

The Pleasing Fungus Beetles of Illinois (Coleoptera: Erotylidae) Part I. The Dacninae

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ABSTRACT

The Illinois fauna of the subfamily Dacninae (Coleoptera: Erotylidae) is composed of 3 known species: *Dacne quadrimaculata* (Say); *Megalodacne fasciata* (Fabricius) and *Megalodacne heros* (Say). One other species, *Microsternus ulkei* (Crotch), is not recorded, but may occur in the state. Keys to the identification of adults, descriptions of species, habitus drawings and distribution maps are provided. Fungal host relationships of each species are reported and discussed.

INTRODUCTION

The family Erotylidae includes colorful fungus feeding beetles commonly called "pleasing fungus beetles". They are world wide in distribution with over 1800 described species. The family was comprehensively revised for North America by Boyle in 1956. Of the 44 genera reported from the New World (Blackwelder 1945; Boyle 1956); 10 genera and 49 species are known north of Mexico (Boyle 1956, 1962; Goodrich & Skelley 1991). Within the subfamily Dacninae 3 genera and 8 species occur nationally. The purpose of this series of papers is to provide a complete list of the Erotylidae occurring in Illinois, keys and descriptions of species for their identification, distribution maps of their occurrence within the state, and descriptions of their biology and host relationships.

The family Erotylidae can be separated from other beetles by their convex elongate-oval to ovoid shape, 3-4 segmented antennal club which is often capitate, 5-5-5 tarsal formula, glabrous body surface, closed procoxal cavities, well developed maxillary palps which are often expanded apically, and frequently bright color patterns. A number of other families are confused with the Erotylidae, but are distinguished by the following characteristics. The Languriidae, once included in the family Erotylidae, are elongate, and have open procoxal cavities. The Endomychidae are distinctly pubescent and/or have a pair of longitudinal grooves at the base of the pronotum. Cryptophagidae have dense pubescence and open procoxal cavities. Species of the related family Biphyllidae, once included in the Erotylidae, are similarly densely pubescent, and have the 2nd and 3rd tarsomeres lobed beneath. The more distantly related Mycetophagidae are common fungus feeding beetles and may be distinctly patterned in bright colors, but are densely pubescent and usually have a reduced tarsal formula. Some fungus feeding Tenebrionidae and Melandryidae also have color patterns similar to the Erotylidae, but have a tarsal formula of 5-5-4. Most often confused with Erotylidae are some of the Nitidulidae, which are also shining, convex beetles commonly occurring in soft fungi. Among other characteristics, the Nitidulidae may be distinguished by their transverse procoxae; erotylid procoxae are globular. See Arnett (1963), Borror, Triplehorn & Johnson (1989) and Dillon & Dillon (1961) for additional family characteristics.

Some generalizations regarding the biology of the Erotylidae can be made. They are usually fungus feeders of certain basidiomycetes, with adults and larvae sometimes found together. Adults are most active during the season their fungal host is "fruiting". Judging activity periods from museum specimens can be misleading, because adults may be collected in hiding while awaiting the appropriate season. Collection of specimens either feeding on host fungi or by malaise trap will give a more accurate measure of adult activity. Larvae are found only in association with the host fungi and, with care, may be successfully reared. Hosts may be mushrooms, bracket fungi, or soft, hyphae filled bark. Some larvae have a short development time, which is probably due to the short time the fungus stays fresh. In contrast, adults of many species are long lived. The erotylids of the eastern and central United States appear to be associated with the fungi of deciduous trees and are generally restricted to moist, woodland areas. Soft fungi growing on logs, stumps, or from mycorrhizal associations are favored by erotylids.

Adult beetles are often gregarious, whether on the host fungus or in hiding. We have frequently found large masses of an appropriate host fungus and discovered the erotylids concentrated in one or a few basidiocarps. Gregarious habits are also observed away from the host. Large numbers of *Megalodacne* spp. can be found overwintering under bark in the northern states, or in hiding between feeding periods (Park & Sejba 1935). The primary adaptive value of these aggregations may be as an aid in reproduction; copulating pairs are quite frequently found among such groups. A number of other hypotheses related to individual survival may explain these behaviors. Aggregations of beetles may: reduce water loss in dry conditions; provide a better defense against predators;

or the beetles may simply be seeking a particularly suitable microhabitat. The proximate mechanism of aggregation is also not clear. Erotylids have excellent chemoreceptors and patches of large punctures and pores in the integument, so pheromones may elicit the response. Many erotylids possess stridulatory files on the posterior vertex of the head (Arrow 1924; Boyle 1956). Among the North American Erotylidae, Boyle found stridulatory files: present in both sexes; absent in both sexes; or present only in males. When present, they may be important in species recognition for aggregation of individuals or for courtship. Among Illinois Dacninae, stridulatory files are either present only in males, or are absent in both sexes.

A variety of other animals are found in association with erotylids. Mites are frequently collected clinging to adults taken in the field. During rearing, adult beetles often emerge covered with mites. Many of the mites collected belong to the genus *Proctolaelaps* (Acari: Ascidae). These mites are predatory on nematodes, insect larvae and other arthropods inhabiting fungi. It is believed they are phoretic on the erotylids. Potter & Johnson (1976) described *Canestriniphis megalodacne* (Eviphididae: Acari), from the erotylid *Megalodacne heros*. These mites are also predaceous in habit rather than parasitic and occur in transitory habitats such as dung, compost, or fungi. They are known to use various larger arthropods, developing in the same habitat, for dispersal. We have also found large numbers of uropodine mites, which are probably fungivorous in habit, securely fastened to museum specimens of *Megalodacne fasciata* and to reared specimens of *Triplax frontalis*. An enormous amount of work remains to be done on beetle-mite associations, but the mites, while not parasitic, would appear to be the primary beneficiaries of the relationship.

Erotylids are known to have hymenopterous parasites (Elliot & Morley 1907; Tachikawa 1980). During an attempted rearing of a *Tritoma* sp., adult *Tetrastichus* sp. (Hymenoptera: Eulophidae) emerged.

The Erotylidae of North America are widely distributed over the continent and they are generally restricted to moist woodland areas. No specimens have been seen from the Florida Keys, northern Canada, the Great Plains, or in deserts where their host fungi and trees will not grow. A dividing line, which seems to be the western limit for many eastern species, is the 100th Meridian. This line cuts the United States in half through the prairie states. Some eastern species are found further west where river valleys with forests are present. In Illinois, Erotylidae occur wherever hardwood forests persist, sometimes being found in urban settings.

MATERIALS AND METHODS

In addition to extensive collecting by the authors, specimens of the subfamily Dacninae were borrowed for study from 21 museums or private collections. A total of 2,967 specimens of Dacninae were examined and identified; 493 of these were from Illinois. In our study of the Dacninae we followed the taxonomic treatment of Boyle (1956). The range of each species was based on specimens

actually seen and identified by the authors and the detailed records of Boyle (1956).

Erotylids were collected in crevices under bark or in other retreats, in a wide variety of woodland fungi and in insect traps (malaise, U-V light, and pitfall). This provided information on host relationships as well as data on distribution and seasonal activity. Larvae collected in the field were reared in the laboratory by placing the fungal host with larvae in a well ventilated, moist container and allowing them to complete their development.

RESULTS

Three species of Dacninae were found to be widely distributed in Illinois. They are: *Dacne quadrimaculata* (Say), *Megalodacne fasciata* (Fabricius) and *Megalodacne heros* (Say). A fourth species, *Microsternus ulkei* (Crotch) has been collected in Indiana and Kentucky and may occur in southern and eastern Illinois.

KEY TO ILLINOIS SUBFAMILIES OF EROTYLIDAE

Fourth tarsomere scarcely reduced, subequal in length to the third (Fig. 1);
terminal segments of the maxillary palpi cylindrical (Fig. 3) Dacninae

Fourth tarsomere strongly reduced, smaller than the bilobed third (Fig. 2);
terminal segment of the maxillary palpi transverse or triangular (Fig. 4) ...
..... Triplacinae

Among the North American Erotylidae, the Dacninae are considered more primitive than the Triplacinae. This is evident from the more generalized 5-5-5 tarsal formula, compared to the more derived pseudotetramerous structure of the Triplacinae, and from the cylindrical, unspecialized terminal segments of the maxillary palpi, compared to the highly specialized structure of the Triplacinae, in which the terminal segment is expanded.

We also find host associations to be less specific in the Dacninae than in the Triplacinae. The usual hosts of the Dacninae are polypores, which we have speculated is ancestral in Erotylidae (Skelley, Goodrich & Leschen 1991).

The Dacninae include the largest (*Megalodacne heros*) and smallest (*Dacne quadrimaculata*) species of Erotylidae in North America.

KEY TO ILLINOIS SPECIES OF DACNINAE

1. Small, 6 mm or less in length 2
 Large, 9 mm or more in length *Megalodacne* 3
2. Elytra piceous to black with 2 reddish yellow spots on each elytron (Fig. 5); 2.4-3.5 mm long *Dacne quadrimaculata*
 Elytra red with four black spots on each elytron (Fig. 11); 3.8-4.9 mm long *Microsternus ulkei* *
3. Pronotum transverse, its lateral margins broad; orange of subbasal elytral fascia reaching only the outer half of each elytral base (Fig. 7); 9.8-15.5 mm long *Megalodacne fasciata*
 Pronotum subquadrate, its lateral margins narrow; orange of subbasal elytral fascia reaching most of the elytral base (Fig. 9); 14.0-22.0 mm long *Megalodacne heros*

* Not yet recorded for Illinois, but may occur in the state.

DESCRIPTION OF THE SPECIES

Dacne quadrimaculata (Say)

Diagnostic description. *Dacne quadrimaculata* is the smallest of the Illinois Dacninae, ranging from 2.39 to 3.52 mm long. Their antennae are capitate, with the apical club nearly circular. Specimens range from piceous to black in color, with the elytra bearing four orange-red spots, one at the base and one at the apex of each elytron (Fig. 5).

Range. Northeastern and central North America, from North Carolina north to Maine and Quebec, westward to the 100th meridian, reaching Alabama and Texas to the south and Manitoba to the north. Boyle (1956) had only two records from Illinois, but we have specimens from 5 additional locations in the state (Fig. 6).

Biology. We have records of this beetle from a diversity of fungi, predominantly polypores. If we set aside records of single specimens, however, our host data falls into two categories: 11 separate collections totalling 93 specimens from *Polyporus squamosus*, a fleshy polypore that grows on the wounds of living trees or on fallen trees; and 8 collections comprising 101 specimens from *Pleurotus* spp., a group of wood rotting fungi also associated with fallen hardwoods. Although *Pleurotus* has been placed with the "gill fungi" in the past, many mycologists believe that this genus is derived from polypores and therefore allied with them (Donk 1964; Singer 1986). Other workers (Ashe 1990) have found Coleoptera that usually are associated with polypores inhabiting species of *Pleurotus*. In addition to the collection of adults from this host, we have successfully reared *Dacne quadrimaculata* from *Pleurotus ostreatus*. For a complete list of hosts, see our comprehensive treatment of the

hosts of North American Erotylidae (Skelley, Goodrich & Leschen 1991). Adult specimens have been collected in Illinois between 6 May and 10 September. The larvae are undescribed.

Remarks. This species is probably more widely distributed in Illinois than our distribution map would suggest. It is an easily overlooked beetle due to its small size, and one which might be mistaken for a nitidulid. Careful examination of the host fungi described above should produce a substantial number of additional records.

Specimens examined. We have examined a total of 656 specimens, including 57 specimens from Illinois.

***Megalodacne fasciata* (Fabricius)**

Diagnostic description. This species and the one that follows are the only two members of the genus *Megalodacne* to be found in North America. The genus comprises some 61 spp. of world wide distribution, the great majority of which are in the Old World. The two North American species are easily separated from all other North American erotylids by their large size (approximately 10-23 mm in length) and the black elytra with striking orange fasciae. *Megalodacne fasciata* is separated from *M. heros* by its broadly margined, somewhat transverse pronotum. The orange elytral fasciae are also shaped somewhat differently, reaching only the outer half of the elytral bases (Fig. 7). In size, it is significantly smaller, ranging from 9.8-15.5 mm long.

Range. Eastern and central North America, being generally distributed east of the 100th Meridian. Ranging in the north from Connecticut, New York and Ontario westward to Minnesota, Iowa and southeastern Nebraska, and in the south from Florida westward to Texas. Gorham (1888) reports it as far south as Cordova, Vera Cruz, Mexico. Records from Colorado and western Nebraska are old and questionable, but a published record from northern California (Kitayama 1986) probably represents a recently introduced population. We have examined 6 of the specimens collected by Kitayama and they are certainly *Megalodacne fasciata*. *Megalodacne fasciata* is widely distributed in Illinois, with specimens being found in all parts of the state (Fig. 8).

Biology. Although we have a large number of collection records of this species, biological data is limited. It has been collected in association with polyporous bracket fungi on logs and stumps. Our most frequent records (Skelley, Goodrich & Leschen 1991) are from *Ganoderma* spp., most frequently *G. lucidum*, with a few scattered records from other polypores. Adults are often taken under bark, where they may be hibernating, aestivating during a hot, dry period, or simply taking refuge during the day. Specimens are often taken at light, which suggests nocturnal habits similar to those described for *M. heros* by Park & Sejba (1935). Adult specimens have been taken in Illinois between 1 March and 28 October. The larvae and their habits have been described by Beutenmüller (1890), Boving and Craighead (1930-1931), and Skelley (1988).

Remarks. This is the most commonly collected member of the subfamily, perhaps due in part to its large size and conspicuous markings. Additional host data would be welcome, to clarify our understanding of its host relationships.

Specimens examined. We have examined a total of 1,631 specimens, of which 384 were from Illinois.

***Megalodacne heros* (Say)**

Diagnostic description. Shiny black above, with strongly contrasting orange markings on the elytra, as in the preceding species. It is distinguished from *M. fasciata* by the narrower margins and subquadrate shape of the pronotum, and in the shape of the anterior orange elytral fasciae, which reach the elytral bases over 3/4 of their width (Fig. 9). This is the largest of the North American Erotylidae, ranging from 14.0-22.0 mm long. Thus, the smallest *M. heros* is only slightly smaller than the largest *M. fasciata*.

Range. Eastern and central North America, ranging from Florida to Connecticut, New York, Quebec and Ontario, west to Minnesota, Illinois, Oklahoma and Texas. One specimen in the California Academy of Science Collection was taken in Estes Park, Colorado, and a specimen in the Ulke Collection (Carnegie Museum) is labelled "Cala." *Megalodacne heros* has a wide but scattered distribution in Illinois, reflecting the fact that this species is less common than the preceding in our state (Fig. 10).

Biology. Host preferences are similar to those reported for *M. fasciata*. The majority of specimens have been collected from *Ganoderma* spp., with *Ganoderma tsugae* the most frequently recorded host. As with *M. fasciata*, many specimens are taken in shelter niches under bark and not in association with fungi. This is due to their largely nocturnal feeding habits, which have been described in some detail by Park & Sejba (1935). Like other erotylids, this species tends to be gregarious, but not to the extent seen in *fasciata*. Blatchley (1910) says of this beetle "Much less common than *fasciata* and seldom more than two or three found together". In contrast, Smyth (1934) collected 58 specimens within a small space on polyporous fungi on the underside of a decaying log, and we have taken a dozen or more together on several occasions. In Illinois, however, the longest series collected has been 6 specimens. Adult specimens have been taken in Illinois between 1 March and 13 October. For a description of the larvae see Skelley (1988).

Remarks. Additional host information for this large, conspicuous species would be welcome, as well as further distributional and seasonal data.

Specimens examined. We have examined a total of 589 specimens, of which 52 were from Illinois.

***Microsternus ulkei* (Crotch)**

Diagnostic description. A very distinctive species, with the mesosternum very short and transverse; its intercostal width 10 times its length. The antennal clubs are symmetrically oval. This beetle is distinctively marked with a piceous ground color and brownish red elytra; each elytron bearing four piceous spots (Fig. 11). Its length ranges from 3.86-4.90 mm.

Range. Boyle (1956) examined specimens from Kentucky, Ohio, Pennsylvania, Maryland and North Carolina. In addition to these states we have seen specimens from West Virginia and Indiana. Blatchley (1910) reported this species from Posey and Crawford counties in Indiana. We have seen 2 specimens from the Morgan-Monroe Forest near Bloomington, Indiana, about 60 miles east of the Illinois border. Although not yet reported from Illinois, we believe it is likely to occur in the southern and eastern part of our state.

Biology. Biological data for this species is meagre. We have 2 records from *Phellinus gilvus* and one record from *Polyporus cuticularis* (Blatchley 1910). Dury (1878) described the host of *Microsternus ulkei* as *Polypora* (not a very specific identification in 1878, as it could apply to a wide range of polypores). He also gave an interesting account of ants preying on larvae and newly emerged adults. Michael C. Thomas (personal communication) reports taking *M. ulkei* under bark of an old beech stump. Adult specimens have been taken in the northeastern United States between 6 April and 4 September. The larva is illustrated in Lawrence (1991).

Remarks. This remarkable species is the only Midwestern erotyloid with red elytra bearing black spots. It is the only known American member of a genus including 15 spp. of Asiatic distribution (Chûjô & Chûjô 1989). Specimens are relatively rare in collections and few have been taken in recent years. Perhaps, when more is known about their life history and host preferences, more specimens will be collected.

Specimens examined. We have examined a total of 91 specimens, 55 of which are from Kentucky, but none from Illinois.

This is the first in a series of 3 papers covering the Erotylidae of Illinois. We would be pleased to examine and identify any New World members of the family to add to our seasonal and distributional data.

ACKNOWLEDGMENTS

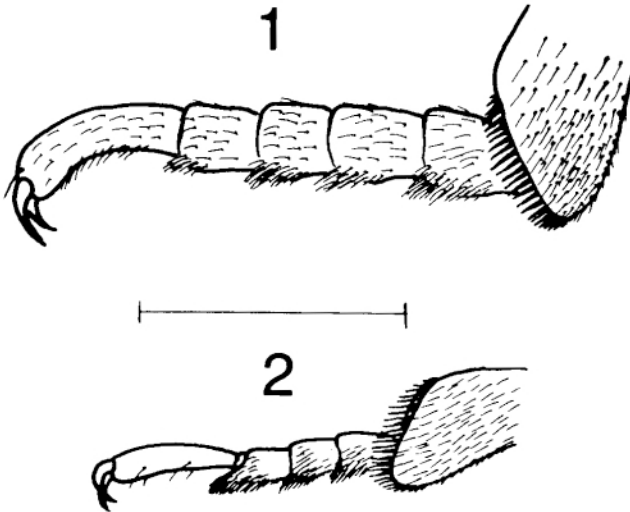
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Figures 1 & 2. Right metatarsus of adult. (Line = 1.00 mm.)
 Dacninae - *Megalodacne fasciata* (Fig.1)
 Tripacinae - *Ischyryus quadripunctatus* (Fig. 2)



Figures 3 & 4. Left maxillary palp of adult. (Line = 0.25 mm.)
 Dacninae - *Megalodacne fasciata* (Fig. 3)
 Tripacinae - *Ischyryus quadripunctatus* (Fig. 4)

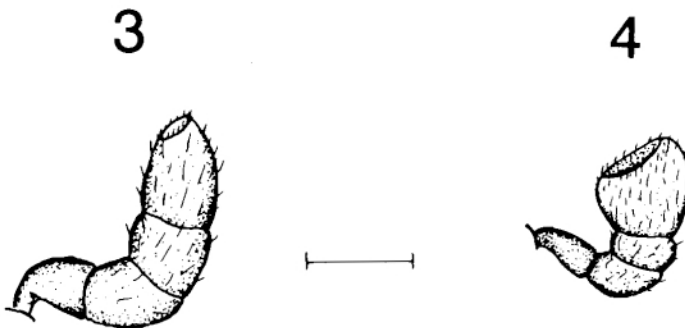


Figure 5. Dorsal habitus of *Dacne quadrimaculata* (Say).
(Line = 1.0 mm.)

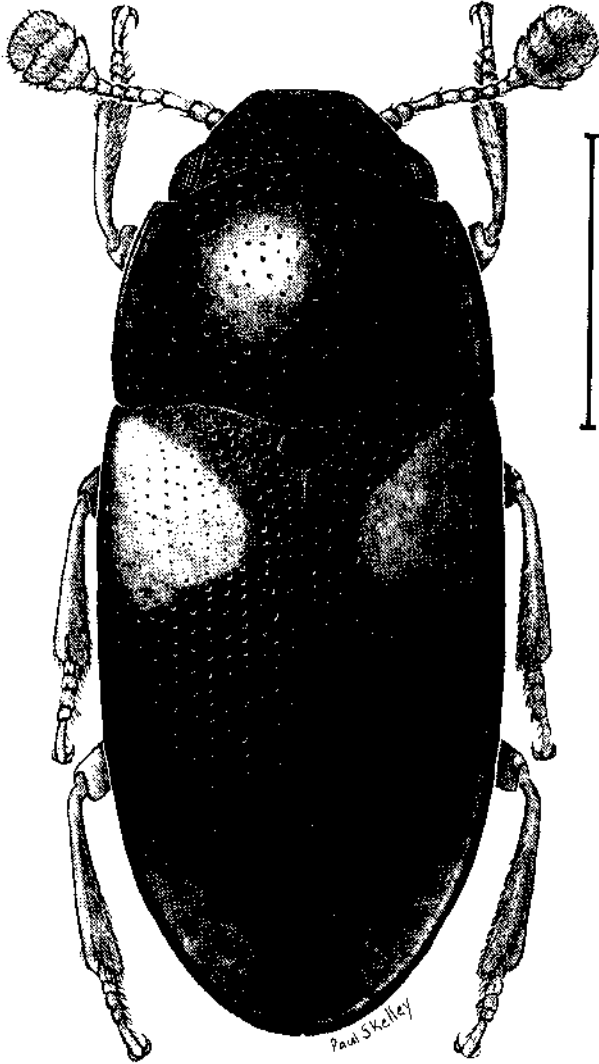


Figure 6. Distribution in Illinois of *Dacne quadrimaculata* (Say).

● = Locality of specimens seen by the authors.

○ = Localities reported by Boyle (1956).

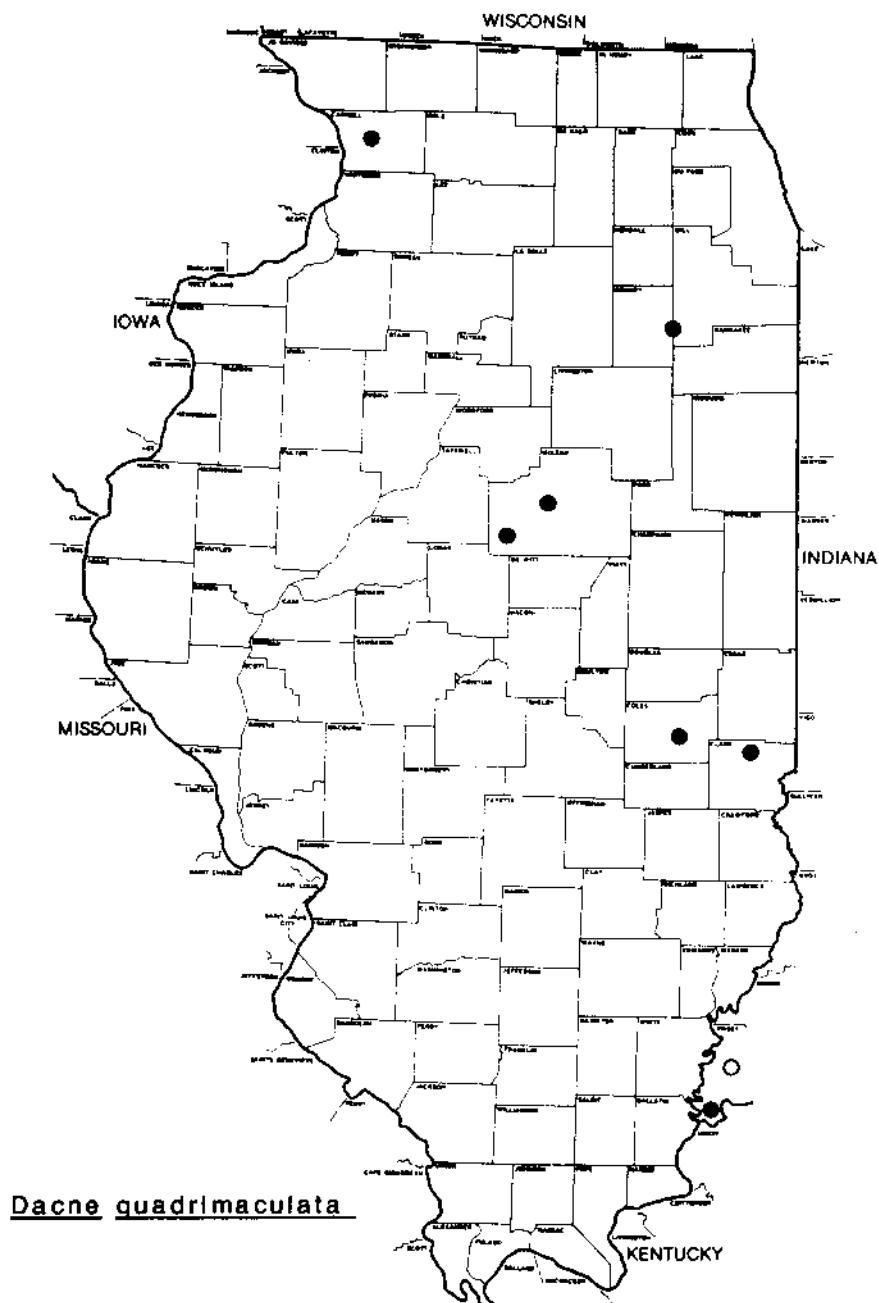


Figure 7. Dorsal habitus of *Megalodacne fasciata* (Fabricius).
(Line = 6.0 mm.)

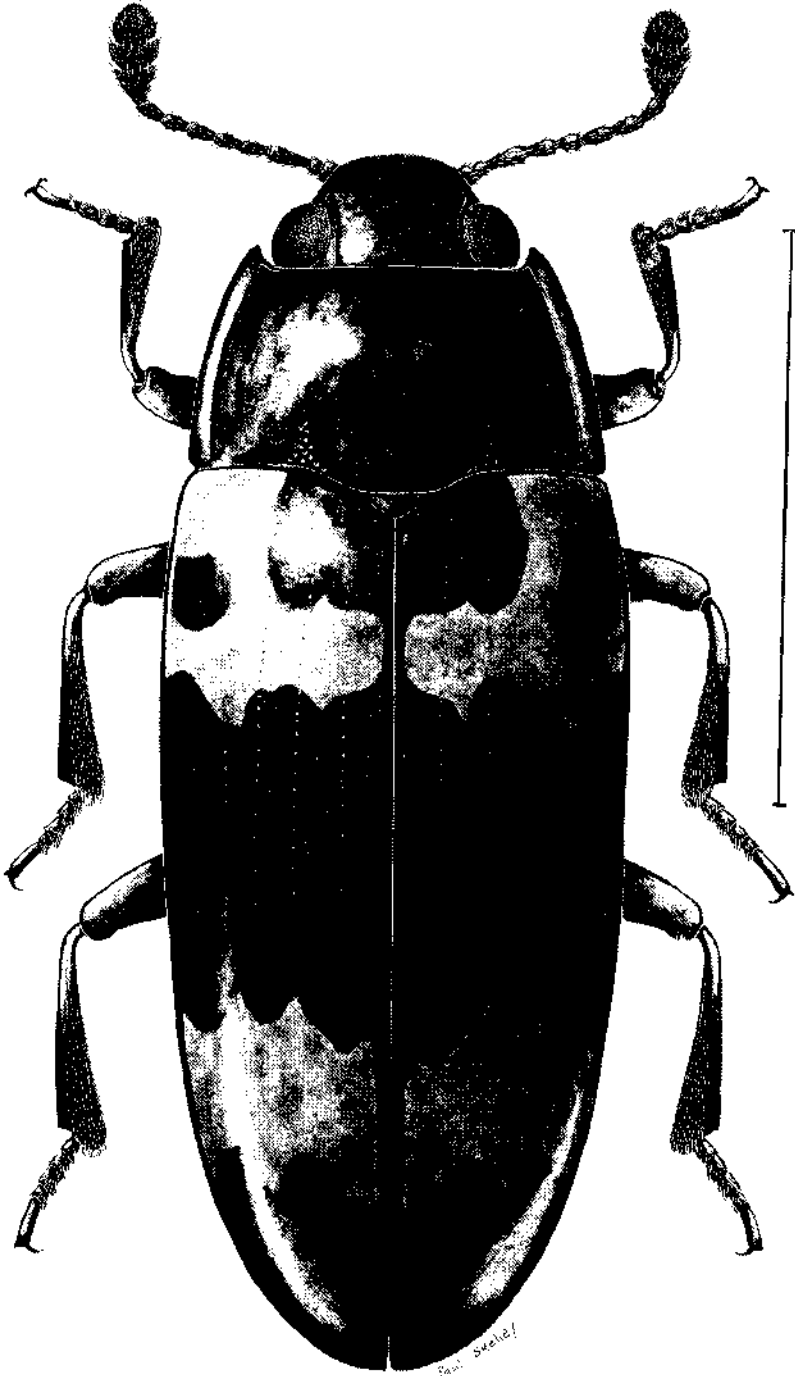


Figure 8. Distribution in Illinois of *Megalodacne fasciata* (Fab.).

● = Locality of specimens seen by the authors.

○ = Localities reported by Boyle (1956).

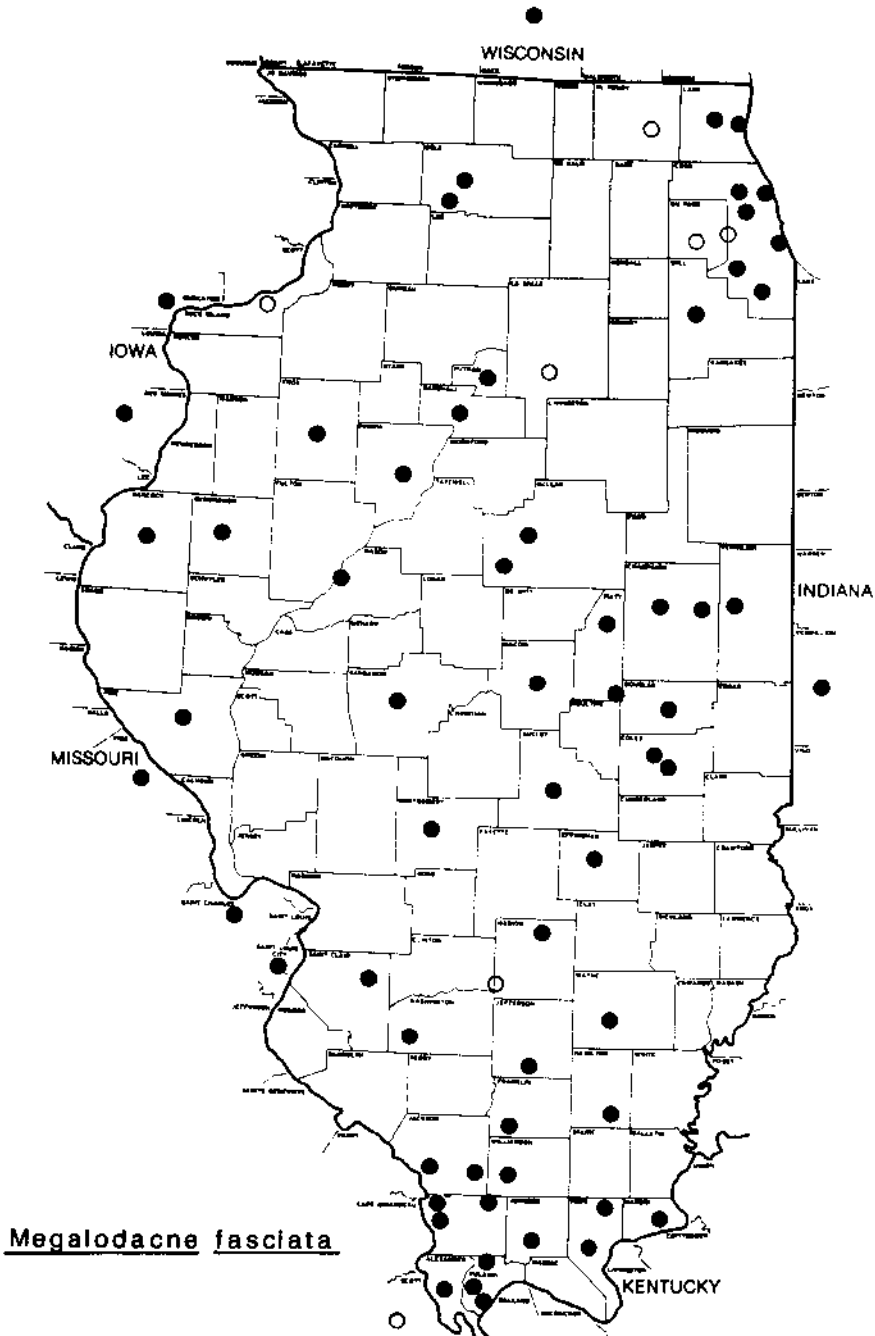


Figure 9. Dorsal habitus of *Megalodacne heros* (Say).
(Line = 8.0 mm.)



Figure 11. Dorsal habitus of *Microsternus ulkei* (Crotch).
(Line = 2.0 mm.)

