Sheppey

([TQ 955 738]–[TR 024 717])

Highlights

The fish fauna recovered from this London Clay outcrop in Kent includes an extraordinary number of both elasmobranch and actinopterygian species. Indications are that the fish communities were at an ecological acme, and developed upon a very broad feeding base.

Introduction

The London Clay Formation exposed on the northern and north-eastern shores of the Isle of Sheppey has yielded an important fauna of Eocene fossil vertebrates. Specimens are still found, and the coast of Sheppey has excellent potential for future finds. In the London Basin the marine London Clay Formation is up to 153 m thick (A.G. Davis 1936), but only the top 52 m are exposed on the Isle of Sheppey (Divisions D-E; (Figure 14.8)). The geology of the Sheppey section has been described by A.G. Davis (1936, 1937), Pitcher *et al.* (1967) and King (1970, 1981, 1984), and the fishes by Agassiz (1833–1845), Woodward (1889b, 1899d), Leriche (1905, 1921), White (1931), A.G. Davis (1936), Stinton (1965c, 1966), Casier (1966, 1967) and Ward (1988).

Description

The main fossiliferous horizon lies in Division D: 'an interval 9.5 m-16 m below the base of division E…' It can be seen on the foreshore and in the base of the cliff between Eastchurch Gap and Paddy's Point [TQ 997 730]– [TQ 971 735], and rises eastwards to a height of about 15 m OD at Warden Point' (King, 1981, p. 53). This bed, probably equivalent to bed C of A.G. Davis (1936, 1937), yields molluscs, brachiopods, bryozoans, crustaceans (including decapods, barnacles and ostracods), annelids, echinoderms, corals, foraminiferans and plants — a mixture of shallow-marine and drifted terrestrial forms.

Most of the published descriptions of fossil fishes and museum specimens have little locality information except 'London Clay, Sheppey'. Hooker and Ward (1980, p. 5) noted that fossil vertebrates occur at various points in the section from [TQ 955 738] to [TR 024 717]. Particular fossil localities include Minster [TQ 955 736], Royal Oak [TQ 967 757], Bugsby's Hole [TQ 974 725], East Church Gap [TQ 997 730], Barrow Brook [TR 013 718] and Warden Point [TR 021 725].

Fauna

Fossil fish from Sheppey are to be found in many British and European museums (Figure 14.9) and (Figure 14.10). The best collections are in the NHM and CAMSM.

Chondrichthyes: Elasmobranchii: Neoselachii: Squalomorphii

Hexanchus agassizi Cappetta, 1976

H. hookeri Ward, 1979

H. collinsonae Ward, 1979

Isistius trituratus (Winkler, 1874)

Notorhynchus serratissimus (Agassiz, 1844)

Squalus minor (Leriche, 1902)

Weltonia burnhamensis Ward, 1979

Chondrichthyes: Elasmobranchii: Neoselachii: Squatinomorphii

Squatina prima (Winkler, 1874)

Chondrichthyes: Elasmobranchii: Neoselachii: Galeomorphii

Anomotodon sheppeyensis (Casier, 1966)

Carcharias hopei (Agassiz, 1843)

Galeorhinus lefevrei (Daimeries, 1891)

G. minor (Agassiz, 1843)

G. recticonus (Winlder, 1873)

Heterodontus vincenti (Leriche, 1905)

H. woodwardi Casier, 1946

H. wardenensis Casier, 1966

Isurus praecursor (Leriche, 1904)

Isurolamna affinis (Casier, 1946)

'*Lamna*' *lerichei* Casier, 1946

Megascyliorhinus cooped Cappetta and Ward, 1977

Mustelus whitei Cappetta, 1976

Odontaspis winkleri Leriche, 1905

Otodus obliquus Agassiz, 1843

Palaeohypotodus rutoti (Winkler, 1874)

Physogaleus secundus (Winkler, 1874)

(= *Physodon secundus, P. tertius, Galeorhinus minor*)

Scyliorhinus gilberti Casier, 1946

S. casieri Cappetta, 1976

'*Scyliorhinus*' *minutissimus* (Winkler, 1873)

'*S.*' *biauriculatus* (Casier, 1950)

Synodontaspis macrotus (Agassiz, 1843)

S. striatus (Winlder, 1874)

Triakis wardi Cappetta, 1976

Xiphodolamia eocaena (Woodward, 1889)

Chondrichthyes: Elasmobranchii: Neoselachii: Batomorphii

Aetobatus irregularis (Agassiz, 1843)

Burnhamia daviesi (Woodward, 1889)

Dasyatis daviesi Casier, 1966

Myliobatis raouxi Arambourg, 1952

M. dixoni Agassiz, 1843

M. latidens Woodward, 1888

M. toliapicus Agassiz, 1843

Myliobatus sp.

Raja sp.

Chondrichthyes: Holocephali: Chimaeriformes

Edaphodon bucklandi Agassiz, 1843

Elasmodus hunteri Egerton, 1843

Osteichthyes: Acanthopterygii: Scombroidei

Acestrus elongatus Casier, 1966

A. ornatus Casier, 1966

Osteichthyes: Actinopterygii: Acipenseroidei

Acipenser toliapicus Agassiz, 1844

Lehmannia sp.

Osteichthyes: Actinopterygii: Teleostei: Osteoglossomorpha

Brychaetus muelleri Woodward, 1901

Osteichthyes: Actinopterygii: Neopterygii: Teleostei: Elopomorpha

Albula oweni Leriche, 1905

Echilus branchialis (Woodward, 1901)

Egertonia isodonta Cocchi, 1866 *Elops* sp.

Phyllodus toliapicus Agassiz, 1844

P. sheppeyensis Casier, 1966

Promegalops signeuxae Casier, 1966

Protarpon oblongus (Woodward, 1901)

P. priscus (Woodward, 1901)

Osteichthyes: Actinopterygii: Neopterygii: Euteleostei

Aglyptorhynchus sulcatus Casier, 1966

Ampheristus toliapicus Konig, 1825

?Ardiodus marriotti White, 1931

?Argillichthys toombsi Casier, 1966

Aulopopsis depressifrons Casier, 1966

A. egertoni Casier, 1966

Beerichthys ingens Casier, 1966

Beerichthys? sp.

Brychaetus muelleri Woodward, 1901

Brarnoides brieni Casier, 1966

Bucklandium diluvii KOnig, 1825

Cybium cf. *proosti* (Storms, 1876)

Cylindracanthus rectus (Dixon, 1850)

Enniskillenus radiatus Casier, 1966

Eoceolopoma colei Woodward, 1901

E. gigas Casier, 1966

E. hopwoodi Casier, 1966

Eothynnus salmoneus (Agassiz, 1844)

Esocelops cavifrons (Agassiz, 1845)

Eutrichiurides winkleri Casier, 1944

Goniocranion arambourgi Casier, 1966

Halecopsis insignis (Delvaux and Ortlieb, 1887)

Hemirhabdorhynchus elliotti Casier, 1966

Labrophagus esocinus Agassiz, 1844

Laparon alticeps Casier, 1966

Lehmanamia sheppeyensis Casier, 1966

'Myripristis toliapicus' Agassiz, 1845 *nomen nudum*

Naupygus bucklandi Agassiz, 1844

Paraberyx bowerbanki David, 1946

Percostoma angustum Agassiz, 1845 *nomen nudum*

Phyllodus toliapicus Agassiz, 1844

Plesioserranus cf. *wemmeliensis* Casier 1966

Podocephalus curryi Casier, 1966

P. nitidus Casier, 1966

Progempylus edwardsi Casier, 1966

Promegalops signeuxae Casier, 1966

P. sheppeyensis Casier, 1966

Protarpon oblongus (Woodward, 1901)

P. priscus (Woodward, 1901)

Pseudosphaerodon antiquus Noetling, 1885

Pycnodus bowerbanki Egerton, 1877

Pycnodus. sp.

Rhinocephalus planiceps Casier, 1966

Sciaenurus bowerbanki ?Agassiz, 1845

S. bowerbanki cf. *crassior* Casier, 1966

Sciaenuropsis turneri Casier, 1966

Scombramphodon crassidens Woodward, 1901

S. sheppeyensis Casier, 1966

Scombrinus macropomus (Agassiz, 1835)

S. nuchalis Woodward, 1901

Serranopsis londinensis Casier, 1966

Sphyraenodus priscus Agassiz, 1839–1844

Tamesichthys decipiens Casier, 1966

Teratichthys antiquitatis König, 1825

Trichiurides sagittidens (Winkler, 1874)

Wetherellus brevior Casier, 1966

W. cristatus Casier, 1966

W. longior Casier, 1966

Whitephippus tamesis Casier, 1966

Whitephippus sp.

Woodwardella patellifrons Casier, 1966

Xiphiorhynchus priscus (Agassiz, 1839)

X. parvus Casier, 1966

Interpretation

The London Clay Formation on Sheppey is interpreted by King (1984, p. 121) as a marine deposit laid down in a 'well-oxygenated low-energy shelf environment, varying in depth from *c.* 20 to *c.* 100 metres. Alternation of fine and coarser layers is ascribed to minor sea-level fluctuations. The upper part of the London Clay Formation was deposited in a progressively shal-lowing environment.'

The bulk of the fauna — foraminifera, coelenterates, scolecodonts, serpulids, brachiopods, bryozoans, benthic molluscs, pteropods, ostracods, crustaceans and echinoderms were predominantly epifaunal or infaunal in habit. The fishes and turtles were indigenous marine forms, but the remainder (as with wood, leaves, pollen and spores and insects) may have been washed in.

The abundance of elasmobranch fishes indicates a great range of predatory forms attracted to the wealth of small animals present, especially the benthos. The primitive squaloitiorphs were probably bottom-dwelling forms, like the extant dogfishes. *Squatina prima* is present, as in almost all the sites described and is the single squatinomorph, but the galeomorph sharks were in great variety as active fusiform-bodied predators. Their prey presumably included much nekton. The batomorphs, too, may have been, like *Myliobatis,* widespread benthonic ray-like animals. Teleosts, though by no means rare, are by contrast poorly represented, perhaps for overall reasons of taphonomy.

Allison (1988) has studied the taphonomy of the prolific and diverse London Clay biota at Sheppey. He found that apatite was the first preservational mineral to form, followed by calcite and pyrite. Only those organisms with an original phosphate content (such as the vertebrates) have become phosphatized. Organisms preserved during the earliest phase of mineralization retain the most detail. Soft-part preservation is very rare while the hard parts are almost always preserved in three dimensions within the pyrite and calcium phosphate concretions (Casier, 1966; Ward, 1979).

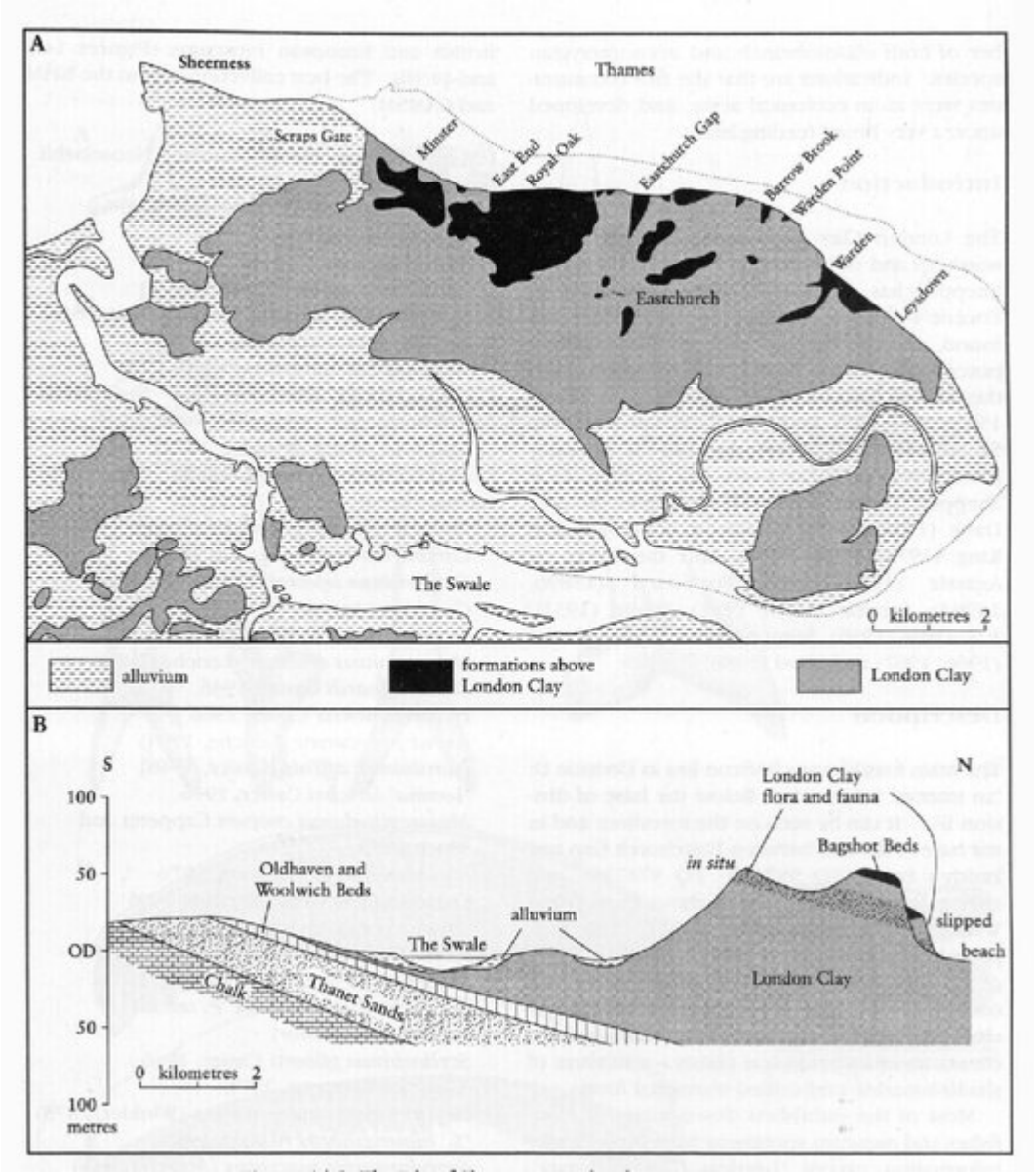
Comparison with other localities

The nearest comparable units with the London Clay Formation of Sheppey outside Britain are the Sables de Erquelinnes (Hainaut, Belgium; Late Palaeocene), the Argile d'Ypres (France, Belgium; Early Eocene), and the Sables de Bruxelles (Belgium; Mid-Eocene), as well as equivalent-age units in France, Morocco, Nigeria, Mali and the eastern United States.

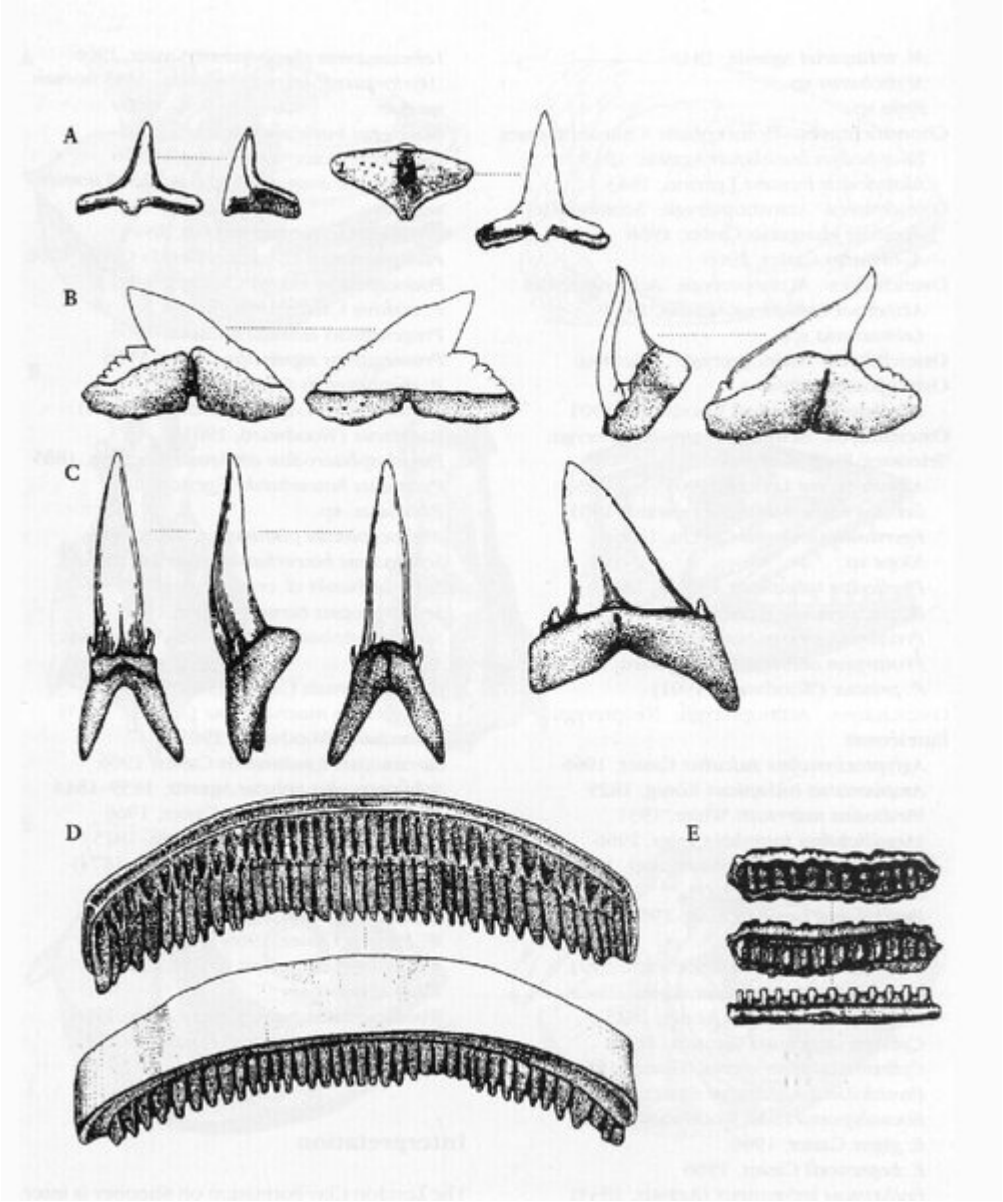
Conclusion

The London Clay Formation fish fauna at Sheppey is important for both its relative abundance and diversity, and the good quality of preservation, hence the site's conservation value. The locality has been well known by palaeontologists for over 150 years, yielding many type specimens.

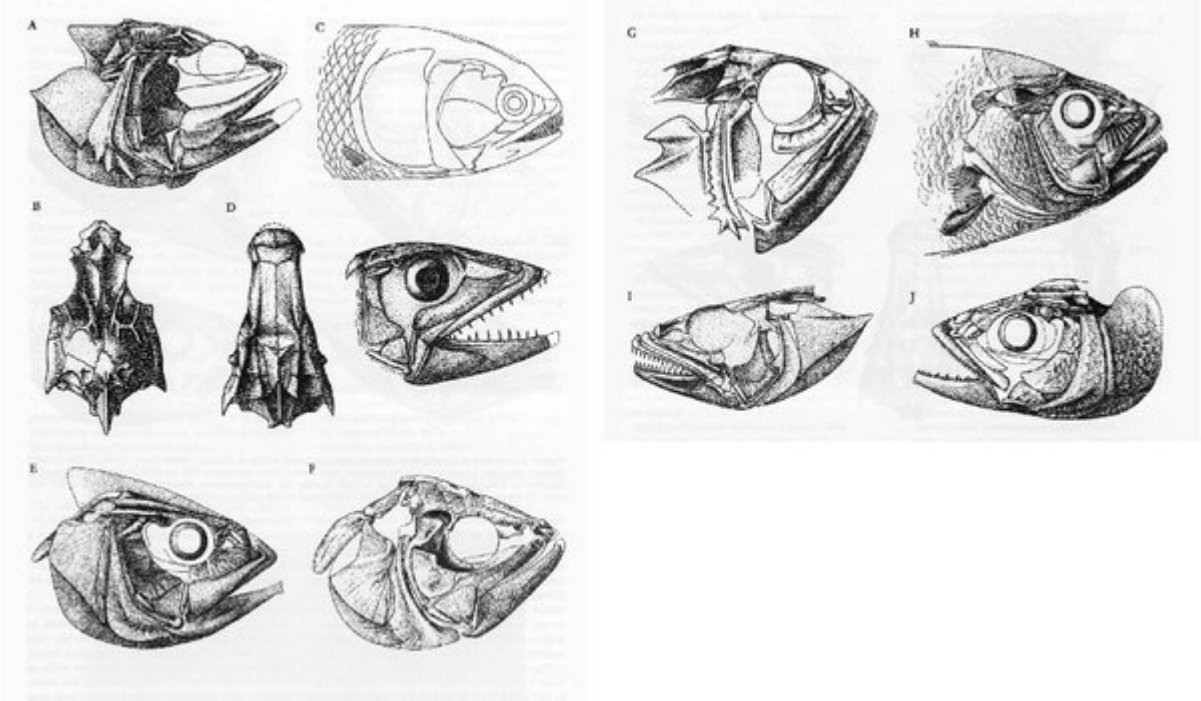
References



(Figure 14.8) The Isle of Sheppey: (A) sketch map, (B) section.



(Figure 14.9) Common elasmobranch fossils from the London Clay, as at the Isle of Sheppey (after Kemp et al., 1990). (A) Squatina prima (Winkler), lateral tooth (left) and anterior tooth (right), x 2.5. (B) Physogaleus secundus (Winkler) female antero-lateral tooth, x 2, lingual and labial views (left) and male antero-lateral tooth, lingual and labial views (right). (C) Carcharias hopei (Agassiz), lower anterior tooth, x 1.23, labial lateral and lingual views (left) and upper lateral tooth, lingual view (right). (D) Aetobatus irregularis (Agassiz), single tooth from lower dentition, x 1.2, basal and occlusal views. (E) Burnhamia daviesi (Woodward), tooth, x 1.25, occlusal, basal and lateral views.



(Figure 14.10) Uncommon teleosts from the London Clay at Sheppey (after Casier, 1966, © The Natural History Museum, London). (A), (B) Ampheristus toliapicus Konig, reconstruction of the skull, right side and dorsal views; (C) Brychaetus muelleri Woodward, right side of head; (D) Eocoelopoma hopwoodi Casier, reconstruction of skull in dorsal and right side views; (E) Eothynnus salmonens Woodward, reconstruction of head in right side view; (F) Promegalops signeuxae Casier, right lateral view of skull. All figures c. x 0.5. (Continued on page 514.)Uncommon teleosts from the London Clay at Sheppey (after Casier, 1966, © The Natural History Museum, London). (G) Percostoma angustum Casier, reconstruction of skull in right side view; (H) Sciaenurus bowerbanki Agassiz, head in right profile; (I) Rhinocephalus planiceps Casier, skull in left side view; (j) Wetberellus cristatus Casier, incomplete skull in left profile. All figures c. x 0.5.