

山东省青岛市灵山岛下白垩统中 发现鱼类和叶肢介化石

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内容提要: 山东省青岛市灵山岛下白垩统沉积岩地层首次发现鱼类和叶肢介化石。鱼类化石为 *Lecoptera sinensis* Woodward (中华狼鳍鱼); 叶肢介化石为 *Yanjiestheria* Chen (延吉叶肢介属), 分为 4 个种。该鱼化石属于热河生物群的典型分子, 和该叶肢介属在胶莱盆地中广泛分布, 属于早白垩世陆相河湖动物群。两类化石同层保存, 化石保存完整, 属于原地埋藏, 所以含这些化石的地层应属于陆相沉积, 而与海相沉积关系不大。这套地层因岩性和沉积环境与胶莱盆地南部地区的莱阳群法家莹组 (K_1f) 非常接近, 建议使用法家莹组之名, 而不使用因被认为是海相浊流沉积而命名的“灵山岛组”。

关键词: 鱼类; 叶肢介; 下白垩统; 法家莹组; 灵山岛组; 灵山岛; 青岛市; 山东省

山东省青岛市灵山岛发育下白垩统 (Wang Jun et al., 2012), 山东省地矿局认为出露两套地层: 上部的青山群八亩地组 (K_1b) 火山岩不整合覆盖于下部的莱阳群法家莹组 (K_1f) 沉积岩之上, 法家莹组属于河湖相沉积 (山东省第四地质矿产勘查院, 2003)。吕洪波等 (2011, 2012) 根据软沉积变形构造认为这套沉积岩地层是一套形成于洋盆中的大陆斜坡条件下的远源浊积岩, 基于此观点, 张海春等 (2013) 建立了一个新的岩石地层单位——灵山岛组。但钟建华 (2012) 认为这是一套陆内体制下的三角洲相沉积, 而不是海相浊积岩。由此可以看出, 以上对这套沉积岩地层沉积环境的认识大相径庭, 原因在于都是依赖沉积构造的特征, 而缺乏指相化石的有力证据。

在前人多次对灵山岛地质进行考察与研究而寻找动物化石未果的情况下, 笔者等在 2016 年 11 月对灵山岛考察过程中, 恰遇村民进行建筑地基开挖, 幸运地在开挖的这套地层中首次发现了鱼类和叶肢介化石。这一发现对于这套地层的划分和形成环境的恢复具有重要的意义。

1 化石发现基本情况

化石发现于灵山岛打渔口村近海的公路边靠山

一侧, 坐标为 $N35^{\circ}45'08''$, $E120^{\circ}9'12''$ (图 1)。采样点为一个建房地基开挖槽 (图 2a), 槽深 4m, 揭露地

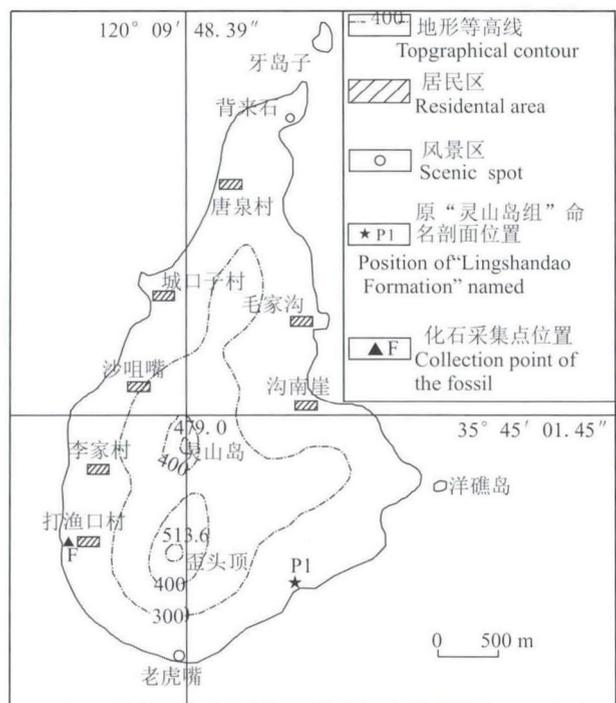


图 1 青岛市灵山岛发现化石的位置
Fig. 1 The fossil point in Lingshan Island, Qingdao, Shandong

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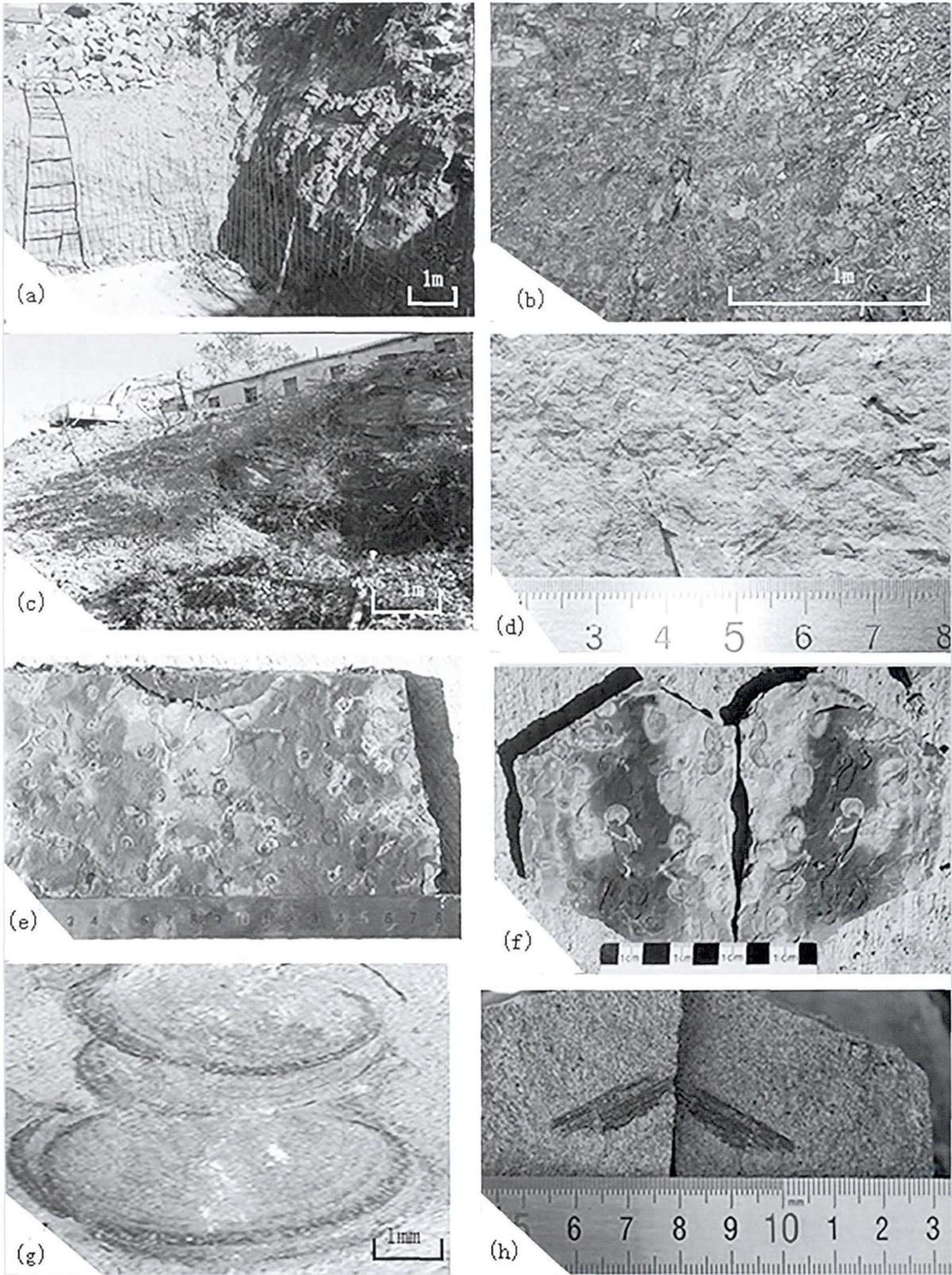


图2 青岛市灵山岛发现化石的地层及化石保存状况：(a) 建房地基开挖槽；(b) 灰黑色泥页岩夹浅灰色砂岩；(c) 灰黄色砂岩；(d)、(h) 植物碎片化石；(e)、(f) 叶肢介群体保存化石；(g) 叶肢介两壳保存化石

Fig. 2 The strata found fossils in Lingshan Island, Qingdao, and fossils preservation: (a) the box cut of strata; (b) dark mudstone, shale and french grey sandstone alternating layers; (d), (h) fossil plant fragments; (e), (f) group preservation of conchostracan fossils; (g) two valves together preservation of conchostracan fossils

层为灰黑色泥页岩夹浅灰色砂岩(图2b),下伏为整合接触的一套厚约2m的灰黄色砂岩(图2c)。该地层与张海春等(2013)所建灵山岛组时描述剖面的第三层相当。

鱼化石和叶肢介化石主要保存于泥岩之中,同层保存(图3c),鱼化石保存比较完整,有的头部缺失;叶肢介化石保存完整(图2e、2f),许多叶肢介双壳仍然铰合在一起或者分离不远(图2g)。在薄层砂岩中可见植物碎片化石(2d、2h)。

2 鱼化石

本次发现的鱼化石有三块标本,经与有关资料

(山东省地质矿产局区域地质调查队,1990)对比鉴定均属于 *Lecoptera sinensis* Woodward(中华狼鳍鱼)(图3)。其中两块为成体化石(图3a、3b),一块为幼体化石(图3c)。成体头部未保存,但椎体和鳍保存精美;而幼体保存完整,椎体骨化较弱。

3 叶肢介化石

本次发现的叶肢介化石数量较大,壳体虽然保存完整,但纹饰保存不甚清楚。经与前人研究成果(张文堂等,1976;沈炎彬,1981;山东省地质矿产局区域地质调查队,1990)对比鉴定,均属于 *Yanjiestheria* Chen(延吉叶肢介属),分别属于4个



图3 青岛市灵山岛发现的鱼化石 *Lecoptera sinensis* Woodward(中华狼鳍鱼)

(a) 标本号:111601; (b) 标本号: 111602; (c) 标本号:111603

Fig. 3 Fish fossil *Lecoptera sinensis* Woodward found in Lingshan Island, Qingdao, Shandong

(a) sample No. : 111601; (b) sample No. : 111602; (c) sample No. : 111603

种: *Y. kyongsangensis* (Kobayashi) (庆尚延吉叶肢介)
介)(图 4e、4f)、*Y. wannanensis* Chen et Shen(皖南

延吉叶肢介)(图 4c、4d)、*Y. chekiangensis*
(Novojilov) (浙江延吉叶肢介)(图 4a、4b)和 *Y.*

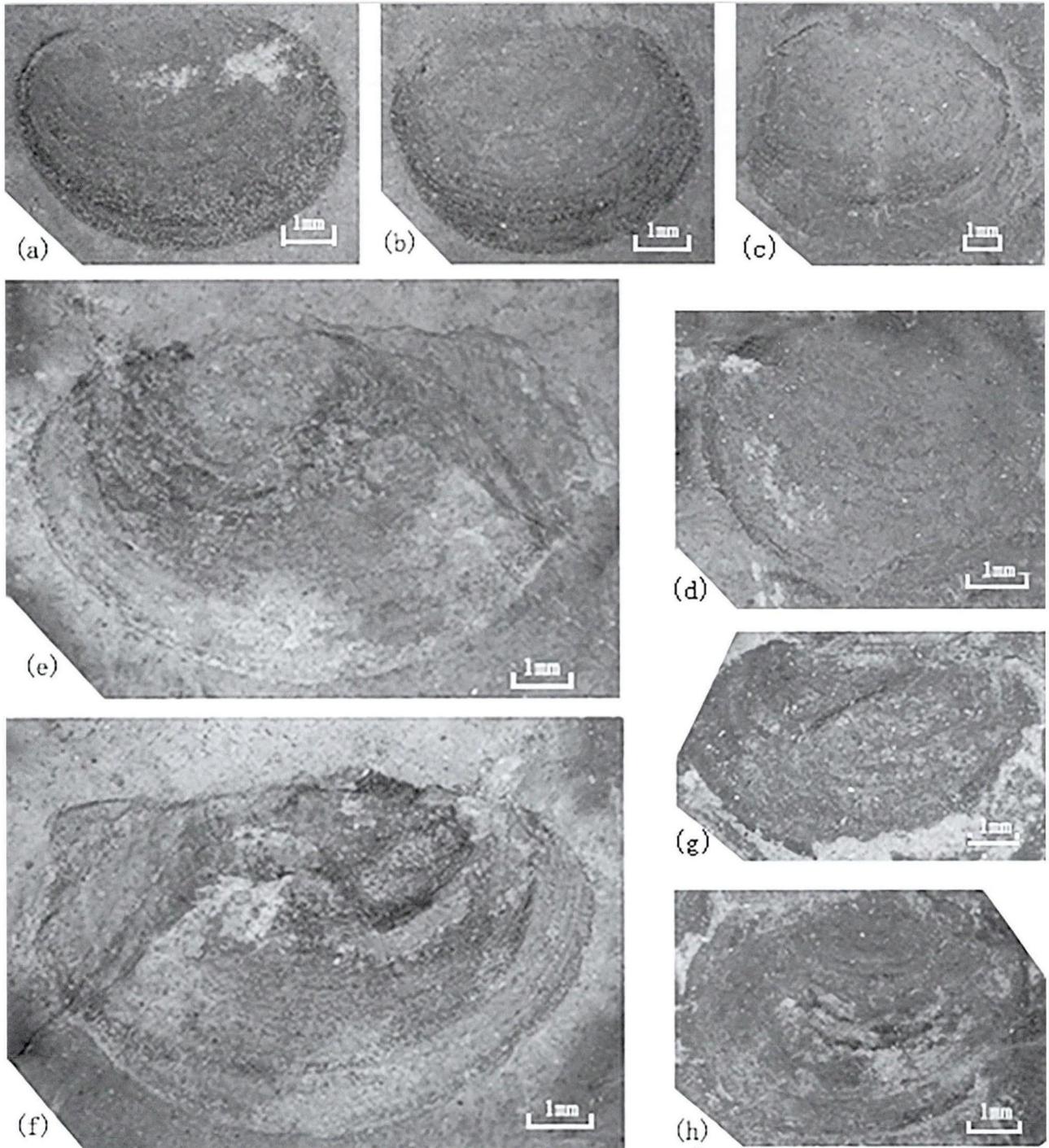


图 4 青岛市灵山岛发现的叶肢介化石: (a)、(b) *Y. chekiangensis* (Novojilov)(浙江延吉叶肢介), 标本号: 80846, 80849;
(c)、(d) *Y. wannanensis* Chen et Shen(皖南延吉叶肢介), 标本号: 80803, 80804; (e)、(f) *Yanjiaestheria kyongsangensis*
(Kobayashi)(庆尚延吉叶肢介), 标本号: 80811, 80812; (g)、(h) *Y. yumenensis*(Chang et Chen)(玉门延吉叶肢介), 标
本号: 80800, 80801

Fig. 4 Conchostracan fossils found in Lingshan Island: (a), (b) *Y. chekiangensis* (Novojilov), sample No.: 80846, 80849;
(c), (d) *Y. wannanensis* Chen et Shen, sample No.: 80803, 80804; (e), (f) *Yanjiaestheria kyongsangensis* (Kobayashi),
sample No.: 80811, 80812; (g), (h) *Y. yumenensis* (Chang et Chen), sample No.: 80800, 80801

yumenensis (Chang et Chen) (玉门延吉叶肢介) (图4g, 4h)。尚有一部分化石等待精确鉴定。

4 化石发现的地质意义

(1) 本次研究的化石在该地属于首次发现, 这填补了以往没有动物化石发现的空白, 对于这套地层的划分和形成环境的恢复具有重要的科学价值。

(2) 鱼类 *Lecoptera* 属于我国下白垩统热河生物群的典型分子 (季强, 2002), *Yanjiestheria* 与 *Lecoptera* 在胶莱盆地下白垩统莱阳群中同层产出 (山东省第四地质矿产勘查院, 2003), 为典型的陆相河湖动物群。灵山岛发现的以上化石从保存状况看, 属于原地埋藏, 所以含这些化石的地层应属于陆相, 而与海相浊流沉积关系不大。

(3) 发现化石的这套沉积岩地层与胶莱盆地南部地区莱阳群法家莹组的岩性非常接近, 并均为陆相河湖相沉积, 所以是否应该沿用法家莹组之名, 而无需另建“灵山岛组”?

我们相信, 随着更多化石发掘和分析工作的进行, 该地还会发现更多门类 (比如介形类、孢粉) 和更多数量的化石, 必将进一步推动地层学、沉积学和相关学科研究工作的进步。

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Discovery of Fish and Conchostracan Fossils in Lower Cretaceous in Lingshan Island, Qingdao, Shandong

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Abstract: The fish and conchostracan fossils are firstly discovered from sedimentary strata of Early Cretaceous in Lingshan Island, Qingdao, Shandong, China. The coordinate of discovery site is N35°45'08", E120°9'12". The rocks preserved the fossils are dark mudstone, shale and french grey sandstone alternating layers. The fish is *Lecoptera sinensis* Woodward and the conchostracan is *Yanjiestheria* Chen, belonging to four species; *Y. kyongsangensis* (Kobayashi), *Y. wannanensis* Chen et Shen, *Y. chekiangensis* (Novojilov) and *Y. yumenensis* (Chang et Chen). *Lecoptera* was the typical element of the Jehol Biota. Meanwhile, both fish and conchostracan species were widespread in the Jiaozhou—Laiyang Basin of Shandong Province and attributed to continental lacustrine fauna of the Early Cretaceous. The strata that contained above fossils buried in situ should be part of continental depositions. Owing to the high similarity in the lithology and sedimentary environment with the Fajiyang Formation of the Laiyang Group in southern region of Jiaozhou—Laiyang Basin, it is suggested to use the Fajiyang Formation rather than "the Lingshandao Formation", which was named after the marine turbidite deposits.

Keywords: fish; conchostracan; Jehol Biota; Lower Cretaceous; Fajiyang Formation; Lingshandao Formation; Lingshan Island; Qingdao City; Shandong Province.

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