New records of the Chlorophyta from South Africa, with the emphasis on the marine benthic flora of KwaZulu-Natal

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Eleven species of marine Chlorophyta that have not previously been reported for South Africa have been found on the coast of KwaZulu-Natal: Avrainvillea cf. riukiuensis Yamada; Boodleopsis pusilla (Collins) W.R. Taylor, Joly & Bernatowiz; Bornetella nitida Sonder; Caulerpa serrulata (Forsskål) J. Agardh; C. taxifolia (Vahl) C. Agardh; Chaetomorpha spiralis Okamura; Cladophoropsis sundanensis Reinbold; Halimeda gra-
cillis Harvey ex J. Agardh; Neomeris annulata Dickie; Neomeris blimbata Koster; Udotea indica A. Gepp & E. Gepp. Three of the above genera (Avrainvillea, Boodleopsis and Bornetella) are new for South Africa. Descriptions and illustrations are provided for each species. Furthermore the species are compared with other similar species in the area and their ecology and biogeography are briefly discussed.

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Introduction

The seaweed flora of South Africa has long been recognised as being rich in species when compared with other regions. Detailed data, especially for the south and east coast, are not readily available but a synthesis of available information gives a total of around 800 species, 150 of which are Chlorophyta (Bolton and Anderson 1997). The high species diversity in South Africa is a consequence of the extreme diversity of marine conditions. The different temperature regimes on the west, south and east coast (caused by the different ocean currents which sweep along the South African shores) result in more or less distinct seaweed floras (see Stephenson 1947, Bolton 1986, Bolton and Anderson 1990, Bolton and Anderson 1997).

The coast of KwaZulu-Natal stretches from Port Edward in the south to the Mozambiquan border in the north, on the east coast of South Africa. The coastline was designated as the 'subtropical East Coast', characterised by a distinct flora, by Stephenson (1947). More recently the existence of a distinct subtropical flora in KwaZulu-Natal was questioned, as the flora seems to be composed of an eastwardly decreasing number of Agulhas Province species, replaced largely by Indo-West Pacific species as the water temperature rises (Hommersand 1986, Bolton and Anderson 1997).

It should be pointed out that the knowledge of the seaweed flora of KwaZulu-Natal is scarce and that a detailed study of the flora is needed in order to make further biogeographic conclusions. In a joint research project between the University of Ghent (Belgium) and the University of Cape Town (South Africa) the biogeography of the seaweeds of KwaZulu-Natal are being studied. This study should give us a better understanding of the seaweed distribution in KwaZulu-Natal and the affinities with other seaweed floras.

Apart from a thorough treatment of the genus Codium by Silva (1959) and a number of other publications dealing with Chlorophyta (e.g. Papenfuss 1940, 1943, 1952, 1956, Papenfuss and Egerod 1957, Norris 1992), the benthic marine green algae of the east coast of South Africa, especially the coast of KwaZulu-Natal are understudied. 131 Chlorophyta taxa in 38 genera have been reported for the Indian Ocean coast of South Africa. The genera Caulerpa (23 taxa), Cladophora (20 taxa), Codium (19 taxa) and Enteromorpha (9 taxa) are responsible for more than half of the taxa. Other genera with relative high species numbers (5 or more) are Bryopsis, Chaetomorpha, Rhizoclonium and Ulva.

This paper gives a preliminary report on 11 Chlorophyta species which are reported for the first time for South Africa.

Material and Methods

Specimens examined were collected along the eastern coast of South Africa on several occasions between November 1995 and August 2000 in the framework of a bilateral scientific cooperation between the Flemish community (Belgium) and South Africa. The collecting sites were located between Cape Morgan (southern Transkei) and Kosi Bay (northern KwaZulu-Natal) (Map 1). In total over 800 Chlorophyta specimens were collected. Specimens were processed as herbarium specimens in the field and part of each specimen was preserved in 5% formalin in seawater.
Voucher specimens are deposited in GENT and BOL. Herbarium abbreviations follow Holmgren et al. (1990).

Results

**Cladophorales**
Cladophoraceae

**Chaetomorpha spiralis Okamura**, 1903a: no. 94; 1903b: 131–132


Description: Thallus dark green, erect, composed of rigid, simple filaments, spirally coiled at the base, attached by branched rhizoids. Basal cell curved, length up to 4 000 μm, diameter 300 μm at the base, up to 750 μm at the distal end. Cells above the basal cell subcylindrical, diameter 530–570 μm, gradually increasing in diameter towards the apex and becoming barrel-shaped; distal cells up to 1 100 μm.
in diameter; l/w of cells in middle and distal part of thallus 1.5–2.0.

Ecology: epiphytic on *Amphiroa bowerbankii* Harvey in intertidal rockpools.

Specimens examined: KZN 814: Palm Beach (19/08/1999); KZN 943: Port O'Call, Trafalgar (20/08/1999).

Discussion: Along the East African coast this species has only been reported from Somalia (Sartoni 1992) and Kenya (Coppejans *et al.* 2000). The species resembles *C. crassa* (C. Agardh) Kützing, which has previously been reported from South Africa (Simons 1977, Farrell *et al.* 1993), but differs in its mode of attachment (*C. crassa* is a free floating species), the elongate basal cell and smaller diameter of the filaments (Sartoni 1992).

**Cladophoropsis sundanensis** Reinbold, 1905: 147

Figures 6–8


Description: Thallus light green, forming compact cushions, up to 6cm across and 1.5cm thick, composed of strongly entangled, branched filaments. Basal branching pseudodichotomous, terminal branching unilaterally with lateral branches arising under a cross wall and not displacing the main axes. Apical cells cylindrical with rounded tips, diameter 70–140μm, l/w ratio up to 80. Diameter of intermediate branches 90–140μm, l/w ratio of cells 4–50. Diameter of basal filaments 180–250μm. Short haptoridal rhizoids present throughout the thallus.

Ecology: Epilithic in intertidal rockpools and infralittoral fringe.


Discussion: Our specimens correspond very well with the descriptions and illustrations of *C. sundanensis* by Weber-van Bosse (1913: 77–79, figure 18), Bergesen (1935: 10–11, figure 1), Egerod (1975: 46, figures 8–10) and Sartoni (1986: 365, figure 6B).

*C. sundanensis* has a pantropical distribution; in the south western Indian Ocean it has been recorded from Kenya, Tanzania, Mauritius and Réunion (Silva *et al.* 1996: 793–794).

The only *Cladophoropsis* species hitherto recorded for South Africa is *C. herpestica* (Montagne) Howe, which differs from *C. sundanensis* by its much coarser filaments (generally 240–340μm in diameter), abundant, long, descending rhizoids throughout, and lateral branches which tend to displace the main axis.

**BRYOPSIDALES**

**Caulerpaceae**

**Caulerpa serrulata** (Forsskål) J. Agardh, 1837: 174

Figure 1

*Fucus serrulatus* Forsskål, 1775: 189

Type locality: Mokha, Yemen (leg. Forsskål, C).

Description: Thallus relatively stiff, consisting of a creeping, irregularly branched stolon, giving rise to erect fronds and downward growing rhizoid-bearing branches; erect fronds simple or dichotomously branched, flat, branched in a single plane, not spirally twisted, up to 15mm high and 2mm wide, with coarsely serrate margins.

Ecology: Growing on sand and sand-covered rocks, at a depth of 12–20m.


Discussion: The coarsely serrate, flattened, erect fronds distinguish *C. serrulata* from any *Caulerpa* reported from South Africa. The species resembles certain growth forms of *C. cupressoides* (Vahl) C. Agardh characterised by a wide rachis with marginally placed dichotomous branchlets or spines, which has also been reported for South Africa (Seagriff 1980: 21). However, the rachis of the latter is always terete to slightly compressed but never flattened as in *C. serrulata* (Coppejans and Prud'homme van Reine 1992: 673). *C. serrulata* is widely distributed in the Atlantic, Pacific and Indian Oceans, and is known from all countries along the East African coast (Silva *et al.* 1996).

**Caulerpa taxifolia** (Vahl) C. Agardh, 1817: XXII

Figure 2

*Fucus taxifolius* Vahl 1802: 36.

Type locality: St. Croix, Virgin Islands (leg. H. West). M Vahl was professor in botany at the University of Copenhagen, so it would be logical that his specimens were accommodated in Copenhagen. According to Nielsen and Price (pers. comm.) the existence of any original material in C and several other herbaria could not be documented and therefore the selection of a neotype is needed.

Description: Branched stolons bearing pinnate erect fronds, 10–40mm high, 5–8mm wide; rachis 0.8–1mm in diameter, occasionally branched, naked at the base (1–3mm); branchlets on 2 opposite rows in a single plane, dorso-ventrally compressed, navicular, upwardly curved, slightly constricted at the base, with parallel sides and gradually tapering to the acuminate apex; ramuli densely set but not overlapping.

Ecology: epipsammic on coarse sand, growing at a depth of 20–43m.

Discussion: *C. taxifolia* resembles *C. mexicana* Sonder ex Kützing and the two species are not always easily distinguished. The branchlets of *C. taxifolia* have parallel sides in the middle part, whereas those of *C. mexicana* have a marked swollen part in the middle or subapical part, resulting in overlapping ramuli (Coppejans and Beeckman 1990, Coppejans and Prud’homme van Reine 1992). Small plants of *C. mexicana* have been reported from KwaZulu-Natal (The Bluff, Durban and Umhlanga Rocks) by Papenfuss (1956: 65–66) but might, in fact, belong to *C. taxifolia*. The species is widely distributed in the subtropical and tropical parts of the Atlantic, Indian and Pacific Oceans.

Halimedaceae

*Halimeda gracilis* Harvey ex J. Agardh, 1887: 82
Figures 3, 9–10
Type locality: Sri Lanka [Harvey’s Ceylon Algae (1857a) no 72, BM; sets of the exsiccate at FH, FMC, L and NY *fide* Staffeau and Cowan (1981)].
Description: Thallus flaccid and decumbent, up to 25cm long. Branching di- or trichotomous, sparse basally, more frequent higher up, 1–8 segments between two consecutive branchings. Segments flattened and ribbed, heavily calcified, brittle, cuneate or tri-lobed, the upper margin entire, undulated or tri-lobed, up to to 8mm long and 10mm broad. Colour when dry whitish to light green. Cortex composed of two layers of utricles, primary utricles hexagonal in surface view, (30–) 35–50 (~55)μm in diameter, 40–80μm long in section, up to 7 supported by each secondary utricle; secondary utricles clavate, 25–50μm broad, up to 100μm long and generally extending to the medulla.

Ecology: Epilithic, 43m deep.


Discussion: *Halimeda gracilis* is a pantropical species, occurring in the Indian Ocean, western Pacific and the western Atlantic. Along the east African coast the species has only been recorded from Kenya (Coppejans and Verellen 1991: 16) and Tanzania (Coppejans et al. 2000: 72). *H. gracilis* can be recognised by its entangling and decumbent
thallus and the whitish, brittle, cuneate or trilobed segments (Hillis-Colinvaux 1980: 144–147).

Udoteaceae

**Udotea indica** A. Gepp & E. Gepp, 1911: 121–122, plate II: figures 13, 14; plate VI: figures 52, 53

Figures 4, 11–12

Type locality: Karachi, Pakistan (leg. J.A. Murray, BM).

Description: Thallus erect, 2–5cm long, slightly calcified and thus rather stiff, composed of a stipe and a blade, attached to the substratum by a small tuft of rhizoids. Stipe simple, 5–15mm long, about 1mm thick. Blade 15–40mm long, 15–35mm broad, elliptical, ovate or rotund-lobulate, usually rounded at the base but sometimes cuneate or subcordate.

Filaments of the blade 40–50μm in diameter, radiating from the stipe to the margin, dichotomously branched, the supra-dichotomous constrictions being markedly uneven; filaments locally bearing numerous unilateral, short, unbranched, pelleted or truncate papillae, borne only on the exposed surface of the filaments. Filaments of the stipe irregularly dichotomously branched, having lateral appendages with dichotomously divided apices forming an external cortex.

Ecology: Shallow intertidal pools.


Discussion: The only **Udotea** species hitherto recorded for South Africa is **Udotea orientalis** A. Gepp & E. Gepp, which in habit is very similar to the above species. **U. orientalis** differs from **U. indica** in the blade filaments being devoid of lateral papillae (Gepp and Gepp 1911: 122).

**Avrainvillea** cf. **rikuviensis** Yamada, 1932: 267–268, figure 1, plate III

Figures 5, 13–16

Type locality: Nawa, Ryukyu-retto, Japan (leg. T. Teramachi, 12768b, SAP).

Description: Thallus solitary, olive-green, 12mm tall. Blade thin, reniform, faintly zonate, 9mm tall, 13mm wide. Stipe unbranched, cylindrical, 3mm long, 1.5mm in diameter. Blade siphons cylindrical, 5–16μm in diameter (up to 25μm at dichotomies). Morphology of the blade siphon apices rounded to slightly inflated. Medullary siphons of stipe cylindrical to slightly moniliform, 17–38μm in diameter. Cortical siphons of stipe cylindrical to slightly moniliform, 7–30μm in diameter.


Discussion: Blade siphons of most **Avrainvillea** species are thicker than 20μm. Three taxa have been described with smaller blade siphon diameters: **A. hollenbergii** Trono from the Caroline Islands with blade siphons (3–) 6–12 (–14)μm in diameter, **A. rikuviensis** from Japan with blade siphons (9–) 19μm in diameter, and **A. levis** Howe f. **translucentis** D. Littler & M. Littler from the Caribbean with thin blade siphons (5–10μm) intermixed with thick (20–30μm) siphons (Olsen-Stojkov 1985: 44, Littler and Littler 1992: 394).

Only one small (juvenile?) specimen was found in our collections. The siphon morphology and dimensions correspond fairly well with the descriptions and illustrations of **A. rikuviensis** (Olsen-Stojkov 1985: 44, figure 23, plate 9a) and the original description of **A. gracillis** Borgesen from Mauritius (Borgesen 1940: 52, figure 15, plate II, figure 2), a species that has been reduced to synonymy of **A. rikuviensis** by Olsen-Stojkov (l.c.). Our plant differs however from **A. rikuviensis** in its overall smaller habitus.

This is the first record of the genus **Avrainvillea** in South Africa.

**Boodleopsis pusilla** (Collins) W.R. Taylor, Joly & Bernatowicz 1953: 105–106

Figures 17–21

**Dichotomosiphon pusillus** Collins, 1909: 431–432

Syntype localities: Jamaica and Bermuda (leg. Collins, NY).

Description: Thallus uncalcified, forming caespitose tufts, consisting of a main axis forming slender ramified rhizoidal filaments and upright intertwined siphonous branches. Main axis 80–210μm in diameter; rhizoidal filaments dichotomously branched, 8–30μm in diameter. Erect filaments 60–120μm in diameter near the base, 40–55μm in the middle and apical parts; branching dense, mainly di- or trichotomous, occasionally verticillate; filaments constricted just above the supporting filament.

Only one, immature gametangium observed.

Ecology: Intertidal, sometimes entangled with the stolons of **Caulerpa racemosa** (Forsskål) J. Agardh.


Discussion: **Boodleopsis pusilla** is a pantropical species. Along the east African coast it has been reported from Kenya (Coppejans et al. 1992: 63), Tanzania (Lawson 1980: 3) and Mozambique (Issac and Chamberlain 1958: 124–127, figure 2, 3). This is the first record of the genus in South Africa.

**Dasyycladales**

Dasyycladaceae

**Borneicelit nitida** Sonder, 1880: 39

Type locality: Tonga [Harvey's Friendly Island Algae (1857b) n° 83, MEL; sets of the exsiccate at FH, G, L and NY fide Staffel and Cowan (1981)].

Description: Thallus clavate, sometimes curved, 2–2.5cm high, 6–7mm in diameter, dark green, consisting of a central...
axis bearing whorls of lateral branches along its entire length. First order branches distally producing second order branches with inflated apices cohering laterally to form a monostromatic cortex. Cortex cells (measured in surface view between parallel sides of the lateral walls of the hexagons) 190–210 μm; lateral walls of the cortex cells calcified. Gametangia spherical, borne laterally on the first order branches, 1–2 per branch, 200–210 μm in diameter, each producing a large number (>20) of cysts.

Ecology: Subtidal (-20 m), epilithic.


Discussion: Bornetella nitida is widely distributed in the tropical south-eastern Pacific and Indian Oceans; in the southwestern Indian Ocean it has been recorded from Mauritius (Bergesen 1946), Réunion (Payri 1985) and the Comore Islands. This is the first record of the genus for South Africa. Bornetella comprises 4 species, two of which (B. nitida and B. oligospora Solms-Laubach) are characterised by clavate thalli, the others [B. capitata (Harvey ex E. Wright) J. Agardh and B. sphaerica (Zanardini) Solms-Laubach] by spherical thalli. B. oligospora differs from B. nitida by the large number of gametangia (>4) on the primary axes and the low number of cysts (<8) produced per gametangium (Valet 1969: 586). See Silva et al. (1996: 887) for nomenclature of this species.

Neomeris Lamouroux 1816: 241
Neomeris is a pantropical genus of 7 species, two of which (N. dumetosa Lamouroux and N. van-bosseae Howe) have been previously reported for South Africa; N. annulata and N. bilimbata are reported here for the first time for South Africa. N. van-bosseae is the most common Neomeris species in KwaZulu-Natal; N. annulata and N. bilimbata were each only found on one occasion. The occurrence of N. dumetosa (Critchley et al. 1994) remains uncertain since no description nor illustration was given. Table 1 gives the main characters to distinguish the four South African species.

Neomeris annulata Dickie, 1874: 198
Figure 22
Type locality: Mauritius (leg. Colonel Pike, BM).

Description: Thallus 10–14 mm long and 2–2.5 mm in diameter. Primary branches 250–320 μm long, 14–20 μm in diameter at the base and 50–65 μm at the apex. Secondary branches with a flattened apex, strongly calcified except for the cortex surface, each branch bearing an unbranched hair at the apex (leaving a scar when shed). Gametangia strongly calcified and cohering in discontinuous transverse rows within a calcareous sheath, elongate elliptical to obovate, 150–190 μm long, 65–90 μm in diameter.

Ecology: Epilithic, subtidal (-10 m), mixed with Neomeris bilimbata.

Specimen examined: KZN 258b: 2-Mile Reef, Sodwana Bay (08/08/1999).

Discussion: Neomeris annulata is widely distributed in the tropical Atlantic, Indian and Pacific Oceans. In the southwestern Indian Ocean it has been recorded for the Comore Islands, Mauritius (type locality), Réunion, Tanzania and Kenya (Silva et al. 1996: 889, Coppejans et al. 2000: 77). N. annulata is unmistakable on account of the discontinuous transverse rows of calcification at the base of the thallus, visible with the naked eye.

Neomeris bilimbata Koster 1937: 221–223, plate XV: figures 1, 4, 5.

Figure 23
Type locality: Itu Aba, Tizard Bank, South China Sea (Expedition of the Oceanographic Institution of Nhatrang (Annam, Vietnam) to the Tizard Bank, Station 871, n° 4, L 930254130).

Description: Thallus 8–10 mm long, 1.5–2 mm in diameter. Primary branches 300–370 μm long, 30–35 μm in diameter at the base and 40–50 μm at the apex; basal branches clavate, 400–500 μm long, 60–100 μm in diameter. Secondary branches strongly calcified, each branch bearing an unbranched hair at the apex (leaving a scar when shed). Gametangia strongly calcified but free from each other, ellipsoid, 100–115 μm long, 75–80 μm in diameter. Cellulosic plug as a cylinder in the pedicel of the gametangium.

Ecology: Epilithic, subtidal (-10 m), sometimes mixed with Neomeris annulata.

Specimens examined: KZN 258a: 2-Mile Reef, Sodwana Bay (08/08/1999); KZN 2092: 2-Mile Reef, Sodwana Bay (10/02/2001).

Discussion: Neomeris bilimbata is known from the W-and

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<th>primary segments coherent by calcification</th>
<th>gametangia laterally coherent by calcification</th>
<th>shape of gametangia</th>
<th>cellulosic plug morphology</th>
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<td>N. annulata</td>
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<td>N. vanbosseae</td>
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<td>N. dumetosa</td>
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SW-Pacific; in the Indian Ocean the species has, up to now, only been reported from Singapore and the Seychelles. *N. bilimbata* resembles *N. van-bosseae* Howe and *N. mucosa* Howe, but differs in the morphology of the cellulose plug and apical shape of the primary branches (Koster 1937: 221–223, Valet 1969: table on pg 599).

**General discussion**

Many of the newly reported species consist of relatively wide-spread tropical species: *Boodleopsis pusilla*, *Caulerpa taxifolia*, *Cladophoropsis sundanensis*, *Halimeda gracilis*, and *Neomeris annullata*. Most other species are widely distributed in the tropical and subtropical Indo-Pacific: *Caulerpa serrulata*, *Chaetomorpha spiralis*, *Udotea indica*, *Bornetella nitida* and *Neomeris bilimbata*. The presence of *Boodeopsis pusilla* and *Caulerpa serrulata* along the northern part of the KwaZulu-Natal coast is not suprising as these species have been reported from the Inhaca Peninsula near the southern border of Mozambique (Isaac and Chamberlain 1958, Pocock 1958), therefore only indicating a minor range extension. Most of the other species mentioned above have been previously recorded in the south-western Indian Ocean, yet one species, *Chaetomorpha spiralis*, constitutes a substantial range extension. *C. spiralis* is a Japanese species with a disjunct distribution in the Pacific Ocean (Philippines, Papua New Guinea, Australia and California), and the northern and eastern parts of the Indian Ocean [often as *Chaetomorpha torta* (Farlow ex Collins) Yendo; see Silva et al. (1996)]. In the western Indian Ocean *C. spiralis* has only been reported from Somalia (Sartoni 1992: 299) and Kenya (Coppejans et al. 2000: 62). *Avrainvillea riukiuensis* seems to have a very disjunct distribution. The species has been described from Japan and has also been recorded from Mauritius and Bahrain (as *Avrainvillea gracilima*).

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**References**

Agardh CA (1817) Synopsis algarum Scandinaviae ... Lundae (Lund), 135 pp

Agardh JG (1837) Novae species algarum, quas in itinere ad oras maris rubri collegit Eduardus Rüppell; cum observationibus non-nulis in species rariores antea cognitiae. Museum Senckenbergianum 2: 169–174

Agardh JG (1887) Till algernes systematik. Nya bidrag. (Femte afdelingen.) Lunds Universitets års-Skrift, Afdelingen för Mathematik och Naturvetenskap 23: 174 pp


Bergesen F (1935) A list of marine algae from Bombay, Kongelige Danske Videnskabernes Selskab, Biologiske Meddelelser 12: 64 pp


Collins FS (1909) The green algae of North America. Tufts College Studies (Science) 2: 79–480

Coppejans E, Beeckman T (1990) *Caulerpa* (Chlorophyta, Caulerpaceae) from the Kenyan coast. Nova Hedwigia 50: 111–125


Forsskål P (1775) Flora aegyptiaco-arabica ... Post mortem auctoris edidit Carsten Niebuhr. Haviae (Copenhagen), 219 pp


Harvey WH (1857a) Ceylon algae. Nos 1–106 (Exsiccatia with printed names)

Harvey WH (1857b) Friendly Island algae. Nos 1–124 (Exsiccatia with printed names)


Koster JTh (1937) Algues marines des îlots Itu-Abâ, Sand Caye et Nam-Yit, situés à l’ouest de l’île Palawan (Philippines). Biouma,
suppl. 1: 219–228
Lamouroux JV (1816) Histoire des polyplaires coralligènes flexibles
vulgairement nommés Zoophytes. Caen; 559 pp.
Lawson GW (1980) A check-list of East African seaweeds (Djibouti
to Tanzania). Department of Biological Sciences, University of
Lagos, Nigeria; 65 pp.
Littler DS, Littler MM (1992) Systematics of Avrainvillea
(Bryopsidales, Chlorophyta) in the tropical western Atlantic.
Phycologia 31: 375–418
Norris RE (1992) Six marine macroalgae genera new to South
Okamura K (1903a) Algae japonicae exsiccateae. Tokyo, Fasc.
II, Nos 51–100
Okamura K (1903b) Contents of the “Algae Japonicae Exsiccateae”
Fasciculus II. Botanical Magazine (Tokyo) 17: 129–132
Olsen-Stojkovich J (1985) A systematic study of the genus
Avrainvillea Decaisne (Chlorophyta, Udoteaceae). Nova
Hedwigia 41: 1–68
Papenfuss GF (1940) Notes on South African marine algae. I.
Botaniska Notiser 1940: 200–226
Papenfuss GF (1943) Notes on South African marine algae. II.
Journal of South African Botany 9: 79–92
Papenfuss GF (1952b) Notes on South African marine algae. III.
Journal of South African Botany 17: 167–188
Papenfuss GF (1956) Notes on South African marine algae. IV.
Papenfuss GF, Egerod LE (1957) Notes on South African marine
Chlorophyceae. Phytomorphology 7: 82–93
Payri CE (1985) Contribution to the knowledge of the marine benth-
ic flora of La Réunion Island (Mascareignes Archipelago, Indian
Ocean). Proceedings of the Fifth International Coral Reef
Congress, Tahiti, 27 May–1 June 1985: 638–640
Pocock MA (1953) Preliminary list of marine algae collected at
Inhaca and on the neighbouring mainland. In: Macnae W, Kalk M
(ed) A natural history of Inhaca Island, Mozambique.
Witwatersrand University Press, Johannesburg; pp 23–27
Reinbold T (1905) Einige neue Chlorophyceen aus dem Ind. Ocean
(Nederl. Indien), gesammelt von A. Weber-van Bosse. Nova
Notariis 16: 145–149
Sartoni G (1986) Algal flora and his vertical distribution on the
Somalia. 3. The Siphonocladales–Cladophorales complex.
Webbia 48: 291–326
Seagriff SC (1980) Seaweeds of Maputaland. In: Bruton MN,
Cooper KH (eds) Studies on the ecology of Maputaland. Rhodes
University and the Natal Branch of the Wildlife Society of
Southern Africa, Durban, pp 18–41
Silva PC (1959) The genus Codium (Chlorophyta) in South Africa.
ISBN 0–520–09810–2
Simons RH (1977) Seaweeds of southern Africa: guide-lines for
their study and identification. Republic of South Africa,
Department of Industries, Sea Fisheries Branch, Fisheries
Bulletin 7: 113 pp
Sonder OG (1880) Supplementum ad volumen undecimum
Fragmentorum phytographiae Australiae, indices plantarum
acolyledonarum complectens. I. — Algae australianaec hactenus
cognitae. In: Von Mueller F (ed.) Fragmenta phytographiae
Australiae ..., Vol. 11 Suppl., Melbourne, pp 1–42
Stafleu FA, Cowan RS (1981) Taxonomic literature ..., Volume III:
Lh–O. Scheitler & Holkema, Utrecht/Bohn, 980 pp. ISBN
90–313–0444–1
Stephenson TA (1947) The constitution of the intertidal fauna and
flora of South Africa. Part III. Annals of the Natal Museum 11:
207–324
Taylor WR, Joly AB, Bernatowicz AJ (1953) The relation of
Dichotomosiphon pulvisius to the algal genus Boodleopsis. Papers
of the Michigan Academy of Science, Arts and Letters 38: 97–107
Vahl M (1802) Endeel kryptogamiske Planter fra St.-Croix. Skrifter af
Naturlig-historie-Selskabet (Copenhagen) 5: 29–47
et reproduction. 3. Révision systématique. Nova Hedwigia 17:
551–644
Weber-van Bosse A (1913) Liste des algues du Siboga. I.
Myxophyceae, Chlorophyceae, Phaeophyceae avec le concours
de M. Th. Reinbold. Siboga-Expedition Monographie 58a: 186 pp
Hokkaido Imp. University of California Publications in Botany 2:
267–276

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