MARINE BOTANICAL RESOURCES OF KENYA COAST.

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ABSTRACT

Investigations have shown that Kenya coast botanical resources are underutilized and have not been realized as exploitable resources. Apart from the mangroves which are heavily exploited, algae and marine angiosperm resources are the least exploited. In a step to realize these as future exploitable resources their current uses in Kenya and how they could be used is discussed. A review of research work which could be seen as a prelude to further research is also included.

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Aquatic marine macrophytes and mangrove shrubs comprise the major marine botanical resources. The term macrophytes encompasses the algae and marine angiosperms. Macrophytes and mangroves form the colourful canopy of the coastal waters, the former being very conspicuous on the intertidal zone especially on a spring low tide day whereas mangroves are confined to creeks and estuaries.

There are already various initial scientific studies that have been undertaken. Identification of different types of species of the blue-green algae (Cyanophyta) green algae (Chlorophyta), red algae (Rhodophyta) and brown algae (Phaeophyta has been done by Isaac (1967, 1968 and 1971) and he published the species lists. In connection to this, some notes on the types of algae have been given by Lind (1956); Gerloff (1960); Lawson (196) Moorjani (1970, 1978, 1980) who even wrote a key for identification and Knutzen and Jasuund (1979) creating a good foundation for further scientific investigations. Isaac (1968 b) gave the species list to the Kenya marine angiosperms. Graham (1929), Lewis (1956) and I (1968) made descriptions of the types of Kenya mangroves further facilitating marine botanical research which like any other biological research discipline requires prior accurate identification of the type of species being studied.

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To date Kenya botanical studies have been qualitative. However, field observation have shown that the macrophytes show seasonal abundances related to the northest (NE) and southeast (SE) monsoon (Isaac 1968, Moorjani 1978 and 1979) due to the contrasting changes in the climate, hydrography and tidal patterns during these seasons as documented by Newell (1957, 1959) and Brakel (1980). The harvestable Rhodophyta which dominate the flora in number of species show two peaks both in N.E and S.E monsoons: Phaeophyta are more abundant towards the end of the the SE monsoon period in September and October whereas Chlorophyta show maximum growth in December/January during the NE monsoon and July/August during the SE monsoon. In general, there is better algae growth and angiosperms during the SE monsoon (Isaac and Isaac 1968; Moorjani 1978, 1979).

The reproduction biology of algae, some marine angiosperms and mangroves has been done. Moorjani (1969, 1978) discussed the fruiting phenology of the algae. Various reproductive structures of mangroves have been described by Isaac and Isaac (1968). Kay (1971) studied the floral structures of marine angiosperms *Cynodocea serrulata* and *Thalassodendroin ciliatum (Cymodocea ciliata* at Mida creek. Some studies on the flowering of other marine angiosperms *Halophila stipulacea; Syringodium isoetifolium, Zostera capensis, Cymodocea serulata and Thalassia hemprichii* have been carried out under controlled conditions by McMillan (1980 a) and (1980 b).

Botanical resources are broadly important in two ways, namely ecologically and economically. The ecological importance of macrophytes and mangroves are as follows:

1 They are the primary producers and produce the food which is the key maintenance of the ecosystem;

2. Offer shelter to many invertebrates, e.g., echinoderms; crustecea, molluscs, epiphytes etc;

3. They are sediment binders and builders; e.g., sand binder *Rhizoclonium* spp. roots of various angiosperms, especially *Thalassia* and *Cymodocea* help to hold soil particles together, creating suitable microhabitats for organisms that would be easily swept away by current; mangrove roots help the accumulation of sediments which accommodate various detritivores which release various nutrients.

No other botanical resource at the Kenya coast other than mangroves have been used as resources of acquiring income. Mangroves are used in various ways notably as:

1. Poles which are used for building and even exported to other countries, e.g., in the Middle East;

2. Charcoal;

3. Tannin used for treating leather, have formed a good trade.

The marine angiosperm *Enhalus acoroides* which has long tough leaves and rhizomes found around Lamu is used in two ways:

1. Its leaves are used for weaving mats;

2. Its rhizomes are eaten notably by the Lamu people. Various types of brown algae like *Cytoseira* spp. *Turbinaria* spp. and *Sargassum* spp. red algae, e.g., *Hypnea* spp. and green algae, e.g., *Ulva* spp. are used as baits in traps to catch herbivorous fish at various parts of the Kenya coast. Indeed a comparison of the worldwide uses of the types of aquatic macrophytes also found in Kenya (table 1) shows clearly how our resources have been underutilized. In Tanzania the brown algae *Sargassum, Turbinaria* and red algae *Eucheuma, Hypnea* and *Glacilaria* are being exploited and *Eucheuma* is actively picked, especially around Pemba, Zanzibar and Mafia (Matthes 1974).

Different types of uses of aquatic macrophytes products have been documented by many authors and the following uses summarized from Dawnson (1966); Levrin, Hope and Schmid (1969) and Kumar and Singh (1971) Phaeophyta are the sources of alginic acid and alginates which are salts of the latter. The types of algae from which these are extracted and which are also found in Kenya shores are indicated in table 1. Alginic acid and alginates have been variously used in the following ways:

1. They are used in preparation of products of human consumption, e.g., soup and antibiotic capsules among other things.

2. Alginates are used as thickeners in cosmetic, textile and pharmaceutical industries and as emulsfying agents in preparation of polishes and paints.

Rhodophyta are notably known algae source of agar extraction. Agar is used as:

1. A culture media for, among other things, bacteria and fungi in various medical and institutional researches;

2. As stabilizers in food, cosmetics and leather.

The use of aquatic marine macrophytes for food and fertilizer is due to the high valuable mineral elements they accumulate. Phaeophyta are rich sources of soda, potash, iodine and can yield a good amount of ammonia, tar and charcoal when carefully processed Rhodophyta yield more iodine than any other types of algae. Iodine is used for treatment of goiter. Marine macrophytes are also rich in copper, iron, zinc, cobalt, vanadium, molybdenum, manganese, boron and chromium, which is all the more reason why they are used as fertilizers. Another reason why they are useful in agriculture is that they increase the water holding capacity because the fragments of algae hold much water providing valuable small reservoir of water in close contact with the roots of cultivated plants. Furthermore, the bulky organic substances decay slowly in the soil and form humus.

Periodically, large masses of marine macrophytes are cast at various places of the Kenya coast shore and are not used. Indeed these could be used as fertilizers.

Why the macrophytes are not popular exploitable resources in Kenya could be due to the facts that they:

1. are not locally used for food;

2. have not been known to be fertilizers;

3. have not been considered as worthwhile money earning resource to support livelihood and probably that is why it has been overlooked to suggest collecting, process and export to countries in need of the macrophytes raw materials or products.

At this juncture, needless to further stress, even though there is little local use of marine macrophytes unlike the over exploited mangrove shrubs and whose importance for conservation and need for research has been discussed by one of the participants, Dr. W.H. Brakel, at this symposium, algae and marine angiosperms could be used in the various ways stated. A small project could be carried out to show the importance of marine macrophytes casts as good fertilizers and secondly, ways in which they could be picked and marketed to utilizers who would buy at profitable prices and how this would create an interest into their exploitation. Whereas now we are faced with an unrealized underexploited resource, whose importance has been overlooked, at this current pace of various identification for potential exploitable resources will definitely be realized and used. Moreover, since meaningful exploitation inevitably requires scientific research, quantitative biomass assessment, mineral content composition and culturing need to be undertaken. Apart from Imbamba (1972) there have been no other studies on the mineral content of the Kenya marine algae a further study which is now essential in order to identify the unique marine macrophytes that could be efficiently used as fertilizers or for various further useful extracts. Based on the various stated uses of marine macrophytes, this new area of resources definitely calls for research.

Table: 1 Various uses of the types of algae that are also found in Kenya intertidal zone.

(Summarized from: Dawnson (1966); Levring, Hoppe and Schmid (1969), and Kumar and Singh (1971).

Type of Algae	Utilization of product	Place of production or Utilization
A. Chlorophyta		
1. *Caulerpa*	food	Mediterranea countries, Asia
2. *Chaetomorpha*	food	Asia
3. *Enteromorpha*	salad and food for animals	India
B. Rhodophyta		
1. *Eucheuma*	Raw material of agar	Japan
2. *Gelidium*	" "	World wide
3. *Gracilaria*	" "	" "
4. *Ceramium*	" "	Eastern countries
5. *Hypnea*	Hypnean	Subtropic and tropical countries
6. *Lithothamnion*	Powdered and used in place of lime in conditioning soil	Asia

C. Phaeophyta

1. *Cystoseira*		alginic acid and alginates	Worldwide
2. *Sargassum*	(a)	Alginic acid and Alginates	"
	(b)	Food	Asia
3. *Turbinaria*	(a)	Alginic acid and alginates	Worldwide
	(b)	Fertilizer for Coconut plantations	Phillipines and India
4. *Padina*		fertilizer	Phillipines

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