

NEW DESCRIPTIONS, INTRASPECIFIC VARIATION AND
SYSTEMATIC IMPORTANCE OF DRUMMING BEHAVIOR IN
SELECTED NORTH AMERICAN PLECOPTERA

Order No. DA8705142

WILKINSON, MONCHAN, PH.D. *North Texas State University*, 1986.
5pp. Major Professor: K. W. Stewart

Drumming behavior is described for the first time in 33 North American Plecoptera species, and signals of an additional five species, *Pteronarcys pictetii*, *Acroneuria abnormis*, *Paragnetina edia*, *Clioperla clio* and *Isogenoides zionensis*, are further detailed.

An out-group comparison of behavioral characters in all 104 world species whose drumming is known showed that the behavior is more advanced in the Arctoperlaria Group Systellognatha than in the group Euholognatha. In general, tapping, monophasy, touching, sequenced exchange and less than 50 taps/answer are ancestral states, and rubbing, grouping, phasing, tremulation, interspersed exchange and equal or more than 50 taps/answer are derived states. There has been some co-evolution between abdominal structure and drumming behavior. Scanning Electron Micrographs of 30 species showed that the primitive state of tapping is associated with three classes of abdominal structure: (1) absence of derived structures, (2) lobes or vesicles, and (3) hammers. The derived behavior of rubbing, however, occurs only in species with derived structures, and is predominant in species having vesicles and hammers. Drumming can be used as a line of evidence to aid in defining genera and species, since the behavior has a variable degree of specificity or exclusiveness in all species, particularly in groups of species I have studied in the genera *Isoperla*, *Pteronarcys* and *Taeniopteryx*.

Typical and variant computer-synthesized male calls of three stonefly species were tested with live females. They responded at high levels in such a way that the important informational content conveyed was identified as: (1) a minimal threshold of beat numbers, and (2) a discriminant window of beat intervals. Rub frequency and bibeat calling were critical informational parameters in two species.

CLASSICAL BIOLOGICAL CONTROL OF THE FILBERT
APHID, *MYZOCALLIS CORYLI* (GOETZE) (HOMOPTERA:
APHIDIDAE) IN WESTERN OREGON Order No. DA8705548

MESSING, RUSSELL H., PH.D. *Oregon State University*, 1986. 144pp.
Major Professor: M. T. AliNiazee

A classical biological control project was undertaken against the filbert aphid, *Myzocallis coryli* (Goetze), in western Oregon. Hazelnut orchards in Spain, France, and Italy were searched for natural enemies of the aphid, and a parasitic wasp, *Trioxys pallidus* Haliday, was imported, quarantined, mass-reared, and released in Oregon orchards.

The wasp successfully attacks and completes its development on the Oregon race of the filbert aphid. A greenhouse culture of the parasitoid has been maintained continuously for over 50 generations, and approximately 30,000 adult wasps have been released in the Willamette Valley. Overwintering survival has been documented in at least eight different locations. In three commercial orchards, the parasitoids reduced aphid populations by 26-32%.

The newly imported biotype of *T. pallidus* attacking the filbert aphid was compared with the previously established biotype attacking the walnut aphid. The two races are morphologically indistinguishable, and were shown to freely hybridize in reciprocal crosses, producing viable, fertile offspring. However, the races showed distinct differences in host suitability, with the newly imported biotype having greater reproductive success on filbert aphids than the previously established (walnut) biotype.

Bionomics of both *M. coryli* and *T. pallidus* were studied in the laboratory. Data indicate a higher developmental threshold for overwintering parasitoid pupae (7.4°C.) than for overwintering aphid eggs (3.3°C.). Based on a common threshold of 6.0°C., thermal requirements for time-to-adult are ca. 240 and 265 degree days for summer generations of aphids and parasitoids, respectively. Diapause termination in aphids is more strongly influenced by winter chilling than is diapause termination in parasitoids.

SYSTEMATICS OF THE NEOTROPICAL MOTH FAMILY
DALCERIDAE (LEPIDOPTERA) Order No. DA8704480

MILLER, SCOTT EVERETT, PH.D. *Harvard University*, 1986. 151pp.

The family Dalceridae is revised and descriptions, keys, and illustrations are provided for all 85 species (except the *Acraga infusa* species complex). The family includes 11 genera: *Acraga* (= *Anacruga* n. syn., *Dalargentina* n. syn.), *Ca*, *Dalcera*, *Dalcerides* (= *Acragopsis* n. syn.), *Dalcerina*, *Minacruga*, *Minacrugides*, *Minonoa*, *Oroya* n. gen., *Paracruga*, and *Zikanyrops*. These genera are retained in two subfamilies, Acraginae (*Acraga*, *Dalcerides*, and *Zikanyrops*) and Dalcerinae (all others). The status of *Zikanyrops* is uncertain because no males have been available. Cladistic relationships among the genera are discussed. Dalceridae are tentatively placed in a monophyletic group including Epipyropidae, Limacodidae, and Megalopygidae, but many problems exist in the higher classification of the families associated with Zygaenoidea and Cossioidea. Dalceridae are restricted to the Neotropical Region, except one species, *Dalcerides ingenita* (Hy. Edwards), which occurs as far north as Arizona. The geographical and ecological distributions of all species are reviewed, the latter via Holdridge Life Zones. The slug-shaped larvae, distinctive in their dorsal covering of gelatinous conical tubercules, appear to be general feeders on smooth leaved trees and shrubs.

MEASUREMENTS OF POPULATION STRUCTURE IN THE
TERMITE *RETICULITERMES FLAVIPES* (KOLLAR) (ISOPTERA:
RHINOTERMITIDAE) AND COMPARISONS WITH THE
EUSOCIAL HYMENOPTERA Order No. DA8703888

REILLY, LINDA MARIE, PH.D. *Vanderbilt University*, 1986. 159pp.
Director: David E. McCauley

The population genetic structure of the common eastern United States subterranean termite *Reticulitermes flavipes* (Kollar) (Isoptera: Rhinotermitidae) was analyzed. Variation in allozymes resolved via starch gel protein electrophoresis was used to determine the amount of genetic variation within and among adjacent termite colonies, as well as among colonies hundreds of miles apart. This partitioning of genetic variance was expressed first in terms of Wright's F statistics. A measure of relatedness was used to determine the relatedness of individuals within a colony to each other, relative to a population average. Spatial autocorrelation was used to measure the genotypic variance and pattern in the population. Most of the total genetic variance in the population was among adjacent colonies. The colonies were genetically isolated from one another. There was some evidence of genetic structuring within colonies.

To complement the results obtained from the allozymes, behavioral interactions between nearby colonies were quantified. These behavioral interactions, coupled with the electrophoretic information, were used to determine whether genetically distinct colonies behaved aggressively upon contact. Termites tend to behave agonistically toward conspecifics originating from colonies located at a distance; the aggressive response is not a reliable indicator of colony identity.

This information was then compared to similar studies conducted with the eusocial Hymenoptera. The results of this study suggest that phylogenetically diverse eusocial insects share elements of a common population structure. In family-structured models of kin selection, population structure can contribute to the evolution of eusociality. "Altruistic" behaviors, such as the sterility of a eusocial insect, can be promoted through selection among families. This selection among families can offset the effects of individual selection, which would usually act against a trait such as sterility. These family structured models do not depend on the haplodiploidy of the Hymenoptera; quantification of the population structure of termites can provide a test of the generality of these models. The present study is the first measurement of the population structure of a termite species.



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