hunting for termites: a) since the termites forage within a small range around their burrow, the scorpion must actively forage for them rather than employ the usual sit-and-wait tactic; and b) termites are small and possess an effective alarm system. To use the short time available before the termites disappear, the scorpion must skillfully sting as many individuals as possible, without wasting time on handling and collecting. A comparable termite hunting tactic was observed in the web-building spider *Chrosiothes tonala* that specializes on termites (Eberhard 1991).

Collecting dead, motionless termites requires use of sense organs other than the mechanical receptors that are used by most scorpions to detect movement of live prey. Krapf (1986) showed in laboratory conditions that *B. occitanus* scorpions used contact chemoreception to detect motionless prey. Chemoreceptors may play an important role in hunting of termites, by allowing the scorpions to separate the short time available for attacking and subduing the prey from the time-consuming process of collecting and handling the dead prey.

Sit-and-wait foraging has been described as a low-cost, low-profitability strategy that may have evolved in species under predation pressure (Huey & Pianka 1981). By switching from their normal mode of ambush foraging into a widely-foraging mode of termite hunting, *B. occitanus*

scorpions may enjoy increased foraging success. However, a widely-foraging scorpion might also have to endure greater metabolic costs of foraging and increased risk of predation.

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LITERATURE CITED

Eberhard, W. G., 1991. *Chrosiothes tonala* (Araneae, Theridiidae): a web-building spider specializing on termites. Psyche, 98:7–19.

Formanowicz, D. R. & P. J. Bradley. 1987. Fluctuations in prey density: effects on the foraging tactics of scolopendrid centipedes. Anim. Behav., 35: 453–461.

Huey, R. B. & E. R. Pianka. 1981. Ecological consequences of foraging mode. Ecology, 62:991–999.

Krapf, D. 1986. Contact chemoreception of prey in hunting scorpions (Arachnida: Scorpiones). Zool. Anz., 217:119–129.

Levy, G. & P. Amitai. 1980. Fauna Palestine Arachnida I: Scorpiones, 1st Edition. Israel Acad. Sci. and Human., Jerusalem.

Polis, G. A. 1990. Ecology. Pp. 247–294, *In* The Biology of Scorpions, 1st Ed. (G. A. Polis, ed.). Stanford Univ. Press, Stanford, California.

Schoener, T. 1971. Theory of feeding strategies. Ann. Rev. Ecol. Syst., 2:369–404.

Stephens, D. W. & J. R. Krebs. 1986. Foraging theory. Princeton Univ. Press, Princeton.

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