Status of the enigmatic fossil vesicomyid bivalve *Pleurophopsis*

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The status of the vesicomyid genus *Pleurophopsis* Van Winkle, 1919, which occurs in chemosynthetic environments, is evaluated based on a redescription of the type material and observations on subsequently collected material. It is concluded that the name *Pleurophopsis* should not be used because the presently known material of its type species, *P. unioides* of middle Miocene age, does not show critical hinge details like nymph, subumbonal pit, and cardinal tooth 3a of the right valve. From the presently known characters, it can be concluded that *Adulomya? unioides* is very similar to the type species of *Adulomya* and *Ectenagena*, and it is shown that *Ectenagena* is a synonym of *Adulomya*. However, should better preserved material of *P. unioides* become available and confirm its close relation to *Adulomya* and *Ectenagena*, *Pleurophopsis* would have priority as it is the oldest of the three names.

Introduction

When Boss and Turner (1980) described *Calypogena magnifica* from hydrothermal vents at the Galapagos Rift, they considered the enigmatic fossil genus *Pleurophopsis* Van Winkle, 1919 as synonym of *Calypogena* Dall, 1891. Since then, vesicomyids have been described from various chemosynthetic habitats, including many hydrothermal vents in the Pacific and Indian Ocean (Van Dover et al. 2001; Desbruyères et al. 2006), hydrocarbon seeps on continental slopes of virtually all ocean basins (Levin 2005), whale carcasses (Smith and Baco 2003), and from ancient hydrocarbon seeps as old as the Early Cretaceous (Kanie et al. 1993). There is currently little consensus on the use and systematics of vesicomyid genera, not least because several of them are based on poorly preserved fossil species. The scope of this note is to redescribe the type species of *Pleurophopsis*, which is *P. unioides* Van Winkle, 1919, and to show that the generic name *Pleurophopsis* should not be used until better preserved material becomes available.

Institutional abbreviations.—PRI, Paleontological Research Institution, Ithaka, USA; USNM, U.S. National Museum of Natural History, Washington DC, USA.

Material and methods

*Pleurophopsis unioides* is known only from internal molds (steinkerns) from isolated limestones on Trinidad (Van Winkle 1919). It was first described by Maury (1912) as *Unio* sp., accompanied by the drawing of a specimen that lacked the posterior end, and showed the hollow spaces left by the hinge. Maury’s specimen was included in the synonymy of *P. unioides*, but Van Winkle’s drawing of her holotype shows a specimen with complete posterior margin, which clearly represents a different specimen than that illustrated by Maury (1912). Van Winkle’s holotype is missing from the PRI collection and must therefore be considered lost. Van Winkle’s illustration was reproduced in the Treatise (Keen 1969: fig. E136-6). The specimen figured by Maury (1912) as *Unio* sp. is present in the PRI collection (PRI 28452) and is here designated as neotype for *P. unioides*. A silicon rubber cast of the anterodorsal area of the neotype was made to clarify hinge features.

The type locality of *P. unioides* was initially considered Oligocene or Pliocene (see Boss and Turner 1980) and was recently regarded as Miocene (Gill et al. 2005). The label associated with the PRI material states “middle middle Miocene”. This note was probably made by Katherine Van Winkle herself, because she often added new information to specimens in the collection (Jennifer A. Hodgson, personal communication 2005).

Systematic paleontology

Class Bivalvia Linnaeus, 1758
Subclass Heterodonta Neumayr, 1884
Family Vesicomyidae Dall and Simpson, 1901
Genus *Pleurophopsis* Van Winkle, 1919

*Type species:* *Pleurophopsis unioides* Van Winkle, 1919, by monotypy; middle Miocene, Trinidad.

*Note:* The Treatise (Keen 1969) cited the author of *Pleurophopsis* as “Palmer, 1919”, because Katherine Van Winkle (1895–1982) changed her name to Palmer when she married Ephraim Laurence Palmer (1888–1970), Cornell University professor of Nature Study in 1921. However, her account on the fossils from Trinidad that included the introduction of *Pleurophopsis* was published two years earlier under her maiden name Van Winkle.

*Pleurophopsis unioides* Van Winkle, 1919

Fig. 1.

1912 *Unio* sp.; Maury 1912: 50, pl. 8: 18, 19.
1919 *Pleurophopsis unioides* sp. nov.; Van Winkle 1919: 24, pl. 3: 12.
2005 *Pleurophopsis unioides* Van Winkle; Gill et al. 2005: 205, fig. 7A, B.
Material.—The description below is based on (i) the neotype PRI 28452, (ii) a rubber cast of the neotype, (iii) Van Winkle’s illustration, and (iv) own observations on subsequently collected material (see Gill et al. 2005). Because only the lower portion of the hinge is preserved, characters like nymph and nymphal ridge, escutcheon, and lunule can not be evaluated.

Description.—Shell elongate elliptical, beak small, pointed and slightly prosogyrate, positioned in anterior quarter of shell; anterior margin evenly rounded, ventral margin straight or slightly convex, posterior margin rounded but more pointed than anterior margin, posterodorsal margin almost straight to slightly convex, only slightly inclined ventrally; after slight angulation at about three quarters of total shell length, shell margin slopes gently toward its rounded posterior end. Anterior adductor scar deeply impressed, almost straight on posterior side where bordered by strong vertical ridge; rounded on anterior side. Anterior pedal retractor scar deep, triangular, located directly above
strong ridge bordering anterior adductor scar; posterior muscle scars not observed. Pallial line impressed on anterior side of shell, fading away on posterior side of shell; presence or absence of pallial sinus unknown. Interior of shell shows fine radial striations between pallial line and ventral shell margin.

Only lower portion of hinge dentition preserved. Right valve: cardinal tooth 1 strong, triangular in ventral view; cardinal 3b elongate at base, 3a unknown; socket for cardinal 2b of left valve rectangular and deep. Left valve: cardinal 2a thin; cardinal 2b strong, flat on its ventral side. Ligament, nymph, potential escutcheon, and lunule not discernible due to poor preservation. Postero dorsal margin shows some variation in its slope.

Comparisons.—Whereas Van Winkle’s (1919) specimen shows a long, inclined and almost evenly convex postero dorsal margin that reaches close to the posterior end without angulation, the angulation is quite pronounced in some better-preserved specimens. Compared to other elongate vesicomyids, *P. unioides* angulation is quite pronounced in some better-preserved specimens.

Discussion

There is some consensus in the taxonomic literature on vesicomyids that the presence and shape of the cardinal tooth 3 of the right valve, nymph and nymphal ridge, subumbonal pit, es-
the rise of whales in the Eocene resulted in the radiation of the modern vent and seep fauna. Accordingly, they argued that whale carcasses provided dispersal "stepping stones" for vent and seep taxa, especially vesicomyids, thereby expanding their dispersal capabilities and opening new habitats for them. This hypothesis was challenged by the notion that vesicomyids do not occur at fossil whale falls in the Eocene and Oligocene, but only started to appear in this habitat in the Miocene (Kiel and Goedert 2006).

However, the study of Kiel and Goedert (2006) showed only that the rise of the whales in the Eocene and Oligocene had no significant impact on the evolution of vesicomyids, it did not rule out the possibility that vesicomyids underwent a major radiation once they started to adapt to whale falls in the Miocene. This question may be addressed using a detailed reconstruction of the origin and diversification of vesicomyid species and genera. The clarifications and redescription of P. unioides provided here are good steps toward such a consistent taxonomic and phylogenetic assessment of this group.

Due to the lack of data on hinge tooth 3a, nymph, subumbonal pit, escutcheon, lunule, and palial sinuvs in all currently available specimens of P. unioides, the generic name Pleurophopsis should not be used. Instead, the species should be referred to as Adulomya? unioides. However, should better preserved material become available, Pleurophopsis would have priority over both Adulomya and Ectenagena, because it is the oldest of the three names.

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References


