

Recognition of an Eastern Pacific *Macoma* in the Coralline Crag of England and its Biogeographic Significance

BY

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EVIDENCE HAS BEEN ACCUMULATING over the last few years that Bering Strait was open during the late Miocene, closed through most of the Pliocene, then open and closed several times from the late Pliocene through the Pleistocene. These submergences allowed the exchange of marine life, chiefly from the Pacific to the Atlantic Oceans (MACNEIL, 1965; HOPKINS, 1967).

Pacific elements in the Coralline Crag of England, of Astian (Pliocene) age (BADEN-POWELL, 1960), may represent either late arrivals from the late Miocene submergence (Hopkins, personal communication) or early arrivals from the late Pliocene submergence (Zullo, personal communication). The larger influx (in terms of the number of species) of Pacific elements present in the Red Crag (Pleistocene) of England and similar deposits on the mainland of Europe and in Iceland may represent either an event of submergence in the Bering Strait area or similar tectonic events in the Canadian archipelago (HOPKINS, 1967).

In connection with a revision of the Eastern Pacific Tellinacea, I can now report further evidence concerning the trans-Arctic migrations of mollusks. The boreal species of the genus *Macoma*, with a geological record from the Eocene to the Recent in the Eastern Pacific (KEEN & BENTSON, 1944), have recently been discussed as not having reached the Atlantic Ocean until the Pleistocene influx (DURHAM & MACNEIL in HOPKINS, 1967). I find that *M. obliqua* (SOWERBY, 1817)¹, reported from the Coralline Crag of England (WOOD, 1848, 1874; British Museum [Natural History], 1963) and from the correlative, Scaldisian strata in Belgium (GLIBERT, 1958a, b), is conspecific with a Recent West American boreal species, commonly identified with *M. incongrua* (VON MARTENS, 1865)².

Macoma lyelli DALL, 1894, described from the late Miocene or early Pliocene of Marthas Vineyard, Massachusetts (also DALL, 1900b), and *M. cookei* GARDNER, 1943, described from the Upper Miocene of Virginia seem to be closely related.

As Recent and fossil Eastern Pacific specimens of *Macoma obliqua* differ significantly from Recent material from Japan, type locality of *M. incongrua*, the Western Pacific form should be regarded as a distinct subspecies or species. *Macoma obliqua* has become extinct in the North Atlantic since the Pleistocene.

¹ *Tellina obliqua* J. SOWERBY, 1817, *non* WOOD, 1815. The International Commission on Zoological Nomenclature has been petitioned to conserve the name of this well-known Cenozoic fossil which has only recently been discovered to be a junior homonym of an unimportant junior subjective synonym. Type specimens of the Sowerby species are in the British Museum (Natural History), and Stanford University now has specimens from the Red Crag which have been compared with this type material.

² *Tellina incongrua* VON MARTENS, 1865. A potential lectotype, measuring 25.4 mm in length, is in the Zool. Mus., Humboldt Univ., Berlin, no. 7624. Synonyms appear to be *Tellina nasuta truncata* MIDDENDORFF, 1851, *non* LINNAEUS, 1767, and *T. nasuta brevior* SCHRENCK, 1867. *Macoma frigida* (HANLEY, 1844), described from Kamchatka, seems to be a closely-related, but distinct species.

DALL (1900a) suggested that *Tellina rotundata* SOWERBY, 1867, might be a synonym of *Macoma incongrua*. The type specimen in the BM(NH) proves to be *M. balthica* (LINNAEUS, 1758). He also suggested that *M. californiensis* BERTIN, 1878, was a synonym. Photographs of the type specimens of the latter, kindly provided by l'École des Mines, Paris, prove these to be *Macalia bruguieri* (HANLEY, 1844), mislabeled as to locality, for the species is Asian.

The synonymy of *Macoma obliqua* and the West American *M. incongrua* of authors, foreshadowed by the association of the two names in the Pleistocene of Iceland (EINARSSON, HOPKINS, & DOEL in HOPKINS, 1967), suggests that migrations from the Pacific to the Atlantic during the first Cenozoic submergence of Bering Strait in the late Miocene may have been more extensive in terms of the number of species involved than previously thought (as listed by DURHAM & MACNEIL in HOPKINS, 1967). West American paleontologists and marine molluscan systematists will have to take into account this exchange and the resulting nomenclatural involvements with European and Atlantic fossil species.

I would also suggest that the isolation created by the Pliocene land bridge subsequent to the late Miocene sea passage may partially explain the presence of so many boreal species of some genera, such as *Macoma*, in the North Pacific Basin. For instance, *M. middendorffi* DALL, 1884, a related Bering Sea species, with published records in the Miocene, Pliocene, and Pleistocene of the North Pacific, may represent the population which remained in the Pacific Ocean when *M. obliqua* traveled to and became isolated in the Atlantic-Arctic in the Pliocene.

A preliminary survey of literature indicates that another, now extinct species of boreal *Macoma* may have reached the Atlantic as early as the European Anversian (Miocene). Taxa that ought to be compared with one another in order to prove this are *M. albaria* (CONRAD, 1849), *M. virginiana* (CONRAD, 1866) (and its subspecies), and *M. elliptica* (BROCCHI, 1814) of GLIBERT (1958a, 1958b) and others.

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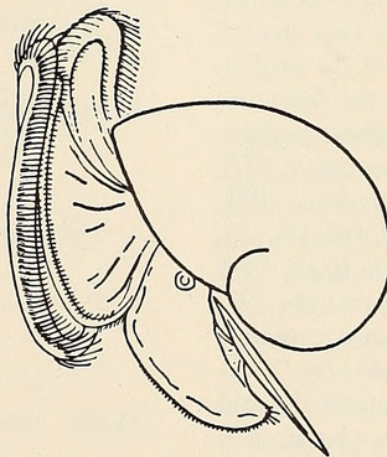
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