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COST 48
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Outdoor Seaweed Cultivation
Proceedings of the Second Workshop
of COST 48 Subgroup 1
Port Erin, Isle of Man, British Isles
21-23 April 1989

Editors: Joanna M. Kain (Jones), James W. Andrews and Bruce J. McGregor

COST 48, Commission of the European Communities
Brussels 1989

DG XII/F Biotechnology – Rue de la Loi 200
B-1049 Brussels – Belgium

Preliminary Study of *Eucheuma* and *Gracilaria* Culture off Kenya

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Bilateral scientific agreements between Kenya and Belgium resulted in 3 marine research projects along the Kenyan coast :

1. 1984-1988. Ecology and management of the coastal zone.
2. 1988-1991. Floristics, faunistics and ecology of Kenyan coastal biotopes.
3. 1989-1991. Dynamics and assessment of Kenyan mangrove ecosystems.

Research is done in and from the Kenya Marine and Fisheries Research Institute at Mombasa.

The local staff scientists working on phycology are mostly interested in developing a proper plan for the harvesting of natural populations, mariculture and use of commercially important seaweeds. It was obvious that a broad survey of the Kenyan coastal water was needed, to look at potential sites for significant stands of commercially important seaweeds. The conclusion of this fieldwork is that there are no beds of such seaweeds available for wild harvest along the Kenyan coast (except maybe for *Gracilaria corticata* and *G. salicornia*). Any exploitation of existing stands of commercially important seaweeds will cause irreparable damage to the primary productivity in the coastal zone and drastically change the biotope where they occur.

Therefore the future development of the Kenyan coastal algal resources could only be realized by outdoor seaweed cultivation.

This seaweed farming should be in rather shallow water. The Kenyan coast is partly characterized by coastal reefs with a steep drop-off from the reef edge onwards or by a fringing reef (at 100-200 m from the beach) or by large mangrove areas.

The areas with a coastal reef do not have any shallow water at all; the mangrove biotopes have a fluctuating salinity and are characterized by heavy sedimentation which is not optimal for algal mariculture. Therefore only the lagoons behind the fringing reef could be considered for seaweed farming. But this biotope is in most cases already used for other purposes: either for fishing by local fishermen, or for tourism (windsurfing, snorkelling, swimming etc.). Other parts are nature reserves or natural parks. The major problem for algal mariculture in the open sea off Kenya is the lack of available space.

The situation is completely different in Tanzania: the continental shelf is wide (at least in the northern part) and covered by a series of small islands with almost no river input and therefore no sedimentation. The tidal flux brings in large quantities of nutrients; hence optimal conditions for open sea algal mariculture are present. Another possibility for Kenya would be to do seaweed farming in outdoor ponds as suggested by Wamukoya (1988a). But here the problem might be the strong insolation (heating of the water, possible

photosynthesis-inhibiting light levels) necessitating large pumps to keep the water circulating as well as shading devices. A cost/profitability study would be necessary before starting up this type of infrastructure.

Natural populations of *Eucheuma*

Eucheuma is extremely sparsely present as isolated specimens along the whole Kenyan coast except for the extreme southern part (region of Shimoni). Here 5 species occur, locally in abundant populations: *E. cottonii* Web. van Bosse, *E. odonthophorum* Børgs., *E. platycladum* Schmitz, *E. denticulatum* (Burm.) Coll. & Herv., *E. striatum* Schmitz (personal observations and collections, identifications by Wamukoya 1988b). This could either mean that Shimoni is the northernmost limit of the biogeographical distribution of *Eucheuma* along the African coast due to climatological factors or that Shimoni is the only locality off Kenya with appropriate ecological conditions for *Eucheuma* to develop in the wild. Wamukoya (1988b) started up a pilot plant of line culture of *E. denticulatum* in this region and the results are satisfactory but the problem of available space is restrictive here as well.

Natural populations of *Gracilaria*

A large number of *Gracilaria* spp. occur along the Kenyan coast. They are difficult to identify at species level. Some of them grow in large stands and it would therefore be interesting to study the quality of their agar as well as their biomass, productivity, regeneration speed and seasonality.

Gracilaria salicornia (C. Ag.) Dawson covers large surfaces in the intertidal zone and has a large standing crop during a part of the year (quantification is under study by Oyieke).

Gracilaria corticata J. Ag. mainly grows epiphytically on the vertical stems of the seagrass *Thalassodendron ciliatum* in sheltered habitats (lagoons, mangrove areas). In these biotopes it has an impressive biomass but careless harvesting of *G. corticata* might present a major problem: if the shoots of the seagrass are damaged this might cause destruction of the seagrass beds. As *G. corticata* also develops well on ropes of buoys it probably would be easy to do line culture of this species (as there are problems of available space).

Gracilaria crassa Harv. ex J. Ag. is a common species with large biomass off the Tanzanian coast. In Kenya it occurs at most of the visited sites, but always in small quantities in low midlittoral tidal pools.

Gracilaria verrucosa (Huds.) Papenf. is extremely rare, exclusively growing attached to shell debris in the tidal channel of the mangrove at Gazi (with high nutrient levels and somewhat reduced salinities).

Gracilaria edulis (Gmel.) Silva and *G. arcuata* Zanard. occur subtidally or in low midlittoral pools. They are never abundant.

Conclusions

Large wild populations of *Eucheuma* are absent along the Kenyan coast (except for the southernmost part, Shimoni, but even here not enough for harvesting). Some *Gracilaria* species have a large biomass and harvesting of the natural populations might be economically interesting (more detailed studies are necessary).

Outdoor mariculture in the open sea is in my opinion impossible off Kenya because of the lack of available space (unsuitable coast or other uses of the appropriate habitat). Before starting algal mariculture in outdoor ponds a thorough feasibility and cost/profitability study should be done.

References

- Wamukoya, G. (1988a). A preliminary evaluation of the mariculture potential of *Eucheuma* and *Gracilaria* (Rhodophyta: order Gigartinales) in Kenya. Research proposal.
- Wamukoya, G. (1988b). Taxonomy, ecology and mariculture potential of *Eucheuma* J. Ag. (order Gigartinales) in Wasini Channel, Shimoni, Kenya. Abstract HYSEA-Symposium Nairobi : 42.

Verbal discussion

Q. Was there any response in Tanzania?

A. There is not much information available, with difficult politics and economy.

Q. Could you grow it on rafts?

A. Yes but monsoon storms and strong currents would be problems.

Q. What about mangrove areas?

A. Yes, although they are muddy and dense and not very large in area. *G. corticata* grows well on the ropes used for oyster culture here.

Q. Is inland pond culture possible, as in Indonesia?

A. Inland there are some fish ponds and *Artemia* production but temperature and light would probably inhibit algal culture.