

significance of the green colour in the tanned exocuticle is not clear although Travis⁸ observed in spiny lobster; such a green colour in the regions which later show positive metachromasia. The acid mucopolysaccharide referred to in the scorpion cuticle may be extracted with 5% sodium hydroxide in 24 hours. After such treatment the cuticle ceased to stain with toluidine blue. Presumably the acid mucopolysaccharide is removed from the cuticle by alkali extraction.

To verify the nature of this material the alkali extract was analysed for acid mucopolysaccharides. For this purpose the extract was neutralised and zinc hydroxide followed by amyl alcohol chloroform mixture added to remove the protein. The polysaccharide was later precipitated using ethanol following the method of Rice⁹ and analysed chromatographically according to the method of Hammerman.¹⁰ The solvent used was 55% 0.05 M di-sodium hydrogen orthophosphate and 45% isopropyl alcohol. On developing with toluidine blue (prepared by dissolving 40 mg. in 80 ml. of acetone and 20 ml. of distilled water) a purple spot appeared on the paper indicating the presence of acid mucopolysaccharide.

The material obtained from alkali extract referred to above and shown to contain acid mucopolysaccharide was hydrolysed and its constituent sugars analysed chromatographically. The hydrolysis was carried out with 6N HCl at 105° C. for 24 hours, and the hydrolysate spotted on Whatman No. 1 filter-paper. Circular chromatograms were run with Butanol-acetic acid-water (4:1:5)¹¹ and developed with silver nitrate (0.1 c.c. in 20 ml. of acetone) and sodium hydroxide (0.5 NaOH in 25 c.c. of rectified spirit) as suggested by Trevelyan *et al.*¹² The sugars identified from their Rf values are glucose, galactose and fucose. That the sugars mentioned above are derived from acid mucopolysaccharide has been verified as follows. The chitinous part of the cuticle obtained after separation of the epicuticle was hydrolysed and analysed chromatographically. The hydrolysate contained glucose, galactose and fucose. When the same material was extracted with alkali, as mentioned above and subsequently hydrolysed and analysed, only glucose was found to be present. These observations indicate that while glucose is the only sugar constituent of chitin the acid mucopolysaccharide contains glucose, galactose and fucose. In this respect it recalls the acid mucopolysaccharide described in the crustacean *H. nudus*.¹ The constituent sugars

of the acid mucopolysaccharide of *O. virilis* and *C. ferrugineus* are not known.

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Madras-5, October 7, 1964.

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UPWELLING OFF THE EAST COAST OF INDIA*

THE presence of upwelling off the Central part of the east coast of India has been indicated by LaFond and others in a series of publications.¹⁻⁴ They base their evidence mainly on the distribution of parameters like temperature, salinity and density on the continental shelf off the Central east coast, between the mouths of the Godavari and Krishna rivers in the south and of the Mahanadi in the north. According to these authors the evidence obtained so far conclusively establish the existence of upwelling along this coast from March to May. As a result of more extensive investigations in recent years and also in the light of modern developments in our ideas concerning oceanic phenomena such as upwelling, sinking, etc., it has been found that these observations require more critical reappraisal.

On a detailed examination of the data, it has been seen that the upwelling reported in this region (*i.e.*, off the coast of Waltair) differs considerably both in regard to the extent and in regard to other associated physico-chemical and biological conditions, from the classical upwelling regions of the world like off the coast of California, South-West Africa and so on. Also there is a marked difference between this

upwelling and that reported along the south-west coast of India (Arabian Sea). In the latter it has been seen that during the late south-west monsoon and early post-monsoon upwelling is fairly intense and the shelf is pervaded by water which is cold, dense and saline, highly deoxygenated (values of oxygen less than 1.0 ml./L. occurring almost within 10 meters from the surface) and very rich in nutrients.^{5,6} The biological and fishery productivity have also been shown to be very high in the west coast waters following the upwelling. Similar changes in the conditions have, however, not been seen in the waters off the east coast to any appreciable extent. It is possible that the upwelling observed by LaFond and others is a case of a very much localized phenomenon and also is too weak to exert any influence on a wider scale.

The author has had occasion to examine some of the data collected for the same area in the same period by the U.S. Research Vessel *Anton Bruun* during her recent cruises in the Bay of Bengal in connection with the International Indian Ocean Expedition. As a few stations were worked by this research vessel on the continental shelf off Visakhapatnam, it was felt that a careful examination of these data should reveal a clearer picture of the conditions. Another happy coincidence is that for the same period a line of five stations was occupied by INS KISTNA just outside the edge of the continental shelf between Madras and Visakhapatnam and as such these data were also available for studying in conjunction with the *Anton Bruun* data. Besides examination of temperature and salinity data both for surface waters and waters at the subsurface levels, a detailed study was made of the variations in the thickness of the upper mixed layers and the level of the oxygen-deficit layers. It may be mentioned here that during the period when there is intense upwelling it is usual for the low oxygen water to come up almost to the surface. From the available data it is seen that the oxygen-poor layer lies well below 50 meters in all the stations and in the stations close to the coast the oxygen is quite high down to the bottom. No temperature discontinuity is seen in the waters on the shelf and outside, the thermocline being well below 50 meters. There is thus no indication whatsoever of the existence of upwelling in the waters off this coast at this time of the year. It is worth mentioning in this connection that with the exception of the Somali-Arabian Coast, no marked upwellings have so far been recorded along the east coasts of continents elsewhere in

the northern hemisphere. This, however, does not rule out the possibility that upwellings can exist along east coasts of continents under certain special meteorological and oceanographical conditions. The only question is what are the special conditions that may have contributed to this upwelling off the Waltair coast as reported by LaFond and co-workers at the Andhra University. It is quite clear that more detailed investigations are necessary both on the shelf and in the offshore waters off the east coast of India for getting a proper answer to these questions.

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**A NEW SPECIES OF DEIGHTONIELLA
ON ARTHRAXON LANCIFOLIUS;
(TRIN.) HOCHST. FROM BHOPAL
(INDIA)**

IN the course of investigation of fungi causing leaf spot diseases at Bhopal the author collected a leaf spot disease of *Arthraxon lancifolius* (Trin.) Hochst. from the Botanical Garden, Motilal Vigyan Mahavidyalaya, Bhopal, on 17th September 1963.

The spots start as light brown dots but finally enlarge and become oval to elongated in the direction parallel to the veins. They are surrounded by a yellow halo. Two or more spots often coalesce together forming large irregular patches measuring upto 2.5 cm. in length. The midrib and other veins are freely traversed. Microscopic examination of the infected portions revealed an interesting species of *Deightoniella* having the following morphological characters.

Hyphae repent, subhyaline to pale or golden-brown in colour, slender, septate and branched; conidiophores (Fig. 9) brown, erect, straight or curved, simple or branched, arising singly or in groups of 2-4, measuring 68-327 × 4.8-7.2 μ (average 172 × 6 μ), smooth except the sporogenous cell, 2-10 septate, basal cells swollen