THE METANOTAL GLAND AS A TAXONOMIC CHARACTER IN OECANTHUS OF THE UNITED STATES[1]

(ORTHOPTERA: GRYLLIDAE)

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Male crickets of the subfamily Oecanthinae have a large glandular cavity in the metanotum. This metanotal gland is sometimes called Hancock's gland because Hancock (1905) was the first to describe it adequately. The metanotal gland is mouthed (i.e., "licked" or bitten) by the female before and after she receives the spermatophore from the male. Its secretions probably are important both to the successful transfer of the spermatophore and to the diversion of the female while the sperm pass from the spermatophore into the sperm receptacle. During this time, the male has the tegmina raised, exposing the gland, and the female is astride the male. The female removes and eats the spermatophore soon after leaving the male. A third function of the gland may be to keep the pair together until another spermatophore can be passed. Postcopulatory feeding at the gland may last for over an hour (65 minutes observed in *Oecanthus pini* by TJW), and a second spermatophore may be transferred within 70 minutes of the first (observed in *O. argentinus* by TJW). A fourth function may be that the secretions are specifically distinct and account

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for the usual failure of females to respond to the courtship of heterospecific males (Walker 1963).

The morphology and histology of the oecanthine metanotal gland are described by Engelhardt (1914) for *Oecanthus pellucens* (Scopoli) and by Fulton (1915) for an unspecified species of *Oecanthus* (probably *nigricornis* or *quadripunctatus*). Males of some species in other gryllid subfamilies have metanotal glands—Gryllinae, *Discoptila fragosoi* (Bolivar) (Boldyrev 1928); Phalangopsinae, *Homoeogryllus* (LeRoy 1964); Eneopterinae, *Tafalisca, Hapithus* (TJW). However, only in Oecanthinae are the glands large and complex and present in all species examined. The chief parts of the metanotal gland in Oecanthinae are a metascutum (Fig. 4, *ms*) and metascutellum (*msl*), henceforth referred to here as "scutum" and "scutellum." A well-defined and distinctive posterior median lobe of the scutum (Fig. 4, *pml*) occurs in some species but not in others; it is henceforth termed "posterior median scutal lobe."

L. Chopard and A. B. Gurney were first to examine oecanthine metanotal glands for their taxonomic value: Chopard (1955, Fig. 30–32) pointed out that three similar species of African *Oecanthus* differed in features of the gland. Gurney, in 1951, examined many New World species of *Oecanthus* and drawings were made (including Fig. 1–6 of this paper). Because of uncertainties in the taxonomy and nomenclature of U. S. *Oecanthus* he did not publish his results. These uncertainties were subsequently dealt with by Walker (1962, 1963).

As a result of Gurney's work with *Oecanthus*, Walker (1967, Fig. 20–27) studied the metanotal glands of the oecanthine genus *Neoxabea*, discovered features of taxonomic value, and illustrated the glands of eight species.

The present paper summarizes the early studies by Gurney and the later studies by Walker of the metanotal glands of U. S. *Oecanthus*.

Methods. Five or more specimens of each U. S. species (except *laricis*) and closely related Latin American species were examined. Specimens from diverse localities were selected to maximize intraspecific variation. Pinned specimens were relaxed, and their metanotal

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Fig. 1–9. Male metanotum of *Oecanthus*. Fig. 1–5, Dorsal view of scutum and scutellum (scale beneath Fig. 1). Fig. 1. *niveus*, specimen from Geneva, N. Y.; fig. 2, *exclamationis*, Johnson City, Tenn.; fig. 3, *nigricornis*, Glen Echo, Md.; fig. 4, *californicus*, Huachuca Mts., Ariz.; fig. 5, *allardi*, Ciudad Trujillo [Santo Domingo], Dominican Republic; fig. 6, Posterior median scutal lobe of *rileyi* (Locality of figured specimen uncertain, probably Corvallis, Oreg.); fig. 7–9, Caudal view of scutellum (small portions of scutum showing, scale as in fig. 1); fig. 7, *exclamationis*, Gainesville, Fla.; fig. 8, *leptogrammus*, Brownsville, Tex., fig. 9, *niveus*, Highlands Co., Fla. *ms*—metascutum (scutum), *msl*—metascutellum (scutellum), *pml*—posterior median lobe of scutum, *set*—setae on scutum at scutoscutellar suture, *setl*—setae on scutellum, *st*—scutal tubercle, *w*—width of posterior median scutal lobe.

glands were exposed by elevating and pulling forward the tegmina. They were then dried in this position. In alcohol-preserved specimens, the glands were exposed by amputating the tegmina.

Results. Among U. S. species of *Oecanthus* the scutellum is not elaborately modified as in most species of *Neoxabea* (Walker 1967), nor is there, except in *O. niveus*, a well-developed median scutal tubercle (Fig. 1, *st*) such as Chopard (1955) found useful in identifying African *Oecanthus*. However, as the following key and accompanying figures illustrate, features of the metanotal glands may be used to separate the species into the same species groups that have been recognized on the basis of other features such as antennal markings, calling song, and stridulatory file (Walker 1962). Features of the metanotal gland, especially the lack of brushes or bundles of long setae on the scutum at the scutoscutellar suture or on the scutellum, indicate that species related to *rileyi* are not closely related to *niveus*. Therefore, the *rileyi* group of species is here recognized as distinct from the *niveus* group. Although Walker (1962) considered these to be a single group, features of the antennal markings, calling song, and stridulatory file support the present division.

In general, species within a species group are difficult or impossible to separate on the basis of the metanotal gland, and other characteristics are adequate for identification. However, as indicated in couplets 4 and 5 of the key, within the *niveus* group the metanotal gland easily separates species that in a few instances are difficult to separate by other means. Indeed, the differences in the glands within the *niveus* group are as great as the differences used to separate the other species into species groups.

Oecanthus fultoni shows significant geographical variation in the structure of the metanotal gland. West Coast specimens have a posterior median scutal lobe similar to that of *O. rileyi*, and eastern specimens resemble the West Indian *O. allardi* in this respect.

KEY TO U.S. **Oecanthus** SPECIES, BASED ON MALE METANOTAL GLANDS

1. Brushes or bundles of long setae on scutum at scutoscutellar suture (Fig. 2, *set*) or on scutellum (Fig. 1, *setl*) ..... **niveus** group 4
1′ No setal brushes or bundles on scutum at scutoscutellar suture nor on scutellum (Fig. 3, 4, 5) 2
2 (1′) Scutum with posterior median lobe (Fig. 4, 5) 3
2′ Scutum without posterior median lobe (Fig. 3) ..... **nigricornis** group, including **argentinus** Saussure, **celerinictus** T. Walker, **laricis** T. Walker, **nigricornis** F. Walker, **pini** Beutenmuller, and **quadripunctatus** Beutenmuller
3 (2) Width of posterior median scutal lobe (Fig. 4, *w*) twice length or more; anterior edge of lobe describing a shallow arc (Fig. 4) ..... **varicornis**

group, including **californicus** Saussure, **latipennis** Riley, **major** T. Walker, and **varicornis** F. Walker

3′ Width of posterior median scutal lobe (Fig. 5, *w*) twice length or less; anterior edge of lobe describing a semicircle (Fig. 5) or a circumflex (∧) (Fig. 6) ..... **rileyi** group, including **allardi** T. Walker & Gurney, **fultoni** T. Walker, and **rileyi** Baker

4 (1) Pair of vertical, bent-tip, setal bundles on scutum at scutoscutellar suture (Fig. 7) ..... **exclamationis** Davis

4′ No setal bundles at scutoscutellar suture 5

5 (4′) Scutellum with a pair of forward-directed horn-like processes; pair of setal brushes on scutum at scutellar processes (Fig. 8) ..... **leptogrammus** T. Walker

5′ Scutellum without horn-like processes; pair of setal brushes on scutellum (Fig. 9) ..... **niveus** (De Geer)

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