HOLOCENE SEA-LEVEL CHANGES: A REPLY

J. T. GREENSMITH and E.V. TUCKER

It is gratifying that Shepard supports our claim that the Flandrian Transgression in the Essex coastal region has not been a continuous event, but has been interspersed with regressive episodes and coastal progradation. In this respect we attempted to deduce from the Essex Holocene succession what is common knowledge about Holocene coastal sequences in The Netherlands, namely the presence of transgressive and regressive episodes (e.g. Jelgersma, 1971, p. 43). Apart from earlier brief indications by the authors (Greensmith and Tucker, 1971a, 1971b) this is the first summation of the evidence favouring episodic events in Essex. The evidence is based on detailed lithological and ecological inspection and interpretation of the succession, including modern deposits, from which it is possible to deduce environmental relationships. For example, the relationships of the peat seam dated at 4959 ± 65 B.P. imply formation close to high water mark. According to R.G. West (pers. comm. 1968) the peat contains a strong local component of macro-species of salt marsh and marsh vegetation suggestive of an estuarine environment.

It appears necessary to repeat the remarks made in the introduction and summary of our paper, to the effect that the causes of the various episodes are complex and probably involve factors such as subsidence, sedimentation (including compaction) and climate, in addition to eustatism. There has never been any doubt cast on the proposition that subsidence has played a role in Holocene deposition in the southern North Sea region (Bennema, 1954). In southeast England subsidence rates may have varied between 15-40 cm/100 years (Churchill, 1965; Godwin et al, 1965); since 1918 geodetic estimates show that subsidence has been at approximately 1.7 mm/year (Valentin, 1953). Perhaps it should have been made clearer in the text that in our graph (fig. 6), explicitly stated to be tentative, no adjustments are made either for subsidence or compaction (cf. Kraft, 1971, fig. 25). Hence, eustatic changes in sea-level are to some, as yet indeterminate, degree masked. The depths indicated on the graph correspond to true present depths of certain marker levels (peat, chenier, geosol, etc) within the succession. Expressed in a different way Shepard, by interpolating our Essex sea-level curve into a complex of other authors eustatic curves in his figure 1, is attempting a direct comparison that we would regard as invalid. He appears to be misled by the fact that we draw comparisons in the text between our local sea-level curve and those of Morner and Fairbridge. What we are trying to indicate is that certain of our transgressive and regressive episodes (using these terms strictly in the sense of Jelgersma, 1971, p. 43) do approximately conform in time, though not necessarily in degree, with sections of the Morner and Fairbridge curves. Also certain Essex episodes tie-in reasonably well with similar dated events in The Netherlands.

The reasoning behind our statements that eustacy (superimposed on subsidence implicitely) may have played a partial, but important, role in the episodes, is the broad similarity between some of the dated Essex events and events in The Netherlands, despite the probability of differences in rates of subsidence between the two areas (Greensmith and Tucker, 1971a). during and subsequent to deposition. This reasoning is independent of any published eustatic curves.

REFERENCES

Bennema, J. (1954) – Holocene movements of land and sealevel in the coastal area of the Netherlands. Geol. en Mijnb., 16, p. 254-262.

Churchill, D.M. (1965) – The displacement of deposits formed at sea-level, 6,500 years ago, in southern Britain. Quaternaria, 7, p. 239-250.

Godwin, H., E.H. Willis and V.R. Switsur (1965) – Cambridge University natural radiocarbon measurements, VII. Radiocarbon, 7, p. 205-212.

Greensmith, J.T. and E.V. Tucker (1971a) – The effects of late Pleistocene and Holocene sea-level changes in the vicinity of the River Crouch, east Essex. Proc. Geol. Assoc. London, 82, p. 301-322.

—— (1971b) – Overconsolidation in some fine-grained sediments; its nature, genesis and value in interpreting the history of certain English Quaternary deposits. Geol. en Mijnb., 50, p. 743-748.

Jelgersma, S. (1971) – Sea-level changes during the last 10,000 years. Introduction to Coastline Development, Macmillan, London, p. 25-48.

Kraft, J.C. (1971) – Sedimentary facies patterns and geologic history of a Holocene marine transgression. Geol. Soc. Amer. Bull., 82, p. 2131-2158.

Valentin, H. (1953) – Present vertical movements of the British Isles. Geograph. J., 119, p. 299-305.