

Scientific Notes

A *PARACOPIMUM* (HEMIPTERA: TINGIDAE) FROM *CLERODENDRUM INERME* (VERBENACEAE) WHICH IS NOT GALL FORMING, WITH A NOTE ON OTHER HERBIVORES

D. H. Murphy

Two genera of Tingidae form flower galls of a unique type which have attracted much attention (Drake & Ruhoff, 1965: 6-9). Indeed, the first scientific mention of the family seems to be Réaumur's (1738) description of the gall formed by *Copium clavicorne* on *Teucrium chamaedryx* in Europe (Péricart, 1983). Known hosts of the palaeotropical genus *Paracopium* Distant are almost all species of *Clerodendrum* (Verbenaceae), although only known for seven of the 35 species listed in that genus. In *Clerodendrum*, normal flowers usually have a long tubular corolla expanding apically into a more or less zygomorphic, trumpet shaped aperture. When in bud, the apex is dilated around 4 loosely coiled anthers which become long exerted on opening. *Paracopium* galls have been illustrated by Drake & Davis (1960: fig. 52), Drake & Ruhoff (1963: plate 24) both for the African *P. hamadryas* on *C. buchholzi*, and by Drake & Catley (1964) for the Papuan *P. albofasciatum* on *C. populneum*. They show the corolla tube to become inflated and fleshy and to remain sealed throughout the development of the insects. Unlike in *Copium*, many insects develop in each gall.

Clerodendrum inerme (L.) Gaertn. is a common scrambling shrub in back mangroves and seashore situations in Singapore. The species extends from Bombay to the Pacific (Burkill, 1966). It has typical elongate tubular flowers in axillary cymes. Although commonly carrying populations of an unidentified species of *Paracopium* in Singapore, no trace of flower galls has been seen, though heavily infested plants show total die-back of the flower cymes. Both adults and well grown immatures are found feeding on the shoots. At first sight then, this species seems to conflict with the known biology of the genus. Species of the genus are typically recognised by thickened distal antennal segments, otherwise differing little from the *Tingis* and *Perissonemia* complexes of the Tinginae. In this species the antennae are only slightly enlarged and, but for the host association its identity might be obscure. However, several described species share this feature (e.g. *P. australicum*, *P. lewisi* and *P. sauteri*) and judging by descriptions, some named species of *Perissonemia* may have to be considered. For this reason the species is not described as new. Only a specialist with access to types would be in position to do so. This short note is justified on the grounds that its unique biology may throw light on the origin of the gall forming habit in the group.

Dissection of flower buds from an infested plant showed that although there is no true gall formation, early stages of development are indeed carried through inside the bud. Eggs are laid into the swollen apex of a half grown bud and are similar to those described for *Copium clavicorne* (Monod & Carayon, 1958) in having a bell-shaped operculum. One to five eggs are laid through a single perforation and lie loose in the corolla cavity.

The young larvae are anthophagous and can entirely destroy the contents of the anthers. No damage to filaments or corolla was seen. 8 to 12 larvae were seen in buds examined and two sizes of exuviae seen so that at least the first three instars are passed in the closed bud. Several sizes of larvae coexist and this, together with the recorded size of egg-batch, suggests several ovipositions into each flower. The flower then opens normally and larvae escape to begin feeding externally. At least some of these older larvae feed preferentially at the base of the flowers, often being seen within the calyx and apparently attacking the ovary. It is at this stage that flowers are destroyed. Entire axial cymes are attacked, both the flowers originally occupied and others nearby becoming shrivelled and withered. Yet older larvae then disperse and can be found feeding from young shoots, both on stems and on mid-ribs of expanding leaves, which however show little damage.

It is possible that this mode of life represents a precursor stage of the true "tingicecidium". One should at least expect that not all species of *Paracopium* will be found to cause such conspicuous hypertropic growth or deformation as has been previously reported.

Clerodendrum inerme also supports a number of other herbivores in Singapore. Extensive damage to young foliage is caused by adult maturation feeding by an alticine beetle *Hyphasis* aff. *fulvicornis* Jac. (Col. Chrysomelidae) and by gregarious larvae of the chrysomeline *Phyllocharis undulata* (L.) (Col. Chrysomelidae). The polyphagous grasshoppers *Valanga nigricornis* (F.) (Orth. Acrididae) and *Ducetia thymifolia* (Orth. Tettigoniidae) both attack it, and it constitutes their only known mangrove host. The fruit-fly *Myoleja superflucta* (End.) (Dipt. Tephritidae) is a known associate (Hardy, 1973: 263) and females have been seen ovipositing into fruit.

Young leaves are mined by a *Phyllocnistis* (Lep. Gracillariidae) which seems indistinguishable from *citrella* Stainton, and from material also reared from *Avicennia* and *Excoecaria* within the mangrove flora. This needs confirmation, but it makes sense that a species dependent upon a short-lived and unpredictable resource such as flushing leaves would be polyphagous. Leaves and shoots are often heavily infested by midge-galls (Dipt. Cecidomyiidae) which remain unidentified.

Acknowledgement – This work was funded under Research Grant RP 880352 from the National University of Singapore.

LITERATURE CITED

- Burkill, I. H., 1966. *A dictionary of the economic products of the Malay Peninsula*, 2 vols., 2444 pp. Second edition. Kuala Lumpur.
- Drake, C. J. & A. Catley, 1964. An unreported gall-producing lace-bug in New Guinea (Papua) (Hemiptera: Tingidae). *Pacific Insects*, 6 (2): 229-230.
- Drake, C. J. & N. T. Davis, 1960. The morphology, phylogeny and higher classification of the family Tingidae, including the description of a new genus and species of the subfamily Vianaidinae (Hemiptera: Heteroptera). *Entomologia americana*, 39 (n.s.): 1-100.
- Drake, C. J. & F. A. Ruhoff, 1965. Lacebugs of the World: a Catalog (Hemiptera: Tingidae). *Bull. U. S. Natn. Mus.* 243, 634 pp., 56 plates.
- Hardy, D. E., 1973. The fruit-flies (Tephritidae-Diptera) of Thailand and neighbouring countries. *Pacific Insects Monograph*, 31, 353 pp., 8 plates.
- Monod, T., & J. Carayon, 1958. Observations sur le *Copium* (Hémipt. Tingidae) et leurs action cécidogène sur les fleurs de *Teucrium* (Labiées). *Arch. Zool. Exp. Gén.*, (notes et revue) 95(1): 1 - 31.

Raffles Bulletin of Zoology 1989 37 (1 & 2)

Péricart, J., 1983. Hémiptères Tingidae euroméditerranéens. *Faune de France*, 694, 623 pp. CNRS Paris.

Reáumur, R. A., 1738. *Mémoires pour servir à l'étude des Insectes. III.* 532 pp., Paris.

Address: DHM - Department of Zoology, National University of Singapore, Kent Ridge, Singapore 0511, Republic of Singapore.

***BUFO QUADRIPORCATUS* BOULENGER, 1887,
A TOAD NEW TO SINGAPORE ISLAND
(AMPHIBIA: ANURA: BUFONIDAE)**

Kelvin K. P. Lim

The family Bufonidae is represented by two species in Singapore, viz., *Bufo melanostictus* Schneider, 1799 and *Pelophryne brevipes* (Peters, 1867). Past collections in Singapore (see Lim, 1989: 51 for references) did not reveal the presence of other forest-dwelling bufonids, although the remaining forests of Bukit Timah Hill and the central catchment area seem to provide many promising habitats for these.

On 12th December 1989, a crew from the Singapore Broadcasting Corporation was filming a natural history documentary at the Sime Road forest, Singapore. Mr. R. Subharaj and Mr Farid Hamid, who were helping the crew, obtained an unusual toad. The toad was filmed, photographed from various angles, and later released. These photographs (Colour Plate 2B, C) were passed to the present author for identification of the toad.

The specimen they obtained is referable to *Bufo quadriporcatus* Boulenger, 1887, a species not hitherto known from Singapore. The present record represents the first report of this species, and only the third bufonid, from Singapore. From the photographs, the diagnostic features of the species are clearly visible. These are: parotoid glands narrowly elongated (maximum width seldom exceeding one fifth of length) and sharply raised; a pair of distinct continuous supraorbital-parietal ridges on the top of the head lying straight and parallel to each other; head about as wide as long; snout obtusely pointed; tympanum distinct.

The present Sime Road specimen is coarse-skinned, rust-coloured above and on the sides, with dark-grey patches on the dorsum. The specimen measured approximately 6 cm from snout to vent. *Bufo quadriporcatus* is known from Peninsular Malaysia (type locality Malacca), Borneo and Sumatra (Inger, 1966: 66; Frost, 1985: 57). According to Berry (1975: 52), this species grows to 65 mm (snout-vent length), inhabits primary forest and is "... [f]ound in forest floor or near small streams." The present example was found in