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A BRIEF REVIEW OF THE GENUS *POLYPEDILUM* IN OHIO, WITH KEYS TO KNOWN STAGES OF SPECIES OCCURRING IN NORTHEASTERN UNITED STATES (DIPTERA, CHIRONOMIDAE)[1]

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ABSTRACT. Of the 25 species recorded for the northeastern states, only four are abundant: *Polypedilum scalaenum,* with larvae occurring commonly among algae in streams and lotic situations in lakes; *P. convictum,* highly variable, with larvae occurring widely in rocky streams and in lake localities subject to wave action; *P. halterale,* sometimes regarded as a nuisance species and a pioneer in silting new reservoirs, present in shallower water of eutrophic lakes and ponds; and *P. illinoense,* with larvae commonly associated with vegetation (*Potamogeton, Nelumbo, Myriophyllum,* moss) in relatively quiet and unpolluted water. Less abundant but present in Ohio are the following: *P. albicorne, P. tritum, P. sordens, P. fallax, P. calopterus, P. ontario, P. albinodus, P. acifer, P. trigonus, P. ophioides* and *P. aviceps.* Not yet recorded for Ohio are *P. nubeculosum, P. laetum, P. braseniae, P. artifer, P. apicatum, P. parvum, P. gomphus, P. vibex, P. pedatum* and *P. angustum.* Adults of *Polypedilum* have been collected from May to October in Ohio. Larvae vary from pale yellow to bright red and occupy a wide range of habitats from swift streams to ponds and leaf litter. Generally they form silken tubes in silt or sand or in plant tissues, feeding principally on plankton but larvae are known to occupy cases of caddisworms. Typically late-instar larvae overwinter. Larvae show a wide range of response to organic and industrial pollution. Immatures for 14 of the 25 northeastern species are known.

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INTRODUCTION

Authorities disagree with respect to the limits of the genus *Polypedilum.* In the current paper a conservative view has been adopted. Species with hairy wings are easily separated from the rest and have commonly been placed in *Pentapedilum* as a genus or subgenus. Unfortunately, study of immatures lends little support for this arrangement. Some workers, following Townes (1945), have recognized *Tripodura* as a subgenus or even as a genus but general acceptance has been less than enthusiastic. The placement of R_{2+3} in relation to R_1 seems to be too variable and elusive to be significant and useful. Division into subgenera should be supported by features of immatures as well as by those of adults. Until our information on larvae and pupae is more complete, subdivision of *Polypedilum* should probably be postponed. Adults may be characterized as follows: ♂ antennae 14-segmented, ♀ 6-segmented; frontal tubercles absent; acrostichals upright; R_{2+3} rather indistinct, parallel with R_1 apically or somewhat divergent (figs. 1, 6 and 7); fCu under radial end of rm to distinctly beyond rm; squamae fringed; mid tibia with posterior and hind tibia with anterior comb provided with an elongate spine, other comb in each case unarmed (fig. 2); abdomen not scarred above.

Relatively little is known about the detailed life history of the various species of *Polypedilum.* Soponis (1983) studied emergence patterns of several species in Florida. It is apparent that these patterns vary greatly, even within a species, and that they are modified by the degree to which an environment is favorable or unfavorable. Species with a wide geographic distribution may be expected to show marked

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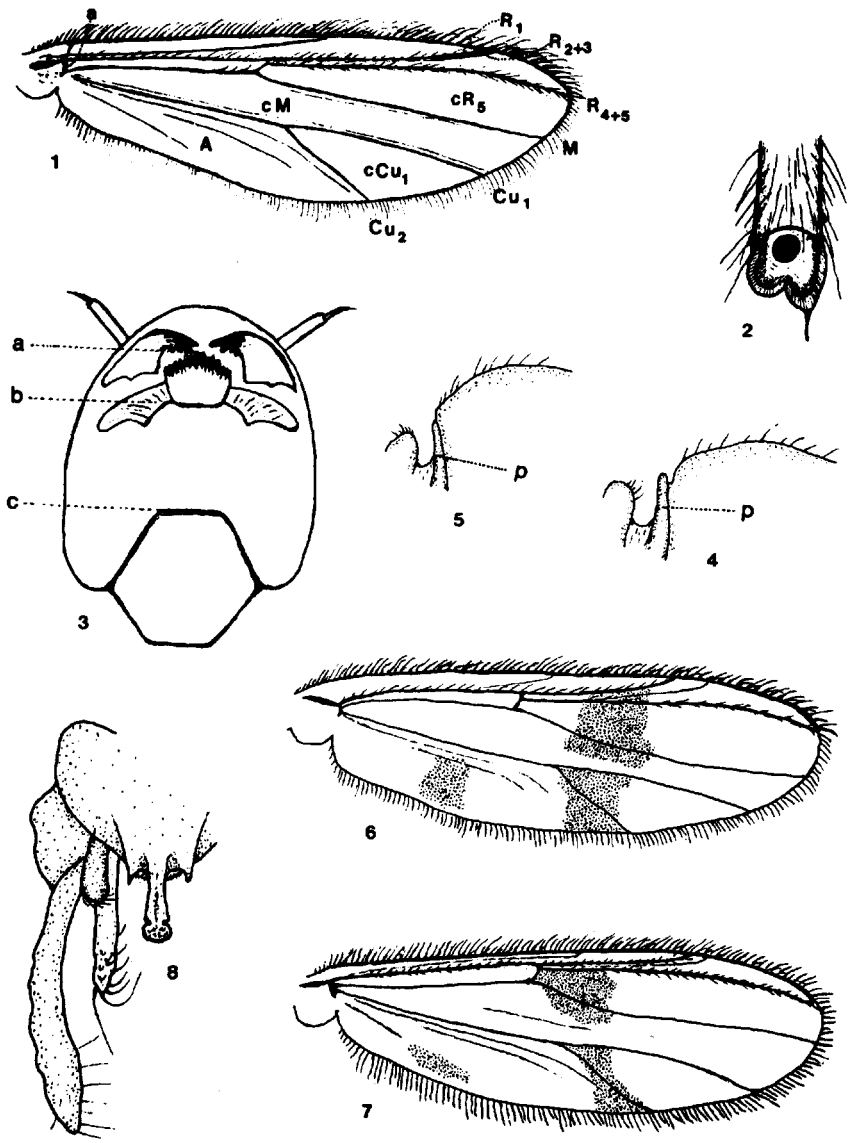


FIGURES 1–8. *Polypedilum,* details. 1. Wing, veins and cells. 2. *P. ontario,* apex of hind tibia. 3. Larval head, diagrammatic (gular index = bc/ab). 4. *P. nubeculosum,* pronotum (p). 5. *P. halterale,* pronotum (p). 6. *P. scalaenum,* wing. 7. *P. halterale griseopunctatum,* wing. 8. *P. halterale,* ♂ genitalia.

differences in details of the life history. Emergence patterns in Florida may exhibit little resemblance to the patterns of the same species in Canada (Soponis 1983).

MATERIALS AND TERMINOLOGY

The present study is based largely on a personal collection of more than 1000 specimens collected since 1924. States best represented are Ohio, New York and Michigan but every effort has been made to include all species recorded from the 22 states north and east of southwestern Missouri. Adults have been preserved in two ways: dry on points and mounted on slides, usually in diaphane. All immatures have been mounted on slides. In the case of reared material, adults have been mounted on the same slide with larval and pupal exuviae, making

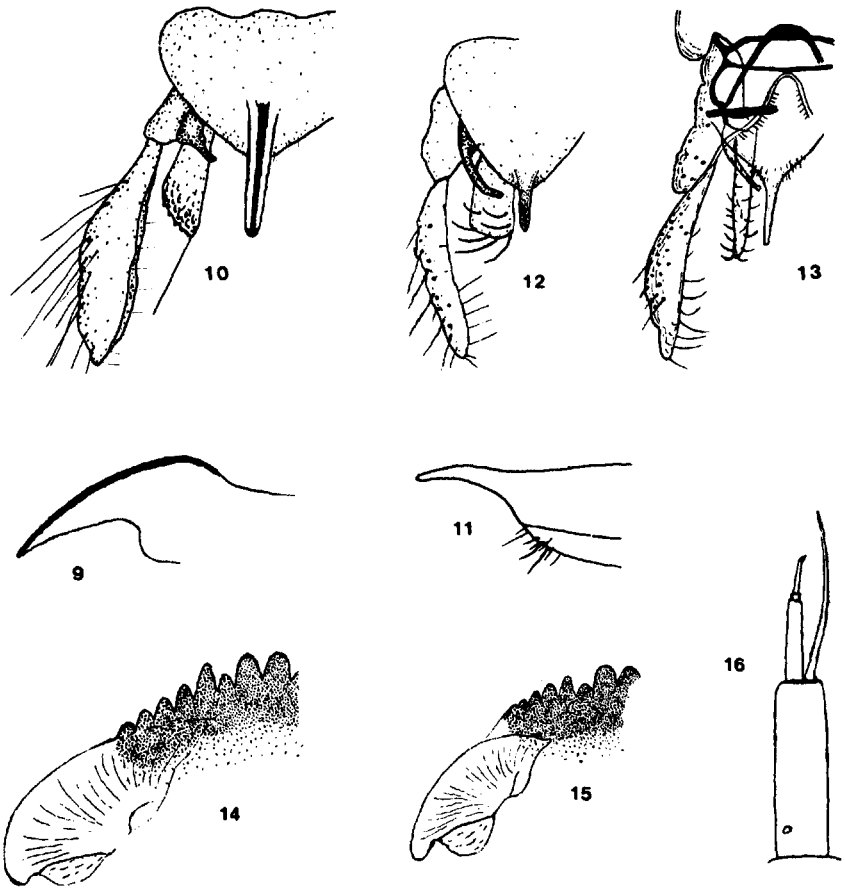
possible a positive association of the stages. Particular attention has been directed toward females, which all too frequently have been given rather casual and inadequate treatment. Keys are presented for all known stages. Stages which are unknown or inadequately described are omitted from the keys. To make the keys useful for both dry and slide mounts, multiple characteristics are frequently given. Characteristics enclosed in brackets should be helpful but are not altogether contrasting. Terminology largely follows that adopted for a series of review papers published since 1974 (Boesel 1974, 1983, Boesel and Winner 1980). Abbreviations for use in the keys have been selected for brevity and adaptability for pluralization and are listed below. Only one is new. Wing features are shown in fig. 1. The traditional but questionable interpretation of media has been adopted here. Veins of the anal area (A) are more or less vestigial.

Abbreviation definitions follow. WL: length of wing, from arculus (fig. 1, a) to tip. w, ww: wing, wings. c: wing cell. fCu: cubital fork. AR: antennal ratio; terminal flagellomere/remaining flagellomeres. fm: flagellomere. f, ff, 1f, 2f, 3f: femur, femora, fore femur, mid femur, hind femur. t, tt, 1t, 2t, 3t: tibia, tibiae, fore tibia, mid tibia, hind tibia. x, xx, 1x, 2x, 3x: tarsus, tarsi, fore tarsus, mid tarsus, hind tarsus. x_1, x_2, x_3, x_4, x_5: first, second, third, fourth, fifth tarsomere.

LR: leg ratio; lx_1/lt. abd, th: abdomen, thorax. abd 1, abd 2, etc.: first abdominal segment, second abdominal segment, etc. app 1: superior genital appendage. app 2: inferior genital appendage. GI: larval gular index, bc/ab (fig. 3).

KEY TO MALES

1. w membrane hairy ..... (2)
1. w membrane bare ..... (3)
2. Dorsolateral bristles between the mesonotal vittae in a double row; LR 1.25; stem vein (brachiolum) with 4-6 bristles; WL 2.5 mm; dististyle ovate ..... *P. sordens*
2. Dorsolateral bristles between the mesonotal vittae in a single row; LR 1.7; stem vein with 1-2 bristles; WL 1.5 mm; dististyle sublinear ..... *P. tritum*
3. Pronotum dorsally well developed, nearly reaching level of mesonotum, projecting (fig. 4); [th and abd all dark; knob of halter blackish; WL 3.5 mm; LR 1.4; R_{4+5} tip at level of M tip] ..... *P. nubeculosum*
3. Pronotum dorsally thin, reduced, closely applied to mesonotum and not reaching dorsal level of mesonotum (fig. 5) ..... (4)
4. R_1 and R_{2+3} apically divergent, distinctly separated (fig. 6), R_{2+3} sometimes faint; [abd never basally whitish; th dark; 1f never brown with apical fifth pale; WL not over 3.0 mm; w never with 6 spots; w never almost entirely brown] ..... (5)
4. R_1 and R_{2+3} apically adjacent and parallel (fig. 1); [WL normally over 1.5 mm; anal spine not sagitate and not with spinous shoulders] .... (12)
5. w with 4 distinct spots: 2 in cR_5, 1 across Cu_2, 1 in middle of anal area ..... *P. apicatum*
5. w with not more than 3 definite spots ..... (6)
6. w with 3 gray spots, the 2 spots near middle of w sometimes tending to form a band across the w; base of cR_5 clear; [halter white; WL 1.55 mm; LR 1.8; M entirely bare; R_1 hairy; R_{4+5} hairy except broadly at base (fig. 6)] ..... *P. scalaenum*
6. w clear or indistinctly marked with gray or spotted, but if spotted, base of cR_5 darkened ..... (7)
7. Anal point simple; knob of halter white; legs whitish ..... (8)
7. Anal point sagitate or spatulate; knob of halter white or black; legs stramineous or pale brown ..... (9)
8. Dististyle narrow, about 7 times as long as wide; anal point with spinous shoulders; LR 1.9; AR 1.4 ..... *P. gomphus*
8. Dististyle broad, about 3 or 4 times as long as wide; anal point without spinous shoulders; LR 1.6; AR 2.1 ..... *P. trigonus*
9. Genital shoulders short, inconspicuous; WL under 1.5 mm ..... (10)
9. Genital shoulders spinous, strong; WL over 1.5 mm ..... (11)
10. LR 2.1; ff stramineous, apically brown ..... *P. acifer*
10. LR 1.65; ff rather dark with indistinct subapical pale ring ..... *P. parvum*
11. Halter knob partly blackish; anal point spatulate, laterally incised (fig. 8); LR 1.9; WL 1.8 mm ..... *P. halterale*
11. Halter knob white; anal point sagitate, laterally expanded; LR 1.5; WL 2.3 mm ..... *P. albinodus*
12. w brown except for base which is yellow; ff and tt brown, xx contrastingly whitish .... *P. ontario*
12. w largely hyaline, sometimes with darker spots or faintly brownish; ff and tt largely pale or only partly brown, not uniformly darker than xx . (13)
13. w with 6 distinct spots; [WL 2.6 mm; ff brown; tt and xx yellowish; abd brown] ..... *P. laetum*
13. w hyaline, without spots ..... (14)
14. Halter with tip of knob dark brown; [WL 3.4 mm; legs largely stramineous, brownish apically; base of 1f brown; abd 1-5 greenish white to pale brown with brown subbasal band on abd 2-5; abd posteriorly dark; LR 1.55; 1f whitish, basally brown; dorsolaterals between the vittae in 1 or 2 irregular rows] ..... *P. vibex*
14. Halter white or yellowish ..... (15)
15. LR 1.2; [abd uniformly dark] .... *P. pedatum*
15. LR over 1.3 ..... (16)
16. WL 1.5-3.0 mm; [dorsolaterals between the vittae in a single row] ..... (17)
16. WL 3.0-5.0 mm ..... (20)
17. Mesonotum brown to black; abd brown; [LR 1.5] ..... *P. albicorne*



FIGURES 9–16. *Polypedilum*, details. 9. *P. convictum*, ♂ anal spine, lateral view. 10. *P. convictum*, ♂ genitalia. 11. *P. illinoense*, ♂ anal spine, lateral view. 12. *P. illinoense*, ♂ genitalia. 13. *P. calopterus*, ♂ genitalia. 14. *P. illinoense*, larval paralabial plate and labium. 15. *P. convictum*, larval paralabial plate and labium. 16. *P. halterale*, larval antenna.

17. Mesonotum whitish to greenish yellow, sometimes tinged with brown; abd at least largely pale (see note below) ..... (18)
18. w, especially anterior veins, brownish; outer mesonotal vittae usually darker than median vitta; antennal flagellum dark except for basal fm which is pale but apically ringed with brown; dististyle slender, about 7 times as long as wide; app 1 sickle-shaped (fig. 12); LR 1.8; [anal spine short, narrow (fig. 11)] ..... *P. illinoense*
18. w, including anterior veins, whitish; mesonotal vittae pale; antennal flagellum largely pale except for hair sockets; basal fm usually pale, not apically ringed with brown; dististyle broad, about 4 times as long as wide; app 1 birdhead-shaped (fig. 10); LR 1.5-1.7 ..... (19)
19. LR 1.6-1.8; AR 1.9; WL 1.9-2.0 mm; anal spine tapered to narrow tip, ventrally keeled .... *P. convictum*
19. LR 1.4-1.5; AR 1.7; WL 2.2-2.3 mm; anal spine unusually broad, subovate ..... *P. aviceps*
20. R_{4+5} and M ending about equidistant from w tip; R_{4+5} slightly curved; abd usually light green; LR 1.6; w base not distinctly darkened; app 2 broad, wider than dististyle ..... *P. braseniae*
20. R_{4+5} protracted, strongly curved; abd usually darkened posteriorly; LR 1.4; w base dark brown; app 2 slender, narrower than dististyle (fig. 13) ..... (21)
21. Dorsolaterals between the mesonotal vittae in a double row; abd dull white or pale brown, often darker posteriorly; [WL 3.8 mm] ... *P. calopterus*
21. Dorsolaterals between the mesonotal vittae in a single row; abd 1-5 or 1-6 white, the rest darkened ..... (22)
22. If all white; WL 3.4 mm ..... *P. artifer*
22. If brown, apex narrowly but distinctly white; WL 2.9 mm ..... *P. fallax*

NOTE. Excluded from the key are 2 species that key to couplet 18 and are currently separable only on the basis of minor characteristics: (1) *P. ophioides:* LR 1.65; app 2 terminally oblique; dististyle narrow; (2) *P. angustum:* LR 1.55; app 2 narrow; app 1 as in *P. illinoense;* dististyle rather broad.

KEY TO FEMALES

1. w membrane hairy ..... (2)
1. w membrane bare ..... (3)
2. Dorsolateral bristles between the vittae in a double row; LR 1.25; stem vein (brachiolum) with 4-6 bristles; WL 2.5 mm ..... *P. sordens*
2. Dorsolateral bristles between the vittae in a single row; LR 1.7; stem vein with 1-2 bristles; WL 1.5 mm ..... *P. tritum*
3. w entirely brown except for base, which is yellow; ff and tt of all legs uniformly dark brown, contrasting with xx which are largely yellowish white ..... *P. ontario*
3. w membrane hyaline, or spotted, or irregularly clouded, or slightly brownish but not distinctly brown with contrasting pale base; ff and tt not uniformly dark brown contrasting with pale xx ..... (4)
4. w with 6 spots, the largest at the base of cR_5; no spot in cM ..... *P. laetum*
4. w with fewer than 6 spots or without spots, sometimes with indistinct streaks or clouds along veins ..... (5)
5. Pronotum dorsally distinctly separated from mesonotum and projecting (fig. 4); [R_{4+5} tip at level of M tip; th and abd all dark; knob of halter blackish; WL 3.5 mm; LR 1.45] ..... *P. nubeculosum*
5. Pronotum dorsally closely applied to mesonotum and not projecting (fig. 5) ..... (6)
6. th pale, whitish ..... (7)
6. th dark, brownish ..... (9)
7. w brownish; antennal flagellum usually brownish except for basal fm which is whitish; outer mesonotal vittae often darker than median vitta; legs brownish yellow; LR 1.85 ..... *P. illinoense*
7. w whitish; antennal flagellum usually whitish except for terminal fm which is darkened; mesonotal vittae entirely orange-yellow; legs whitish yellow; LR 1.65 ..... (8)
8. Ultimate fm wider near base, tapering to apex; length of ultimate fm/length of penultimate fm 2.0-2.4; maximum width of ultimate fm usually 0.19-0.23 mm ..... *P. convictum*
8. Ultimate fm long, slender, only very slightly wider near base; length of ultimate fm/length of penultimate fm 2.3-2.8; maximum width of ultimate fm usually 0.18-0.19 mm ..... *P. aviceps*
9. abd pale brown or brown, banded whitish; WL 2.8-3.4 mm ..... (10)
9. abd dark brown; WL 1.3-2.5 mm ..... (13)
10. w with grayish or brownish band across middle ..... *P. calopterus*
10. w entirely clear ..... (11)
11. Knob of halter dark brown ..... *P. vibex*
11. Knob of halter white ..... (12)
12. If bicolored, brown with white apex ..... *P. fallax*
12. If entirely white ..... *P. artifer*
13. LR 1.2; [R_{4+5} ending nearer w tip than M; WL 2.5 mm; w membrane not clouded; w veins pale brown; legs whitish; antennae dark brown] ..... *P. pedatum*
13. LR 1.5-2.1 ..... (14)
14. Legs with ff in part darker than xx; WL 1.2-1.4 mm ..... (15)
14. Legs except coxae whitish to stramineous, ff unicolorous; WL 1.5-2.0 mm ..... (16)
15. LR 1.7; w not spotted but membrane along veins often cloudy; halter whitish ..... *P. acifer*
15. LR 2.1; w spotted with gray; halter often blackish ..... *P. parvum*
16. Halter knob partly dark, blackish; [w with 3 more or less distinct spots or iridescent areas, 1 spot or iridescent area occupying base of cR_5 but extent variable; legs yellowish; LR 1.9; R_1 and R_{2+3} apically divergent] ..... *P. halterale*
16. Halter knob entirely whitish ..... (17)
17. w with spots or with cloudiness on membrane adjacent to veins; if spotted, spot in cR_5 not occupying extreme base of cell; legs whitish, tips of ff darkened; [R_1 and R_{2+3} apically divergent; LR 1.85; WL 1.6 mm] ..... *P. scalaenum*
17. w clear, without spots or cloudiness along veins; legs (except coxae) whitish ..... (18)
18. WL 2.0 mm; tips of R_1 and R_{2+3} distinctly separated, divergent; tips of R_{4+5} and M equidistant from apex of w; LR 1.7 ..... *P. trigonus*
18. WL 2.5 mm; tips of R_1 and R_{2+3} adjacent; R_{4+5} tip near w apex; LR 1.55 ..... *P. albicorne*

NOTE. Females of *P. albinodus, P. apicatum, P. gomphus* and *P. angustum* are unknown. Those of *P. braseniae* and *P. ophioides* cannot safely be placed in the key.

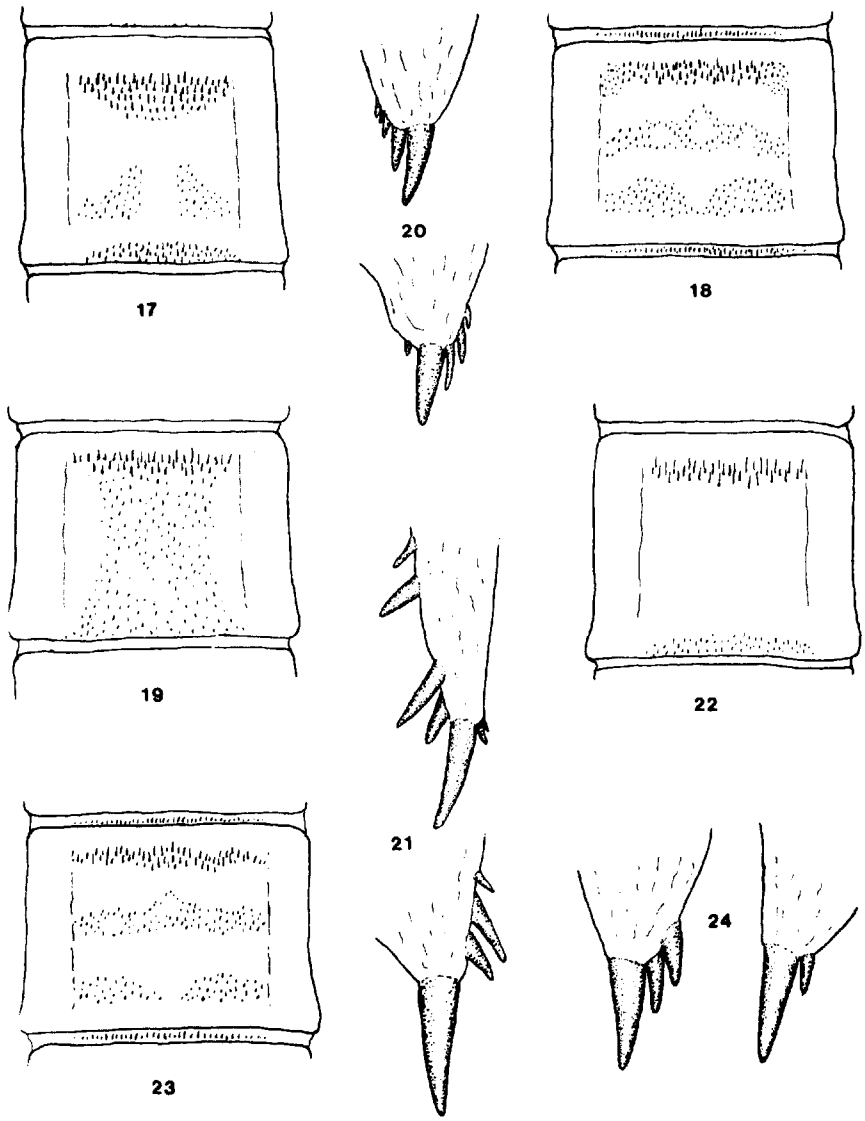
KEY TO LARVAE

1. Medial labial teeth colorless, contrasting with darkened laterals; medial teeth shorter than first laterals (Leathers 1922b) ..... *P. braseniae*
1. Medial labial teeth pigmented, like the laterals; medial teeth usually as long as or longer than first laterals ..... (2)
2. First lateral labial teeth about as large as second laterals and usually at least half as long as medial teeth ..... (3)
2. First lateral labial teeth distinctly smaller than second laterals and usually less than half as long as medial teeth ..... (7)
3. Medial labial teeth perceptibly longer than first lateral teeth ..... (4)
3. Labial teeth about equal ..... (5)
4. Antennal segment 2 long, about 2 times as long as 3, 4 and 5 combined; posterior lobe of paralabial plate prominent ..... *P. aviceps*
4. Antennal segment 2 short, shorter than 3, 4 and 5 combined; posterior lobe of paralabial plate small ..... *P. sordens*

5. Mouthparts unusually small; paralabial plate with well developed posterior lobe .... *P. ontario*
5. Mouthparts normal; paralabial posterior lobe indistinct .... (6)
6. Antennal segments 3, 4 and 5 combined considerably longer than 2; transverse dimension of paralabial plate less than 2.5 times distance between plates .... *P. laetum*
6. Antennal segments 3, 4 and 5 combined about equal to 2 or shorter than 2; transverse dimension of paralabial plate more than 2.5 times distance between plates .... *P. fallax*
7. Gula darkened posteriorly; [antennal segment 3 about as long as 4; antennal segments 2 and 3 subequal, 3 and 4 together distinctly longer than 2; medial and second lateral labial teeth about equal] .... *P. nubeculosum*
7. Gula nearly uniformly pale .... (8)
8. Antennal segment 3 short, hardly longer than wide (fig. 16) .... (9)
8. Antennal segment 3 distinctly longer than wide .... (10)
9. Antennal segment 4 long, much longer than 3 and approaching length of 2; gular index 1.3 .... *P. halterale*
9. Antennal segments 3-5 vestigial, with combined length less than that of 2; gular index 0.9 .... *P. scalaenum*
10. Paralabial plates approximate, the distance between them being about equal to the combined width of the medial labial teeth .... *P. trigonus*
10. Paralabial plates distant, the distance between them being more than twice the combined width of the medial labial teeth .... (11)
11. Medial labial teeth short, about half the length of the second lateral teeth .... *P. ophioides*
11. Medial labial teeth nearly as long as or longer than the second lateral teeth .... (12)
12. Paralabial plate with a strong posterior lobe, being posterolaterally deeply emarginate (fig. 15); [posterior margin of head capsule black, thick; in life pale greenish yellow or pinkish with green thoracic suffusion] .... *P. convictum*
12. Paralabial plate with a weak posterior lobe, being posterolaterally indistinctly emarginate (fig. 14) .... (13)
13. Dorsomesal mandibular tooth black; apical tooth in some views broad and hardly longer than dorsomesal tooth; [posterior margin of head capsule brown, thin; in life pale orange-red] .... *P. illinoense*
13. Dorsomesal mandibular tooth pale; apical tooth long .... *P. tritum*

KEY TO PUPAE

1. abd 8 with a sclerotized area bearing a few small teeth but without a distinct spur. .... *P. braseniae*
1. abd 8 with a strong posterolateral spur bearing spinules .... (2)
2. Cephalic tubercles well developed, longer than distance between the antennal bases (Maschwitz 1975) .... *P. ontario*
2. Cephalic tubercles small or absent .... (3)
3. Lobes of anal fin each with more than 100 filaments; spur on posterolateral angle of abd 8 slender, simple, without strong secondary spines .... *P. fallax*
3. Lobes of anal fin each with fewer than 80 filaments; spur of abd 8 broad basally and/or with strong secondary spines .... (4)
4. Intersegmental spinules of abd 3-4 indistinct or absent (fig. 17) .... (5)
4. Intersegmental spinules of abd 3-4 present (fig. 18) .... (9)
5. abd 8 with posterolateral comb consisting of a single long spur with about 10-14 small superficial spines; [usually about 25-30 marginal filaments on lobe of anal fin] .... *P. trigonus*
5. abd 8 with posterolateral comb consisting of a large spur with several to many unequal smaller spurs or spines .... (6)
6. Shagreen of abd 4 diffuse, more or less enclosing irregular clear windows but not concentrated into distinct and separate groups of microsetae (fig. 19); [posterolateral comb of abd 8 usually consisting of more than 3 closely appressed spurs, the smallest minute, the longest normally under 0.06 mm long (fig. 20)] .... (7)
6. Shagreen of abd 4 consisting of microsetae concentrated into 2 or more distinct groups .... (8)
7. Each lobe of anal fin with more than 40 marginal filaments, the filaments being crowded and difficult to count .... *P. convictum*
7. Each lobe of anal fin with fewer than 40 marginal filaments, the filaments being regularly spaced and easy to count .... *P. aviceps*
8. Posterolateral comb of abd 8 consisting of a large terminal spur and several widely and irregularly spaced secondary spurs but without additional small superficial spines (fig. 21); lobe of anal fin with about 30-35 marginal filaments; abd 4 with 2 or 4 groups of microsetae (figs. 17 and 22); cephalic tubercles small, with preapical bristle .... *P. halterale*
8. Posterolateral comb of abd 8 consisting of several strong spurs plus numerous small superficial spines; lobe of anal fin with about 45 marginal filaments; abd 4 with 3 transverse bands of microsetae; cephalic tubercles very small or absent .... *P. sordens*
9. Shagreen of abd 4 in the form of 3 patches of microsetae, the posterior group sometimes narrowly divided medially (figs. 18 and 23). .... (10)
9. Shagreen of abd 4 not in the form of 3 more or less transverse patches of microsetae, the shagreen patches on the posterior third of the segment either very widely separated or unified with the central patch .... (13)
10. Lobes of anal fin each with about 20-25 marginal filaments .... (11)
10. Lobes of anal fin each with about 30-50 marginal filaments .... (12)
11. Tergites 7 and 8 with faint anterolateral patches of shagreen; abd 6 with 3 lateral filaments; abd 5



FIGURES 17–24. *Polypedilum,* pupal details. 17–19, 22–23. Fourth abdominal tergite. 17. *P. halterale,* ♀ . 18. *P. illinoense,* ♀ . 19. *P. convictum,* ♂ . 22. *P. halterale,* ♂ . 23. *P. illinoense,* ♂ . 20–21, 24. Abdominal armature, variations. 20. *P. convictum.* 21. *P. halterale.* 24. *P. illinoense.*

with anterior transverse shagreen band which is convex anteriorly and posteriorly (Roback 1957, fig. 394); [cephalic tubercle low, obtuse, with preapical bristle] ..... *P. scalaenum*

11. Tergites 7 and 8 bare; abd 6 with 4 lateral filaments, abd 5 with anterior transverse shagreen band which is concave anteriorly, convex posteriorly (Roback 1957, fig. 413) ..... *P. tritum*

12. Posterior shagreen band on abd 4 nearly or completely divided medially (figs. 18 and 23); shagreen fenestrated; [posterolateral comb of abd 8 usually composed of 2 or 3 well defined and closely adjacent spurs or spines, the large primary spur typically over 0.06 mm long (fig. 24)] ..... *P. illinoense*

12. Posterior shagreen band on abd 4 broad, not distinctly divided medially; shagreen not or only slightly fenestrated (Maschwitz 1975) ..... *P. ophioides*

13. abd 4 with transverse anterior group of strong spinules together with a central subtriangular patch of weaker spinules and a pair of posterolateral

patches, the latter 3 patches showing a variable tendency to merge; about 35 marginal filaments on lobe of anal fin ..... *P. nubeculosum*

13. abd 4 with a transverse anterior group of strong spinules together with a diffuse but extensive fenestrated shagreen pattern covering most of tergite; about 25 marginal filaments on lobe of anal fin ..... *P. laetum*

DISCUSSION AND REVIEW

As defined in the introduction, *Polypedilum* is easily among the most common genera of Chironomidae, both in terms of abundance of individuals and number of species. Unfortunately, many of the species are unknown as immatures or are so poorly known or described that accurate placement in keys at present is difficult or quite impossible. However, there is considerable literature which is in need of unification and an effort is here made to characterize species to the extent which is now possible. A completely unexpected result of the current study is the reduction in the number of recorded species for the northeastern states. Some species show a high degree of variability which is strikingly apparent when an abundance of material is available. Wing spots especially cause difficulty. For example, in *P. scalaenum* such spots may be strong or weak; furthermore there may be three distinct spots or two of the spots may be expanded to form a band. In *P. halterale* spots are usually reduced to iridescent areas visible only when examined at an appropriate angle on dry specimens; such areas in turn vary in intensity and extent. There is an extremely interesting statement in Loew's description of *Chironomus octopunctatus* (translation by Johannsen 1905): "each wing with four blackish spots, in certain lights iridescent." In fluid or mounting medium such iridescent spots vanish. In *P. calopterus* wing pigmentation occurs only in the female. As a general rule, females exhibit stronger wing coloration than do males. Antennal ratio varies: turgid antennae have a lower ratio than do those that are dry and contracted. Leg ratio seems to be quite dependable but is still subject to variation, commonly as much as 15%. Reliance upon genitalic differences is sometimes hazardous. Elements of the genitalia may be in different stages of contraction and it is possible to characterize them from various angles, all of which are slightly different. The superior and inferior appendages are subject to rotational changes, resulting in a variety of appearances. Total length and wing length are likely to vary, in part at least with the degree to which growing conditions have been propitious. In pupae the armature on the eighth abdominal segment is so variable as to be almost useless in species determination, except where differences are extreme. Species recorded from the northeastern states are presented and briefly characterized below in the order in which they were described.

POLYPEDILUM SCALAENUM (SCHRANK) 1803

The species was originally described from Germany. In the United States and Canada it is widely distributed and common. Nearctic specimens were once thought to be distinct and, at least in part, went under the name of *P. needhamii*. Malloch (1915) called attention to the wide degree of variability in both intensity and extent of wing coloration. Larvae have often been reported from streams. They occur among algae in thermal (34-35 °C) streams (Robinson and Turner 1975) or among algae growing on submerged wood and in nets on fallen leaves (Roback 1953). Beck and Beck (1966) found them in moderately swift streams. Near Oxford, Ohio, larvae occur in small numbers in the shallow water of a small rocky stream receiving industrial wastes but never near the point of waste introduction nor even in the early or intermediate recovery areas (Winner et al. 1980). In a study of New Mexico streams, *P. scalaenum* was the only species of *Polypedilum* occurring at all stations (Atchley et al. 1979). In the Bigoray River, a brown-water stream in Alberta, Canada, *P. scalaenum* displays very low habitat specificity (Boerger et al. 1982), occurring in eight out of the nine substrates sampled. The species is common in the streams of Quebec (Harper and Cloutier 1979) where emergence is described as unimodal, short and very in-

tense. Boerger (1981) in Alberta also recorded a single emergence phase in June-July. In 1943, adults were so abundant on screens in Put-in-Bay, Ohio, in late July and early August as to attract popular attention. Although the species at times shows a tendency to overwhelm its environment with adults, I have taken adults in Ohio in every month from May to September. Counties represented are Butler, Ottawa, Franklin, Jackson, Ashtabula, Guernsey, Washington, Meigs, Fairfield and Ashland. I have collected the species also at Ithaca, New York, and at Douglas Lake, Michigan. In spite of the fact that *P. scalaenum* is not rare, its larva is inadequately known and its characterization in the key is tentative.

POLYPEDILUM NUBECULOSUM (MEIGEN) 1804

The species is essentially northern Holarctic in distribution; in the United States it has been reported from Michigan, Minnesota, New York, Pennsylvania and the northwestern states (Sublette and Sublette 1965). Harper and Cloutier (1979) found it to be common in Quebec streams. The larvae are the dominant benthic organisms in a small shallow lake in western Ontario but are less common in deeper lakes (Maschwitz 1975). I have adults collected by Dr. Carl P. Boesel at Baptiste, Ontario, May 28-30, 1970, but lack records for Ohio. According to Davies (1976), larvae are normally a part of the benthos but appear in the plankton with a rise in the water level. Larvae are listed by Weber (1973) as intolerant to decomposable organic wastes. Larvae feed on planktonic forms of algae such as *Dinobryon* and *Scenedesmus* (Moore 1979); intensity of feeding is generally regulated by temperature but changing day-length initiates heavy feeding in April and May despite low water temperatures.

POLYPEDILUM LAETUM (MEIGEN) 1818

The species, which is widely distributed in Europe, was first recorded from the Nearctic by Townes (1945) as occurring in Canada, California, Colorado, Nevada, New Mexico, New York and South Carolina. Townes made special note of much variation with respect to wing markings and genitalia. Larvae occur in lakes and streams (Harper and Cloutier 1979, Saether and Galloway 1980, Atchley et al. 1979). The occurrence of *P. laetum* in the Nearctic has been questioned (Saether 1975). I have not seen the species.

POLYPEDILUM ALBICORNE (MEIGEN) 1838

Townes (1952) regarded *P. nigritum* as a synonym of *P. albicorne* and Maschwitz (1975) found only minor differences between European and American specimens. However, the species has commonly been referred to as *P. nigritum* in the Nearctic literature. It occurs in the northeastern and western United States (Sublette and Sublette 1965); larvae have been taken in Quebec from a highland stream (Harper and Cloutier 1979). In a study of Beaver Reservoir in Arkansas, Iovino and Miner (1970) found *P. nigritum* in the area but not in the reservoir itself. European records indicate that this is a cold-water stenothermic species whose larvae occur on moss-covered rocks in strong currents (Maschwitz 1975). I have May and June records from Franklin, Hocking and Ashland counties (Ohio) and have collected the species near Ithaca, New York, during July and August.

POLYPEDILUM CONVICTUM (WALKER) 1856

(*POLYPEDILUM OBTUSUM* TOWNES 1945, N. SYN.)

The first species of *Polypedilum* named from American material was *P. flavus* from New York (Johannsen 1905); it was followed by *P. flaviventris* from Kansas (Johannsen 1907). Townes (1945) compared American specimens with material from England and concluded that both of Johannsen's species and the European *P. convictum* are identical. The species as we know it is widespread, common and highly variable; even by 1929, European authors had indicated two (and possibly three) synonyms. Goetghebuer and Lenz (1937) show the anal spine as simple and parallel-sided. However, the anal spine of *P. flavus*, as illustrated by Johannsen (1905, pl. 32, fig. 12) is strongly tapered from base to

apex and is keeled below. Some of the variations in the anal spine are almost certainly more apparent than real, being positional. When the spine is retracted, only the apex shows and its keeled and tapered nature is obscured. The lateral expansions seem to be extremely thin and transparent and are probably not fixed in position. Townes (1945) described *P. obtusum* as closely similar to *P. convictum* except for genitalia, the anal spine being broader and nearly parallel-sided or slightly tapering, with a dark central axis representing the keel. Maschwitz (1975) figured three variations in the spine of *P. obtusum*. My observations support the conclusions of Maschwitz with respect to the high degree of intraspecific variability of the anal spine. I have specimens with spines showing only rudimentary dorsolateral expansions. Maschwitz (1975) found the immatures of *P. convictum* and *P. obtusum* to be essentially identical. For the present I am inclined to regard *P. convictum* as extremely variable and Holarctic. This is in agreement with the rule that widespread and abundant species tend to be highly polytypic. All conclusions with respect to synonymy are by their very nature tentative. If our Nearctic species proves to be separable from the Palearctic *P. convictum,* it should go under the name of *P. flavus,* with *P. obtusum* as junior synonym.

The species is abundant and typically associated with lotic situations: the rocky bottom of a swift-flowing brook (Johannsen 1937, as *P. flavus*); a small rock-bottomed stream in Louisiana (Sublette 1957, as *P. obtusum*); and comparatively shallow areas in western Lake Erie serving the *Pleurocera-Lampsilis* community, associated with wave action and shifting sands (Shelford and Boesel 1942, as *P. flavus*). However, Iovino and Miner (1970, as *P. obtusum*) found it in an Arkansas reservoir and Beck and Beck (1966) reported it from a sinkhole pond serving as a watering place for cattle. Near Oxford, Ohio, three species of *Polypedilum* were taken from a small rocky stream subject to substantial industrial waste pollution but only *P. convictum* was found in the immediate vicinity of the source of pollution, particularly in shallow water (Winner et al. 1980). In the Ohio River, *P. convictum* is most abundant in relatively fast-moving water (Beckett 1981, Beckett and Miller 1982). Harper and Cloutier (1979) in Quebec found *P. convictum* and *P. aviceps* concentrated in riffle areas. According to Simpson and Bode (1980), the larvae are filter feeders with occurrence apparently governed more by current speed and suspended food particles than by water quality and are commonly associated with *Rheotanytarsus exiguus*. Adults have been taken in Ohio in every month from May to October. The following counties are represented: Butler, Ottawa, Brown, Franklin, Ashland, Fairfield, Jefferson, Washington, Licking and Hocking. I also have specimens from Ithaca, New York, and Petersburg, Indiana.

Polypedilum tritum (Walker) 1856

(*Polypedilum albulum* Townes 1945, n. syn.)

Species of *Polypedilum* with hairy wings have traditionally been assigned to *Pentapedilum*. Early in the present century *Pentapedilum* was commonly placed among the Tanytarsini (Goetghebuer and Lenz 1937) although the close relationship to Chironomini was understood (Edwards 1929). Both of our hairy-winged species are Holarctic and were originally described from Europe. Apparently neither is commonly collected. First described was *P. tritum,* which has been widely reported from the United States and Canada. Adults have been taken in Ohio in every month from May to October, except September, in the following counties: Butler, Jackson, Franklin, Carroll and Harrison. I also have specimens from Pennsylvania, collected in September after emerging from a very small pond (area 15 sq. m., depth 10 cm.) by Dr. W. S. Ettinger. The species is listed by Weber (1973) as facultative in relation to decomposable organic wastes. In Canada it showed a decrease in numbers in response to crude oil contamination (Rosenberg and Wiens 1976). The larva is a net-spinning plankton-eater that lines its

burrows with silk and creates a current bringing in food; it bores into stems of aquatic plants (Berg 1950) but consumes little plant material. It may also form excavations in leaves (Iovino and Miner 1970).

In 1945 Townes described *P. albulum* on the basis of two males from New York; apparently they had emerged from Mud Pond. Hauber (1947) reported a single male from a shallow pond in Iowa; it differed in several respects from the original description of *P. albulum*. Dendy and Sublette (1959) mentioned a single female from Alabama which they did not place specifically, apparently because it had traits combining the features of *P. tritum* and *P. albulum*. Specimens available to me suggest that Townes, in describing *P. albulum,* had two unusually small, pale specimens of *P. tritum* which, like other species of *Polypedilum,* is highly variable. However, I have seen no specimens with the basally "wedge-shaped" wings which are supposed to characterize *P. albulum* although the tip of the anal area tends to fold in some specimens, resulting in a deceptive appearance, particularly in slide mounts.

POLYPEDILUM SORDENS (VAN DER WULP) 1874

This Holarctic species has a known American range of Michigan to Rhode Island in the northeastern states; it also occurs southward to Virginia and northward to Quebec (Sublette and Sublette 1965, Harper and Cloutier 1979). It has typically been reported from lakes. Larvae bore into tissues of *Potamogeton,* lining their tunnels with silk and creating a current bringing in planktonic food such as diatoms; they also gather material such as filamentous algae outside (Berg 1950). Pupation occurs in the tubes and larvae overwinter on or in *Potamogeton* beneath the ice; in Michigan, adults appear in May or early June (Berg 1950). I have taken adults in Ohio (Carroll and Ottawa counties) in June and July and in New York in June, August and September. Descriptions of the pupa of *P. sordens* in the literature (Berg 1950, Roback 1957, Maschwitz 1975) are not entirely in agreement; placement of this species in the key for pupae is highly tentative.

POLYPEDILUM HALTERALE (COQUILLETT) 1901 (*CHIRONOMUS GRISEOPUNCTATUS* MALLOCH 1915, N. SYN.; *POLYPEDILUM SIMULANS* TOWNES 1945, N. SYN.; *POLYPEDILUM DIGITIFER* TOWNES 1945, N. SYN.)

This is an abundant Nearctic species which ranges widely over the United States and Canada. It is extremely variable but males and females were first described by Coquillett (1901) as having hyaline wings. Malloch (1915) described the female of *P. griseopunctatum* as having spotted wings; the male of the latter was described by Townes (1945) who indicated that it has indistinct wing spots that are often practically absent. In typical dry specimens of *P. halterale,* the wing if viewed at an appropriate angle shows three areas of iridescence in the location of the spots of *P. griseopunctatum.* The iridescence varies greatly in intensity, in some specimens giving the appearance of faint spotting. Its extent varies also: two of the spots may even tend to merge to form an irregular band across the wing. At the other extreme, iridescence may be confined to the membrane adjacent to the wing veins. The genitalia are subject to considerable variation. I have found genitalia with the typical curved superior appendage of *P. griseopunctatum* on specimens otherwise identifiable as *P. halterale* as described by Townes (1945). Two additional species, *P. digitifer* and *P. simulans,* closely resembling *P. halterale,* were described by Townes (1945). Except for genitalia, the only tangible traits mentioned are minor differences in wing length, leg ratio and antennal ratio. I have been unable to correlate the latter characteristics with genitalic features or with each other. *P. halterale* seems to exist in several and possibly many forms. Any attempt to name all of these can lead only to confusion. Hauber (1947) reported that *P. halterale* and *P. simulans* are usually indistinguishable, even genitalia exhibiting a rather wide range of variation. Townes (1945) seemed to attach considerable

importance to Coquillett's description of *P. halterale* as having a leg ratio of about 2.0. I have specimens which check with *P. halterale* genitalia as figured by Townes but which have a leg ratio of 1.65. It is interesting and probably significant that the larvae and pupae of the various forms seem to be identical.

The forms of *P. halterale* are not equally abundant. Least commonly reported is *P. griseopunctatum* which represents an extreme approach to spotted wings. The form *P. digitifer* may be so abundant as to constitute a nuisance: Grodhaus (1968) found the larvae abundant in silt in new reservoirs in California; Ali and Fowler (1983) listed *P. halterale* as a nuisance species in urban and suburban lakes in Florida; in an Arkansas reservoir, *P. digitifer* larvae inhabited sand substrate down to a depth of six meters but were absent at or below the thermocline (Iovino and Miner 1970). Darby (1962) found *P. digitifer* to be rare in rice fields. The form *P. simulans* has also been reported from quiet waters (Mason and Sublette 1971, Driver 1977, Dendy 1971). Danks (1971) found *P. simulans* larvae occupying chiefly the edge of a eutrophic Canadian pond, overwintering there in the third and fourth instars and forming freezing-tolerant cocoons of salivary secretions plus attached particles. Paterson and Fernando (1970) in Ontario found *P. simulans* abundant in a reservoir one year after it was filled but apparently absent the first summer. Miller (1941) in Ontario made a study of *P. halterale* in a small lake with a sandy bottom covered with a layer of ooze. Larvae were confined to shallow water above the thermocline. First-instar larvae appeared in August and increased in size until freeze-up in November. Emergence of adults started in May, was heaviest in June, but continued into July. Miller concluded that there is a one-generation life cycle. In New Brunswick, larvae of *P. simulans* occurred in a small bog lake 2 m. deep and surrounded by a sphagnum mat; larvae were most abundant on leaf blades of *Nuphar* but were present also on petioles and in the benthos (Ramcharan and Paterson 1978). Studying a subtropical lake in Florida, Cowell and Vodopich (1981) found *P. halterale* abundant at sandy, shallow stations; the species comprised about 70% of the shoreline chironomid population. Larval life was completed in 14-17 days at 31 °C. Less abundant species present were *Glyptotendipes paripes, Chironomus crassicaudatus, Cryptochironomus fulvus, Cryptochironomus blarina, Coelotanypus concinnus* and *Procladius culiciformis*. Apparently *P. halterale* larvae reach their greatest abundance in the quiet and shallow water of lakes, ponds and reservoirs, especially when the substrate consists of sand or silt. However, larvae occur in small numbers in similar lenitic situations associated with streams (Roback 1957, Beck and Beck 1966, Mason and Sublette 1971). Menzie (1980) reported *P. digitifer* from a shallow cove in the Hudson River Estuary containing a monospecific stand of *Myriophyllum apicatum;* larvae lived solely in the sediments. The larvae of *P. halterale* are commonly found in the island area of western Lake Erie, typically in shallow water but absent in the deeper waters of the lake. However, in 1944 a few larvae appeared in dredge samples taken at a depth of about 9.14 m (30 ft) in the open water of the lake at a station subject to intense continuous study, between Rattlesnake Island and South Bass Island. The record is so unusual that it seems probable that larvae had been carried out of their usual environment by water currents into deeper water. All of the so-called forms of *P. halterale* occur in Ohio. Adults have been taken in every month from May to September. Counties represented are Butler, Ottawa, Jackson, Washington, Adams, Franklin, Auglaize, Ashtabula and Carroll.

Polypedilum fallax (Johannsen) 1905

The species is closely related to the European *P. pedestris* and may be identical with it (Johannsen 1937). It is widely distributed in the United States and Canada (Sublette and Sublette 1965, Rosenberg and Wiens 1976). Adults in Ontario

emerge from late spring to early fall (Judd 1964, 1967). Judd (1964) mentioned a larval association with *Nuphar.* Johannsen (1937) reported larvae on a water-soaked log in a shallow pond. Roback (1953) believed boring into rotten wood to be the preferred mode of life. Coffman (Elliott and Bartoo 1981) reported the larvae to be carnivorous. Paine and Gaufin (1956) found the larvae in Lytle Creek in Ohio. Procter (1946) recorded the species from a brook in Maine. Harper and Cloutier (1979) in Quebec found it to be more common in slow streams than in lakes; emergence occurred throughout the summer without a distinct pattern. In Northwest Territories, the species showed a positive response to crude oil contamination (Rosenberg and Wiens 1976). Simpson and Bode (1980) noted that the species occurs in both pristine and polluted sites and in a wide range of ecological conditions but always in small numbers. I have specimens from the following Ohio counties: Jackson, Franklin, Licking and Harrison, with collection dates from May to August. The species appears to be nowhere common.

POLYPEDILUM CALOPTERUS (MITCHELL) 1908

(*POLYPEDILUM WALLEYI* TOWNES 1945, N. SYN.)

Mitchell (1908) described the species on the basis of a single female. Townes (1945) described the male under the name of *P. walleyi.* His failure to associate the sexes was evidently due to the fact that the male of *P. calopterus* completely lacks the conspicuous wing spot which characterizes the female. He erroneously considered *P. calopterus* to be a variety of *P. fallax.* Fortunately I have collected the sexes in the same environment three times in the case of the former and two times in the case of the latter. In both sexes the species are distinct and easily separated, as indicated in the keys. Although widely distributed over the eastern half of the United States and Canada, *P. calopterus* always seems to be present in limited numbers. I have adults from Ottawa and Ashland counties in Ohio and from Pelee Island, Canada. Dates include every month from May to August.

POLYPEDILUM ILLINOENSE (MALLOCH) 1915

The species is widely distributed and abundant in the United States and Canada. It is among the four most common species of the genus in Ohio. Berg (1950) studied the life history in Michigan, where larvae fed on the floating leaves of *Potamogeton* from May to October. Larvae made channels, feeding on one epidermal layer and mesophyll tissue, skeletonizing the leaves in a manner similar to that of *Polypedilum braseniae* and *Cricotopus trifasciatus.* Pupation occurred in silken tubes in the channels. Pupae swam about a few hours before emerging as adults (Berg 1950). Apparently the association of *P. illinoense* with aquatic vegetation is general, not specific. At Put-in-Bay, Ohio, I found larvae on the leaves of water lotus (*Nelumbo lutea*) in Squaw Harbor. The larvae were associated with but less abundant than those of *Cricotopus trifasciatus.* In the laboratory, larvae isolated in dishes spun silken tubes. Beck and Beck (1966) in Florida collected larvae from a sand-bottomed stream and from a senescent lake with a rich growth of vegetation. Roback (1953) found larvae associated with moss and wood surfaces in the Savannah River. Hauber (1947) found the species in shallow ponds and in protected areas along the shore of the Mississippi River. Paine and Gaufin (1956) reported this to be the predominant species in Lytle Creek (Ohio) in a zone of glacial boulders and piled rock and regarded it as a positive indicator of an unpolluted habitat. Simpson and Bode (1980) concluded that *P. illinoense* has a wider range of tolerance than *P. convictum;* they suggested that occasionally *P. illinoense* may occupy a niche from which *P. convictum* has been eliminated by toxic problems. In a small cove in the Hudson River, Menzie (1980) found larvae primarily on *Myriophyllum;* in laboratory studies larval development (egg hatching to pupation) required about 15 days at 5 °C. He presented evidence suggesting that the species is multivoltine. In Que-

bec, Harper and Cloutier (1979) found *P. illinoense* larvae present in quieter waters; emergence occurred throughout the summer; larvae were more common in slow streams than in lakes. In the Ohio River, *P. illinoense* is the most common species at dam sites where currents are slow (Beckett and Miller 1982). Adults in Ohio occur in every month from May to September and have been taken in the following counties: Butler, Ottawa, Jackson, Tuscarawas, Guernsey, Washington, Meigs and Franklin.

POLYPEDILUM BRASENIAE (LEATHERS) 1922

Although not often reported, the species seems to be widely distributed from Ontario, Minnesota and New York southward to Florida and westward to Oregon (Sublette and Sublette 1965). It is present in a brown-water stream in Alberta where it has two distinct emergence peaks (Boerger 1981). Saether and Galloway (1980) recorded it from Lake Winnipeg, Manitoba. The life history of this species was detailed by Leathers (1922b). According to Leathers, larvae cut burrows in the floating leaves of water shield (*Brasenia schreberi*) and, to a lesser extent, of the sweet-scented water lily (*Nymphaea odorata*). Eggs are laid on the leaves in strings that are wound about in such a manner as to form a disc-like mass by fusion of the gelatinous coat; larger larvae in their tunnels construct nets which catch microorganisms that, with the nets, are eaten at intervals (Johannsen 1937). There is considerable confusion with respect to the affinities of *P. braseniae*. Berg (1950) considered it closely similar to *P. illinoense*. On the other hand, Townes (1945) placed it nearer to *P. convictum*. Leathers (1922a) described the adult wings as whitish, suggesting *P. convictum*. However, he figured male genitalia which could be those of *P. illinoense* or even *Microtendipes*. The larval labium strongly suggests *Microtendipes*. Maschwitz (1975) figured a labium which is still different. I have followed the author of the species in constructing the keys. The species has not been recorded for Ohio; in fact, its status is more or less uncertain. The possibility that Leathers worked with a mixed series must be considered.

POLYPEDILUM ONTARIO (WALLEY) 1926

This strikingly unique species occurs widely over the eastern half of the United States and Canada. The larvae are most unusual in that they live in the cases of caddisworms of the genus *Cheumatopsyche* (Beck 1977). Mitchell (1908) noted that adults tend to rest on the underside of leaves. All of my Ohio records are from Ottawa and Butler counties, with dates of June, July and August. I have seen specimens from Illinois and Oklahoma and have collected the species near Ithaca, New York.

POLYPEDILUM ARTIFER (CURRAN) 1930

The species occurs widely from California to New York and Virginia (Sublette and Sublette 1965). Hauber (1947) reported it as fairly common in Iowa and noted a close similarity to *P. fallax* except for the light coloration of the fore femur. I have a single specimen from Michigan but have not collected the species elsewhere. Townes (1945) found it to be rather common along the banks of medium- to large-sized stony-bottom streams. The early stages are unknown.

POLYPEDILUM APICATUM TOWNES 1945

The status of *P. apicatum* is not entirely clear. Johannsen (1905) included *P. octopunctatus* in his key for *Chironomus*. Loew had described the species from Cuba in 1861. Malloch (1915) listed two October records of *C. octopunctatus* for Urbana, Illinois. Townes (1945) considered Malloch's record a probable misdetermination of *P. apicatum* which Townes at that time described from New Mexico on the basis of six males. However, Townes (1952) ignored Malloch's records in his treatment of northeastern United States species. Sublette (1960) recorded a member of each sex from California. The species was again recorded from California by Frommer and Sublette (1971). I can find no other records for *P. apicatum*. Only the male has been described. When the early stages are dis-

covered the species should be compared with *P. octopunctatum* of Cuba and *P. quadrimaculatum* of Europe. Malloch (1915) noted that his specimens were closely similar to *P. griseopunctatum,* which suggests that *P. apicatum* may be a rare form of the highly variable *P. halterale.* I have not collected *P. apicatum.*

POLYPEDILUM PARVUM TOWNES 1945

The species is apparently not common. Records are largely southern and western, the only northeastern record being from Maryland.

POLYPEDILUM ALBINODUS TOWNES 1945

Apparently the species has been reported only three times: originally by Townes (1945) from Idaho and Virginia; by Sublette (1960) from California; and by Harper and Cloutier (1979) from Quebec. Harper and Cloutier took 179 individuals from a highland stream in which *P. albinodus* was outnumbered by three species of *Polypedilum: P. convictum, P. illinoense* and *P. fallax.* Not recorded was *P. halterale.* I have three males from Canada (Baptiste, Ont., 30 May 1970, Carl P. Boesel) and two females from Ohio (Westerville, OH, 9 May 1927, M. W. Boesel). The species is deceptively similar to *P. halterale,* even with respect to genitalia. Discovery of the larva and pupa should aid in clarifying its position. The female is here recognized for the first time.

POLYPEDILUM GOMPHUS TOWNES 1945

This was described from two males, one from Massachusetts and another from South Carolina. Since then it has been reported from Florida, apparently on the basis of one individual (Beck 1961). Boerger (1981) found it in limited numbers in a brown-water stream in Alberta, Canada.

POLYPEDILUM ACIFER TOWNES 1945

Apparently this species has not been reported since it was originally described, from Michigan. Its minute character has probably limited its appearance in collections. I have only three specimens, all taken in July. One is from Douglas Lake, Michigan; two are from Oxford, Ohio.

POLYPEDILUM TRIGONUS TOWNES 1945

The species ranges from Quebec to Florida and Louisiana and from New Jersey to Idaho (Townes 1945, Harper and Cloutier 1979). Atchley et al. (1979) found it in New Mexico streams. Larvae have been taken from lakes and ponds with a rich growth of vegetation (Dendy 1971, Beck and Beck 1966). Maschwitz (1975) collected larvae from cells in partially rotted *Typha* leaves. I have records from Ontario, Pennsylvania and Ohio, from May to September. Ohio records are from Butler, Franklin and Morgan counties.

POLYPEDILUM VIBEX TOWNES 1945

This species appears to be widely distributed from coast to coast (Sublette and Sublette 1965) but present in small numbers. Genitalia resemble those of *P. fallax* (Townes 1945). Early stages are unknown. Harper and Cloutier (1979) found larvae in very small numbers in highland streams in Quebec. I have not seen the species.

POLYPEDILUM PEDATUM TOWNES 1945

Townes originally recognized *P. pedatum excelsius* as a western subspecies but Maschwitz (1975) found intermediates fairly common. The species ranges from coast to coast and from Louisiana northward into British Columbia and Quebec. Habitats include a bog (Townes 1945), marsh (Judd 1953) and highland stream (Harper and Cloutier 1979). Grodhaus and Rotramel (1980) found larvae of the western subspecies in dry tree-hole litter in California; the larvae are apparently drought-resistant; larvae were taken also from leaf litter at the edge of a spring. The larva of the western subspecies as described by Grodhaus and Rotramel (1980) is similar to the larva of *P. illinoense,* differing in having the first lateral labial teeth only slightly smaller than the medials and in having the paralabial plates separated by only the combined width of the medial and first lateral teeth. Grodhaus and Rotramel (1980) placed the pupa in the *P. fallax* group of Roback (1957). There are no Ohio records.

POLYPEDILUM ANGUSTUM TOWNES 1945

The species has been recorded from New Jersey and Massachusetts westward to Illinois and Minnesota, and from Florida northward to Quebec (Townes 1945, Beck and Beck 1959, Harper and Cloutier 1979, Maschwitz 1975); environments mentioned are an acid bog, a marsh and a highland stream. Only the male is known. I have not seen the species.

POLYPEDILUM OPHIOIDES TOWNES 1945

The original description of the male is very brief, indicating structural similarity to *P. convictum* except for wing length, leg ratio, antennal ratio and genitalia. But *P. ophioides* is probably more closely related to *P. illinoense*. It is known to occur in the same environment with *P. illinoense* (Berg 1950, Rosenberg and Wiens 1976). Furthermore, only minor differences have been noted in the immatures (Berg 1950, Oliver et al. 1978). Larvae gnaw away at the upper epidermis and mesophyll tissues of *Potamogeton* leaves in irregular patches; according to Berg (1950) they differ from *P. illinoense* in that they produce no distinct channels, being found on rolled lateral edges of young leaves, not exposed on the flat leaf surfaces as in *P. illinoense*. Larvae mature in June and early July in Michigan; pupation occurs in leaf rolls; pupae swim into open water where adults emerge (Berg 1950). Harper and Cloutier (1979) found *P. ophioides* in very small numbers in a highland stream in Quebec. The species occurs in northeastern and western United States and Canada. It has been recorded from Summit Co., Ohio (Townes 1945). There is the remote possibility that *P. ophioides* will prove to be a form of *P. illinoense*.

POLYPEDILUM AVICEPS TOWNES 1945

The male of this species was originally described as being structurally similar to that of *P. convictum*. The female has not been described. The high degree of variability in *P. convictum* tends to introduce some doubts with respect to the validity of the anal spine and perhaps other genital features in identifying *P. aviceps*. The environmental demands of *P. convictum* and *P. aviceps* appear to be similar or identical; their larvae may occupy the same environment. According to Harper and Cloutier (1979), they both show a definite preference for riffle areas. Maschwitz (1975) indicated that the two species are easily separated in both larval and pupal stages. My Ohio material, some of it reared, clearly supports the conclusions of Maschwitz. Careful study of reared material indicates that the female is unique and readily identifiable. Characteristics of the female are presented in the key.

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EDITOR'S NOTE

New manuscripts usually will be published within 7 months of acceptance in *The Ohio Journal of Science.*