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Studies on the chorionic structure of the eggs of Corixoidea (Hemiptera: Heteroptera) with scanning electron microscopy

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Abstract

The chorionic structure of the eggs of sixteen species of Corixoidea (*Ectemnostega* (*Ectemnostega*) *quadrata* (Signoret), *E.* (*Ectemnostegella*) *quechua* (Bachmann), *Trichocorixa mendozana* Jaczewski, *Centrocorisa kollari* (Fieber), *Heterocorixa brasiliensis* Hungerford, *Sigara* (*Aphelosigara*) *tucma* Bachmann, *S.* (*Tropocorixa*) *denseconscripta* (Breddin), *S.* (*T.*) *platensis* Bachmann, *S.* (*T.*) *rubyae* (Hungerford), *S.* (*T.*) *santiagiensis* (Hungerford), *S.* (*T.*) *schadei* (Hungerford), *S.* (*T.*) *yala* Bachmann, *Tenagobia* (*Incertagobia*) *incerta* Lundblad, *T.* (*Fuscagobia*) *fuscata* (Stål), *T.* (*Schadeogobia*) *schadei* Lundblad, and *T.* (*Tenagobia*) *pulchra* Hungerford) is described for the first time using scanning electron microscopy. In addition, the eggs of some of these species are described based on color and morphometry. The sculpturing of the chorion and the structure of the micropylar area here in studied using scanning electron microscopy together with the length of the stalk distinguish the eggs of the genera (except *Sigara*, genus without a uniform pattern on the sculpturing of the chorion) and subgenera (including *Aphelosigara* and *Tropocorixa*) of Corixoidea present in Argentina. The above mentioned characters, together with the egg length, proved to be useful for the identification of the Argentinian species. An identification key to the eggs of Argentinian species of Corixoidea based on the material herein studied, and additional data present in the literature, is provided.

Key words: Nepomorpha, morphology, egg, chorionic structure, key, scanning electron microscopy

Introduction

The eggs of Corixoidea are variable in shape and in the way of attachment to the substrate. Some are elongate and glued lengthwise to the substrate without a special fastening structure; other eggs are ovoid or top-shaped and placed upright by an adhesive pad with a very short or considerably long stalk. The external structure of the chorion is also variable, being either smooth or with projections. The eggs are laid underwater attached singly or together to aquatic plants, dead leaves and twigs, woody debris, stones, and other available substrates. The most unusual oviposition habit is displayed by *Ramphocorixa acuminata* (Uhler), which deposits its eggs on the exoskeletons of crayfish (Griffith 1945).

Although the taxonomy and systematic of the adults of Corixoidea are comparatively well known, very few studies on the morphology of the immature stages are available in the literature. Regarding the eggs, there are only data of macroscopic characteristics and studies of the polygonal pattern of the chorion by optical microscopy. Studies using scanning electron microscopy are still not presently available in the literature.

The existing works include figures and descriptions of the size, color, shape, external structure of the chorion and the attachment system of the eggs of species of several genera of Corixoidea, e.g., *Agraptocorixa* Kirkaldy (Hale 1922, under *Porocorixa* Hale; Hungerford 1948b; Walton 1962; Fernando & Leong 1963; Fernando 1965),

between the above mentioned genera: *Heterocorixa*, EL: 0.50–0.55 mm, EW: 0.45 mm; *Sigara*, EL: 0.44–0.77 mm, EW: 0.31–0.62 mm; *Trichocorixa*, EL: 0.62–0.74 mm, EW: 0.37–0.42 mm (Table 2).

Further research including descriptions of the eggs of the species of Corixoidea is needed. In particular, studies including additional species are needed to confirm the characters herein established for separate genera and subgenera of Corixoidea. The egg morphology and chorionic structure within the families Corixidae and Micronectidae need to be assessed through more detailed approaches as they are still poorly known. Future studies should focus on providing useful morphological data, which will improve the resolution of analyses of the phylogeny of the Corixoidea.

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References

- Abbott, J.F. (1912) A new type of Corixidae (*Rhamphocorixa balanodis*, n. gen., et sp.) with an account of its life history. *The Canadian Entomology*, 44, 113–120, 1 pl.
<http://dx.doi.org/10.4039/ent44113-4>
- Bachmann, A.O. (1979) Notas para una monografía de las Corixidae argentinas (Insecta, Heteroptera). *Acta Zoologica Lilloana*, 35 (1), 305–350.
- Bachmann, A.O. (1981) Insecta Hemiptera Corixidae. *Fauna de Agua Dulce de la República Argentina*, 35 (2), 1–270.
- Bachmann, A.O. (1983) Notas sobre Corixidae (Heteroptera) (Cuarta Serie). *Revista de la Sociedad Entomológica Argentina*, 41 (1–4), 197–200.
- Bachmann, A.O. (1998) Heteroptera acuáticos. In: Morrone, J.J. & Coscarón, S. (Dir.), *Biodiversidad de Artrópodos Argentinos. Una Perspectiva Biotaxonomica*. Ediciones Sur, La Plata, pp. 163–180.
- Barata, J.M.S. (1981) Aspectos morfológicos de ovos de Triatominae II—Características macroscópicas e exocoriais de dez espécies do gênero *Rhodnius* Stål, 1859 (Hemiptera: Reduviidae). *Revista de Saúde Pública*, 15, 490–542.
- Buchanan White, F.B. (1873) Notes on *Corixa*. *Entomologist's Monthly Magazine*, 10, 60–63, 75–80.
- Candan, S. & Suludere, Z. (1999) Chorionic Structure of *Graphosoma lineatum* (Linnaeus, 1758). (Heteroptera, Pentatomidae). *Journal of the Entomological Research Society*, 1, 1–7.
- Cobben, R.H. (1968) *Evolutionary trends in Heteroptera. Part I: Eggs, architecture of the shell, gross embryology, and eclosion*. Centre for Agricultural Publishing and Documentation, Wageningen, Netherlands, 475 pp.
- Davis, C.C. (1965) A study in the hatching process in aquatic invertebrates. XII. The eclosion process in *Trichocorixa niais* (Kirkaldy) (Heteroptera, Corixidae). *Transactions of the American Microscopical Society*, 84 (1), 60–65.
- Dufour, L. (1833) *Recherches anatomiques et physiologiques sur les Hémiptères, accompagnées de considérations relatives à l'histoire naturelle et à la classification de ces insectes*. Mémoires des Savants étrangers, Paris, 4, 333 pp + 19 pl.
- Fernando, C.H. (1965) A preliminary account of the water bugs of the family Corixidae in Ceylon. *Journal of the Bombay Natural History Society*, 61 (3), 603–613.
- Fernando, C. & Leong, C.Y. (1963) Miscellaneous notes on the biology of Malaya Corixidae (Hemiptera: Heteroptera) and a study of the life history of two species, *Micronecta quadristrigata* Bredd. and *Agraptocorixa hyalinipennis* (F.). *Annals and Magazine of Natural History*, 6 (13), 545–558.
- González, G., Aldana, E., Lizano, E. & López, G. (2009) Arreglo de los polígonos del exocorion de huevos eclosionados de algunas especies de los géneros *Triatoma* Laporte, *Meccus* Stal y *Nesotriatoma* Usinger (Heteroptera: Reduviidae). *EntomoBrasilis*, 2, 76–79.
- Griffith, M.E. (1945) The environment, life history and structure of the water boatman, *Rhamphocorixa acuminata* (Uhler) (Hemiptera, Corixidae). *The University of Kansas Science Bulletin*, 30, 241–365.
- Hale, H.M. (1922) Studies in Australian aquatic Hemiptera. No. 1. Family Corixidae. *Records of the South Australian Museum*, 2, 309–330.
- Heidemann, O. (1911) Some remarks on the eggs of North American species of Hemiptera-Heteroptera. *Proceedings of the Entomological Society of Washington*, 13, 128–140.
- Howard, L.O. (1901) Egg of *Corixa mercenaria*. In: *Insect book*. pp. 273.
- Hungerford, H.B. (1917) Life history of a boatman. *Journal of the New York Entomological Society*, 25 (2), 112–122.

- Hungerford, H.B. (1919) The Biology and ecology of aquatic and semiaquatic Hemiptera. *Kansas University Science Bulletin*, 11, 1–328, 33 pls.
- Hungerford, H.B. (1923) Notes on the eggs of Corixidae. *Bulletin of the Brooklyn Entomological Society*, 18 (1), 13–16.
- Hungerford, H.B. (1948a) The Eggs of Corixidae (Hemiptera). *Journal of the Kansas Entomological Society*, 21 (4), 141–146.
- Hungerford, H.B. (1948b) The Corixidae of the Western Hemisphere (Hemiptera). *The University of Kansas Science Bulletin*, 32, 1–827.
- Hutchinson, G.E. (1940) A revision of the Corixidae of India and adjacent regions. *Transactions of the Connecticut Academy of Arts and Sciences*, 33, 341–476.
- Konopko, S.A. (2012) Description of the immature stages of *Sigara (Tropocorixa) schadei* (Hungerford) (Hemiptera: Heteroptera: Corixidae). *Zootaxa*, 3487, 41–57.
- Konopko, S.A. (2013a) Immature stages of the genus *Ectemnostega* Enderlein (Hemiptera: Heteroptera: Corixidae), with an identification key to instars and redescription of the nymphs of *E. (Ectemnostega) quadrata* (Signoret). *Studies on Neotropical Fauna and Environment*, 48 (1), 40–55.
- Konopko, S.A. (2013b) Description of the immature stages of *Sigara (Tropocorixa) santiagiensis* (Hungerford, 1928) (Insecta: Heteroptera: Corixidae). *Journal of Natural History*, 47, 1959 – 1982.
<http://dx.doi.org/10.1080/00222933.2012.763066>
- Konopko, S.A. (in press) The immature stages of *Sigara (Aphelosigara) tucma* Bachmann, 1961 (Hemiptera: Heteroptera: Corixidae). *Journal of Insect Science*, 19 pages.
- Konopko, S.A. & Mazzucconi, S.A. (2011) Morphometry and chaetotaxy of the nymphs of *Ectemnostega (Ectemnostegella) quechua* (Bachmann 1961) (Insecta: Hemiptera: Heteroptera: Corixidae). *Journal of Natural History*, 45 (31), 1995–2014.
- Konopko, S.A., Mazzucconi, S.A. & Bachmann, A.O. (2010a) Description of the nymphs of *Tenagobia (Incertagobia) incerta* Lundblad 1929 and *Tenagobia (Schadeogobia) schadei* Lundblad 1929 (Hemiptera: Heteroptera: Micronelectidae), with emphasis on morphometry and chaetotaxy. *Zootaxa*, 2511, 39–58.
- Konopko, S.A., Mazzucconi, S.A. & Bachmann, A.O. (2010b) Description of the nymphs of *Ectemnostega (Ectemnostegella) stridulata* (Hungerford 1948) (Hemiptera: Heteroptera: Corixidae). *Zootaxa*, 2639, 19–34.
- Konopko, S.A., Mazzucconi, S.A. & Bachmann, A.O. (2011) Description of the immature stages of *Trichocorixa mendozana* Jaczewski (Hemiptera: Heteroptera: Corixidae). *Zootaxa*, 3060, 47–61.
- Konopko, S.A. & Melo, M.C. (2009) Larval morphology of *Ectemnostega (Ectemnostegella) montana* (Lundblad 1928) (Hemiptera: Heteroptera: Corixidae: Corixinae), with an emphasis on chaetotaxy. *Zootaxa*, 2315, 1–18.
- Leuckart, R. (1855) Ueber die Micropyle und den feinereu Bau der Schalenhaut bei den Insekteneiern. *Archiv für Anatomie, Physiologie und Wissenschaftliche Medicin*, 1855, 91–257.
- Matesco, V.C., Furstenau, B.R.J., Bernardes, J.C., Schwertner, C.F. & Grazia, J. (2009) Morphological features of the eggs of Pentatomidae (Hemiptera: Heteroptera). *Zootaxa*, 1984, 1–30.
- Obara, M.T., da Rosa, J.A., da Silva, N.N., Ceretti, W. Jr., Urbinatti, P.R., Barata, J.M., Jurberg, J. & Galvão, C. (2007) Morphological and histological study of eggs of six species of the *Triatoma* genus (Hemiptera: Reduviidae). *Neotropical Entomology*, 36, 798–806.
<http://dx.doi.org/10.1590/s1519-566x2007000500023>
- Padilla Gil, D.N. & Nieser, N. (1994) A new *Neosigara* from Colombia with a key to species and ecological notes (Heteroptera: Corixidae). *Aquatic Insects*, 16 (1), 37–53.
- Peters, W. & Spurgeon, J. (1971) Biology of the water-boatman *Krizousacorixa femorata* (Heteroptera: Corixidae). *American Midland Naturalist*, 86 (1), 197–207.
<http://dx.doi.org/10.2307/2423700>
- Poisson, R. (1923) Accouplement, ponte et éclosion chez les Hémiptères aquatiques *Bulletin biologique de la France et de la Belgique*, 57, 89–97, pt. III.
- Poisson, R. (1933) Quelques observations sur la structure de l'œuf des insectes Hémiptères-Hétéroptères. *Bulletin de la Société Scientifique de Bretagne*, 10 (1, 2), 38 pp.
- Poisson, R. (1938) Les Hémiptères aquatiques Sandaliorhyncha de la faune française. II. Micronelectinae. Etude systématique et biologique; principales espèces paléarctiques. *Annales de la Société Entomologique de France*, 107, 81–120.
- Poisson, R. (1957) Hétéroptères aquatiques. *Faune de France*, 61, 1–263.
- Rosa, J.A., Justino, H.H. & Barata, J.M. (2003) Differences in the size of eggshells among three *Panstrongylus megistus* colonies. *Revista de Saúde Pública*, 37, 528–30.
- Sailer, R.I. (1948) The genus *Trichocorixa* (Corixidae, Hemiptera). In: Hungerford, H.B. (Ed.), *The Corixidae of the Western Hemisphere (Hemiptera)*. *University of Kansas Science Bulletin*, 32, 289–407.
- Sandoval, C.M., Nieves, E., Angulo, V.M., Rosa, J.A. & Aldana, E. (2011) Morphology of the eggs of the genus *Belminus* (Hemiptera: Reduviidae: Triatominae) by optical and scanning electron microscopy. *Zootaxa*, 2970, 33–40.
- Scudder, G.G.E. (1966) The immature stages of *Cenocorixa bifida* (Hung.) and *C. expleta* (Uhler) (Hemiptera: Corixidae). *Journal of the Entomological Society of British Columbia*, 63, 33–40.
- Suludere, Z., Candan, S. & Kalender, Y. (1999) Chorionic sculpturing in eggs of six species of *Eurydema* (Heteroptera: Pentatomidae): A scanning electron microscope investigation. *Journal of the Entomological Research Society*, 1, 27–56.
- Walton, G.A. (1962) The egg of *Agraptocorixa gestroi* Kirkaldy (Hemiptera: Heteroptera: Corixidae). *Proceedings of the Royal Entomological Society of London (A)* 37, 104–106.
<http://dx.doi.org/10.1111/j.1365-3032.1962.tb00468.x>
- Wróblewski, A. (1958) The Polish species of the genus *Micronelecta* Kirkaldy. *Annales Zoologici*, 17, 247–381.