The experiments described here show that much briefer exposures to high temperatures interrupt development, but that after a delay (of perhaps a month in *Aedes*) normal pupation occurs and adults are then produced after the usual interval.

This extended life-history in insects may be of practical importance. In Nature, insects may often be exposed to temperatures similar to those used in these experiments, and if this causes a substantial prolongation of the life-history, it may give rise to unexpected emergences of insects which are important vectors of disease or pests of stored products.

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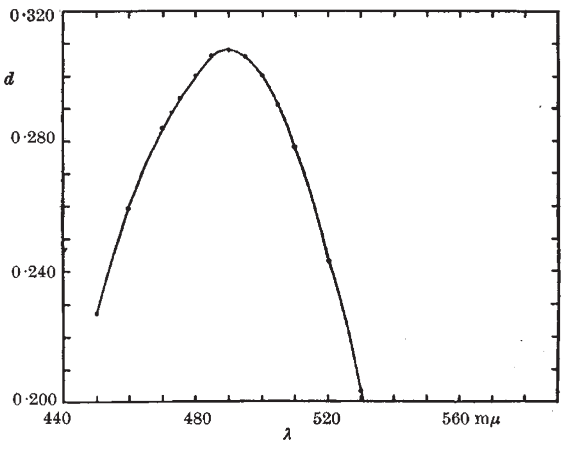
An Acidogenic Carotenoid in a Bathypelagic Nemertean Worm

CERTAIN brightly coloured littoral nemerteans contain carotenoids, and it is likely that most deep-sea species of similar coloration likewise store this class of biochrome[1].

Recently, there arose a rare opportunity to examine briefly the red-orange pigment from three freshly collected specimens of *Nectonemertes mirabilis* Verrill (one immature male and two females, 30–34 mm. long and 5 mm. wide). These were taken in a depth haul from 1,200 m. to the surface in the Santa Barbara Passage off the coast of Southern California by Dr. N. T. Mattox at the Allen Hancock Foundation, and were presented to Prof. W. R. Coe of the Scripps Institution, who identified them as members of this widely distributed species, usually encountered at depths from 500 m. down, in the North and the South Pacific Ocean.

The specimens, fixed in dilute formalin, then preserved in 70 per cent ethanol, were examined within a week after capture. The deep red-orange pigment was concentrated in oil droplets in the digestive diverticula. In view of the unlighted habitat and the microcrustacean diet of this worm, it was of special interest to learn whether, as in numerous other marine carnivores, its richly stored pigment might belong to the oxygenated carotenoids[1].

The preserved worms had lost none of their bright colour, but substitution of absolute ethanol readily leached the pigment out, imparting a red-orange colour to the solvent and leaving the animals quite pale. The pigment was completely epiphasic, migrating quantitatively from the alcohol into light petroleum to give a yellow solution. However, after an hour's exposure to warm ethanolic potassium hydroxide, the pigment showed quantitative hypophasic behaviour, thus reflecting the absence of carotenes and the original presence of esterified xanthophylls. Dilution effected the migration of a trace of yellow pigment into the petroleum, while the more copious red component now separated as a potassium salt at the liquid interface. In its preferential solubility in alcohol, and in its reversible transference from alkaline or neutral alcohol to petroleum,



Absorption curve of acidic carotenoid derived from an ester occurring in *Nectonemertes mirabilis* Verrill

the yellow component behaved like a neutral xanthophyll. Its quantity was insufficient for further study.

The red interfacial salt was washed with additional petroleum and was then readily dissolved in this solvent containing a little acetic acid. The yellow petroleum solution displayed, on shaking with water, the transient pinkish emulsion which characterizes other acidogenic carotenoids, such as astacene and metridioxanthin[2]. The acid-free petroleum solution was evaporated in an inert atmosphere and the deep orange residue was dissolved in redistilled pyridine (b.p. 114–116° C.). This red-orange solution exhibited a single, discrete absorption peak whose steep, symmetrical shape and maximum at 490 mμ differentiated it from astaxanthin or its artefact, astacene, which show a less sharp maximum at 500 mμ in the same solvent (Beckman photoelectric spectrophotometer; see accompanying figure). In its spectrum the nemertean pigment recalls a similar acidogenic carotenoid from the marine shrimp *Hippolyte*[3] and another from the anemone *Metridium*[4].

Evidently this deep-sea pelagic ribbon-worm owes its bright red-orange colour to the presence of an acidogenic carotenoid ester, related to but not identical with astaxanthin. The principal carotenoid and the accompanying traces of esterified neutral xanthophyll doubtless originate from the animal's consumption of planktonic crustaceans and other pelagic fauna. The finding of rich stores of oxygenated carotenoids, unaccompanied by any carotene hydrocarbons, adds to the growing list of xanthophyll-selecting marine carnivores[1], a widely occurring species the habitat of which is limited to great oceanic depths.

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