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The Nearctic Species of *Agnetina* (Plecoptera: Perlidae)[1]

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ABSTRACT: The nearctic *Agnetina* (=*Phasganophora*) are reviewed and three valid species are recognized. *A. annulipes* (Hagen), n. comb. and *A. flavescens* (Walsh), n. comb. are removed from the *A. capitata* (Pictet) synonymy and the three species are redescribed. Keys for imagoes and nymphs are provided and a lectotype is designated for *A. flavescens*.

As Zwick (1984b) noted, the stoneflies currently placed in *Agnetina* have suffered a disproportionate number of systematic changes. Nearctic forms have been placed as *Neophasganophora capitata* (Pictet) (Jewett, 1956) or *Phasganophora capitata* (Illies, 1966; Hitchcock, 1974) but Banks (1948) recognized eight species which he placed in *Harrisiola*. Stark and Gaufin (1976) indicated a species complex was involved but inadequate material prohibited a review at that time. Recent acquisitions by the National Museum of Natural History of the J. F. Hanson and S. W. Hitchcock collections, along with Alabama collections by S. Harris, have provided additional material necessary for this review.

Materials and Methods

Techniques for preparation and study of genitalia and eggs are found in Stark and Szczytko (1981). Specimens obtained on loan are designated by initials of the respective institution or individual. These include: Boris C. Kondratieff (BCK); Barry C. Poulton (BCP); Clemson Univ. (CU); Monte L. Bean Museum, Brigham Young Univ. (MLBM); Museum of Comparative Zoology, Harvard Univ. (MCZ); Oregon State Univ. (OSU); United States National Museum of Natural History (USNM). Specimens without designations are in the collection of the author.

Keys to Nearctic Species of *Agnetina*

Adults

1. Femora transversely banded (Fig. 7); male hemitergal process foot-shaped with long slender ankle and toe (Figs. 1, 16), female subgenital plate truncate, dark pigment covers sternum 8 in continuous mesal band (Fig. 4) ..... *A. annulipes*
– Femora longitudinally banded (Figs. 8, 9); male hemitergal process either with toe blunt or ankle short (Figs. 2, 3); female subgenital plate rounded with areas of basolateral dark pigment (Figs. 5, 6) 2
2. Ventral margin of femora dark forming mesal yellow window (Fig. 8); apical portion of male hemitergal process long and sinuate, toe bluntly rounded (Figs. 2, 19); dark pigment areas on female sterna 8 and 9 large quadrangular (Fig. 5) ..... *A. capitata*
– Ventral margin of femora light (Fig. 9); swollen area of male hemitergal

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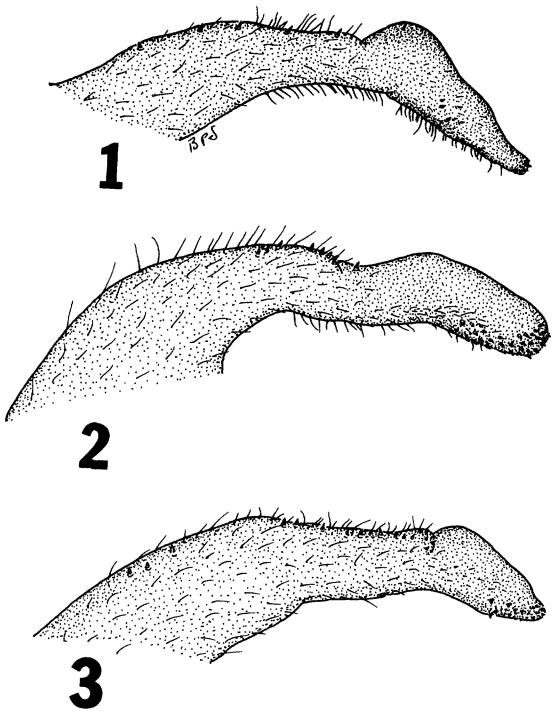


Figs. 1–3. *Agnetina* male hemitergal processes, lateral aspect. 1. *A. annulipes.* 2. *A. capitata.* 3. *A. flavescens.*

process adjacent to foot obscuring ankle area (Figs. 3, 22); dark pigment areas of female sterna 8 and 9 not quadrangular (Fig. 6) .... *A. flavescens*

Preliminary Key to Mature Nymphs

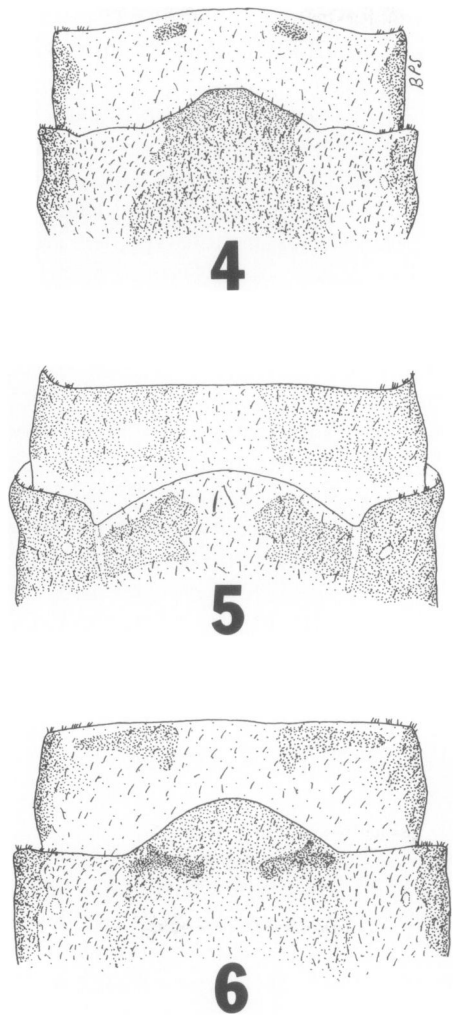
1. Apex of tergum 10 dark (Fig. 11) ..... *A. annulipes*
– Apex of tergum 10 light (Figs. 13, 15) 2
2. Arms of M-line on head mask directed essentially laterally (Fig. 12); dark pigment of tergum 10 continuous (Fig. 13) ..... *A. capitata*
– Arms of M-line on head mask directed posterolaterally (Fig. 14); dark pigment of tergum 10 interrupted mesally (Fig. 15) ..... *A. flavescens*

Agnetina annulipes (Hagen), new combination

Perla annulipes Hagen, 1861. Holotype ♂ (MCZ #249). Washington, D.C.

MALE: Forewing length (FWL) 11–13 mm. Apical portion of hemitergites foot-shaped in lateral aspect with distinct "ankle", "heel" and long slender "toe" regions. Prominent sensilla basiconica (SB) are scattered over "toe" and extend along "arch" to near ankle; additional large SB form an irregular row along basal portion of hemitergites which terminate at a swollen area below "ankle" (Figs. 1, 16–18).

FEMALE: FWL 14–17 mm. Sternum eight with dark mesal pigment band (Fig. 4); sternum nine with posteromesal pigment areas small. Subgenital plate truncate.



Figs. 4–6. *Agnetina* female sterna 8 and 9. 4. *A. annulipes.* 5. *A. capitata.* 6. *A. flavescens.*

ADULT FEMORA: Distinctly banded in dark brown and yellow. Proximal dark band extends from femoral base to near midline, distal dark band smaller. Mesal yellow band subequal to proximal dark band (Fig. 7).

NYMPH: Dark pigment on tergum 10 extends to apex (Fig. 11). Arms of M-line of head mask directed posterolaterally (Fig. 10).

EGG: Surface irregularly granular with shallow follicle cell impressions restricted to area below micropylar line. Collar reduced to small circular area to which a large umbrella-like anchor plate is attached. Collar end with a subapical ring. Micropyles located in subequatorial-position near posterior pole; orifices oval and slightly raised above chorionic surface; canals distinct (Figs. 21, 24).

COMMENTS: This species was correctly recognized by Banks (1948) based on his figures of femora and male hemitergites. The apparent distribution pattern is similar to that of *Acroneuria arenosa* (Pictet), *Paragnetina fumosa* (Banks) and

Neoperla carlsoni Stark and Baumann. Current records are from Pennsylvania to Florida along the Atlantic Coastal Plain and west to the Mississippi River on the Gulf Coastal Plain.

MATERIAL EXAMINED: AL: *Covington Co.,* Five Runs Crk, Hwy 24, 12-VI-82, 1♂, 3♀♀, S. Harris. Blue Spring, 12-VI-82, 2♂♂, 2♀♀, S. Harris. Yellow Crk, Hwy 4, 12-VI-82, 2♂♂, S. Harris. *Tuscaloosa Co.,* Big Sandy Crk, 7-V-84, 3♂♂, S. Harris. Same location, 2-VI-83, 7♂♂, 1♀, S. Harris. Same location, 9-VI-82, 6♂♂, 11♀♀, S. Harris. DC: Washington, 1♂, O. Sacken (holotype, MCZ #249). FL: *Gadsden Co.,* Rocky Comfort Crk, 18-IV-73, 3♂♂, A. R. Gaufin. Same location, 10-VI-70, 3♂♂, Jones et al. LA: *Tangipahoa Par.,* Tangipahoa Riv, 1 mi E Kentwood, 27-V-72, 1♂, 1♀ (reared), T. Huggins. MD: *Montgomery Co.*, Plummers Island, 10-VI-02, 2♂♂, Barber (USNM). Same location, 15-VI-02, 1♂, Barber (USNM). Same location, 2-VII-07, 1♂, Barber (USNM). No locality, 25-VI-14, 1♂, W. T. Davis (USNM). MS: *Oktibbeha Co.,* State College, 1♂, H. E. Weed (USNM). *Pike Co.,* Tangipahoa Riv, Hwy 51, 7-IV-79, 2♀♀ (reared), B. Stark and M. Stegall. *Simpson Co.,* Mill Crk, Hwy 472, 24-V-80, 1♂, B. Stark. PA: *Pike Co.,* Milford, 20-VI-65, 1♂, 2♀♀, Cornell (OSU). SC: *Aiken Co.,* Upper Three Runs Crk, 13-VI-77, 1♂, Herlong-Pritchard. *Allendale Co.,* Lower Three Runs Crk, Rt 66, 5-VI-85, 12♂♂, 5♀♀, B. C. Kondratieff (BCK). *Pickens Co.,* Clemson, 19-V-49, 1♂ (CU). VA: *Fairfax Co.,* Great Falls, 11-VI-10, 1♂, W. T. Davis (USNM). *Shenandoah Co.,* Fort Valley nr. Elizabeth Furnace, 1♂, O. S. Flint (USNM).

Agnetina capitata (Pictet)

Perla capitata Pictet, 1841. USA (Type missing).
Perla tristis Hagen, 1861. Holotype ♂ (MCZ #245).
Perla hieroglyphica Provancher, 1876. Canada.
Perla marginipes Provancher, 1876. Quebec.
Perla americana Banks, 1900. Holotype ♀ (MCZ #11324).
Perla illustris Banks, 1908. Holotype ♂ (MCZ #11323). Mont St. Hilaire.
Perla innota Banks, 1918. Holotype ♀ (MCZ #10045). Ithaca, NY.
Harrisiola nigriscens Banks, 1948. Holotype ♂ (MCZ #27719). Antrim Co., MI.
Harrisiola abbreviata Banks, 1948. Holotype ♂ (MCZ #27720). Catskill Mts., NY.
Harrisiola modesta Banks, 1948. Holotype ♂ (MCZ #27718). Marietta, OH.

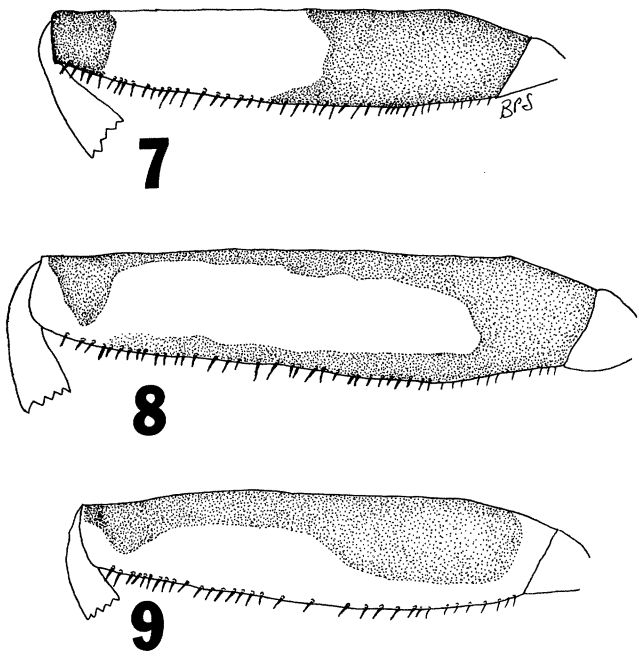
MALE: FWL 12–13 mm. Apical portion of hemitergites sinuate in lateral aspect without distinct "heel" (Figs. 2, 19, 20). Prominent SB distributed on apex and along basal portion of hemitergites to swollen area below "ankle".

FEMALE: FWL 16–19 mm. Sternum eight with subquadrangular pair of dark pigment areas on subgenital plate; sternum nine with posteromesal pigment areas large, quadrangular and containing a small circular light area. Subgenital plate rounded (Fig. 5).

ADULT FEMORA: Yellow "window" almost totally surrounded by dark border on anterior surface (Fig. 8).

NYMPH: Apex of tergum 10 with cordate light area (Fig. 13). Arms of M-line of head mask sinuate; not directed posterolaterally (Fig. 12). The frontispiece of Claassen (1931) beautifully illustrates this species.

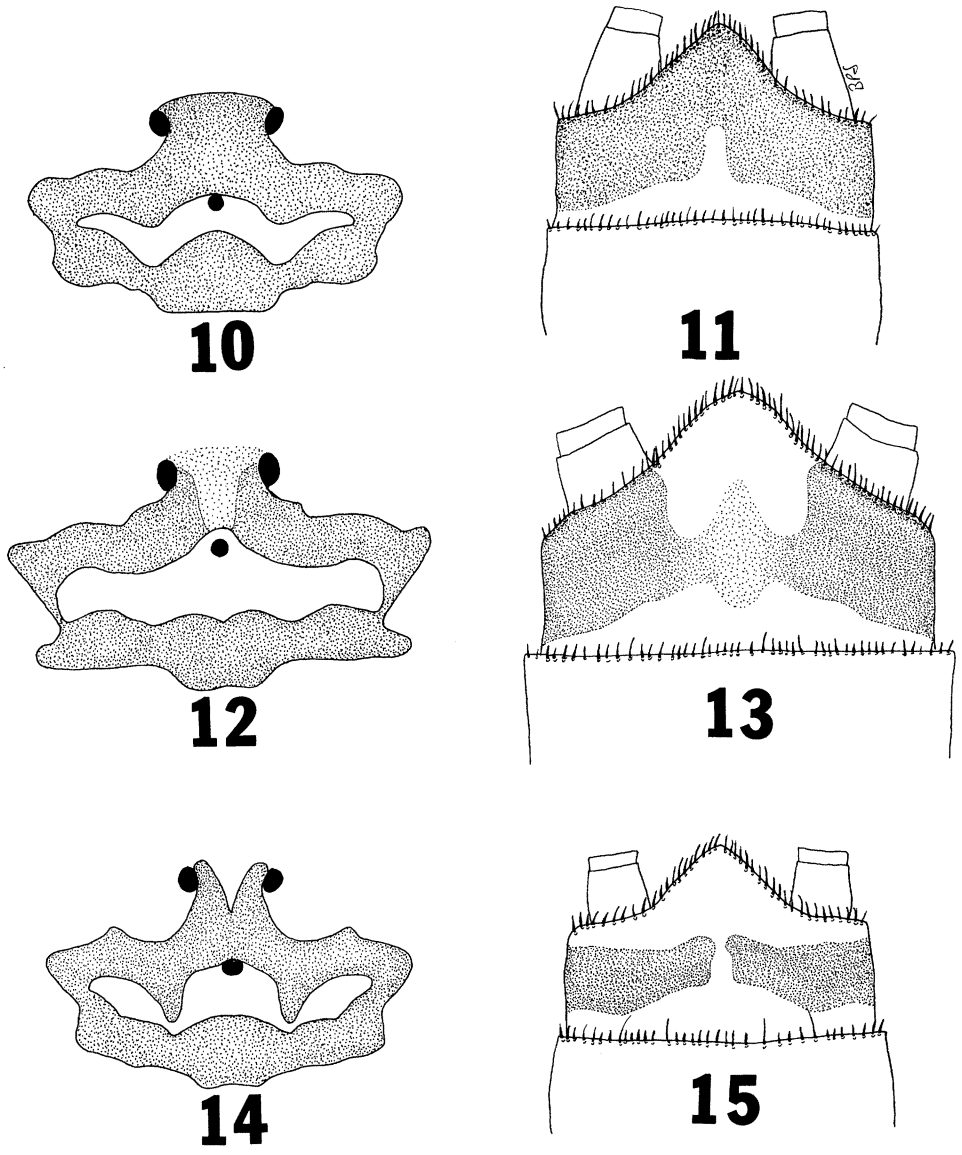
COMMENTS: The type specimen of *Perla capitata* was not found by Ricker (1938) or Zwick (1972) and it may be desirable to designate a neotype when an appropriate



Figs. 7–9. *Agnetina* adult femora, anterior aspect. 7. *A. annulipes.* 8. *A. capitata.* 9. *A. flavescens.*

specimen is available from the Philadelphia area where several of Pictet's type specimens were collected. The two Provancher types have not been studied in recent years and were unavailable to me; one or both of these may later need to be placed as synonyms of *A. flavescens.* The range of *A. capitata* is apparently form southern Canada to Virginia west to Minnesota and Missouri.

MATERIAL EXAMINED: CT: *Litchfield Co.,* Cornwall, 29-VII-23, 2♂♂, 2♀♀, C. Frost (USNM). Same location, 4-VI-64, 2♂♂, S. W. Hitchcock (USNM). Housatonic Riv, Sheffield, 15-VI-39, 4♂♂, J. Hanson (USNM). *New London Co.,* East Lyme, 1-VI-60, 1♂, S. W. Hitchcock (USNM). MA: *Hampshire Co.,* Amherst, 22-VI-39, 1♂, J. Hanson (USNM). Belchertown, 12-VI-39, 1♂, J. Hanson (USNM). ME: *York Co.,* Saco Riv, Bar Mills, 18-VI-39, 1♂, J. Hanson (USNM). MI: *Antrim Co.,* 1♂ (MCZ #27719). MN: *Fillmore Co.,* Root Riv, 11-VI-73, 5♂♂, 1♀ (USNM). *Pine Co.,* Snake Riv, 11-VI-78, 2♂♂, G. Daussin. MO: *Dallas Co.,* Bennett Springs St. Pk., 25-VIII-71, R. W. Baumann, 2♂♂ (MLBM). NH: *Coos Co.,* Lancaster, 1♂ (USNM). NY: Trenton Falls, 1♂, 1♀ (MCZ #245). Catskill Mts., 2♂♂ (MCZ #27720). *Genesee Co.,* Tonkawa Indian Res., 10-VI-59, 1♂, L. Pechuman (USNM). *Tompkins Co.,* Ithaca, 1♀ (MCZ #10045). Ithaca, 22-VI-22, 3♂♂, W. T. Forbes (USNM). OH: Marietta, 1♂ (MCZ #27718). *Geauga Co.,* Stebbins Gulch, 14-VI-76, 1♂ (USNM). QB: Montreal, 1♂, 1♀ (MCZ #11323). Rt 22 S of Coaticook, 27-VI-67, 2♂♂, S. W. Hitchcock (USNM). VA: Shenandoah Nat. Pk., Thornton Riv, 8-VII-61, 1♂, O. and R. Flint (USNM). *Fairfax Co.,* Falls Church, 1♀ (MCZ #11324). VT: *Essex Co.,* Lemington, Connecticut Riv, 28-VI-67, 4♂♂, S. W. Hitchcock (USNM).



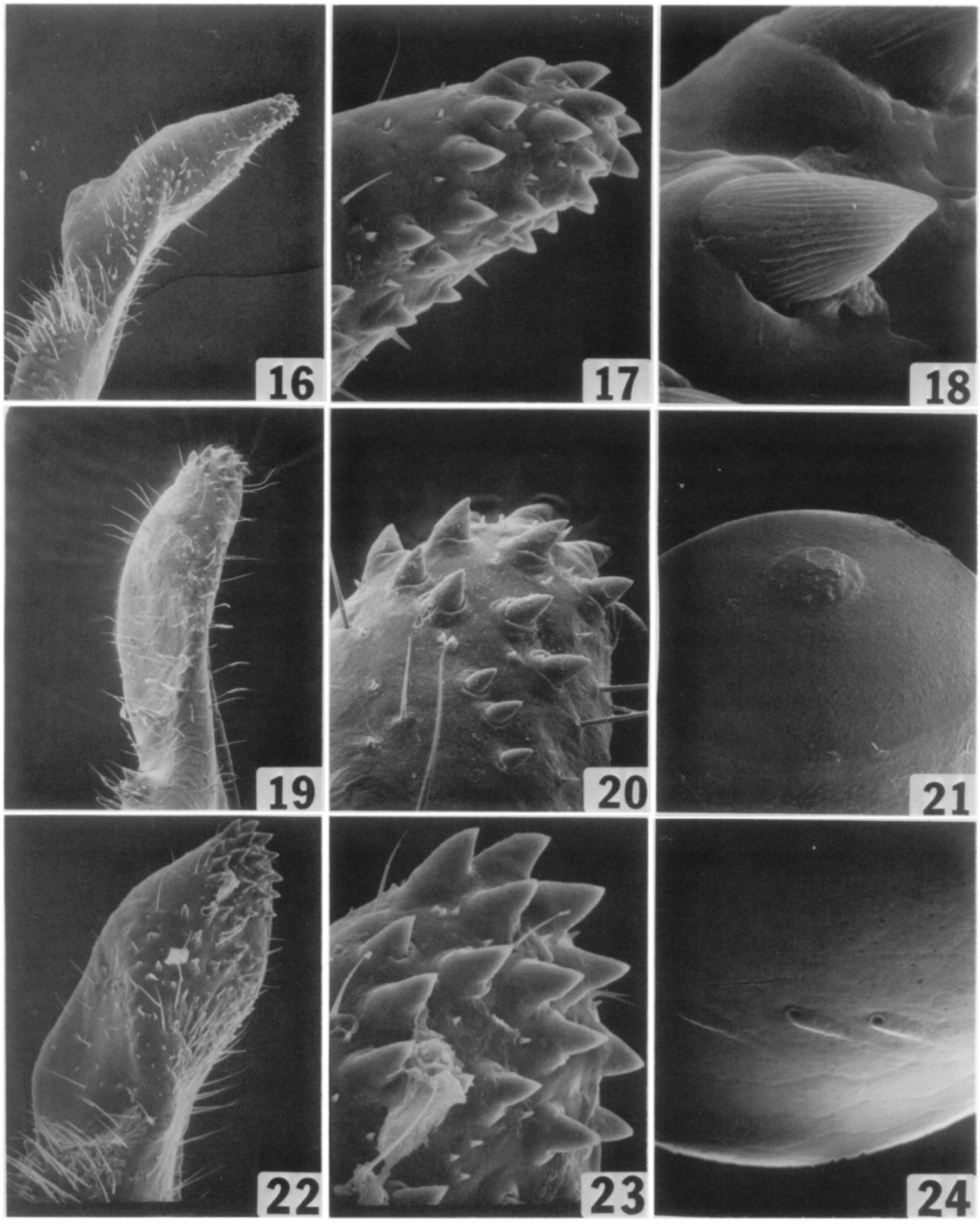
Figs. 10–15. *Agnetina* nymphal head mask and tergum 10. 10, 11. *A. annulipes.* 12, 13. *A. capitata.* 14, 15. *A. flavescens.*

Agnetina flavescens (Walsh), new combination

Perla flavescens Walsh, 1862. Lectotype ♀ (MCZ #10127). Rock Island, IL.
Harrisiola klapaleki Banks, 1948. Type series (MCZ #27717). Loudonville, OH.

MALE: FWL 12–13 mm. Apical portion of hemitergites short, "heel" distinct. "Toe" and "arch" covered with sensilla basiconica; swollen area prominent and located near "heel" (Figs. 3, 22, 23).

FEMALE: FWL 16–18 mm. Sternum eight with dark mesal band and a pair of



Figs. 16–24. SEM micrographs of *Agnetina* structures. 16. *A. annulipes,* hemitergite, lateral (×120). 17. *A. annulipes,* apex of hemitergite (×800). 18. *A. annulipes,* sensilla basiconica on hemitergite (×4000). 19. *A. capitata,* hemitergite, lateral (×126). 20. *A. capitata,* apex of hemitergite (×632). 21. *A. annulipes,* collar end of egg (×575). 22. *A. flavescens,* hemitergite, lateral (×200). 23. *A. flavescens,* apex of hemitergite (×800). 24. *A. annulipes,* micropyles and polar end of egg (×1150).

darker blotches on subgenital plate; posteromesal pigment areas on sternum nine sub-triangular (Fig. 6). Subgenital plate rounded.

ADULT FEMORA: Ventral margin of anterior surface with narrow yellow band extending full length (Fig. 9).

NYMPH: Distal half of tergum 10 entirely yellow; narrow dark pigment band interrupted mesally (Fig. 15). Arms of M-line of head mask almost interrupted by dark pigment (Fig. 14). The habitus in Frison (1935) apparently represents this species.

COMMENTS: According to Banks (1948) the MCZ collection contained a male paratype of *P. flavescens* but apparently the only remaining Walsh specimen is a female with MCZ #10127 on the label. This specimen has been damaged considerably, however, I am designating it as lectotype. The type of *Harrisiola klapaleki* Banks was unavailable but Banks' (1948) figures suggest this synonymy. The apparent range of *A. flavescens* is from New York to northern Georgia westward to the Ozark-Ouachita area of Oklahoma-Arkansas.

MATERIAL EXAMINED: AL: *Cleburne Co.,* Tallapoosa Riv, Hwy 66, 25-V-84, 1♂, S. Harris and P. Lago. AR: *Montgomery Co.,* Smiths Crk, Hwy 8, 5-VII-84, 1♂ (reared), B. C. Poulton (BCP). *Newton Co.,* Buffalo Riv, Hwy 43, 1♂ (reared), B. C. Poulton (BCP). GA: *Cherokee Co.,* Etowah Riv, 6.5 mi ESE Ball Ground, 22–25-VI-71, 5♂♂, 4♀, W. L. Peters et al. (USNM). *Dawson Co.,* Etowah Riv, 8 mi N Coal Mountain, 18-VI-73, 1♂, 10♀♀, B. Stark & G. Vaught. *Rabun Co.,* Clayton, VI-09, 1♂, W. T. Davis (USNM). IL: Rock Island, 1♀ (MCZ #10127). IN: *Joseph Co.,* Elkhart, 18-VI-04, 3♂♂, 4♀♀ (USNM). MD: *Montgomery Co.,* Plummers Island, 3-VI-02, 1♂ (USNM). MO: *Taney Co.,* Swan Crk, Swan, 23-V-72, R. W. Baumann, 2♂♂ (MLBM). NY: *Tompkins Co.,* Ithaca, 29-VI-04, 1♂ (USNM). OH: *Montgomery Co.,* Miami Riv, Dayton, 2-VI-51, 2♂♂, A. R. Gaufin (MLBM). OK: *Adair Co.,* Baron Fork, 26-VI-71, 1♂, 3♀♀, B. Stark. SC: *Chesterfield Co.,* Lynches Riv, Rt 264, 17-VI-85, 2♀♀, B. Kondratieff (BCK). VA: *Shenandoah Co.,* Fort Valley nr. Elizabeth Furnace, 20-VII-74, 1♂, 1♀, O. S. Flint (USNM).

Discussion

Nearctic *Agnetina* are morphologically more similar to the European species, *A. elegantula* (Klapalek), than to oriental forms (Zwick, 1984b; Wu, 1938; Stark and Gaufin, 1976). Indeed, Zwick's (1984b) figures of *A. elegantula* male genitalia are very suggestive of *A. capitata* as defined herein. Unlike the European species, however, Nearctic populations appear to be relatively common and all three species have been collected within the past decade. Hilsenhoff (1970) reports nymphs to be common in "medium to large" Wisconsin streams while Harper (1973) and Kovalak (1978) found other populations in the Great Lakes area numerous enough for life history and food habit analysis. These studies may well be based on mixed populations of *A. capitata* and *A. flavescens* since both species have been taken at Ithaca, New York and in Ohio and Minnesota. Maketon and Stewart (1984) reported the drumming behavior of a Delaware Co., Oklahoma population which presumably is *A. flavescens.*

In addition to the species listed by Zwick (1984b) for the genus, *Marthamea armata* Banks should be transferred to *Agnetina.* Stark and Gaufin (1976) previously placed the species in *Phasganophora,* illustrated the holotype male and suggested a possible synonymy with *A. multispinosa* (Wu). This has apparently been overlooked in subsequent studies (Zwick, 1984a, b).

ACKNOWLEDGMENTS

In addition to those listed above who provided material for this study, I wish to thank Steve Harris for the excellent Alabama series and Charles Vogt for arranging the loan of types from the MCZ. I also thank David Lentz, Univ. Mississippi Dental School, and Stanley W. Szczytko for assistance in preparation of SEM micrographs.

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