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SEASONAL GROWTH AND REPRODUCTION OF TWO SPECIES OF *SARGASSUM* AT PANGE ISLAND, ZANZIBAR, TANZANIA

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ABSTRACT

Field investigations were carried out on the growth and reproduction of two species of the brown algae *Sargassum aquifolium* (Turn) J. Agardh and *S. asperifolium* (Her et Mart.) J. Agardh growing at Pange Island, Zanzibar between May 1983 and December 1984. A general decline in size and leafyness of the plants was noted between July and December. *S. asperifolium* disappeared between September and October 1983 and July-November 1984. Many *S. aquifolium* stipes on the other hand persisted, but suffered much attrition and had minimum size between November and December. Decline in stipe size in both species was attributed to be mainly due to disintegration, leaf and receptacle shedding of the thalli of old mature plants. Many thalli were reduced to mere leafless stumps between August and early December. From late December, positive size increase was observed. This resulted from the fast growing buds of pre-existing stumps as well as fresh germlings. *S. asperifolium* which had virtually disappeared between September and October 1983, July - November 1984, started appearing at the end of November, and by January had acquired a higher average size in comparison to *S. aquifolium*. In general the two species appeared to grow best between January and June. They then degenerated between July and early November. Reproduction was most pronounced during the best growing season.

INTRODUCTION

THE BROWN algal genus *Sargassum* is often a conspicuous element of the seaweed flora on the rocky shores of Tanzania (Hauk, 1886, 1887, 1888, 1889 ; Jaasund, 1976). Members of the genus are the largest in the East African marine brown algae. Thalli of *S. asperifolium* often attain the height of more than one metre, while *S. aquifolium* occurs in dense populations. The various species have a potential commercial significance as sources of the colloid alginic acid, a vital ingredient in several industrial products ; fertilizer and animal feed additives (Levring *et al.*, 1979).

De Wreede's review (1976) of the literature on *Sargassum* reveals among other things the occurrence of seasonal abundance and productivity of the species even in thermally uniform tropical regions. Maximum vegetative growth as well as fertility has been observed during the cooler months of the year in the tropics (McCourt, 1984).

As a consequence of there being scanty information on the seasonal growth and fruiting of the genus *Sargassum* in Tanzania, the present field investigations were carried out during May 1983 to December 1984, on two species *viz. Sargassum aquifolium*, a more abundant species and *S. asperifolium* a less common species. Information regarding these aspects is essential in /the event of rational exploitation.

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Material and Methods

Fronds of *Sargassum aquifolium* and *S. asperifolium* were collected from Pange Island off the town of Zanzibar to the South. These two species together with other algae occur on the more wave exposed gently slopping southern side of the Island, on dead coral rocks.

Samples of these algae were randomly collected once a month from the area. A collector walked across the area along a transect perpendicular to the shore and using a 0.5×0.5 metre quadrat collected all the plants falling within the quadrat placed at ten metre intervals along the transect. This method was modified from McCourt (1984). Care was taken in collecting the plants so that they were pulled of the substrate with intact hold fasts as much as possible. The samples were then carried to the laboratory where the length of each plant was measured (from hold fast end to the tip of the longest branch). Furthermore, information on the fruiting condition of the plants was collected. This was done by stereoscopic examination of several receptacles from each plant for the presence of embryos and then working out the percentage frequency of fruiting plants in each sample.

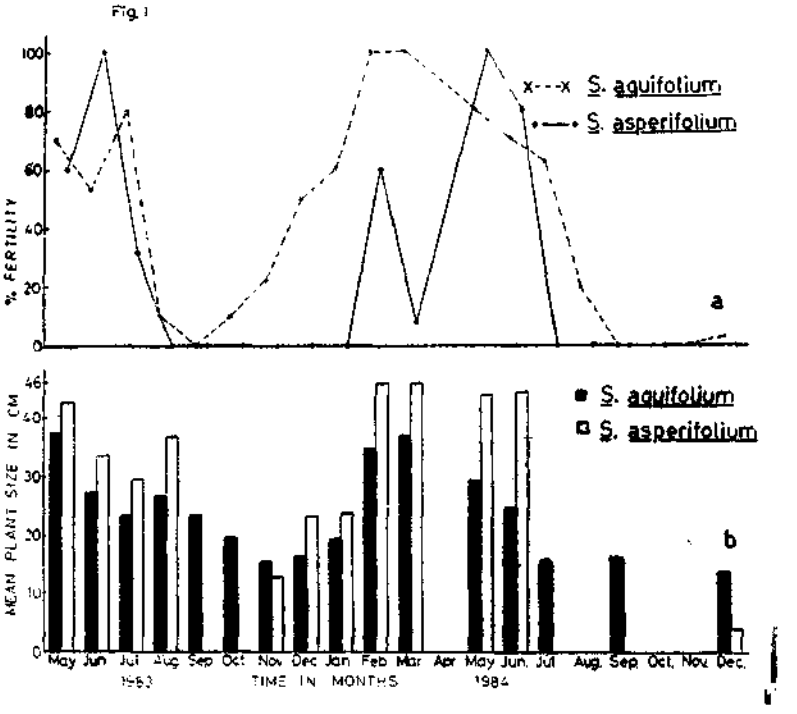

FIG. 1 a. Percentage fertility and b. mean plant size of *S. aquifolium* and *S. asperifolium*.

Results

The monthly percentage of fertile plants and mean stipe size are displayed in Fig. 1. *Sargassum aquifolium* stipes declined in size from a value of 36 cm in May 1983 to a minimum value of 15 cm in December, rose again to a peak value of 35 cm in March 1984 and thereafter declined. *S. asperifolium* on the other hand with a mean plant size of 40 cm

in May 1983 fell to beyond recognition between September and October, reappeared in late November, reached a peak value of about 45 cm in March 1984 and later on declined.

The fertility condition closely followed the vegetative phases with the highest percentage of fertile plants being recorded during the peak size period. Analysis of variance of the monthly mean sizes in the two species showed significant differences.

Discussion

The two species investigated had best growth (based on largest mean stipe size) between May and September 1983, and between February and June 1984. These periods of peak size were also the periods of peak fertility (Fig. 1).

It has been reported (De Wreede, 1976) that tropical *Sargassum* species show peak abundance and fertility during the cooler months of the year. In this investigation, the two peaks occurred during periods of generally low water and air temperatures along the east African Coast (Newell, 1957).

Similarly the poor performance of the algae, which was reflected by severe attrition, shedding of leaves and receptacles occurred during periods of relatively high temperatures (August-January). These observations are similar to those made on *Ulva fasciata* Delile (Shunula, 1983), which had peak biomass during the colder months (June-July) and low values during the hotter months (October-December). Cooler conditions would appear to favour the growth and fruiting of the two species.

The period of high fertility (May-July) precedes a period of high temperatures (August-January), hence the embryos and germlings produced thereafter have to endure the high temperatures which they must encounter during their early embryonic development. This could be investigated by laboratory cultural experiments.

Of the two species investigated, only larger *S. asperifolium* plants were often found to be fertile. This is similar to McCourt's (1984) observation on the fruiting of *Sargassum johnstonii* Setchel and Gardner, *S. herporhizum* Setchel and Gardner and *S. sinicola* Setchel and Gardner. Minimum size and maturity may have to be reached before the plants become fertile. With regard to *S. aquifolium* however, even very short stipes were found bearing fertile receptacles. This was probably because some of these plants develop from buds of pre-existing mature primary stipes which, due to attrition are but reduced to short stumps.

In can further be mentioned that the less abundant *S. asperifolium* is probably ill-adjusted for dispersal as it totally disappears during certain times. This implies a delay (strategy ?), in the process of reproduction. On the other hand, *S. aquifolium* which retains a proportion of its primary stipes throughout the severe conditions of the year is able to produce germlings almost throughout the year. This could perhaps account for its great success in habitat colonization and abundance compared to *S. asperifolium*.

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