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The seaweeds of Kenya: Checklist, history of seaweed study, coastal environment, and analysis of seaweed diversity and biogeography

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Abstract

The seaweeds of Kenya are relatively well documented in comparison with the marine floras of other countries in the Indian Ocean. A checklist is provided of the seaweeds recorded, which includes a total of 386 species (214 red algae, 116 green algae and 56 brown algae), plus an additional 19 infra-specific taxa. This is the first detailed list for almost 30 years, with a 29% increase in species compared to the previous listing. The history of seaweed study in Kenya and the Kenyan coastal environment as a habitat for seaweeds are discussed in detail. An ordination analysis of the global biogeographic relationships of the Kenyan seaweed flora shows clearly the internal consistency of the Indo-Pacific seaweed flora at this large scale. Data on Indian Ocean relationships show that the Kenyan flora produces a distinct grouping of seaweed floras from Tanzania, Madagascar, Mozambique and the Indian Ocean coast of South Africa, which is somewhat separated from the floras of the rest of the Indian Ocean. The data reveal that Mozambiquan seaweeds are seriously understudied, with only 26% of the Kenyan flora having been recorded in that country, compared with 68% in Tanzania, 41% in Madagascar, and 43% in South Africa.

Keywords: Biodiversity; Biogeography; Coastal environment; Indian Ocean; Kenya; Seaweeds

1. Introduction

The seaweeds of Kenya are fairly well-studied floristically, relative to other Indian Ocean countries (Coppejans et al., 2001; Bolton et al., 2003). Seaweeds are economically important, both currently and potentially in the western Indian Ocean (Bandeira, 1998; Mshigeni, 1998; Mollion, 1998; Oyieke, 1998), but there has not been a thorough listing of the species recorded in Kenya for almost 30 years. A comprehensive catalogue of species recorded in the literature for the entire Indian Ocean, with all relevant literature, was published a decade ago (Silva et al., 1996), although a number of species have been newly recorded for Kenya since then; see Coppejans et al. (2000, 2001). The biogeographic affinities of the Kenyan seaweed flora have not previously been analysed in detail. This contribution documents the history of seaweed study in Kenya, describes the coastal environment as a habitat for seaweeds, lists the species which have been recorded, and analyses the biogeographic patterns of distribution of the seaweeds which have been recorded in Kenya, both in the Indian Ocean and worldwide. It comprises Phaeophyceae, Chlorophyta and Rhodophyta, omitting the Cyanophyta (=Cyanobacteria) which, despite the listings in Silva et al. (1996), are much less well studied than the other three groups, and have taxonomic and nomenclatural problems.

1.1. History of seaweed study in Kenya

The first published records on Kenyan seaweeds were made as a result of expeditions undertaken by early German explorers and botanists. An expedition by J.M. Hildebrandt in the late 19th century covered the Red Sea and the Indian Ocean, and taxonomic lists of algae based on his collections from the region were later published by Hauck (1886, 1887, 1888, 1889). The port of Mombasa was one of the stations visited during the expedition, and from Hauck's records, a total of 28 species of algae were recorded. Other floristic records by German botanists

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who called on the East African coastal stations, Mombasa included, were published by Engler (1895), Schmitz (1895), Reinbold (1907) and Schroeder (1912). Schmitz (1895) listed 68 taxa for Tanzania and Kenya, including 19 for Mombasa. There is a wide gap in records of Kenyan algae spanning the period between 1913 and 1956. Lind (1956) published an ecological note based on a collection trip she made to Malindi. She recorded the occurrence and distribution of the common algae of the littoral zone and commented on the paucity of brown algae. In the following year Schmidt (1957) described the flora on a reef platform at Kilindini. He observed that there were significant similarities between the flora of the eastern Africa region and those of Madagascar, India and Malaysia.

Interest in studies and subsequent publications on Kenyan seaweeds has had a significant increase from 1960 to date. Gerloff (1960) examined collections from the East African Herbarium, mostly collected by Greenway and Rawlins between 1952–1953 and 1955–1957. He documented a single species of cyanophyte (*Lyngbya majuscula*) and 35 species of chlorophytes, including ecological observations and the geographical distribution. Taylor (1966) studied Indo-Pacific *Turbinaria*, which included 7 species from Kenya. Of the Kenyan species, *T. crateriformis* and *T. kenyaensis* were described as new species. Ducker (1967) undertook a taxonomic study of the genus *Chlorodesmis* in the Indo-Pacific Region and reported the occurrence of *C. caespitosa* and *C. major* on the Kenya coast. Papenfuss (1967) and Papenfuss and Jensen (1967) reported on the history, morphology and taxonomy of *Hormophysa* and *Cystoseira* species, based on specimens collected in 1962 along the eastern coast of Africa (International Indian Ocean Expedition) which included Kenya.

The first marine botanists to collect, identify and publish their own extensive works on the marine flora of the whole of the Kenyan coast were W.E. Isaac and F.M. Isaac. During the 1960′s they carried out the first extensive survey from Manda Island in the north to Gazi in the south, including information on ecology and distribution (Isaac and Isaac, 1968). W.E. Isaac (1967, 1968, 1971) published lists, including 136 species of Rhodophyta, 86 species of Chlorophyta and 40 species of Phaeophyceae. As part of the International Indian Ocean Expedition in 1962, Lawson conducted a brief ecological survey at Malindi, Mombasa and Diani on the Kenya Coast and at Tanga, Bagamoyo and Dar es Salaam on the Tanzanian coast (Lawson, 1969). He described the vertical distribution of the algae at each locality and distinguished three zones comprising of five belts: (1) an *Entophysalis* belt (littoral fringe zone); (2) a *Bostrychia* belt; (3) an animal belt; (4) an algal community belt without obvious dominants and (5) a belt of marine monocots and larger brown algae (sublittoral zone). He observed that the schemes of zonation that had been used in other countries of the world were not entirely satisfactory when applied to the shores of tropical East Africa.

Moorjani, the first Kenyan to conduct studies and publish findings on Kenyan seaweeds, made her first publication on the reproductive structures of *Udotea orientalis* (Moorjani, 1969). She also carried out a taxonomic study on the Kenyan species of *Acetabularia* (Moorjani, 1970) where she gave a description of Kenyan species including an identification key for the flora. The first non-taxonomic study on the Kenyan algae was conducted by Imbamba (1972). He analyzed the mineral elements (N, P, K, Ca, Mg) of 6 chlorophytes, 4 phaeophytes, 4 rhodophytes and the marine angiosperm *Cymodocea ciliata* from the Diani, Tiwi and Gazi areas. The morphology and taxonomy of *Sarconema filiforme* and *S. scinaioides* specimens collected in Kenya, among other countries, were studied by Papenfuss and Edelstein (1974).

The most extensive ecological study on Kenyan seaweeds was that carried out by Moorjani (1977). She made an attempt to describe the ecology of over 300 species of marine algae, including 160 Rhodophyta. She observed that Caulerpales (="Siphonales") were dominant among the Chlorophyta, while Fucales dominated the Phaeophyceae. A total of 31 species were newly recorded for Kenya in her study. On a geographical basis, she observed that the majority of Kenyan algae had a wide north-south distribution on the coast. Malindi was marked as the transition zone with some species restricted to the north of it. She further observed that there was an abrupt change in the composition of the flora at Mamburi, where Rhodophyta predominated. Moorjani (1980) also noted seasonal changes in both quantity and composition of the flora and discussed shore zonation patterns. Oyieke and Ruwa (1987) described the zonation pattern of 33 species of rocky cliff macroalgae in Mombasa, including 10 new records for Kenya. "Seaweeds of the Kenya Coast" (Moorjani and Simpson, 1988) provides a simple key to the common genera found along the coastal waters of Kenya, with descriptions and illustrations of all included taxa (18 genera of Chlorophyceae, 13 genera of Phaeophyceae and 27 genera of Rhodophyceae). Other recent guides to the seaweeds of regions on the Indian Ocean coast of Africa, which are useful in the identification of Kenyan seaweeds, are Coppejans et al. (1997), Oliveira et al. (2005) and De Clerck et al. (2005).

Recent taxonomic research on the seaweeds of Kenya has been carried out by Coppejans and colleagues, working on *Caulerpa* (Coppejans and Beeckman, 1989, 1990), Codiales (Van den Heede and Coppejans, 1996; Coppejans and Van den Heede, 1996) and *Dictyota* (Coppejans, 1990; De Clerck, 2003). Coppejans et al. (2000) provided an annotated list including 40 species newly recorded in Kenya. In addition, this group carried out ecological studies on the seaweeds associated with mangrove vegetation (Coppejans and Gallin, 1989; De Schryver, 1990) as well as the ecology of epiphytes on seagrasses (Coppejans et al., 1992).

A survey of the marine flora in Mida Creek along the northern coast of Kenya was carried out by Uku et al. (1998) and Mwayuli (2003) studied spatial and temporal changes in species diversity and zonation of macroalgae in the intertidal zones at Kanamai and Vasco da Gama Point along the Kenyan north coast. The latter study recorded a total of 87 species of macroalgae, with the highest species richness observed on the reef platforms. Macroalgal abundance was positively correlated with nutrients and faecal coliforms, while high levels of total suspended solids and oil in water resulted in low macroalgal diversity.

The first studies of potential economic importance of seaweeds in Kenya were a brief contribution by Coppejans

(1989) and a more detailed survey by Yarish and Wamukoya (1990). Both studies found populations of species of economic potential, and Coppejans (1989) was of the opinion that harvesting of *Gracilaria* "might be economically interesting". Yarish and Wamukoya (1990) conducted a survey of 15 sites along the Kenyan coast to evaluate the potential for harvesting seaweeds and for establishing seaweed farms. They observed that *Gracilaria*, whose agar content had been reported to be of low quality, was widely distributed along the Kenya coast, whereas *Gelidium* could be a potential source of high quality bacteriological grade agar. They further suggested that *Eucheuma* could be farmed locally to support the increasing demand for carrageenan. Oyieke (1993a, 1994) quantified and characterised agar from Kenyan *Gracilaria* species collected from different stations along the Kenya Coast. Besides the studies on commercial potential, Oyieke (1993b) and Oyieke and Kokwaro (1993, 1995) studied the taxonomy, ecology and seasonality of Kenyan *Gracilaria*. Oyieke (1994) studied the relationship between phenotypic variation and agar quality in *Gracilaria salicornia*. The Kenyan green alga *Halimeda macroloba* has been reported to contain the triterpenoid Clionasterol, in bioprospecting studies for novel pharmaceuticals (Dzeha et al., 2003). Oyieke (1998) gives an overview of seaweeds of potential economic importance in Kenya. Wakibia (2005) and Wakibia et al. (2006, in press) have recently studied growth rates of three commercial euchemoid isolates (originally from the Philippines); *Eucheuma denticulatum*, and green and brown *Kappaphycus alvarezii* at three sites i.e. Gazi Bay, Kibuyuni and Mkwiro, all from the southern coast of Kenya. These authors also characterized and compared carrageenan extracts from the three morphotypes by studying yields, gel strength, viscosity and sulphate contents. An economic feasibility and socio-economic study for growing *E. denticulatum* and *K. alvarezii* at Kenyan village sites was also undertaken. Wakibia (2005) reiterated the need for the development of a national mariculture programme in Kenya to guide and promote farming of marine resources, including seaweeds.

1.2. The Kenyan coastal environment

The Kenyan coastline (Fig. 1) is ca. 600 km long, stretching from 1°40'S to 4°41′S, and bordering Somalia in the north and Tanzania in the south. While most areas of the world oceans have relatively wide shelf areas, the Kenyan continental shelf is virtually non-existent (Newell, 1957, 1959; Johnson et al., 1982; Nguli, 2005). Most of what may be referred to as the inner shelf consists of a narrow strip area shallower than 50 m. From the shelf edge, the bottom deepens sharply offshore reaching 500 m within a distance of less than 5 km in most cases. Most of the coastline, except where two major rivers (Tana and Sabaki) discharge into the Indian Ocean, is protected by a fairly continuous fringing coral reef platform lying between 0.5–1.5 km offshore, parallel to the coastline (Hartnoll, 1976; IUCN/UNEP, 1988). This fringing reef platform line is known to break strong waves from the open sea, thereby calming waters in the back reef lagoons and adjoining inner coastal waters near the beach (Johnson et al., 1982; Kirugara et al., 1998).

Off-shore patchy reef systems are well developed around the Mida-Lamu-Kiwayu archipelago in the north and Shimoni in the south (Fig. 1). Other features of the continental shelf worth pointing out are the semi-continuous lagoon systems found immediately behind fringing reef platform; the numerous tidal creeks and bays, usually dominated by mangrove swamps (usually following drowned river mouths); the large Ungwana Bay area into which two major rivers drain; and two main banks — the Malindi Bank lying just north of Mida Creek and the North Kenyan Bank located off Kipini (Morgan, 1969) (Fig. 1). The back-reef lagoon waters have physical and chemical parameters that more closely resemble those of oceanic water (Johnson et al., 1982; Kirugara et al., 1998; Nguli, 2005), while the physical parameters of the creek and bay waters fluctuate considerably (Newell, 1957, 1959; Brakel, 1984; Kitheka, 1997). In the bay and creek systems the major environmental drivers include evaporation, precipitation, river inputs, ground-water input, heat budget, incoming and outgoing tidal water, and creek volume (Johnson et al., 1982; Kitheka, 1997; Kirugara et al., 1998; Nguli, 2005).

The leeward side of central and southern Kenya's fringing reefs is frequently dominated by hard substratum areas often colonized by corals, algae, and associated coral reef community (Moorjani, 1977). The northern reefs, on the other hand, are mostly platform reefs (Hamilton and Brakel, 1984), but have a lagoon and edge similar to a fringing reef. The north reef platform is 0.8 m above extreme low water and the lagoon is 0.9 m deep. The central (Kanamai reef) is 1.4 m high at extreme low water and its lagoon 0.3 m deep, while the south (Diani reef) is 0.8 m above extreme low water and 0.6 m deep (McClanahan and Muthiga, 1984). The total area of coral reef in Kenya is estimated at about 50,000 ha (IUCN/UNEP, 1988; McClanahan and Obura, 1984; UNEP, 1998). The biotic components contributing to reef development comprise soft corals, coralline red algae, and calcareous algae. Generally, reef communities here are dominated by *Porites* spp. assemblages in calm waters and *Acropora* spp. assemblages in high energy environments (McClanahan and Obura, 1984; UNEP, 1998). However, the 1997/98 El-Nino event caused extensive bleaching which resulted in local mortalities of up to 70% (Linden and Sporrong, 1999).

The oceanographic conditions experienced in Kenya are driven by four oceanic currents: the South Equatorial Current (SEC), the East African Coastal Current (EACC), the Equatorial Counter Current (ECC), and the Somali Current (SC) (Newell, 1957; Wyrtki, 1971; Swallow et al., 1992). Superimposed on these currents is the broader influence of a seasonal and variable monsoon climate (Newell, 1957). The monsoon variability is driven by annual north–south migration of the Inter-Tropical Convergence Zone (ITCZ), recently being redefined under the Indian Ocean Dipole (IOD) phenomenon (Anderson, 1999; Behera et al., 1999; Saji et al., 1999; Webster et al., 1999). As a result of this IOD variability with seasonally varying pressure, wind, humidity, cloud cover, rainfall, radiation, and evaporation, two monsoon events occur, the southeast monsoons (SEM) and the northeast monsoons (NEM). These drive local differences in the physical, chemical and biological oceanographic conditions

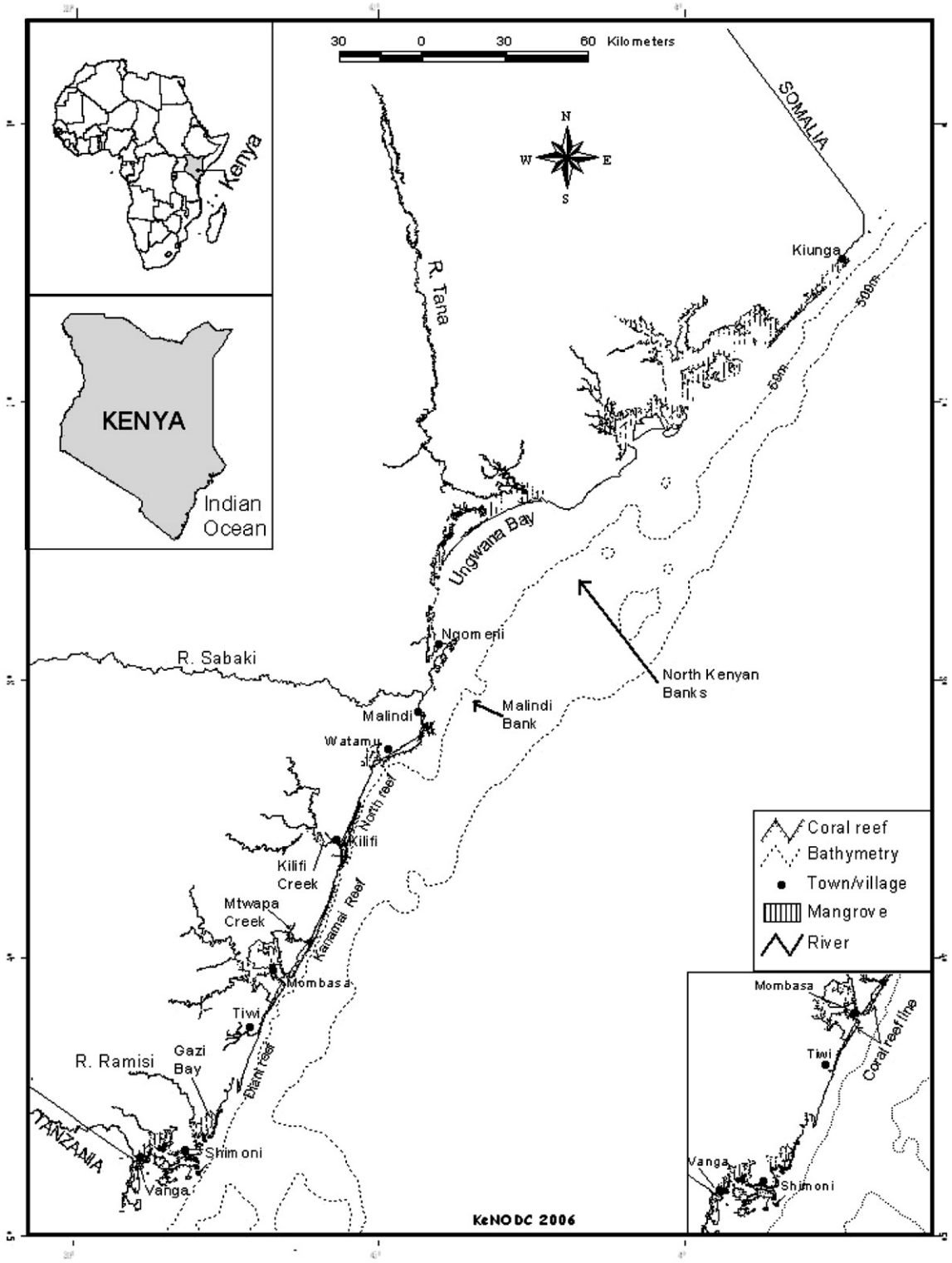

Fig. 1. The Kenyan coastline, showing reef and mangrove habitats and major depth contours.

of coastal waters (Smith and Codisporti, 1990). The alternation between SEM and NEM conditions have been shown to affect the seasonal growth patterns of the carrageenophytes *Eucheuma* and *Kappaphycus* in pilot commercial aquaculture systems (Wakibia, 2005; Wakibia et al., in press).

Of the four coastal currents experienced in the East African region, the Somali Current is the only one that reverses its direction of flow under the influence of the monsoons (Leetmaa, 1972, 1973; Leetmaa and Truesdale, 1972; Johnson et al., 1982). It flows in a south-westerly direction (at about 1.5–2 knots)

Table 1
Percentage of total Kenyan seaweed flora found to occur in other regions of the world (codes are used for the world regions in Fig. 2)

South-east Asia (SEA)	66.4%
Australia and New Zealand (ANZ)	61.6%
Pacific Islands (PAC)	59.7%
East Asia (EAS)	52.4%
West Africa (WAF)	39.1%
Caribbean Basin (CAR)	38.6%
Europe (EUR)	30.9%
Mediterranean Basin (MED)	25.4%
Eastern South America (ESA)	24.6%
Western, North and Central America (WNA)	17.4%
Red Sea (RED)	16.2%
Western South America (WSA)	13.8%
Antarctic and sub-Antarctic Islands (ANT)	3.8%
Eastern North America (ENA)	2.9%

during NEM, and reverses its flow and increases its velocity (to around 2–2.5 knots) in SEM (Duing and Schott, 1978; Tomczak and Godfrey, 1994). During SEM, the EACC move northwards beyond Malindi and joins with the Somali Current and continues right to the Horn of Africa. It also causes upwelling off the Somali coast in June (Duing and Schott, 1978; Tomczak and Godfrey, 1994). EACC drives the waters onshore, under conditions associated with high wind energy, high cloud cover, high rain (and therefore high sedimentation from increased river discharge or surface run-offs), and low water temperatures (Swallow et al., 1992). As a consequence of SEM conditions, reduced phytoplankton productivity and a relatively higher abundance of benthic algae are generally experienced in coastal waters (Bryceson, 1982).

During NEM, the northward extent of the EACC is more restricted. At this time, it meets and joins the southwards flowing SC (with the convergence taking place anywhere between Malindi and Lamu depending on the strength of the monsoon in that particular year). The two streams then turn eastwards and flow offshore as the ECC, driving waters offshore, under conditions associated with high radiation and evaporation, low wind energy, low cloud cover. The net onshore currents result in the sinking of surface waters along most of the coast, except at the northern frontiers (e.g., near Kiunga, Fig. 1) where some mild upwelling is thought to occur during NEM (Bruce and Volkmann, 1969; Findlater, 1971, 1977).

Discharges from major rivers have local effects on salinity, especially during the heavy rainy season in SEM periods. Oceanic salinity increases towards the west from relatively low salinity areas in the east and, off the East African coast, surface salinity gradually increases to a maximum off the Red Sea and the Arabian Sea (Nguli, 2005). Within the smaller river systems draining into the estuaries, a similar trend is observed throughout the region, e.g., in Gazi Bay (Kitheka, 1997), Tudor Creek, Kilindini Harbour (Norconsult, 1975).

1.3. Methods of checklist production and biogeographical analysis

The checklist of the seaweed species of Kenya was extracted from the website www.Algaebase.org (Guiry and Nic Dhonncha, 2005) in March 2005, which is thus the cut-off date for the species noted here. This website includes all the data in Silva et al. (1996) and more recent taxonomic and floristic publications and is updated continually from taxonomic and nomenclatural standpoints. It is thus a comprehensive list of our current knowledge of seaweeds present in Kenya. A few species are commonly listed for the region which have not been validly described, most of them illustrated in Jaasund's (1976) guide to Tanzanian seaweeds (e.g. *Ulva pulchra*, *Acrosorium amphiroae*, *Ceramium multijugum* and *Hypnea esperi*). These have been omitted from the list and analysis, as have a small number of doubtful records. From late 2004, the Algaebase website has also included distribution records for all species by country and provided a summary of the country data in larger biogeographical world regions. The checklist is presented in alphabetical order of genera within phyla, as family concepts in the algae are fluid. The data for Kenyan species were extracted, and two biogeographical analyses were carried out. Firstly, the number and percentage of Kenyan seaweeds in major world regions were calculated and the number and percentage of species of Kenyan seaweeds which have been recorded in various major Indian Ocean countries were analysed. These two datasets were then analysed by ordination (Detrended Correspondence

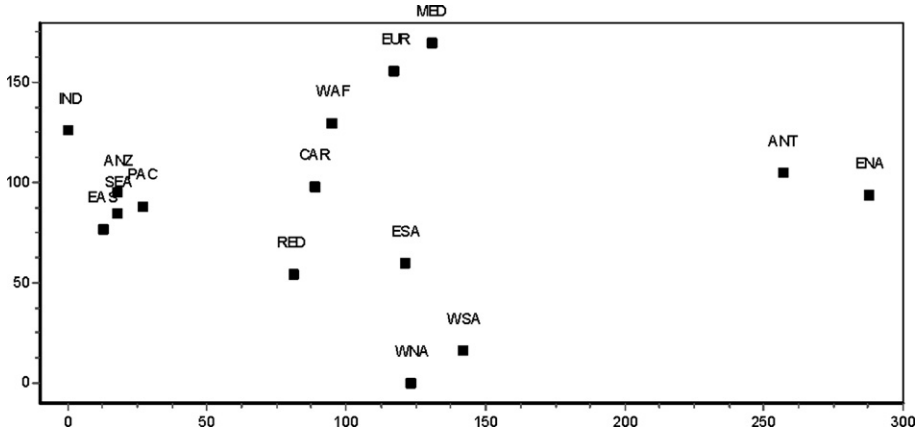

Fig. 2. DECORANA ordination of different world marine regions, based on the seaweeds which occur in Kenya (see Table 1 for codes: Kenya is in the Indian Ocean=IND). Eigenvalues — Axis 1: 0.234, Axis 2: 0.088.

Table 2
Percentage of total Kenyan seaweed flora found to occur in other regions of the Indian Ocean (codes are used for the Indian Ocean regions in Fig. 3)

Tanzania (TAN)	67.6%
India (INDI)	58.7%
Sri Lanka (SRI)	42.8%
South Africa (SAF)	43.0%
Madagascar (MAD)	40.8%
Indonesia (INDO)	40.8%
Arabian Peninsula (ARA)	40.1%
Somalia (SOM)	28.5%
Pakistan (PAK)	26.8%
Mozambique (MOZ)	25.8%
Bangladesh (BAN)	16.9%
Thailand (THA)	9.7%
Burma (BUR)	6.5%

Analysis: DECORANA) techniques using the Community Analysis Package (CAP: Version 2.1: Pisces Conservation Ltd., 2003), to give an idea of the Indian Ocean and global distributions of those species recorded for Kenya.

2. Results of biogeographic analysis

The global distribution of seaweeds occurring in Kenya is shown in Table 1 and Fig. 2. Only a very few cosmopolitan species (<4% of the Kenyan flora) occur both in Kenya and the Antarctic/sub-Antarctic or Eastern North American waters. The analysis reveals that the Indo-Pacific region forms a very distinct cluster, including East Asia, Australia/New Zealand, Southeast Asia, and the Pacific Islands. Over 50% of the Kenyan seaweed flora occurs in each of these regions (Table 1). The Red Sea is separated from this cluster on Axis 2, due to its low species numbers, and hence lower percentage similarity. The rest of the world′s floras form a looser cluster, widely separated from that of the Indo-Pacific.

The distribution of Kenyan seaweeds in the Indian Ocean is shown in Table 2 and Fig. 3. 68% of Kenyan seaweeds occur in Tanzania, the most similar flora. The seaweed floras of the Indian Ocean coastline of southeastern Africa (Tanzania, Kenya, Madagascar, South Africa, Mozambique) form a tight cluster. All these regions, except Mozambique (26% similarity), share more than 40% of their species with Kenya. Most of the remaining Indian Ocean floras (Somalia, Arabian Peninsula, India, Sri Lanka, Indonesia) form a distinct tight cluster. Outliers on the left of Fig. 3 are regions with relatively poorly-studied floras, with consequent low similarities to Kenya (<27% of Kenyan species occur in Thailand, Pakistan, Bangladesh, Burma).

3. Discussion

The Kenyan seaweed flora thus far recorded comprises 386 species (214 Rhodophyta, 116 Chlorophyta and 56 Phaeophyceae: Appendix 1), and also includes 19 additional infraspecific taxa. This is a high figure, in keeping with the biogeographical position of Kenya, forming part of the Indo-West Pacific — the most speciose world marine coastal region (Lüning, 1990; Van den Hoek, 1984). Kenya also has a coastline with a proliferation of habitats for different seaweed communities, in contrast to regions of tropical West Africa (John and Lawson, 1997; Bolton et al., 2003). However, in general, the number of seaweed species in a region is related to coastal length in a log/log relationship (Santelices et al., in press), and thus Kenya does not necessarily have an especially rich flora in an Indian Ocean context. Price et al. (2006), however, applying a complex measure combining species richness, rarity and average taxonomic distinctness to the data of the Silva et al. (1996), suggest that Kenya counts 11th in seaweed biodiversity out of 66 countries or island groups in the Indian Ocean.

The relatively low number of brown algae in the Kenyan flora is in agreement with findings of Santelices et al. (in press), who demonstrated that the proportion of species of brown algae in a seaweed flora is low in tropical regions on a global scale. This pattern has also been demonstrated to occur in the Indian Ocean (Price et al., 2006). The relatively high proportion of green algae (30% of the flora) is similar to many tropical floras (Santelices et al., in press). The seaweeds of Kenya have been relatively well collected, with indigenous phycologists being active earlier than in most other African countries, and with substantial subtidal collections being performed at the end of the 20th century by

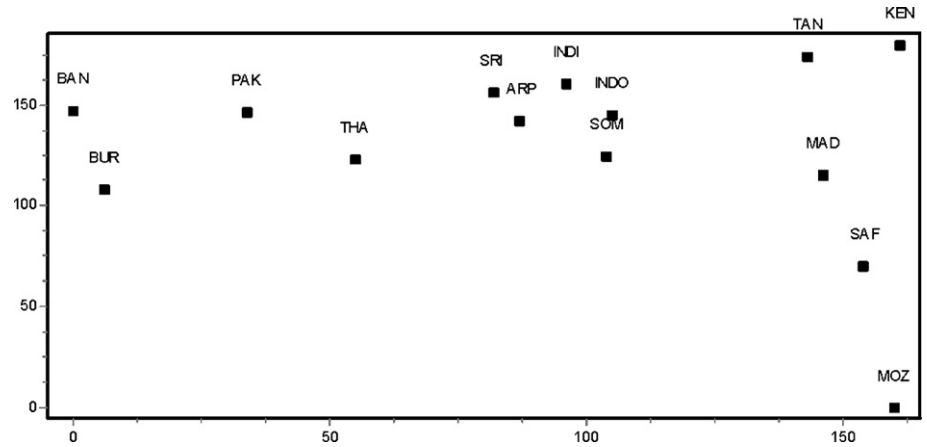

Fig. 3. DECORANA ordination of marine regions in the Indian Ocean, based on seaweeds which occur in Kenya (see Table 2 for codes: Kenya=KEN). Eigenvalues — Axis 1: 0.164, Axis 2: 0.141.

seaweed taxonomists from Belgium (see Coppejans et al., 2000, 2001). The latter added significantly to the recorded floras of both Kenya and Tanzania. The seaweed floras of Somalia and Mozambique are much less well known (Bolton et al., 2003), as is reflected by the low number of species thus far reported to co-occur in Kenya and Mozambique, despite these countries being within the same biogeographical region.

Seaweed species occurring in Kenya are widely distributed within the Indo-Pacific marine region. The world regions with closest links to the Indo-Pacific, as measured by the presence of seaweeds found in Kenya, are Tropical West Africa and the Caribbean. A link between the seaweeds of Mozambique and those of the Caribbean has previously been proposed by Critchley et al. (1994). Interestingly, despite relatively high similarity between the Kenyan flora and that of the Pacific Islands, few Kenyan species occur on the west coasts of the Americas, suggesting the presence of a biogeographical barrier (see Santelices, 1980; Santelices and Meneses, 2000).

The occurrence of very similar floras in southeastern African countries (Kenya, Tanzania, Madagascar, South Africa), separated considerably from other Indian Ocean countries, is evidence of a slightly different flora in these southern regions. The surprisingly low number of seaweeds in Kenya which also grow in Mozambique is very probably an artifact, indicative of the lack of knowledge of Mozambiquan seaweeds in comparison to the seaweeds of Kenya, Tanzania and South Africa. The observed similarity between the seaweeds of Kenya and those of South Africa is due to the tropical nature of the short northeastern section in South Africa (Bolton et al., 2004; Anderson and Bolton, 2005). More distant, well-studied countries in the Indian Ocean (e.g. India, Indonesia) have high numbers of seaweeds also occurring in Kenya.

The narrow continental shelf on much of the Kenyan coast has implications both for seaweed ecology and commercial utilization. It limits the available habitat for seaweed growth and consequently limits natural populations with commercial potential. In addition, it also limits the area available for commercial seaweed aquaculture operations and this is exacerbated by the common occurrence of estuaries, with the concomitant lowered salinities that prevent successful cultivation. Bearing in mind the potential conflict with other coastal uses (e.g. fishing, nature conservation, tourism), it is imperative that studies be carried out to assess the existing habitat which could be used for seaweed cultivation systems (Wakibia, 2005, 2006, in press).

In conclusion, it is clear that detailed documentation of available literature, such as the catalogue of Silva et al. (1996), combined with reliable, web-based data handling (Guiry and Nic Dhonncha, 2005) can produce useful regional information, which can add significantly to our knowledge of biodiversity, biogeography and, ultimately, our ability to conserve marine biotas.

Acknowledgements

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Appendix 1

Checklist of the seaweeds of Kenya, extracted from www.Algaebase.org in March 2005, and edited by JJ Bolton.

PHAEOPHYCEAE (brown algae)

1 *Asteronema rhodochortonoides* (Børgesen) D.G. Müller and E.R. Parodi
2 *Chnoospora implexa* J. Agardh
3 *Colpomenia sinuosa* (Mertens ex Roth) Derbès and Solier
4 *Cystoseira myrica* (S.G. Gmelin) C. Agardh
5 *Cystoseira trinodis* (Forsskål) C. Agardh
6 *Dictyopteris delicatula* J.V. Lamouroux
7 *Dictyopteris hoytii* W.R. Taylor
8 *Dictyopteris polypodioides* (A.P. de Candolle) J.V. Lamouroux
9 *Dictyopteris repens* (Okamura) Børgesen
10 *Dictyota adnata* Zanardini
11 *Dictyota bartayresiana* J.V. Lamouroux
12 *Dictyota cervicornis* Kützing
13 *Dictyota ceylanica* Kützing
14 *Dictyota ciliolata* Sonder ex Kützing
15 *Dictyota dichotoma var. intricata* (C. Agardh) Greville
16 *Dictyota friabilis* Setchell
17 *Dictyota humifusa* Hörnig, Schnetter and Coppejans
18 *Dictyota pardalis f. pseudohamata* A.B.Cribb
19 *Feldmannia indica* (Sonder) Womersley and A. Bailey
20 *Hincksia mitchelliae* (Harvey) P.C. Silva
21 *Hormophysa cuneiformis* (J.F. Gmelin) P.C. Silva
22 *Hydroclathrus clathratus* (C. Agardh) M. Howe
23 *Lobophora variegata* (Lamouroux) Womersley ex Oliveira
24 *Padina boryana* Thivy
25 *Padina gymnospora* (Kützing) Sonder
26 *Padina pavonica* (Linnaeus) Thivy
27 *Padina antillarum* (Kützing) Piccone
28 *Rosenvingea intricata* (J. Agardh) Børgesen
29 *Rosenvingea orientalis* (J. Agardh) Børgesen
30 *Sargassum aquifolium* (Turner) C. Agardh
31 *Sargassum asperifolium* Hering and G. Martens ex J. Agardh
32 *Sargassum cristaefolium* C. Agardh
33 *Sargassum densifolium* Zanardini
34 *Sargassum echinocarpum var. ambiguum* (Grunow) Grunow
35 *Sargassum ilicifolium* (Turner) C. Agardh
36 *Sargassum ilicifolium f. erythraeum* Grunow
37 *Sargassum ilicifolium var. venustum* Grunow
38 *Sargassum latifolium* (Turner) C. Agardh

39 *Sargassum lendigerum var. mombassaense* Grunow
40 *Sargassum oligocystum* Montagne
41 *Sargassum polycystum* C. Agardh
42 *Sargassum portieranum var. mombassiense* Grunow
43 *Sargassum swartzii* C. Agardh
44 *Sargassum wightii* Greville
45 *Spatoglossum asperum* J. Agardh
46 *Sphacelaria novae-hollandiae* Sonder
47 *Sphacelaria rigidula* Kützing
48 *Sphacelaria tribuloides* Meneghini
49 *Stoechospermum polypodioides* (J.V. Lamouroux) J. Agardh
50 *Stypopodium zonale* (J.V. Lamouroux) Papenfuss
51 *Turbinaria condensata* Sonder
52 *Turbinaria conoides* (J. Agardh) Kützing
53 *Turbinaria crateriformis* W.R. Taylor
54 *Turbinaria decurrens* Bory de Saint-Vincent
55 *Turbinaria kenyaensis* W.R. Taylor
56 *Turbinaria murrayana* Barton
57 *Turbinaria ornata* (Turner) J. Agardh
58 *Turbinaria ornata f. ecoronata* W.R. Taylor
59 *Turbinaria ornata f. evesiculosa* (Barton) W.R. Taylor
60 *Turbinaria ornata f. hainanensis* W.R. Taylor
61 *Turbinaria tanzaniensis* Jaasund

CHLOROPHYTA (green algae)

1 *Acetabularia calyculus* J.V. Lamouroux
2 *Acetabularia clavata* Yamada
3 *Acetabularia exigua* Solms-Laubach
4 *Anadyomene stellata* (Wulfen) C. Agardh
5 *Anadyomene wrightii* Harvey ex J.E. Gray
6 *Avrainvillea amadelpha* (Montagne) A. Gepp and E.S. Gepp
7 *Avrainvillea amadelpha* f. submersa A. Gepp and E. Gepp
8 *Avrainvillea erecta* (Berkeley) A. Gepp and E.S. Gepp
9 *Avrainvillea lacerata* Harvey ex J. Agardh
10 *Avrainvillea nigricans* Decaisne
11 *Avrainvillea obscura* (C. Agardh) J. Agardh
12 *Avrainvillea ridleyi* A. Gepp and E.S. Gepp
13 *Boergesenia forbesii* (Harvey) Feldmann
14 *Boodlea composita* (Harvey) F. Brand
15 *Boodlea montagnei* (Harvey ex J.E. Gray) Egerod
16 *Boodleopsis pusilla* (F.S. Collins) W.R. Taylor, A.B. Joly and Bernatowicz
17 *Bryopsis hypnoides* J.V. Lamouroux
18 *Bryopsis indica* A. Gepp and E.S. Gepp
19 *Bryopsis pennata* J.V. Lamouroux
20 *Bryopsis pennata* var. *leprieurii* (Kützing) Collins and Hervey
21 *Bryopsis plumosa* (Hudson) C. Agardh
22 *Caulerpa brachypus* f. *parvifolia* A.B. Cribb
23 *Caulerpa cupressoides* (Vahl) C. Agardh
24 *Caulerpa cupressoides* f. *amicorum* (Harvey) Weber-van Bosse
25 *Caulerpa elongata* Weber-van Bosse
26 *Caulerpa fastigiata* Montagne
27 *Caulerpa lentillifera* J. Agardh
28 *Caulerpa macrophysa* (Sonder ex Kützing) G. Murray
29 *Caulerpa mexicana* Sonder ex Kützing
30 *Caulerpa peltata* J.V. Lamouroux
31 *Caulerpa racemosa* (Forsskål) J. Agardh
32 *Caulerpa racemosa* var. *gracilis* (Zanardini) Weber-van Bosse
33 *Caulerpa racemosa* var. *lamourouxii* (Turner) Weber-van Bosse
34 *Caulerpa racemosa var. occidentalis* (J. Agardh) Børgesen
35 *Caulerpa racemosa var. turbinata* (J. Agardh) Eubank
36 *Caulerpa scalpelliformis* (R. Brown ex Turner) C. Agardh
37 *Caulerpa scalpelliformis var. denticulata* (Decaisne) Weber-van Bosse
38 *Caulerpa serrulata* (Forsskål) J. Agardh
39 *Caulerpa sertularioides* (S.G. Gmelin) M. Howe
40 *Caulerpa taxifolia* (M. Vahl) C. Agardh
41 *Caulerpa verticillata* J. Agardh
42 *Caulerpa webbiana f. tomentella* (Harvey ex J. Agardh) Weber-van Bosse
43 *Chaetomorpha aerea* (Dillwyn) Kützing
44 *Chaetomorpha antennina* (Bory de Saint-Vincent) Kützing
45 *Chaetomorpha brachygona* Harvey
46 *Chaetomorpha crassa* (C. Agardh) Kützing
47 *Chaetomorpha gracilis* Kützing
48 *Chaetomorpha linum* (O.F. Müller) Kützing
49 *Chaetomorpha minima* F.S. Collins and Hervey
50 *Chaetomorpha spiralis* Okamura
51 *Chamaedoris auriculata* Børgesen
52 *Chamaedoris delphinii* (Hariot) Feldmann and Børgesen
53 *Chlorodesmis caespitosa* J. Agardh
54 *Chlorodesmis fastigiata* (C. Agardh) Ducker
55 *Chlorodesmis hildebrandtii* A. Gepp and E.S. Gepp
56 *Chlorodesmis major* Zanardini
57 *Cladophora patentiramea* (Montagne) Kützing
58 *Cladophora prolifera* (Roth) Kützing
59 *Cladophora saviniana* Børgesen
60 *Cladophora socialis* Kützing
61 *Cladophora vagabunda* (Linnaeus) Hoek
62 *Cladophoropsis javanica* (Kützing) P.C. Silva
63 *Cladophoropsis membranacea* (Hofman Bang ex C. Agardh) Børgesen
64 *Cladophoropsis sundanensis* Reinbold
65 *Codium arabicum* Kützing
66 *Codium capitatum* P.C. Silva
67 *Codium decorticatum* (Woodward) M. Howe
68 *Codium duthieae* P.C. Silva
69 *Codium dwarkense* Børgesen
70 *Codium extricatum* P.C. Silva
71 *Codium geppiorum* O.C. Schmidt
72 *Codium lucasii* subsp. *capense* P.C. Silva
73 *Codium pocockiae* P.C. Silva
74 *Codium prostratum* Levring
75 *Codium tomentosum* Stackhouse
76 *Dictyosphaeria cavernosa* (Forsskål) Børgesen
77 *Dictyosphaeria intermedia* Weber-van Bosse
78 *Dictyosphaeria versluysii* Weber-van Bosse

79 *Ernodesmis verticillata* (Kützing) Børgesen
80 *Gayralia oxysperma* (Kützing) K.L. Vinogradova ex Scagel et al.
81 *Halimeda cuneata* K. Hering
82 *Halimeda discoidea* Decaisne
83 *Halimeda distorta* (Yamada) Hillis-Colinvaux
84 *Halimeda gracilis* Harvey ex J. Agardh
85 *Halimeda incrassata* (J. Ellis) J.V. Lamouroux
86 *Halimeda macroloba* Decaisne
87 *Halimeda macrophysa* Askenasy
88 *Halimeda melanesica* Valet
89 *Halimeda micronesica* Yamada
90 *Halimeda opuntia* (Linnaeus) J.V. Lamouroux
91 *Halimeda renschii* Hauck
92 *Halimeda stuposa* W.R. Taylor
93 *Halimeda tuna* (J. Ellis and Solander) J.V. Lamouroux
94 *Halimeda velasquezii* W.R. Taylor
95 *Neomeris annulata* Dickie
96 *Neomeris dumetosa* J.V. Lamouroux
97 *Neomeris van-bosseae* M. Howe
98 *Nereodictyon imitans* Gerloff
99 *Parvocaulis parvula* (Solms-Laubach) S. Berger, U. Fettweiss, S. Gleissberg, L. B. Liddle, U. Richter, H. Sawitsky, H. and G.C. Zuccarello
100 *Rhipidosiphon javensis* Montagne
101 *Rhizoclonium africanum* Kützing
102 *Rhizoclonium ambiguum* (J.D. Hooker and Harvey) Kützing
103 *Spongocladia vaucheriaeformis* Areschoug
104 *Phyllodictyon anastomosans* (Harvey) Kraft and M.J. Wynne
105 *Phyllodictyon pulcherrimum* J.E. Gray
106 *Udotea flabellum* (J. Ellis and Solander) M. Howe
107 *Udotea indica* A. Gepp and E.S. Gepp
108 *Udotea orientalis* A. Gepp and E.S. Gepp
109 *Ulva bulbosa* (Suhr) Hariot
110 *Ulva clathrata* (Roth) C. Agardh
111 *Ulva compressa* L.
112 *Ulva fasciata* Delile
113 *Ulva kylinii i* (Bliding) Hayden, Blomster, Maggs, P.C. Silva, M.J. Stanhope and J.R. Waaland
114 *Ulva lactuca* Linnaeus
115 *Ulva lingulata* A.P. De Candolle
116 *Ulva muscoides* Clemente y Rubio
117 *Ulva pertusa* Kjellman
118 *Ulva reticulata* Forsskål
119 *Ulva rigida* C. Agardh
120 *Valonia aegagropila* C. Agardh
121 *Valonia macrophysa* Kützing
122 *Valonia utricularis* (Roth) C. Agardh
123 *Valoniopsis pachynema* (G. Martens) Børgesen
124 *Ventricaria ventricosa* (J. Agardh) J.L. Olsen and J.A. West

RHODOPHYTA (red algae)

1 *Acanthophora dendroides* Harvey
2 *Acanthophora muscoides* (Linnaeus) Bory de Saint-Vincent
3 *Acanthophora nayadiformis* (Delile) Papenfuss
4 *Acanthophora spicifera* (M. Vahl) Børgesen
5 *Acrocystis nana* Zanardini
6 *Acrosorium ciliolatum* (Harvey) Kylin
7 *Actinotrichia fragilis* (Forsskål) Børgesen
8 *Amansia rhodantha* (Harvey) J. Agardh
9 *Amphiroa anceps* (Lamarck) Decaisne
10 *Amphiroa foliacea* J.V. Lamouroux
11 *Amphiroa fragilissima* (Linnaeus) J.V. Lamouroux
12 *Amphiroa rigida* J.V. Lamouroux
13 *Amphiroa tribulus* (J. Ellis and Solander) J.V. Lamouroux
14 *Amphisbetema indica* (J. Agardh) Weber-van Bosse
15 *Anotrichium tenue* (C. Agardh) Nägeli
16 *Asparagopsis taxiformis* (Delile) Trevisan de Saint-Léon
17 *Balliella crouanioides* (Itono) Itono and Tanaka
18 *Bartoniella crenata* (J. Agardh ex Mazza) Kylin
19 *Beckerella hildebrandtii* (Hauck) Kylin
20 *Beckerella rumpii* (Dickinson) Papenfuss and Fan
21 *Bostrychia radicans* (Montagne) Montagne
22 *Bostrychia tenella* (J.V. Lamouroux) J. Agardh
23 *Botryocladia botryoides* (Wulfen) Feldmann
24 *Botryocladia chiajeana* (Meneghini) Kylin
25 *Botryocladia leptopoda* (J. Agardh) Kylin
26 *Botryocladia skottsbergii* (Børgesen) Levring
27 *Callophycus serratus* (Harvey ex Kützing) P.C. Silva
28 *Caloglossa leprieurii* (Montagne) G. Martens
29 *Carpopeltis maillardii* (Montagne and Millardet) Chiang
30 *Catenella caespitosa* (Withering) L.M. Irvine
31 *Caulacanthus ustulatus* (Mertens ex Turner) Kützing
32 *Centroceras clavulatum* (C. Agardh) Montagne
33 *Ceramium brevizonatum* H.E. Petersen
34 *Ceramium camouii* E.Y. Dawson
35 *Ceramium deslongchampsii* Chauvin ex Duby
36 *Ceramium flaccidum* (Kützing) Ardissone
37 *Ceramium macilentum* J. Agardh
38 *Ceramium truncatum* H. Petersen
39 *Ceratodictyon spongiosum* Zanardini
40 *Chamaebotrys boergesenii* (Weber-van Bosse) Huisman
41 *Champia compressa* Harvey
42 *Champia globulifera* Børgesen
43 *Champia irregularis* (Zanardini) Piccone
44 *Champia parvula* (C. Agardh) Harvey
45 *Champia vieillardii* Kützing
46 *Cheilosporum acutilobum* (Decaisne) Piccone
47 *Cheilosporum sagittatum* (J.V. Lamouroux) Areschoug
48 *Chondria armata* (Kützing) Okamura
49 *Chondria collinsiana* M. Howe
50 *Chondria dangeardii* E.Y. Dawson
51 *Chondria dasyphylla* (Woodward) C. Agardh
52 *Chondria repens* Børgesen
53 *Chondrophycus ceylanicus* (J. Agardh) M.J. Wynne, Serio, Cormaci and G. Furnari
54 *Chondrophycus intermedius* (Yamada) Garbary and Harper
55 *Chondrophycus papillosus* (C. Agardh) Garbary and Harper
56 *Chondrophycus parvipapillatus* (C.K. Tseng) Garbary and Harper

57 *Chondrophycus perforatus* (Bory de Saint-Vincent) K.W. Nam
58 *Chondrophycus poiteaui* (J.V. Lamouroux) K.W. Nam
59 *Choreonema thuretii* (Bornet) F. Schmitz
60 *Coelarthrum boergesenii* Weber-van Bosse
61 *Coelarthrum opuntia* (Endlicher) Børgesen
62 *Corynomorpha prismatica* (J. Agardh) J. Agardh
63 *Crouania attenuata* (C. Agardh) J. Agardh
64 *Cryptonemia undulata* Sonder
65 *Dasya elongata* Sonder
66 *Dasya scoparia* Harvey
67 *Dichotomaria marginata* (Ellis and Solander) Lamarck
68 *Dichotomaria obtusata* (J. Ellis and Solander) Lamarck
69 *Dictyurus purpurascens* Bory de Saint-Vincent
70 *Digenea simplex* (Wulfen) C. Agardh
71 *Duckerella ferlusii* (Hariot) M.J. Wynne
72 *Enantiocladia prolifera* Falkenberg
73 *Endosiphonia horrida* (C. Agardh) P.C. Silva
74 *Eucheuma arnoldii* Weber-van Bosse
75 *Eucheuma chondriforme* J. Agardh
76 *Eucheuma denticulatum* (N.L. Burman) F.S. Collins and Hervey
77 *Eucheuma horridum* J. Agardh
78 *Eucheuma odontophorum* Børgesen
79 *Eucheuma platycladum* F. Schmitz
80 *Eucheuma serra* (J. Agardh) J. Agardh
81 *Euptilota fergusonii* A.D. Cotton
82 *Galaxaura filamentosa* R. Chou
83 *Galaxaura rugosa* (J. Ellis and Solander) J.V. Lamouroux
84 *Gelidiella acerosa* (Forsskål) Feldmann and G. Hamel
85 *Gelidiella myrioclada* (Børgesen) Feldmann and G. Hamel
86 *Gelidiella pannosa* Feldmann and G. Hamel
87 *Gelidiopsis intricata* (C. Agardh) Vickers
88 *Gelidiopsis repens* (Kützing) Weber-van Bosse
89 *Gelidiopsis scoparia* (Montagne and Millardet) De Toni
90 *Gelidiopsis variabilis* (J. Agardh) Schmitz
91 *Gelidium arenarium* Kylin
92 *Gelidium crinale* (Hare ex Turner) Gaillon
93 *Gelidium pusillum* (Stackhouse) Le Jolis
94 *Gracilaria arcuata* Zanardini
95 *Gracilaria arcuata var. snackeyi* Weber-van Bosse
96 *Gracilaria bursa-pastoris* (S.G. Gmelin) P.C. Silva
97 *Gracilaria canaliculata* Sonder
98 *Gracilaria cervicornis* (Turner) J. Agardh
99 *Gracilaria corticata* (J. Agardh) J. Agardh
100 *Gracilaria corticata var. ramalinoides* J. Agardh
101 *Gracilaria debilis* (Forsskål) Børgesen
102 *Gracilaria dura* (C. Agardh) J. Agardh
103 *Gracilaria edulis* (S.G. Gmelin) P.C. Silva
104 *Gracilaria foliifera* (Forsskål) Børgesen
105 *Gracilaria hauckii* P.C. Silva
106 *Gracilaria millardetii* (Montagne) J. Agardh
107 *Gracilaria salicornia* (C. Agardh) E.Y. Dawson
108 *Gracilaria spinulosa* (Okamura) Chang and B.M.Xia
109 *Gracilaria srilankia* (Chang and B. Xia) Withell, A.J.K. Millar and Kraft
110 *Gracilaria vieillardii* P.C. Silva
111 *Griffithsia ovalis* Harvey
112 *Griffithsia rhizophora* Grunow ex Weber-van Bosse
113 *Haliptilon mauritianum* (Børgesen) Garbary and Johansen
114 *Haliptilon roseum* (Lamarck) Garbary and Johansen
115 *Haliptilon subulatum* (J. Ellis and Solander) Johansen
116 *Haloplegma duperreyi* Montagne
117 *Halymenia durvillei* Bory
118 *Halymenia porphyraeformis* Parkinson
119 *Halymenia venusta* Børgesen
120 *Herposiphonia parca* Setchell
121 *Herposiphonia secunda* (C. Agardh) Ambronn
122 *Herposiphonia secunda f. tenella* (C. Agardh) M.J. Wynne
123 *Hydrolithon farinosum* (J.V. Lamouroux) D. Penrose and Y.M. Chamberlain
124 *Hydrolithon onkodes* (Heydrich) Penrose and Woelkerling
125 *Hydrolithon reinboldii* (Weber-van Bosse and Foslie) Foslie
126 *Hypnea boergesenii* T.Tanaka
127 *Hypnea cornuta* (Kützing) J. Agardh
128 *Hypnea hamulosa* (Esper) J.V. Lamouroux
129 *Hypnea musciformis* (Wulfen) J.V. Lamouroux
130 *Hypnea nidifica* J. Agardh
131 *Hypnea nidulans* Setchell
132 *Hypnea pannosa* J. Agardh
133 *Hypnea rosea* Papenfuss
134 *Hypnea spicifera* (Suhr) Harvey
135 *Hypnea spinella* (C. Agardh) Kützing
136 *Hypnea valentiae* (Turner) Montagne
137 *Jania adhaerens* J.V. Lamouroux
138 *Jania capillacea* Harvey
139 *Jania pumila* J.V. Lamouroux
140 *Jania rubens* (Linnaeus) J.V. Lamouroux
141 *Jania ungulata f. brevior* (Yendo) Yendo
142 *Kappaphycus cottonii* (Weber-van Bosse) Doty ex P.C. Silva
143 *Kappaphycus striatum* (F. Schmitz) Doty ex P.C. Silva
144 *Laurencia distichophylla* J. Agardh
145 *Laurencia flexilis* Setchell
146 *Laurencia indica* Hauck
147 *Laurencia indica var. nidifica* Hauck
148 *Laurencia majuscula* (Harvey) A.H.S. Lucas
149 *Laurencia natalensis* Kylin
150 *Laurencia obtusa* (Hudson) J.V. Lamouroux
151 *Leveillea jungermannioides* (K. Hering and G. Martens) Harvey
152 *Liagora ceranoides* J.V. Lamouroux
153 *Liagora ceranoides f. leprosa* (J. Agardh) Yamada
154 *Liagora mauritiana* Børgesen
155 *Liagora valida* Harvey
156 *Lithophyllum acrocamptum* Heydrich
157 *Lithophyllum kotschyanum* Unger
158 *Lithophyllum pygmaeum* (Heydrich) Heydrich
159 *Lomentaria baileyana* (Harvey) Farlow
160 *Lophocladia lallemandii* (Montagne) F. Schmitz
161 *Lophosiphonia reptabunda* (Suhr) Kylin

162 *Martensia elegans* Hering
163 *Melanamansia dietrichiana* (Grunow) R.E. Norris
164 *Melanamansia glomerata* (C. Agardh) R.E. Norris
165 *Mesophyllum crispescens* (Foslie) M. Lemoine
166 *Mesophyllum erubescens* (Foslie) M. Lemoine
167 *Microcladia gloria-spei* Stegenga
168 *Microdictyon japonicum* Setchell
169 *Murrayella periclados* (C. Agardh) F. Schmitz
170 *Neogoniolithon accretum* (Foslie and M. Howe) Setchell and Mason
171 *Neogoniolithon trichotomum* (Heydrich) Setchell and Mason
172 *Neurymenia fraxinifolia* (Mertens ex Turner) J. Agardh
173 *Osmundaria melvillii* (J. Agardh) R.E. Norris
174 *Parviphycus tenuissimus* (Feldmann and Hamel) B. Santelices
175 *Peyssonnelia involvens* Zanardini
176 *Peyssonnelia rubra* (Greville) J. Agardh
177 *Phacelocarpus tristichus* J. Agardh
178 *Platysiphonia delicata* (Clemente y Rubio) Cremades
179 *Spongoclonium caribaeum* (Børgesen) M,J, Wynne
180 *Polyopes intricatus* F. Schmitz
181 *Polyopes ligulatus* (Harvey ex Kützing) De Toni
182 *Polysiphonia crassicollis* Børgesen
183 *Polysiphonia denudata* (Dillwyn) Greville ex Harvey
184 *Polysiphonia howei* Hollenberg
185 *Polysiphonia scopulorum* Harvey
186 *Polysiphonia scopulorum var. villum* (J. Agardh) Hollenberg
187 *Polysiphonia subtilissima* Montagne
188 *Portieria dichotoma* (Hauck) P.C. Silva
189 *Portieria harveyi* (J. Agardh) P.C. Silva
190 *Portieria hornemannii* (Lyngbye) P.C. Silva
191 *Pterocladia heteroplatos* (Børgesen) Umamaheswara Rao and Kaliaperumal
192 *Pterocladiella caespitosa* (Kylin) Santelices
193 *Pterocladiella capillacea* (S.G. Gmelin) Santelices and Hommersand
194 *Pterocladiella nana* (Okamura) Shimada, Horiguchi and Masuda in Shimada and Masuda
195 *Ptilothamnion subsimplex* E. Gordon
196 *Sarcodia montagneana* (J. Hooker and Harvey) J. Agardh
197 *Sarconema filiforme* (Sonder) Kylin
198 *Sarconema scinaioides* Børgesen
199 *Scinaia furcellata* (Turner) J. Agardh
200 *Scinaia moniliformis* J. Agardh
201 *Sebdenia flabellata* (J. Agardh) P.G. Parkinson
202 *Solieria jaasundii* Mshigeni and Papenfuss
203 *Solieria robusta* (Greville) Kylin
204 *Sporolithon erythraeum* (Rothpletz) Kylin
205 *Spyridia cupressina* Kützing
206 *Spyridia filamentosa* (Wulfen) Harvey
207 *Spyridia hypnoides* (Bory de Saint-Vincent) Papenfuss
208 *Taenioma perpusillum* (J. Agardh) J. Agardh
209 *Tenaciphyllum lobatum* Børgesen
210 *Tenaciphyllum rotundilobum* Børgesen
211 *Titanophora weberae* Børgesen
212 *Tolypiocladia calodictyon* (Harvey ex Kützing) P.C. Silva
213 *Tolypiocladia condensata* (Weber-van Bosse) P.C. Silva
214 *Tolypiocladia glomerulata* (C. Agardh) F. Schmitz
215 *Trichogloea requienii* (Montagne) Kützing
216 *Tricleocarpa cylindrica* (J. Ellis and Solander) Huisman and Borowitzka
217 *Tricleocarpa fragilis* (Linnaeus) Huisman and Townsend
218 *Vanvoorstia spectabilis* Harvey
219 *Yamadaella caenomyce* (Decaisne) I.A. Abbott

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