

**AGABUS (COLEOPTERA: DYTISCIDAE) LARVAE OF
SOUTHEASTERN UNITED STATES**

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Abstract.—Six newly associated larvae of the genus *Agabus*, *A. punctatus*, *A. aeruginosus*, *A. stagninus*, *A. erythropterus*, *A. seriatus*, and *A. obtusatus*, are described and a key to the known larval forms from southeastern United States is presented. Southeastern species of *Agabus* for which larvae are unassociated are briefly discussed.

The genus *Agabus* Leach is probably the largest and most complex non-hydroporine dytiscid genus in North America. Its distribution is primarily northern, however, and only 16 species occur in the southeastern states (Virginia, North and South Carolina, Georgia, Florida, Alabama, Mississippi, and Tennessee). Southeastern adults may be keyed with Michael and Matta (1977) or Brigham (1982). Michael and Matta omit *Agabus bifarius* (Kirby) and Brigham omits several principally northern species that are occasionally found in the Virginia and West Virginia mountains.

Larval *Agabus* are found in most vernal pools and in backwater areas of streams. They are fierce predators and while usually not the top predator in a system they are frequently the most numerous of the larger invertebrate predators. They frequently coexist with small fish and amphibian larvae and have been observed feeding on fish larvae.

The larvae of 10 North American *Agabus* have been described (James, 1969; Watts, 1970; Barman, 1972; Hilsenhoff, 1974) and 5 of these, *Agabus ambiguus* Say, *Agabus bifarius*, *Agabus confusus* (Blatchley), *Agabus disintegratus* Crotch, and *Agabus semivittatus* LeConte, occur in the southeast. In this paper six newly associated larvae are described and a key to the 11 known larval forms from southeastern United States is presented.

Five southeastern species remain to be associated. Three of these, *Agabus anthracinus* Mannerheim, *Agabus planatus* Sharp, and *Agabus taeniolatus* (Harris), are primarily northern in distribution and are rarely collected in the southeast. *Agabus gagates* Aubé and *Agabus johannis* Fall are common in the southeast and larval stages should be frequently encountered. Tentatively associated but un-reared specimens lead me to believe that both species will key to couplet 7.

METHODS

A method for rearing hydroporine larvae was presented by Matta and Peterson (1984). This method has worked equally well with larger larvae and was used in rearing the larvae described here.

Measurements were made with an ocular micrometer in a Wild M8 microscope at 10× (body length to the nearest 0.1 mm) or 50× (other measurements to the nearest 0.02 mm). When ratios are given for segmented appendages, the basal segment is given first and the value given in the ratio is the length in millimeters.

Abbreviations used in the descriptions for the placement of spines on the legs are: AV = anteroventral, PV = posteroventral, and D = dorsal, as proposed by Wolfe and Roughley (1984).

DIAGNOSIS FOR THIRD INSTAR LARVAE OF SOUTHEASTERN *AGABUS*

Color of integument yellowish white. Dorsal sclerites of abdomen peppered with black spots that mark the points of insertion of setae; spots densest on segments 6–8. Venter and legs yellowish white, legs with dark markings at base of coxae.

Head subquadrate, posterior fifth severely constricted, without a cervical ridge. Stem of epicranial suture more than half as long as head. Six ocelli located in an upright oval patch at anterior third of head. Antenna 4-segmented, inserted just in front of the ocelli. Maxillary stipe about 3 times as long as wide, with a short fingerlike projection on the inner apical angle.

Thorax with mesothoracic spiracles on membranous area, without pro- and metathoracic spiracles. Fore- and midlegs subequal in length; hindlegs longer, almost reaching last abdominal segment.

Abdomen with segments 7 and 8 completely sclerotized ventrally; segments 1–6 membranous ventrally; with spiracles on mesolateral margins of sclerotized areas of terga 1–6 and ventrolaterally on segment 7. Black setae relatively short and inconspicuous on anterior segments, becoming longer and more numerous on posterior segments.

Agabus punctatus Melsheimer

Third instar larvae.—Length 10.0 mm (not including cerci). Dorsal sclerites with a median and 2 sublateral brown stripes that become confluent and diffuse on abdominal segments 6–8; stripes with 1 or 2 variably placed light spots on thoracic segments and abdominal segments 1–5. Head with three temporal spines present laterally in an anteriorly descending line just anterior to the cervical constriction. Ocelli located on end of each lateral stripe. Antennal ratio 0.25:0.20:0.20:0.05; palpal ratio 0.20:0.25:0.20. Labium short, about 3 times as wide as long; palpal ratio 0.25:0.20. Thorax with no precoxal sclerite present. Swimming hairs present on all tarsi and tibia but fewer present on front legs. Chaetotaxy: protarsi, AV-0, PV-0, D-0; protibia, AV-2, PV-0, D-0; mesotarsi, AV-0, PV-0, D-0; mesotibia, AV-6, PV-1, D-0; metatarsi, AV-6, PV-0, D-3 to 4; metatibia, AV-7 to 9, PV-1, D-3 to 4. Margins of sclerotized areas of terga 1–6 and ventrolaterally on segment 7. Cerci about equal in length to eighth abdominal segment; 2-segmented, second short and spikelike; first segment with 3 long setae on basal fifth and 4 long setae at apex.

Described from 27 larvae (5 reared) collected from open temporary pools in The Great Dismal Swamp, Virginia, April 9 to June 1.

Agabus aeruginosus Aubé

Third instar larva.—Length 10.0 mm (not including cerci). Dorsal sclerites with a median and 2 sublateral brown stripes that become confluent and diffuse on abdominal segments 6–8; stripes with 1 or 2 variably placed light spots on thoracic segments and abdominal segments 1–5. Head with 3 temporal spines present laterally in an anteriorly descending line just anterior to the cervical constriction. Ocelli located on end of each lateral stripe. Antennal ratio 0.25:0.20:0.20:0.05. Maxillary palpal ratio 0.20:0.25:0.20. Labial palpal ratio 0.25:0.20. Thorax with no precoxal sclerite present. Swimming hairs present on all tarsi and tibia but fewer present on front legs. Chaetotaxy: protarsi, AV-0, PV-0, D-0; protibia, AV-2, PV-0, D-0; mesotarsi, AV-0, PV-0, D-0; mesotibia, AV-3 to 4, PV-1, D-2 to 3; metatarsi, AV-5 to 6, PV-0, D-3 to 4; metatibia, AV-6 to 7, PV-1, D-4. Cerci about equal in length to eighth abdominal segment; 2-segmented, second short and spikelike; first segment with 3 long setae on basal fifth and 4 long setae at apex.

Described from 6 larvae (1 reared) collected from open temporary pools in The Great Dismal Swamp, Virginia, February 13, March 14, and March 24.

Agabus stagninus Say

Third instar larva.—Length 11.2 mm (not including cerci). Dorsal sclerites brown, lighter laterally, with the posterior margins darker; light spots present on thoracic segments and abdominal segments 1–5. Prothorax with additional light spots on the disk. Head brown, mottled on posterior and posteriolateral margins; with a complex mottling on the anterior third which leaves a cruciform dark area medially. Head with four temporal spines present laterally in an anteriorly descending line just anterior to the cervical constriction. Antennal ratio 0.30:0.27:0.30:0.12. Maxillary palpal ratio 0.25:0.25:0.22. Labial palpal ratio 0.30:0.22. Prosternum with precoxal sclerite present. No swimming hairs present on tarsi and tibia. Chaetotaxy: protarsi, AV-0, PV-0, D-0; protibia, AV-0, PV-3, D-0; mesotarsi, AV-2, PV-0, D-0; mesotibia, AV-3, PV-1, D-0; metatarsi, AV-5, PV-0, D-0; metatibia, AV-5, PV-1, D-0. Cerci shorter than eighth abdominal segment, ratio 1.25:1.50; 2-segmented, second segment short and spikelike; first segment with 3 long setae on basal fourth and 4 long setae at apex.

Described from 10 larvae (reared). Larvae were collected from heavily shaded temporary pools in The Great Dismal Swamp, Virginia, March 11 to April 21. The pools were under loblolly pines and heavily littered with pine needles. Numerous isopods (*Asellus* sp.) and the larvae of *Laccornis difformis* (LeConte) (Coleoptera: Dytiscidae) were also collected from these pools.

Agabus erythropterus Say

Third instar larva.—Length 11.5 mm (not including cerci). Dorsal sclerites light brown, lighter laterally; light spots present on thoracic segments and abdominal segments 1–5. Prothorax with additional light spots on the disk. Head light brown, mottled on posterior and posterolateral margins; with a complex mottling on the anterior third which leaves a cruciform dark area medially. Six temporal spines present laterally in an anteriorly descending line just anterior to the cervical constriction. Antennal ratio 0.20:0.20:0.25:0.12. Maxillary palpal ratio 0.20:0.20:

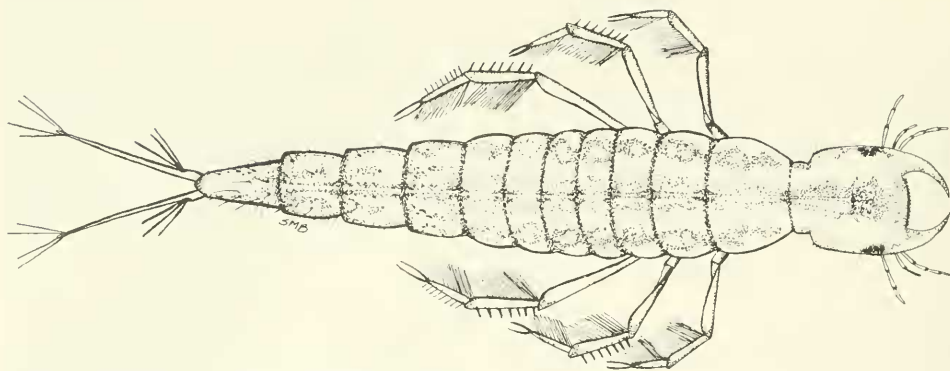


Fig. 1. *Agabus punctatus*, habitus, dorsal view.

0.12. Labial palpal ratio 0.20:0.12. Hindleg almost reaching sixth abdominal segment; no swimming hairs present on tarsus and tibia. Chaetotaxy: protarsi, AV-0, PV-0, D-0; protibia, AV-0, PV-2 to 3, D-0; mesotarsi, AV-2, PV-2, D-0; mesotibia, AV-1, PV-1, D-0; metatarsi, AV-3 or 4, PV-2, D-0; metatibia, AV-3 or 4, PV-1, D-0. Cerci longer than eighth abdominal segment, ratio 2.00:1.60; 2-segmented, second segment short and spikelike; first segment with 3 setae on basal fourth, reaching to the midpoint of cerci, and 4 long setae at apex.

Described from 4 larvae (1 reared). Larvae were collected from grassy areas of an open marshy pool in Pendleton Co., West Virginia, July 21, 1983.

Agabus seriatus Say

Third instar larva.—Length 10.5 mm (not including cerci). Dorsal sclerites brown; light spots present on thoracic segments and abdominal segments 1–5. Prothorax with additional light spots on the disk. Head light brown, mottled on posterior and posteriolateral margins; with a complex mottling on the anterior third which leaves a cruciform dark area medially. Five temporal spines present laterally in an anteriorly descending line just anterior to the cervical constriction. Antennal ratio 0.35:0.32:0.32:0.16. Maxillary palpal ratio 0.35:0.35:0.30. Labial palpal ratio 0.50:0.30. Prosternum with precoxal sclerite present. No swimming hairs present on tarsi and tibia. Chaetotaxy: protarsi, AV-3, PV-3, D-1; protibia, AV-4, PV-0, D-1; mesotarsi, AV-3, PV-3, D-2; mesotibia, AV-3, PV-3, D-2; metatarsi, AV-5 or 6, PV-3 or 4, D-3 or 4; metatibia, AV-5 or 6, PV-4, D-3 or 4. Cerci longer than eighth abdominal segment, ratio 1.50:1.20; cerci 2-segmented, second segment short and spikelike; first segment with 3 long setae on basal fourth, reaching beyond the midpoint to cerci, and 4 long setae at apex.

Described from 6 larvae (1 reared). Larvae were collected from a weed- and algae-choked stream, Seneca, New York, July 26, 1982. Many adult *A. seriatus* have been collected in Virginia and West Virginia, but larvae have not been collected in the southeast.

Agabus obtusatus Say

Third instar larvae.—Length 10.5 mm (not including cerci). Dorsal sclerites brown; light spots present on thoracic segments and abdominal segments 1–5.

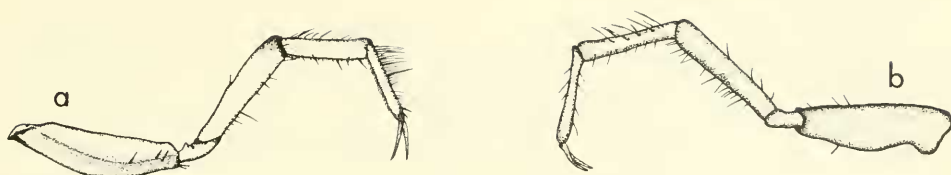


Fig. 2. a, Midleg of *Agabus punctatus*, anterolateral surface. b, Hindleg of *Agabus disintegratus*, posterolateral surface.

Prothorax with additional light spots on the disk. Head brown, mottled on posterior and posteriolateral margins; with a complex mottling on the anterior third which leaves a cruciform dark area medially. Seven temporal spines present laterally in an anteriorly descending line just anterior to the cervical constriction. Antennal ratio 0.25:0.25:0.25:0.12. Maxillary palpal ratio 0.25:0.20:0.20. Labial palpal ratio 0.35:0.25. Prosternum with precoxal sclerite present. No swimming hairs present on tarsi and tibia. Chaetotaxy: protarsi, AV-0, PV-0, D-0; protibia, AV-3, PV-1, D-0; mesotarsi, AV-0, PV-0, D-0; mesotibia, AV-2, PV-0 to 1, D-0; metatarsi, AV-2, PV-1, D-1 to 2; metatibia, AV-4, PV-2, D-1 to 2. Cerci shorter than eighth abdominal segment, ratio 1.80:1.40; 2-segmented, second segment short and spikelike; first segment with 3 setae on basal fourth and 4 setae at apex.

Described from 2 larvae (1 reared). Larvae were collected from an alpine meadow, Dolly Sods, West Virginia, 5 May 1974 and from a marshy stream margin, Greenbrier Co., West Virginia, June 18, 1983.

KEY TO THE KNOWN *AGABUS* LARVAE OF SOUTHEASTERN UNITED STATES

1. Cerci $\frac{1}{3}$ length of last abdominal segment. *bifarius*
- Cerci $\frac{1}{2}$ length of last abdominal segment or longer 2
2. Cerci with many secondary hairs in addition to the 7 primary hairs *confusus*
- Cerci with only 3 basal and 4 apical primary hairs 3
3. Long swimming hairs present on all legs 4
- Swimming hairs absent from all legs although long spines may be present 5
4. Midtibia with 3–4 anteroventral, 1 posteroventral and 2–3 dorsal spines *aeruginosus*
- Midtibia with 6–7 anteroventral and 1 posteroventral spines, without dorsal spines (Fig. 2a) *punctatus*
5. Cerci longer than twice length of last abdominal segment; mid- and hindtibia with 3–5 long dorsal setae (Fig. 2b) that are longer than twice the width of the tibia *disintegratus*
- Cerci less than twice length of last abdominal segment; if dorsal setae present then they are shorter than tibial width, and usually fewer than 3 6
6. Cerci less than or equal to length of last abdominal segment 7
- Cerci distinctly longer than last abdominal segment 8
7. Abdominal segment 6 completely sclerotized; cerci with setae on basal third; piedmont and mountain species (Based on Barman, 1972. I have not seen the larva of this species.) *ambiguus*

- Abdominal segment 6 not completely sclerotized; cerci with 3 setae on basal third; coastal plain species *stagninus*
- 8. Hindtibia and hindtarsus with dorsal setae 9
- Hindtibia and hindtarsus without dorsal setae 10
- 9. Head with distinct cervical ridge; hindtarsus with 2 anteroventral spines *obtusatus*
- Head without cervical ridge; hindtarsus with 5-6 anteroventral spines *seriatus*
- 10. Head with distinct cervical ridge *semivittatus*
- Head without cervical ridge *erythropterus*

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