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The Black Sea and Noah's Flood

Cores from the Black Sea, obtained in 1969, show that there has been regular sedimentation over the area for at least 20,000 years. At 5000 B.C. there is a sudden very large rise in the deposition of dead organic matter and it is suggested that this may be the result of Noah's Flood. Another possible date, perhaps less likely, is the widespread flooding of about 6800 B.C. at which time sea water from the Mediterranean first entered the Black Sea.

The Black Sea and the Caspian Sea lie on either side of Mount Ararat and within 200 – 250 miles of it: they can hardly have escaped Noah's Flood. Not much appears to be known about the earlier history of the Caspian Sea, the level of which is now much lower than it used to be, but with regard to the Black Sea a good deal of information concerning its recent past is now coming to light.

At the present time the Black Sea is saline (about 2% salt). At a depth of 150 – 250 meters, depending on the distance from the shore, the water becomes oxygen deficient¹ owing to inadequate vertical mixing and biological reduction of sulphate to hydrogen sulphide occurs. The Black Sea is the largest expanse of anoxic (oxygen deficient) water in the world. There is entry of Mediter-

ranean water through the Bosphorus but this, though considerable, occurs in fits and starts rather than uniformly. The entry of sea water explains the poor vertical mixing: sea water is more saline than Black Sea water and therefore heavier, so that it sinks to the bottom and only mixes with upper layers very slowly indeed.

In the Spring of 1969 R.V. Atlantis II cruised in the Black Sea from East to West. Over 60 bottom cores were obtained, the longest 11.5 meters in length, representative of the entire length of the Sea. Samples of water at different depths were also collected and many gravity, magnetic, etc. measurements made.

The cores contain organic matter, the C-14 of which has been used to date the various levels. Calcium carbonate (calcite) is also present derived from ancient plankton but at the lower level the deposit is extremely fine and no structure is visible even with the aid of an electron microscope. There is independent evidence that carbonate in cores is often dissolved at one level and redeposited at another, and this seems to have happened in the Black Sea, thus accounting for the lack of visible structure. If the C-14 dating is based on the carbonate rather than on the organic carbon which cannot dissolve and redeposit, the datings are somewhat higher (20% +). It is considered that the organic carbon gives the more reliable dating.

All the cores show three easily visible zones (Ross *et al* gives illustrations²).

(a) The bottom layer (*lutite*), the base of which was not reached in any of the cores, consists of alternate dark and light bands with little organic matter. One core (6 meters in length) from the Eastern region of the Sea was studied in detail; it gave a date of 17,000 B.P. at the lowest part. Near the top the appearance changes suddenly at about 7000 B.P. (5000 B.C.) with the commencement of layer (b).

(b) This middle very dark (*sapropel*) zone is extremely rich in organic matter (*ca* 10–20% carbon; the lutite layer just below contains *ca* 1–3%); its carbonate content is little

changed. Two dates were obtained for the sharp start of this layer; both based on the organic carbon: 7140 (standard core, East of Sea) and 6740 (middle of Sea) (both + or - 200 years) B.P. The average thickness of the sapropel layer is 40 cm.

Under an electron microscope numerous structures resembling biological membranes are visible — an unusual feature in deep marine sediments, no doubt due to the reducing conditions. The black colour is apparently due mainly to carbon but partly to metallic sulphides also.²

At 7000 B.P. the rise of carbon content to *ca* 15% is very sudden and is followed by a slow further rise to 20%. Subsequently there is a fairly steady fall to *ca* 3% right on to the present time. The top of the middle layer is marked not by a sudden fall in carbon content but by a very marked rise in carbonate.

(c) The top zone (*coccolith ooze*) like layer (a) contains alternate dark and light layers, the carbonate content being high. The total depth of the zone varies but averages about 50 cm.: there may be as many as 50-100 distinct layers per cm. and it is clear that they have been deposited seasonally. The darker layers are richer in carbon than the lighter carbonate layers.¹

All three layers are clearly visible over the whole length of the Sea, about 1,000 Km. Individual layers, often only 1 mm. thick can also be correlated over the same distance. The thickness of a given layer of sediment, however, often differs greatly.²

Why the sharp boundaries of the dark region? To find out more about it, Deuser⁴ has determined the $^{18}\text{O} / ^{16}\text{O}$ ratio in the carbonate. The ratio steadily falls from 17000 B.P. to around 8-9000 B.P. after which it rises up to modern times. The steepness of the rise is most marked at 7000-5000 B.P. $^{13}\text{O} / ^{12}\text{O}$ ratios were also measured both for carbonate carbon and organic carbon, but the picture proved very complex, for example calcium

carbonate in the unusual form of aragonite (high O-13) was deposited in one layer about 6500 B.P.

The chief importance of O-18 is that in shells containing carbonate the $^{18}\text{O} / ^{16}\text{O}$ ratio rises with increasing salinity. At the lower level of the core the proportion of O-18 is much lower than has been found in any coccoliths (planktonic organisms) deposited under marine conditions, but is typical of fresh or slightly brackish water. The evidence suggests that sea water began to enter through the Bosphorus at about 8-9000 B.P. after which, until about 3000 B.P. the Black Sea, previously fresh, reached its present salinity which apparently represents an equilibrium. This agrees with our knowledge of ancient sea levels, for it was at about that time, at the end of the last Ice Age, that the sea level rose sufficiently for the Black Sea to become connected with the Mediterranean.

But what of the black carbonaceous matter which started to be deposited so suddenly around 7000 B.P.? Though many problems remain unsolved and at this stage it would be unwise to be dogmatic, it is nevertheless tempting to link it with Noah's Flood. After the devastation the bordering land must have been covered with decaying organic matter and this would naturally and slowly find its way into bordering lakes and seas. Under the reducing conditions pertaining in the Black Sea its preservation would be ensured.

But why the continued deposition of organic material right on to the present time? It is only possible to guess at an answer. Prior to 9000 B.P. the Black Sea is generally believed to have been a fresh water lake filled with water from melting ice from the last Ice Age. If we may suppose that the Flood was caused by a catastrophic rise in sea water level (perhaps 10-20 metres, a possibility fully compatible with present knowledge of former levels⁵) it may, by thawing out the remaining ice, have opened up natural river drainage of the rivers feeding the Black Sea, hitherto blocked with ice, and the rivers may have ever since carried organic matter into the Sea. The cause of the marked rise of carbonate deposit at around 1000 B.C. is not known.

Ancient sea levels apparently often changed suddenly rather than slowly, as is shown by the existence of submerged beaches in stable areas where geologists believe that there has been no rise or subsidence of the sea bed.⁶ They may readily be accounted for by supposing that large areas of the Antarctic Ice Cap broke away and slipped into the sea.⁷ Possible causes for such slippage might be volcanic eruption with lava flow under the ice, or a strike by a meteorite. (Near the border of Wilkes Land, at 71°S 140°E there is a very large gravity anomaly and a depression in the land 2,000 meters deep below the ice.⁸ This is believed to have been caused by a meteorite.) A complete breakaway of the ice from the underlying land in the Antarctic would raise the sea level by 60 meters or more apart, apparently, from the isostatic rise of the land mass now below the level of the sea due to the weight of the Ice Cap.

It is suggested that the sudden beginning of the sapropel layer (b, above) may have been caused by Noah's Flood which, on this view, would have to be dated around 5000 B.C.⁹

If this view is not correct and Noah's Flood occurred at some other date, evidence of it ought still to be obtainable from Black Sea cores. If this date is too early, there are some thin striations still undated in the sapropel layer which have not been mentioned above and might represent a sediment following a widespread inundation.

Another possible view is that the Flood occurred 6500-7000 B.C. when sea water first flowed over the sill at the Bosphorus into the Black Sea. The rise of sea level at this time was probably catastrophic. Earlier evidence on this subject has been collected by O'Connell¹¹ who draws attention to the fact that in Denmark de Geer encountered one enormously thick varve, forty times the average thickness, dated (by varve counting) 6839 B.C., which he took as the zero year of the last glacial epoch. In Finland a similar thick varve was found, the discrepancy of the dates being only 39 years. Similar varves have been found elsewhere.¹² There are then good reasons for thinking that a very widespread flood

occurred around 6800 B.C. But perhaps Noah lived later than that ?

REFERENCES

1. W. G. Deuser, *Science*, 1970, **168**, 1575.
2. D. A. Ross, E. T. Degens and J. MacIlvaine, *Science*, 1970, **170**, 163.
3. D. G. Spencer and P. G. Bremer, *Jour. Geophysical Research*, 1971, **76**, 5877.
4. W. G. Deuser, *Jour. Geophysical Research*, 1972, **77**, 1071.
5. J. D. Milliman and K. O. Emery, *Science*, 1968, **162**, 1121.
6. D. Jongsma, *Nature*, 1970, **228**, 150.
7. See A. T. Wilson, *Nature*, 1964, **201**, 147 and 1966, **210**, 477.
8. C. R. Bentley in T. Hatherton (Ed.), *Antarctica*, 1965, Ch. 10.
9. See Whitelaw's evidence, this JOURNAL, **99**, 16, giving 4500 + or - 500 B.C. and F. A. Filby, previous paper, this issue favouring 4000 + or - 1000 B.C.
10. P. O'Connell, *Science of Today and the Problems of Genesis*, 1959, p. 66f.
11. See, for example, in J. F. Kirkaldy, *Geological Time* (Oliver & Boyd), 1971 ; F. E. Zeuner, *Dating the Past*, 4th ed., 1958, etc.