Floral Mimesis in *Thelymitra nuda* (*Orchidaceae*)

By

Peter Bernhardt and Pamela Burns-Balogh

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Abstract: Insect pollination occurred in *Thelymitra nuda* R. Br. on sunny days when the ambient temperature exceeded 20°C. The flower buds on a raceme opened subsynchronously displaying the brightly-colored, actinomorphic perianth and exposed the contrastingly-colored, scented and ornamented column. In *T. nuda* the staminodes and the filament of the fertile stamen are fused to one another producing an inflated hood over the anther. This staminodal hood is terminated in two non-ornamental, but brightly-colored, central lobes and two terete lateral lobes bearing approximately 400 white trichomes. Each trichome bears a double chain of 30–40 spherical, rugulose cells. Female bees, in the genus *Lasioglossum* (*Halictidae*), were observed to land directly on the hood and curled their bodies around the four lobed tip of the staminodal complex. The bees attempted to forage on the lobes as if they were collecting pollen from fertile, poricidal stamens. These bees applied thoracic vibration to the yellowish central lobes and actively scraped the trichome clusters (Pseudopollen) with their forelegs. Bees carried the pollinaria of *T. nuda* dorsally on their abdomens. Abdominal contact with the rostellum appeared to occur when the female bee disengaged herself from the staminodal hood. Observations made of bees on co-blooming flowers, and analyses of pollen loads collected by bees suggested that the orchid flower mimics the guild of blue-purple flowers that lack floral nectar but offer pollen in poricidal anthers. The models of *T. nuda* are co-blooming *Liliaceae* in the genera *Dichopogon* and *Thysanotus*. However, nectarless, buzz-pollinated flowers are also extensively distributed over the orchid's range. More than 30% of the flowers in the *T. nuda* population had their pollinaria removed, suggesting a high capacity for cross-pollination in an orchid genus usually considered to be self-pollinated via mechanical autogamy. This study confirmed previous predictions that column modifications represented a trend towards pseudanthery.

Descriptions of the floral biology of the Australasian *Thelymitra* spp. (sun orchids) have tended to emphasize self-pollination. The first descriptions of mechanical autogamy, in this genus, were published more than a century ago (FitzGerald 1875–1895, Cheeseman 1881). Both
authors noted that the perianths of some *Thelymitra* spp. failed to expand on cool, cloudy days and when the perianth opened the pollinia had already dropped onto the stigma. These early authorities concluded that the majority of flowers on an inflorescence of certain *Thelymitra* spp. could set seed successfully without cross-pollination. Furthermore, the labella of all *Thelymitra* spp. were not immediately differentiated from other perianth segments unlike most orchid genera (see review by Dressler 1981). This added weight to interpretations made by early pollination biologists that some *Thelymitra* spp. offered neither floral modifications nor attractants which exploit pollinating insects. Darwin (1877) readily used descriptions of self-pollination in *Thelymitra* spp., communicated by Fitzgerald (1875–1895) and Cheeseman (1881), to illustrate modifications of column structure leading to autogamy.

The majority of field research and published observations made during this century have not seriously challenged descriptions of self-pollination in *Thelymitra* spp. Rather, they have tended to promote the classic concept that self-pollination may occur extensively in the genus and that the flowers of some species should be considered subcleistogamous (Rogers 1913, Jones 1981, Primack 1983, Bates 1984, and see review by Beardsell & Bernhardt 1982). Some authorities have reported insects on the flowers of *Thelymitra* spp. (Cady & Rotherham 1970, Leigh & al. 1984, Bates 1984) but there is currently only one set of observations that describe unidentified bees removing the pollinaria (Jones 1981).

There is some circumstantial evidence that *Thelymitra* spp. are not necessarily synonymous with obligate autogamy. The perianths of most species are brightly-colored when the segments expand while the staminodal complex is often a contrasting color to the petals and sepals (Nicholls 1969, Woolcock & Woolcock 1984). Variation in pigmentation is both interspecific and intraspecific within this genus. Some species are so strongly scented that floral fragrance has been used as a secondary characteristic in couplets of keys to the orchid flora of Australia (e.g. Willis 1978). “Rare” species have been reclassified as recurrent interspecific hybrids (see review by Beardsell & Bernhardt 1982, Bates 1984). Finally, *Thelymitra* spp. possess a floral trait unique in the Orchidaceae. The two lateral staminodes and the filament of the fertile stamen have fused forming either an expanded, multi-lobed hood over the anther or high collar surrounding the anther (see review by Burns-Balogh & Bernhardt 1985). The central lobes of the hood, often called the crest, may be ornamented with papillae, ridges, trichomes or raised epidermal cells. The central lobes are usually flanked by two lateral lobes that may be highly sculptured or terminate in clusters of trichomes (Nicholls 1969, Woolcock & Woolcock 1984).