

## A Revision of the Genus *Ametropus* in North America (Ephemeroptera: Ametropidae)<sup>1</sup>

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### ABSTRACT

A new species of *Ametropus* is described and compared with existing North American species.

The following treatment includes a characterization of the genus *Ametropus*, a description of the male and female adult and nymphal stages, a key to the species, and the known distributional limits and biology of the species.

### Genus *Ametropus* Albarda

*Ametropus* Albarda 1878:129.

Type species: *Ametropus fragilis* Albarda.

The genus *Ametropus* includes five described species: *Ametropus fragilis* Albarda, 1878, from Europe; *A. eatoni* Brodskij, 1930, from Europe and Asia; and *A. neavei* McDunnough, 1928, *A. albrighti* Traver, 1935, and *A. ammophilus* n. sp. from western North America. The nymph referred to as *Ametropus* sp. by Behning (1932) is that of *A. eatoni* Brodskij.

### IMAGOS

Compound eyes entire; male eyes large; female eyes smaller; ocelli prominent both sexes. Pronotum well-developed, constricted at midline, expanded laterally; fore legs male 65% as long as fore wings; fore femora male longer than fore tibiae; fore femora and fore tibiae male 60% as long as fore tarsi; fore tarsomeres male in descending order of length: 1, 3, 2, 4, 5; middle and hind femora male longer than tibiae; middle and hind tibiae male longer than tarsi; fore legs female 30% as long as fore wings; fore legs female shorter than middle and hind legs; femora female longer than tibiae; tibiae shorter than tarsi; tarsi longer than femora; tarsal claws both sexes dissimilar; fore wings with two pairs cubital intercalaries, fore pair longer and attached basally to Cu<sub>2</sub>; fore wing with anal vein attached to hind margin

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by veinlet series (Fig. 6a); hind wing well-developed; hind wing costal angulation acute (Fig. 6b). Forceps male 4-segmented (Figs. 3-4); forceps in descending order of length, base to apex: 2, 1, 3, 4; penes bluntly pointed at apex, without armature (Figs. 3-5). Median terminal filament both sexes nearly as long as cerci.

#### NYMPHS

Head hypognathus, nearly square dorsal aspect; compound eyes large in male, small in female; lateral ocelli prominent both sexes. Labrum with median, round emargination, and submedian and marginal setae (Fig. 16); mandibles with well-developed canines and marginal setae (Figs. 11-12); maxillae slender, maxillary palpi 3-segmented and longer than maxilla (Fig. 14); labial palpi 3-segmented, basal segment large, distal segment short and conical (Fig. 13); hypopharynx wider than long (Fig. 15). Pronotum well-developed, produced laterally; pronotum constricted at midline, lateral margins twice as long as midline suture; mesonotum with paired anterolateral projections, each separated from mesonotum by small slit (Figs. 1-2); legs slender; fore legs much shorter than middle and hind; fore coxae with spinous pad attached to base (Fig. 9); claw fore leg with long spinelike denticles (Fig. 9); fore femora and fore tarsi length subequal; fore tibiae and fore claws length subequal; fore femora and fore tarsi 30% longer than fore tibia and fore claw; middle and hind legs wider than fore leg; tarsal claws middle and hind legs without denticles (Fig. 10). Abdomen flattened, slightly convex dorsally; single ovate gill lamellae on segments 1-7; gills smallest segments 1 and 7, subequal segments 2-6; segments 1-7 expanded laterally with gills inserted at apex of lateral expansions; segments 8-9 with small posterolateral spines; tergum 10 rounded posteriorly. Caudal filaments less than half body length; median terminal filament and lateral cerci length subequal; caudal filaments with long setae on both sides, shorter outer side of cerci; spine rows at apex each segment.

#### SYSTEMATICS

The following key will serve to distinguish the nymphs and imagoes of the North American species of *Ametropus*. All specimens examined by the authors are deposited in the University of Utah collection, Salt Lake City, unless otherwise designated.

#### KEY TO THE SPECIES

1. Abdominal terga 2-8 brown with complex dark brown pattern (Figs. 2, 7); head and body usually greater than 22 mm in length; male penes with median cleft (Figs. 4-5); distribution Pacific Northwest and Montana (Fig. 17) -----  
*ammoophilus*

- Abdominal terga 3–7 pale with triangular- or inverted T-shaped dark brown markings (Figs. 1, 8); head and body usually less than 18 mm in length; male penes entire, without median cleft (Fig. 3); distribution Canada or Colorado River drainage ..... 2
2. (1) Abdominal terga 5–7 with inverted T-shaped markings (Fig. 1); adult mesonotum light brown; head and body usually less than 16 mm in length; distribution Alberta and Saskatchewan (Fig. 17) ..... *neavei*
- Abdominal terga 5–7 with triangular-shaped markings (Fig. 8); adult mesonotum dark chocolate brown; head and body usually greater than 17 mm in length; distribution Colorado River drainage (Fig. 17) ..... *albrighti*

*Ametropus albrighti* Traver

*Ametropus albrighti* Traver 1935:431; Edmunds and Musser, 1960:117.

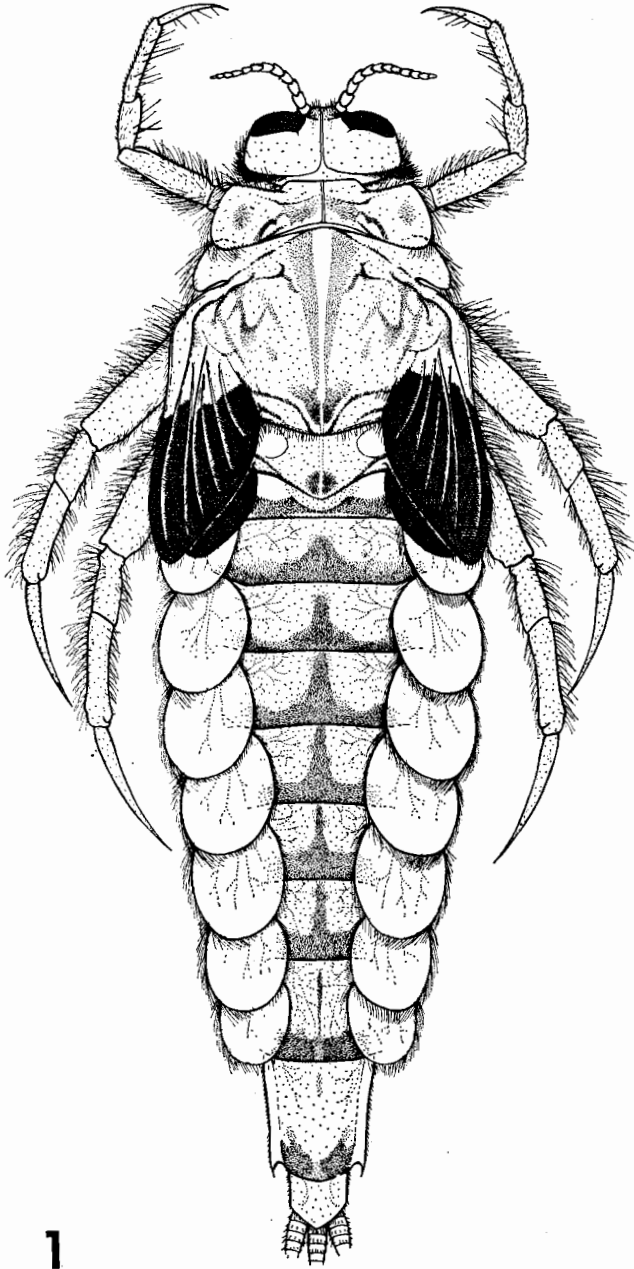
Type locality: San Juan River near Farmington, New Mexico.

Type: No. 1350.3–13, Cornell University, Ithaca; New York.

This species was described from a small series of nymphs collected during the months of October and November in a large, slow-flowing, heavily silted river. The male imago and female subimago are described herein for the first time.

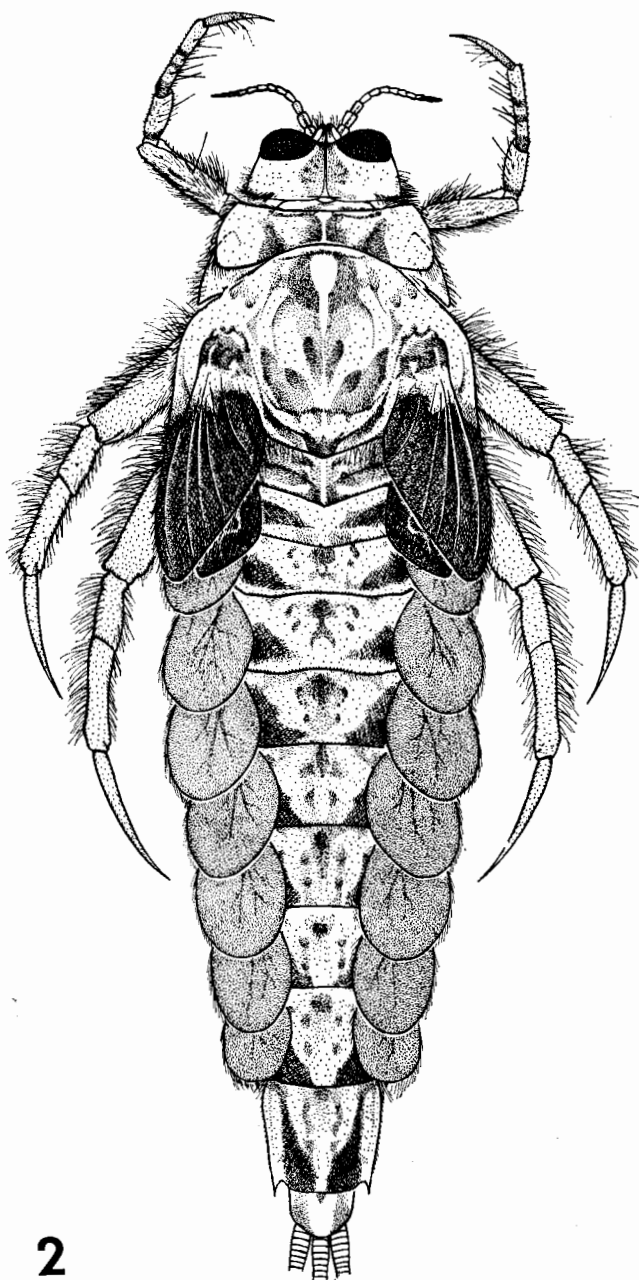
Male imago: Length: body 17–18 mm; fore wing 13–14 mm. General color pale with brown markings. Head dark brown dorsally, pale ventrally; ocelli pale, brown basally; antennae brown; compound eyes pale above, dark below. Thorax dark brown; pronotum dark brown; mesonotum dark chocolate brown; prescutum pale; scutum brown; posterolateral portion dark brown; scutellum and post scutellum dark brown; sclerites mesopleuron brown; mesosternum brown; fore legs brown, base femora pale; middle and hind legs pale with brown markings; middle and hind femora pale basally, light brown apically; middle and hind tibiae and tarsi pale with narrow apical dark brown ring; wings hyaline; wing base with dark brown spot. Abdominal segments pale with dark brown and rose-colored markings; tergum 1 dark brown; tergum 2 pale with wide dark brown posterior band; terga 3–8 pale with dark brown inverted T-shaped markings, posterior band and median longitudinal stripe, median dark brown stripe more pronounced posteriorly as in Fig. 1; tergum 10 pale; abdominal segment 9 with narrow lateral flange; abdominal sterna pale with diffused rose-colored marking in middle each segment; penes fused, round apically (Fig. 3); forceps base deeply emarginate (Fig. 3); subgenital plate with black longitudinal stripes along lateral margins. Caudal filaments pale.

Female subimago: Length: body 16–17 mm; fore wing 12–13 mm. General color pale with reddish-brown markings. Head pale, with



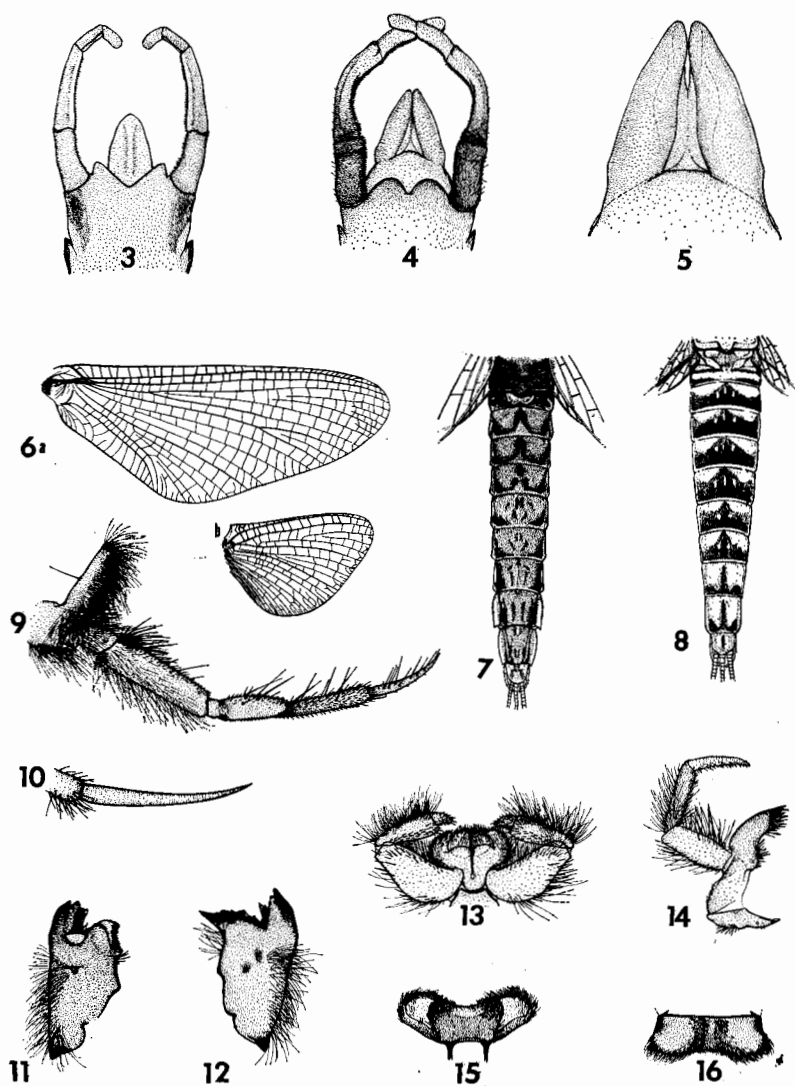
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FIG. 1. *Ametropus albrighti*, mature male nymph, dorsal view.



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FIG. 2. *Ametropus ammophilus*, mature female nymph, dorsal view.



FIGS. 3-8. Adult structures of *Ametropus*. 3. *A. albrighti*, male genitalia. 4. *A. ammophilus*, male genitalia. 5. *A. ammophilus*, penes. 6. *A. ammophilus*, wings. 7. *A. ammophilus* abdomen, dorsal view. 8. *A. neavei*, abdomen, dorsal view. FIGS. 9-16. Nymphal structures *A. ammophilus*. 9. Fore leg. 10. Claw, middle leg. 11. Left mandible. 12. Right mandible. 13. Labium. 14. Maxilla. 15. Hypopharynx. 16. Labrum.

median brown stripe along occipital suture. Thorax pale, except three black macula on mesopleuron. Abdominal terga 1-9 reddish brown. Other characters as in male except for usual sexual differences.

Mature nymph: Length: body 18-19 mm; caudal filaments 7-8 mm. General color pale with brown markings. Head pale with light brown markings on occiput. Thorax pale with brown markings; pronotum pale with submedian and sublateral brown markings; mesonotum with submedian longitudinal stripes and posterior brown macula; metanotum with posterior brown macula; legs pale. Abdominal terga pale with dark brown markings; tergum 1 dark brown; terga 2-8 pale with dark brown inverted T-shaped markings, posterior band with median longitudinal stripe, stripe longer and narrower posteriorly (Fig. 1); tergum 9 pale with paired dark brown submedian macula; tergum 10 pale; abdominal segment 9 with short posterolateral spines; abdominal gills pale; abdominal sterna pale with diffuse light brown marking in middle each segment. Caudal filaments pale.

#### DISTRIBUTION

*Ametropus albrighti* is known from medium to large tributaries of the Colorado River in southwestern Wyoming, eastern Utah, northwestern Colorado and northern New Mexico (Fig. 17). The following localities are representative of specimens examined:

COLORADO: Moffat Co., Yampa River, Deerlodge Park, Dinosaur National Monument, 1-VIII-62, D. Q. Anderson. UTAH: Daggett Co., Green River, Hideout Canyon, 5-VI-60, G. F. Edmunds, Jr., & G. G. Musser; Uintah Co., Green River, Jensen, 5-V-63, G. F. Edmunds, Jr., S. L. Jensen, & W. L. Peters; Green River at Ouray, 2-V-69, G. F. Edmunds, Jr., White River, 2 mi S Ouray, 12-X-74, B. Stark & T. Wolff. WYOMING: Sweetwater Co., Blacks Fork River at Interstate Highway 80, W of Green River (City), 6-VII-68, R. & D. Koss (reared); Green River at Green River (City), 5-VI-63, W. L. Peters.

#### BIOLOGY

The nymphs live in large rivers buried in firm, slightly silty, patches of sand with relatively strong water currents. The sand surface is firm and smooth. The nymphs are found frequently in sandy strips paralleling the shore or in sand bars 1-4 ft wide. In the Blacks Fork River from Granger, Wyoming to Interstate 80, 15 or more nymphs per square meter are found in some parts, but usually they are less common.

They are strong swimmers, and swim with the middle and hind legs trailing to the sides and the fore legs in front of the head. They settle into the sand until only the gills and the eyes protrude, but sometimes the gills and dorsum are faintly visible. The coxal pads are pressed to the sand and appear to function to help the nymph

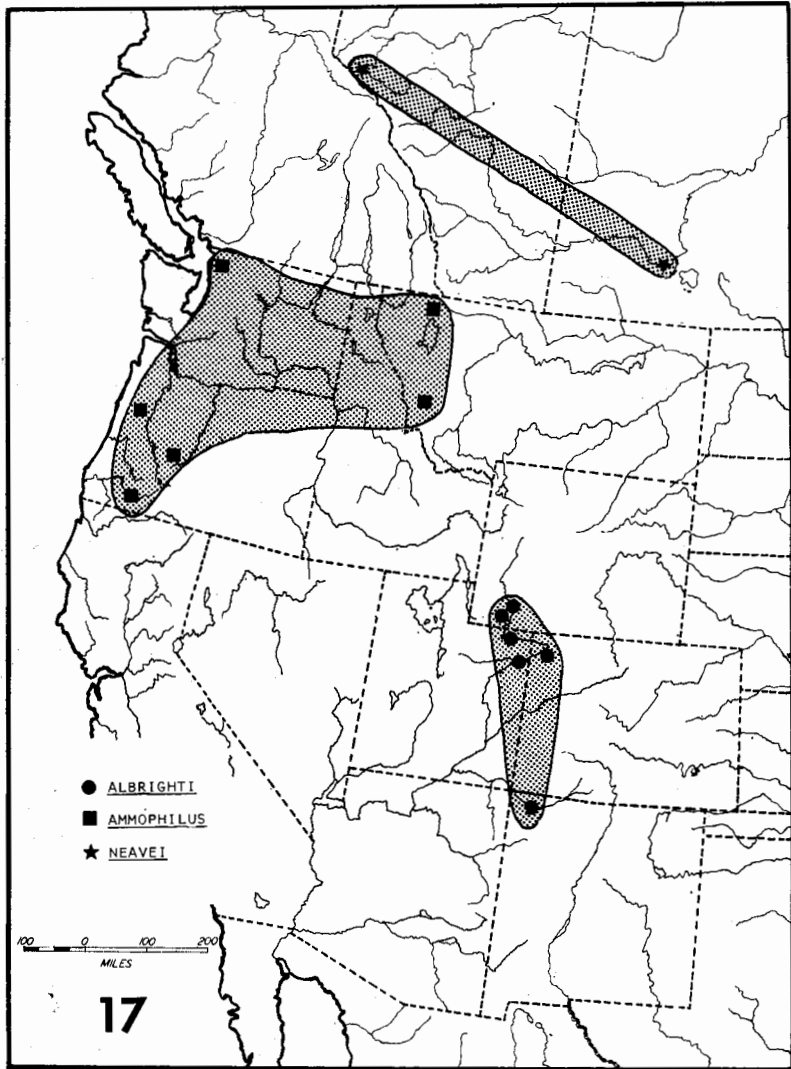


FIG. 17. Distribution of *A. albrighti*, *A. neavei*, and *A. ammophilus*.

maintain its position. The fore legs constantly groom the frons and antennae. Food appears to consist of the microbiota, principally algae that are found interstitially in the sand. In the laboratory, nymphs continued to grow from September to May on food in the sand brought



from the natural habitat. Continuous lighting was necessary for growth of the algae.

*A. albrighti* requires almost one year for development. Young nymphs appear shortly after the adults emerge and are mature the next year. The nymphs are highly variable in size indicating an emergence period of a month or more.

*Ametropus neavei* McDunnough

*Ametropus neavei* McDunnough 1928:9.

Type locality: Old Fort Point, Athabasca River, Jasper Park, Alberta, Canada.

Type: No. 2664, Canadian National Collection, Ottawa.

*Ametropus neavei* was described from a single female imago collected in late July. Descriptions of the male imago and nymphal stages are included herein.

Male imago: Length: body 15–16 mm; fore wing 14–15 mm. General color pale to light brown with dark brown markings. Head pale, dark around ocelli; antennae pale; compound eyes pale above, dark below. Thorax pale to light brown, mesonotum light brown; legs pale, femora and tibiae brown; wings hyaline. Abdominal segments pale with dark brown markings; tergum 1 with posterior marginal brown band; terga 2–7 with median triangular-shaped macula (Fig. 8), with small pale submedian dots; terga 8–9 with median longitudinal dark brown stripe and dark brown posterior margins; tergum 10 pale with small dark brown median macula; abdominal segments 8–9 with moderately developed lateral flanges; abdominal sterna pale; penes fused, rounded apically as in Fig. 3; forceps base deeply emarginate as in Fig. 3; subgenital plate pale. Caudal filaments pale.

Female imago: All characters as in male except for usual sexual differences.

Mature nymph: Length: body 14–15 mm; caudal filaments 6–7 mm. General color pale with dark brown markings. Head pale suffused with brown, occiput with diffused brown macula. Thorax pale, diffused with brown; legs pale. Abdominal terga pale with dark brown markings; tergum 1 with posterior marginal brown band; terga 2–7 with median triangular-shaped macula as in Fig. 8, with small pale submedian dots; terga 8–9 with median longitudinal dark brown stripe and dark brown posterior margins; tergum 10 pale with small dark brown median macula; abdominal segment 9 with short posterolateral spines; abdominal gills pale; abdominal sterna pale. Caudal filaments pale.

DISTRIBUTION

*Ametropus neavei* is known from only the type locality in Alberta and the following locality in Saskatchewan (Fig. 17):

SASKATCHEWAN: North Saskatchewan River, Highway 5, Borden, 4-IV/31-V-74 (reared), R. Demaray.

*Ametropus ammophilus*, new species

*Ametropus* sp. Allen and Edmunds, 1956:86.

Male imago: Length: body 25–26 mm; fore wing 21–22 mm. General color brown with dark brown and rose-colored markings. Head dark brown; ocelli pale; antennae pale; compound eyes pale above, dark below. Thorax dark brown; pronotum dark brown with pale lateral margins; mesonotum dark brown; mesopleuron sclerites dark brown; mesosternum dark brown; fore legs brown, pale distally; middle and hind legs pale; wings hyaline. Abdominal segments brown with dark brown and rose-colored markings; tergum 1 brown; terga 2–10 with complex dark brown pattern (Fig. 7); abdominal segments 8–9 with moderately developed lateral flanges; abdominal sterna rose-colored anteriorly, light brown to pale posteriorly; penes with median cleft in apical portion (Fig. 5); forceps base with submedian rounded protuberances with median, shallow emargination (Fig. 4). Caudal filaments broken.

Female imago: Length: body 25–26 mm; fore wing 21–22 mm. All characters as in male except for usual sexual differences.

Mature nymph: Length: body 22–24 mm; caudal filaments 6–8 mm. General color brown with dark brown and rose-colored markings. Head pale, vertex with numerous irregular small dark brown spots; frons with two dark brown stripes originating at antennae base and continuing anteromedially to dark brown transverse band at labrum base; antennae brown. Thorax light brown with dark brown markings; pronotum brown with two small dark brown submedian maculae and two larger dark brown sublateral maculae; mesonotum light brown with complex pattern of dark brown markings; coxae and trochanters pale; fore femora with median transverse brown band; fore tarsi with two median and one basal transverse brown bands; fore claws brown at base, pale apically; middle and hind femora, tibiae, tarsi and claws pale. Abdominal terga brown with complex pattern of dark brown (Fig. 2); abdominal segment 9 with moderate lateral flange; abdominal segments 8–9 with short posterolateral spines; abdominal gills rose-colored; abdominal sterna rose-colored. Caudal filaments pale at base, dark at apex.

Types: Holotype: male imago, Nooksack River at Lyndon, Whatcom Co., Washington, 10-V-67, K. E. Vander Mey. Paratopotypes: 3 female imagoes, 1 male imago, 4 male subimagoes, 2 female subimagoes, 4 nymphs, and 9 nymphal cast skins, 6-X-66, 9-V/25-V-67, other data same as holotype. Paratypes: 3 nymphs, small stream at Lapine, Deschutes Co., Oregon, 18-IV-64, M. O. Roberts; 1 nymphal cast skin, Rogue River at junction State Highways 230 and 62, Jackson Co., Oregon 24-VIII-54, G. F. Edmunds, Jr., & R. K. Allen; 1 female

imago, Mary's River, Benton Co., Oregon, 14-V-35, R. Koski, in collection Oregon State University, Corvallis; 1 nymph, Swan River, 4 mi S Swan River City, Lake Co., Montana, 12-VII-65, J. L. Parker; 1 nymph, Bitterroot River, Missoula, Missoula Co., Montana, 14-II-65, B. Mitchell.

#### BIOLOGY

Nymphs of *A. ammophilus* are restricted to moderate to large, fast-flowing, clear streams between 400 and 3700 ft elevation. A single mature nymph with black wing pads was taken from the Swan River, a fast-flowing stream between 30 and 40 ft in width, 1-2 ft in depth near the bank, and over 6 ft deep in the channel. The bottom was composed of sand with scattered rocks from several inches to over one ft in diameter. The nymphs live in the sand. Summer daytime water temperatures varied between 54°-58°F.

A swarm of adults, thought to be this species, were observed over this same stream. They were flying 15 to 20 ft over the river in the afternoon of a sunny day in mid-July. Male and female imagoes were reared in northern Washington in May, and a single female imago was also collected in May near Mary's River in western Oregon. It appears that the adults emerge earlier in the season from coastal streams than from interior areas.

#### ACKNOWLEDGMENTS

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