

Epiphyte or parasite?

from Peter D. Moore

It is not difficult to define the difference between an epiphyte and a parasite; the former depends on another organism simply for support whereas the latter exploits its host in a manner which is normally beneficial to the parasite but detrimental to the host. Neat definitions, however, are not always easy to apply in complex field situations. Take, for example, the relationship between the robust, brown, fucoid alga *Ascophyllum nodosum*, which is abundant in the intertidal zone of most of the more sheltered shores around the British Isles, and the small red alga, *Polysiphonia lanosa*, which is almost invariably associated with it. The red alga adheres strongly to its host, since its thallus actually penetrates the tissues of *Ascophyllum*. Where the biomass of the host is greatest, there one finds the greatest density of *Polysiphonia* also. Here is a perfect situation in which the epiphyte/parasite debate can be staged.

One can see certain advantages in the epiphytic habit in this type of algal community. Elevation during immersion provides obvious benefits, for the mass of floating fronds of the brown alga, buoyed up by air bladders, must cast a considerable degree of shade upon any bottom-dwelling algae. At the same time, close association with *Ascophyllum* could make life more comfortable during the periods of immersion when extremes of variation in temperature, relative humidity, salinity and light intensity would be dampened by the presence and protection of a mucilaginous mass of limp fronds. Simple epiphytism would not, therefore, be an unreasonable expectation in such a circumstance.

The possibility that *Polysiphonia* is more than an innocuous passenger demands examination, however, for the attachment of the red algal thallus to its host seems remarkably secure for a species association which is found only where wave action is very slight. An examination of the anatomy of the attachment region by Rawlence and Taylor (*Can. J. Bot.* **48**, 607; 1970) showed that rhizoids of the 'epiphyte' penetrated deeply into the thallus of *Ascophyllum*.

Citharel (*C. r. Séanc. hebdom. Acad. Sci. Paris, Ser D*, **274**, 1094; 1972) used a physiological approach to the problem, considering that, since no true epiphyte would take up metabolites

from its host, any demonstration of transport of reduced carbon from the brown alga to the red would provide grounds for an accusation of hemiparasitism. Citharel chose glutamic acid as the most likely vehicle of carbon transport, since this is the most abundant free amino acid in the *Ascophyllum* thallus. He injected ^{14}C labelled glutamic acid into the thallus of *Ascophyllum* and observed its accumulation in *Polysiphonia* within 12 h. He concluded that, contrary to the opinion of such algal authorities as Fritch, *Polysiphonia* should be considered a partial parasite. The demonstration of such a transfer does not, however, necessarily infer that the red alga is dependent upon *Ascophyllum* as a carbon source, indeed Harlin and Craigie have argued that it is not (*J. Phycol.* **11**, 109; 1975).

A further complication has now been brought to light by translocation experiments by Turner and Evans (*New Phytol.* **79**, 363; 1977). They supplied ^{14}C -labelled bicarbonate ions to *Ascophyllum* tissues and studied translocation of the label to parts of the plant isolated from the initial supply, and also into tissues of *Polysiphonia* attached to the host plant. In this way they hoped to overcome two possible objections to the experiments of Citharel, first that the labelled compound supplied by him was not in fact the product of photosynthetic activity in *Ascophyllum* and, second, that transport of metabolite could occur by secretion into the surrounding medium and reabsorption by *Polysiphonia*, or even by way of the mucilage surrounding the species. The outcome of Turner and Evans' experiments demonstrated that there was no translocation of the label in the tissues of *Ascophyllum* either with or without attached *Polysiphonia*. This means that if *Polysiphonia* is acting parasitically it can only exploit the cells in the immediate vicinity of the rhizoids, for the lack of translocation in the host will preclude any wider effect of such parasitism. They also demonstrated that *Polysiphonia* was able to accumulate ^{14}C from labelled bicarbonate in the surrounding medium, confirming the independent carbon assimilation of the red alga, but they further showed that the 'epiphyte' was able to take up and use exogenously supplied labelled glucose.

So the question of whether or not *Polysiphonia lanosa* is a true epiphyte of *Ascophyllum nodosum* still remains unanswered. What is now clear is that if *Polysiphonia* depends upon its host

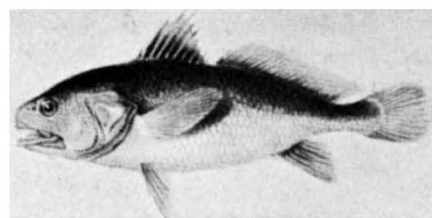
for more than support in a physical sense, it will be limited in its success by the lack of movement of metabolites in the host tissue and will be dependent on a local exploitation of cells or the absorption of materials secreted into the surrounding medium. As Turner and Evans point out, however, one cannot be sure that carbon is the sole object of any parasitism which occurs. Perhaps some other element is being sought, or even an organic growth factor. □

Indo-Pacific drums reviewed

from a Correspondent

THE drums or croakers are fishes of very great commercial importance throughout tropical seas especially in shallow regions and where large rivers join the sea. They derive their common names from their habit of making loud noises of one kind and another; indeed it is claimed that native fishermen of South-east Asia only set their nets when their leader has heard the fish approaching the area. Because of their economic importance fishery workers in various countries have made numerous studies of their biology and aspects of their life history, and some have attempted taxonomic studies to establish some kind of phylogeny as well as a valid nomenclature. Notable amongst these was the work of Y. T. Chu, Y. L. Lo, and H. L. Wu, *A study of the classification of the sciaenoid fishes of China, with descriptions of new genera and species*, Shanghai Fisheries College, 1963, with a short English summary. Chu *et al.* produced a work of fundamental importance in which they placed considerable emphasis in classification on the structure of the otoliths and the swimbladder. Their synthesis proved to be a major landmark in understanding this group of fishes although necessarily it was largely confined to Chinese waters (where their commercial importance is very great).

However, their work has now been amplified and refined by a major revision, *The sciaenid fishes (croakers or drums) of the Indo-West-Pacific* by



Johnius (Johnieops) dussumieri (Cuvier) (Cuvier *Le règne animal*, 1840).

Peter D. Moore is a Senior Lecturer in the Department of Plant Sciences at King's College, London.