SALINITY CHANGES IN THE SWAN RIVER

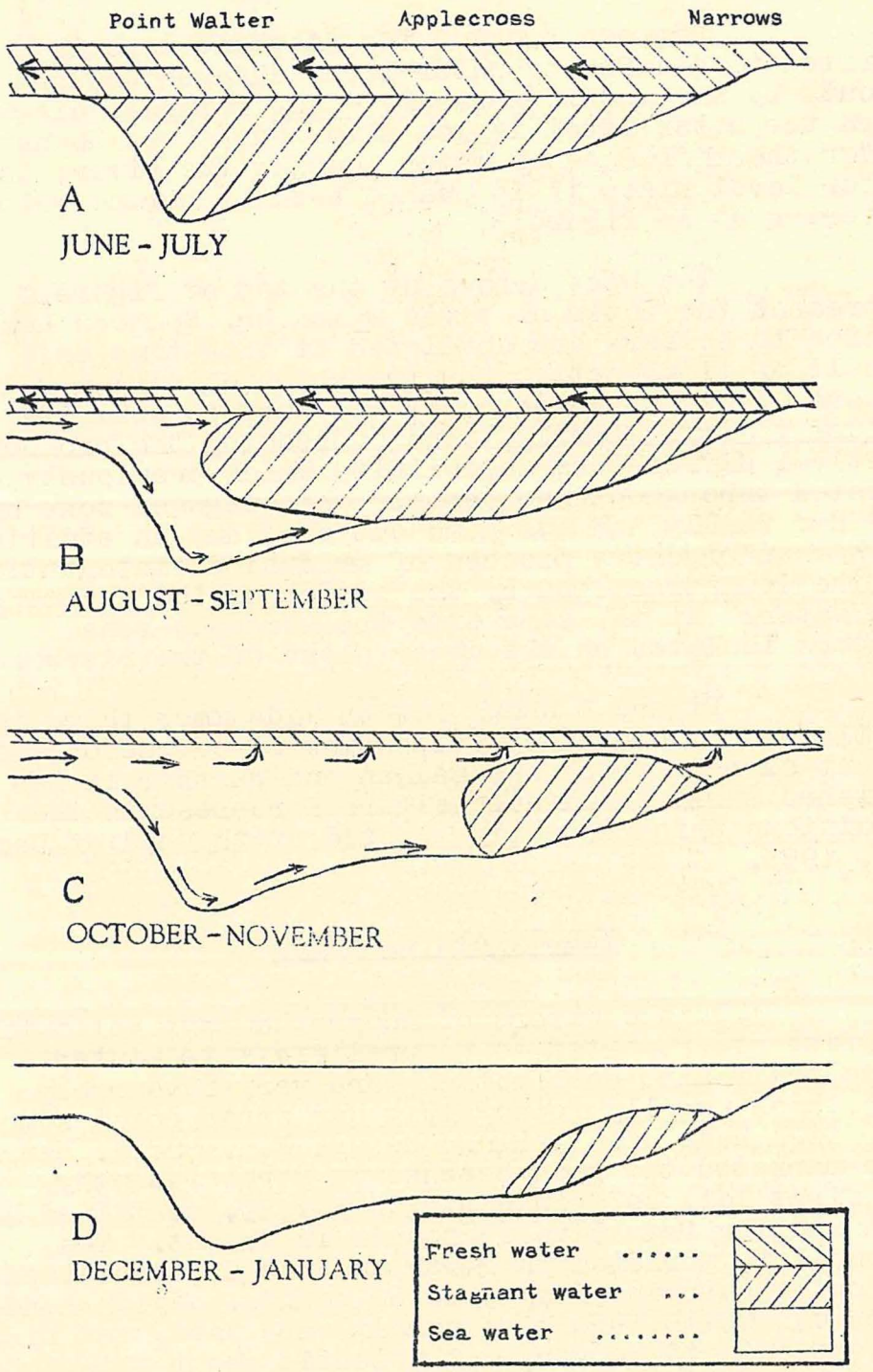
In the October, 1954, issue of this Bulletin were published some remarks made in Parliament by the Minister for Fisheries (Mr. Kelly) in reply to a question asked by Mr. North, M.L.A. He said, it will be recalled, that the region around Applecross contained the only pocket of stagnant water remaining in the Swan by the end of December, 1953, when the summer was only one-third gone.

A recent note from Mr. Rex S. Spencer, of the hydrological section of the Division of Fisheries, C.S.I.R.O., Cronulla, N.S.W., who until quite recently had spent a considerable portion of his official life in Western Australia, says that it can safely be assumed that this is the normal state of affairs near the end of each "recovery cycle", i.e., when the river has recovered, or nearly so, from the effect of the winter rains.

The accompanying diagrams, which have been prepared by Mr. Spencer, may help officers to an understanding of what is generally regarded as being a most complex problem, although it is not really so difficult as it may at first sight appear. In these figures the river bed is shown diagrammatically between Fremantle Bridge and The Narrows; maximum depths of over 60 feet are encountered off Point Walter, after which there is a progressive decrease. The arrows show the direction of the current.

Figure A, which takes in the dead of winter, is quite straightforward. Only the surface layer of freshwater is flowing, and, of course, downstream. The saline waters beneath this layer are low in oxygen, particularly in the Applecross - Crawley region. Figure B shows the position in late winter and early spring, when sea water starts to enter the system and the surface freshwater layer decreases in depth. It will be seen that the sea water spills over into the deeper areas near Point Walter, and then proceeds uphill along the bottom. In effect, this spilling-over permits easier and more efficient mixing than the uphill creep, and this explains why that part of the Swan Estuary below Point Walter is never as stagnant as the area in the vicinity of Applecross, although it is much deeper.

← FREMANTLE PERTH →



Between B and C the stagnant zone is shifted to and fro by water-level changes brought about by barometric pressure - not rainfall discharge. When the water level is low this zone moves downstream under the influence of water leaving the river; as the water level rises it is pushed back by marine water entering as in figure B.

The bent arrows at the top of figure C represent the internal waves which Mr. Spencer has reason to believe are developed at this time as a result of tidal action (by transporting saline water upwards). These waves cause the surface salinity values to rise sharply, thus overcoming the pronounced vertical differences in salinity which previously existed throughout the basin. The stagnant zone by now has really had its head cut off, and in addition it has undergone a process of gradual disintegration at the downstream end by the action of the incoming sea water. At the same time the stagnant zone becomes isolated on the upper slope of the river bed.

Figure D shows how by midsummer there is little or nc stagnancy (depending of course on the amount of rain which has fallen and whether it has finished early or late). Figure D represents the conditions which actually existed at the end of December, 1953.