

## THE GENUS *DICTYOTA* (DICTYOTACEAE, PHAEOPHYTA) FROM INDONESIA IN THE HERBARIUM WEBER-VAN BOSSE, INCLUDING THE DESCRIPTION OF *DICTYOTA CANALICULATA* SPEC. NOV.

O. DE CLERCK & E. COPPEJANS

Universiteit Gent, Laboratorium Plantkunde, K.L. Ledeganckstraat 35, 9000 Gent, Belgium

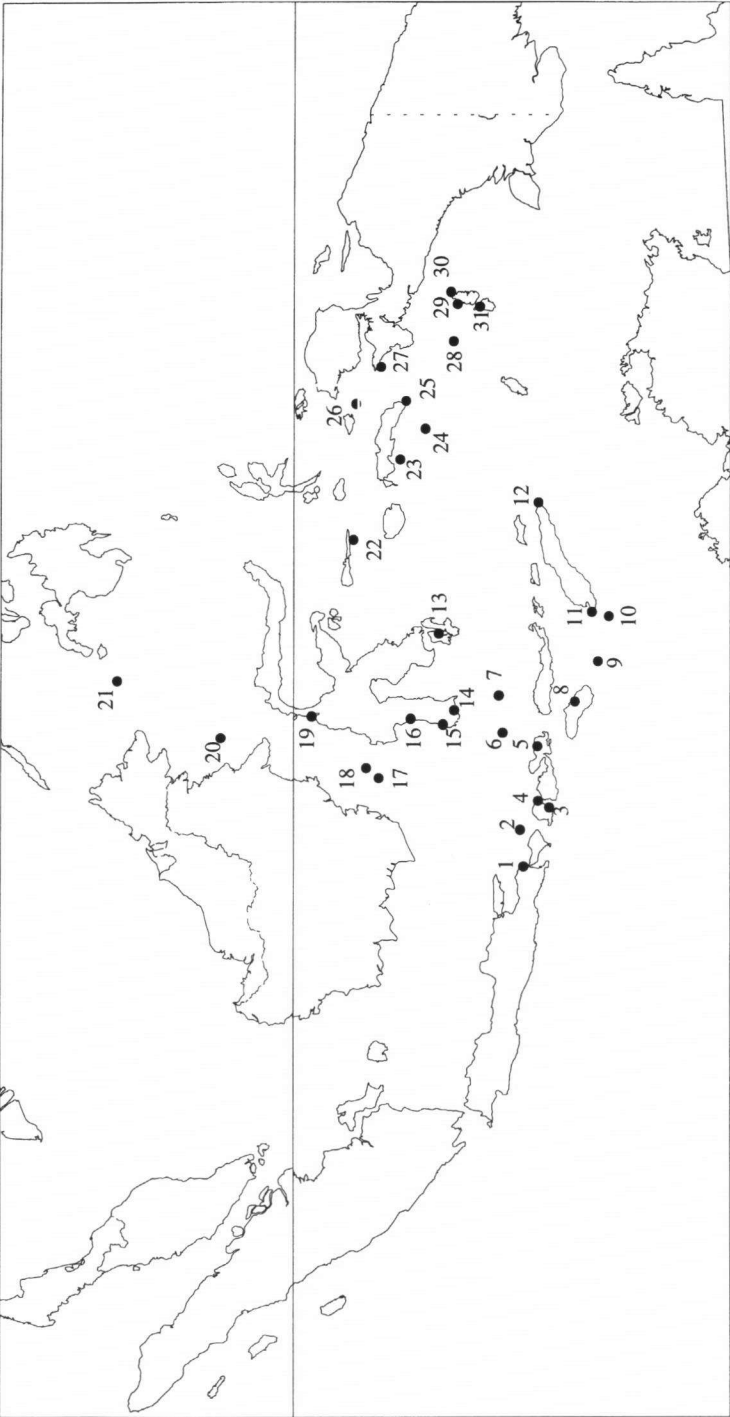
### SUMMARY

In the framework of a revision of the genus *Dictyota* J.V. Lamour. in the Indian Ocean, all specimens from Indonesia present in the herbarium Weber-van Bosse (L) were re-examined. This resulted in a total of 9 species, one species including two different growth forms. Our identifications differ substantially from those of Weber-van Bosse (1913). Specimens recorded as *D. apiculata* J. Agardh were re-identified as *D. crispata* J.V. Lamour., which is the correct name for *D. bartayresiana* sensu Vickers; similarly was *D. bartayresiana* var.  $\beta$  re-identified as *D. cervicornis* Kütz., *D. fasciola* (Roth) J.V. Lamour. as *D. ceylanica* Kütz. and *D. ceylanica* Kütz. var. *rotundata* Weber Bosse as *D. friabilis* Setch. *Dictyota pardalis* Kütz. considered as a distinct species by Weber-van Bosse (1913: 184), is treated as a synonym of *D. cervicornis*. In addition a new combination is made for a growth form of the latter, characterized by recurved branchlets: *D. cervicornis* f. *pseudohamata* (Cribb) De Clerck & Coppejans. *Dictyota beccariana* Zanardini is considered to be a synonym of *D. ciliolata* Sond. ex Kütz. A single specimen, previously assigned to *D. beccariana*, belongs to *D. dumosa* Børgesen. This is the first report of *D. dumosa* for the Malayan region. A new species, *D. canaliculata* De Clerck & Coppejans is described from preserved material, not reported in Weber-van Bosse (1913).

### INTRODUCTION

The algal collections from Indonesia deposited in the Rijksherbarium Leiden (L) are well known among phycologists worldwide and are largely the life's work of a single woman, Dr. Anna Weber-van Bosse. After being in Indonesia once (1888–1889) she assisted her husband, Max Weber, during the Siboga Expedition, which cruised the Malay Archipelago for nearly two years (Weber, 1902: map). For decades the results of this expedition formed a standard work for further phycological studies in the Indonesian region and many families or genera were subject to detailed systematic studies: *Halimeda* (Barton, 1901), Corallinaceae (Weber-van Bosse & Foslie, 1904), *Codium* (A. Gepp & E.S. Gepp, 1911), *Turbinaria* (E.S. Barton, 1891). Other genera were identified by several phycologists (e.g., Dasycladaceae by Solms-Laubach, Ectocarpaceae by Kuckuck and *Sargassum* by Reinbold). The results were summarized in four major publications (Weber-van Bosse, 1913, 1921, 1923, 1928).

In the framework of a revision of the genus *Dictyota* J.V. Lamour. in the Indian Ocean the specimens in L of this genus collected by Weber-van Bosse during the first trip to Indonesia (1888–1889) and during the Siboga Expedition (1899–1900), including alcohol-preserved specimens, were re-examined. Indonesian material sent to Weber-van Bosse during the same period and also present in L, including 7 speci-



Map 1. Distribution of *Dicyrota* species collected during the Siboga Expedition. 1: Batjoelmati, Java. 2: Kep. Seribu. 3: Pidjot Bay, Lombok. 4: Labuan Pandan, Lombok. 5: Teluk Bima, Sumbawa. 6: Sarassa, Kep. Sabalana. 7: Kambaragi Bay, Tanahjampea. 8: Waingapu Bay, Sumba. 9: Sawu. 10: Boeka Bay, Roti. 11: Hansisi, Semau. 12: Timor (NE point). 13: Selat Buton. 14: Bantaeng, Sulawesi. 15: Ujungpandang, Sulawesi. 16: Parepare, Sulawesi. 17: Lumu-Lumu, Makassar Strait. 18: Kabala Dua, Sulawesi. 19: Donggala, Sulawesi. 20: Moearas Reef. 21: Jolo, Sulu Archipelago. 22: Sanana Bay, Sula Besi. 23: Ambon. 24: Kep. Banda. 25: Geser, Ceram. 26: Darum, Misool. 27: Aijatuning, Irian Jaya. 28: Kep. Kai. 29: Ujir, Kep. Aru. 30: Jedan Islands, Kep. Kai. 31: Dobo, Kep. Kai.

mens by Arnoldi from the Kepulauan Aru, Kepulauan Banda and Kepulauan Kai, the material of *D. adnata* by Mortensen and Jensen from the Kepulauan Kai and a single specimen by Van Weel from the Kepulauan Seribu, was examined as well.

The results are presented according to our identifications. No descriptions are provided, except for the new species, but references to relevant descriptions and illustrations are given. For each species a list of specimens is added, including collector, collecting date and origin. The initial identifications by Weber-van Bosse are discussed. Geographical names have been adapted according to current standards. Because of the numerous name changes of geographical names since the Siboga Expedition a geographical map is provided, showing all collecting sites referred to in the text (Map 1). Standard forms of author names follow Brummitt & Powell (1992).

## RESULTS

### *Dictyota adnata* Zanardini

Zanardini (1878) 34–35; Coppejans (1990) 371–380, f. 1–15; De Clerck & Coppejans (1997) 33–36.

A single specimen, collected by Arnoldi, was provisionally identified as '*Dictyota sibogae* n. sp.' by Weber-van Bosse. However, this name was never published and would have been a synonym of the previously published *D. adnata* Zanardini. Only after examining material of a Danish Expedition to the Kepulauan Kai, Weber-van Bosse got to know *D. adnata* (Weber-van Bosse, 1926: 101–102, f. 18–19). Alcohol-preserved material from Kepulauan Kai and a single permanent slide, showing the typical marginal sori of sporangia, are still present in Leiden. This permanent slide has been designated as a neotype (De Clerck & Coppejans, l.c.).

Specimens — Arnoldi s.n. (L 936.74–123), Kep. Kai, 6.5.1909, as '*D. sibogae* n. sp.'; Jensen s.n. (L microslide No. 835), Kep. Kai, 17.3–23.5.1922.

### *Dictyota canaliculata* De Clerck & Coppejans, *spec. nov.* — Fig. 1–4

Planta ad 8–10 cm longa, resupinata (plerumque cum frondibus multistratosis superpositis), regulariter dichotoma; frons conspicue canaliculata, pagina inferiore rhizoideis ad substratum adhaerenti, sine baside conspicua; segmenta latitudine constanti, interdum apicem versus paulo dilatata; segmenta (9–)14(–20) mm longa, (2.8–)3.9(–5) mm lata, ratione: (3.2–)4.2(–6.1), (17–)16.2(–25)  $\mu$ m alta, valde divaricatis: (65–)90(–135)°; apicibus generaliter rotundatis; marginibus laevibus, proliferationibus segmentis primariis similibus; planta haud torsiva, crispata; color: straminea, apicibus atrantibus, plerumque iridescens glaucescens. — Cortex monostromaticus, cellulis paginae superioris (38–)55.8(–79)  $\mu$ m longis, (14–)21.5(–31)  $\mu$ m latis, ratione: 2.46, cellulis paginae inferioris longioribus: (40–)65.6(–98)  $\mu$ m, latitudine equalide, ratione: 3.06; medulla ubique monostomatica, cellulis (108–)148.4(–218)  $\mu$ m longis, (48–)71.6(–84)  $\mu$ m latis, ratione: 2.07. Tetrasporangia in tota pagina superiore dispersa, sine cellulis involucribus, 112  $\mu$ m lata, 100  $\mu$ m alta. — Holotypus: ODC 251 (De Clerck & Coppejans) (GENT; isotypus L, UPNG), Papua New Guinea, Port Moresby area, patch reef E of Loloata Island, -3 to -13 m on sheltered reef, 29.7.1994.

Thalli up to 8–10 cm long, with typical resupinate growth, forming several superposed layers of regularly dichotomous, conspicuously canaliculate straps (especially towards the base); attachment by means of patches of rhizoids wherever the thallus is

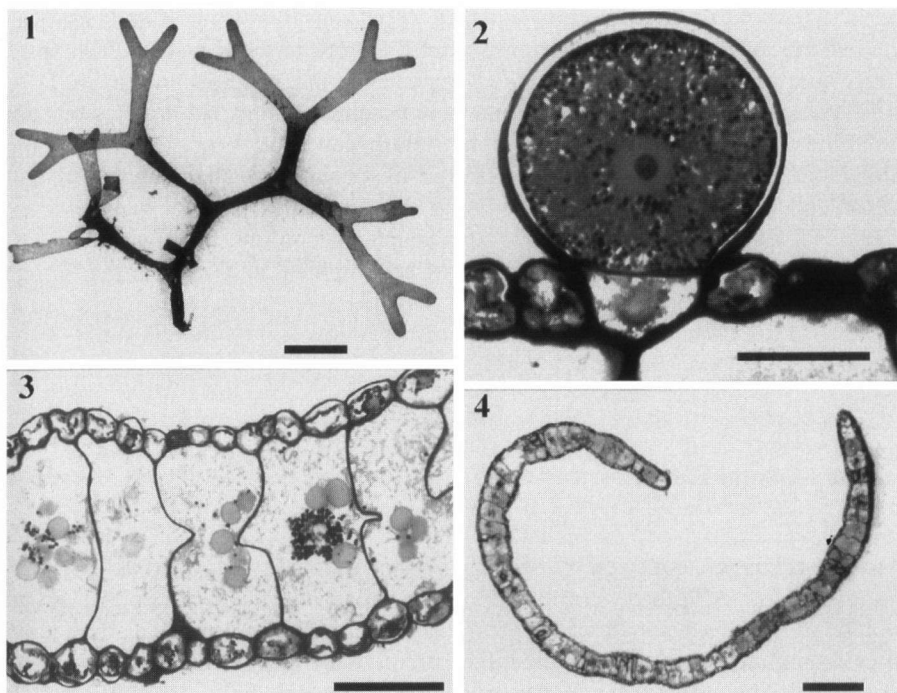


Fig. 1–4. *Dictyota canaliculata* De Clerck & Coppejans (1: ODC 280; 2–4: ODC 280). — 1: Holo-type, habit; scale bar = 1 cm. — 2: Cross section of a sporangium; scale bar = 50 µm. — 3: Cross section upper part of the thallus; scale bar = 100 µm. — 4: Canaliculate aspect of lower part of the thallus; scale bar = 500 µm.

in contact with the substrate, a conspicuous base absent; interdichotomies of constant width (less frequently widening slightly towards the apices): (9–)14(–20) mm long, (2.8–)3.9(–5) mm wide, L/W: (3.2–)4.2(–6.1); apices generally rounded, less frequently obtuse; divarication angle (65–)90(–135)°; margins smooth; proliferations, when present, not markedly narrower than the main thallus; not spirally twisted, crisp; straw-coloured, always with slightly darker tips, often showing a faint blue-green iridescence.

Cortex unilayered, cells of the upper surface (38–)55.8(–79) µm long, (14–)21.5(–31) µm wide, (17–)16.2(–25) µm high, Cl/Cw: 2.46, cells from the lower surface longer: (40–)65.6(–98) µm, width and height similar as for the upper surface cells, Cl/Cw: 3.06; medulla unilayered, cells (108–)148.4(–218) µm long; (48–)71.6(–84) µm wide, height ranging from 100 µm close to the apical parts to 200 µm near the base, Ml/Mw: 2.07; sori of hairs rare to common, depending on the specimen. Sporophytes forming tetrasporangia exclusively on the upper surface, mainly in the middle and the basal parts of the plant; not densely set; not surrounded by a collar of enlarged cortex cells (involucrum); born on a single stalk cell; sporangia 112 µm wide, 100 µm high. Gametophytes not observed.

Distribution — Indonesia, Papua New Guinea.

Habitat & Ecology — Almost exclusively growing on the outer slopes of reefs from -5 to -35 m, epilithic as well as epiphytic.

Etymology — The epithet refers to the characteristic shape of the straps with a longitudinal groove.

Discussion — An alcohol-preserved, sterile specimen in the Weber-van Bosse collection identified as *Dictyota* sp., seems to be very similar to specimens from Papua New Guinea and does not match any described species. The combination of canaliculate straps, a resupinate growth form and the rather crisp texture distinguishes *D. canaliculata* from all other *Dictyota* species. There is some resemblance with deep water growth forms of *D. dichotoma* (Huds.) J.V. Lamour. from the Mediterranean Sea but these thalli never have canaliculate straps, become thinner with increasing depth and are never crisp. *Dictyota patens* J. Agardh shares the same colour and crispate texture but grows typically in hemispherical tufts; moreover straps are never canaliculate. *Dictyota canaliculata* often grows together with *D. friabilis* Setch. but is easily distinguished from the latter by its larger size and resupinate growth form compared to the typically prostrate, imbricate mats of *D. friabilis*. It shares the broad divarication angle with *D. divaricata* J.V. Lamour. but lacks the variable width of the fronds of the latter.

Specimen in the Weber-van Bosse collection — Weber-van Bosse s.n., Labuan Pandan, Lombok, 27.3.1899, alcohol-preserved specimen.

Additional examined specimens deposited in GENT — Coppejans HEC 4344, Hansa Point, Madang Prov., PNG, 11.6.1980; Coppejans HEC 4551, Laing Island, Madang Prov., PNG, 22.7.1980; Coppejans HEC 7941, Gumbi Bay, Saidor, Madang Prov., PNG, 25.7.1988; Coppejans & Prud'homme van Reine Cop. & PvR 13451B, N of Wongat Island, Madang Prov., PNG, 27.7.1990; Coppejans & Prud'homme van Reine Cop. & PvR 13606B, Nagada Harbour in front of Gossem Island, Madang Prov., PNG, 7.8.1990; Coppejans & Prud'homme van Reine Cop. & PvR 13833B, Kranket Island Bay, Madang Prov., PNG, 26.8.1990; De Clerck & Coppejans ODC 210, Motupore Island, Port Moresby area, PNG, 19.7.1994; De Clerck & Coppejans ODC 246, South Patch Reef, Port Moresby area, PNG, 28.7.1994; De Clerck & Coppejans ODC 280, Loloata Island, Port Moresby area, PNG, 4.8.1994.

### *Dictyota cervicornis* Kütz.

Two different growth forms of this variable species are recognized depending on the branching pattern.

### *Dictyota cervicornis* Kütz. forma *cervicornis* — Fig. 5

Kützling (1859) 11, pl. 24, f. 2 and 16–17, pl. 39, f. 2 (as *D. pardalis*); Okamura (1913) 31–32, pl. 108, f. 1–8 as *D. divaricata* J.V. Lamour.

*Dictyota cervicornis* is characterized by the typical 'cervicorn' branching pattern: a combination of spirally twisted straps and subdichotomous branching resembling antlers.

The difference between *Dictyota crispata* and *D. cervicornis* is relatively easy as the divarication angle in the upper dichotomies is generally much broader in *D. cervicornis* (70–130°) compared to *D. crispata* (40–90°). Furthermore, spores of the latter species often tend to be placed on equidistant, transverse rows in the apical parts,

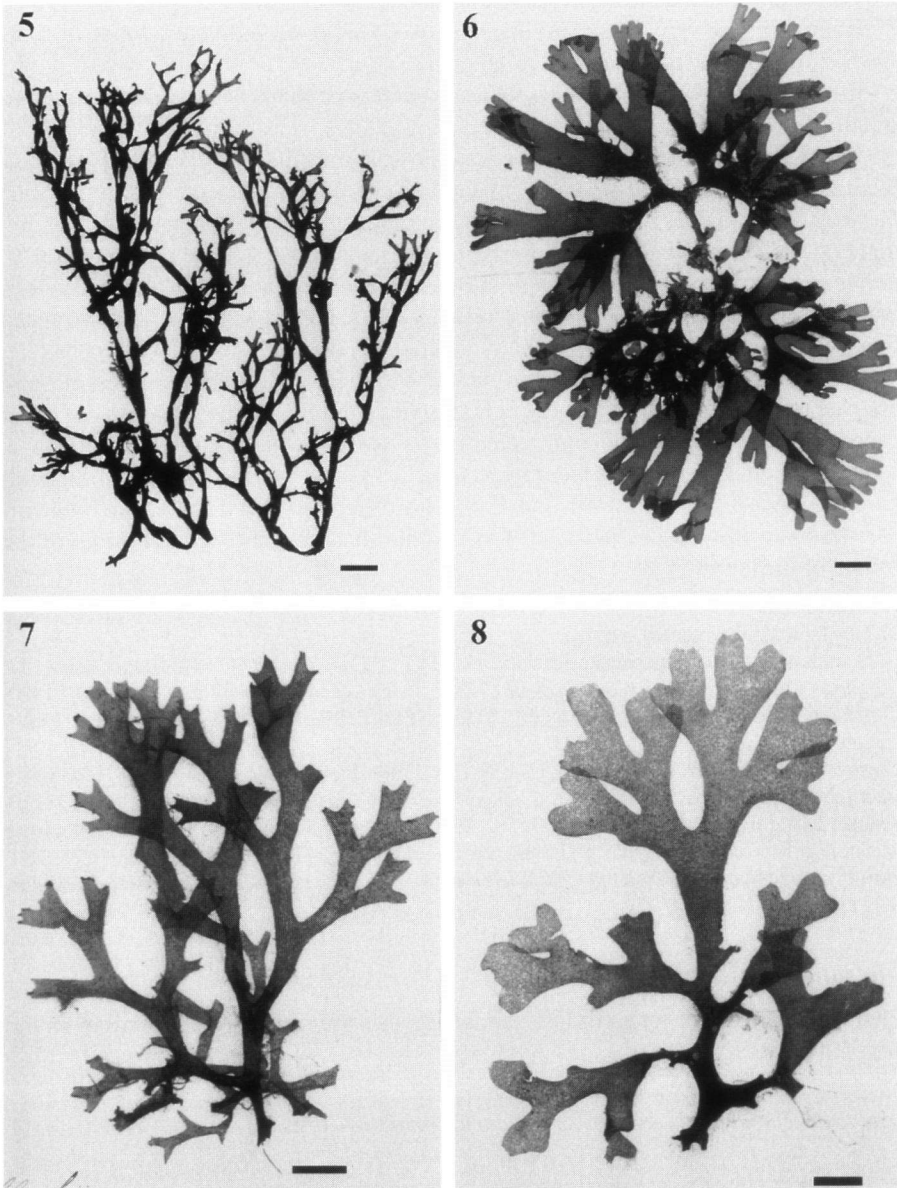


Fig. 5. *Dictyota cervicornis* f. *cervicornis* Kütz. Habit (L 936.74-142); scale bar = 1 cm. — Fig. 6. *D. ciliolata* Sond. ex Kütz. Habit (L 936.74-125); scale bar = 1 cm. — Fig. 7. *D. crispata* J.V. Lamour. Habit (L 936.74-95); scale bar = 1 cm. — Fig. 8. *D. apiculata* J. Agardh var. *jedanensis* Weber Bosse. Holotype, habit (L 936.74-113); scale bar = 1 cm.

whereas *D. cervicornis* generally has no spores in the apical parts and these never form transverse rows. However, it should be noted that identification of some young or atypical specimens can be problematic.

*Dictyota cervicornis* was originally not reported from the Siboga Expedition, but several specimens were identified as *D. bartayresiana* J.V. Lamour. var.  $\beta$  of which Weber-van Bosse had examined the specimen in the herbarium of Lamouroux (CN). After study of the same specimen we conclude that it is indeed conspecific with *D. cervicornis*, but this does not affect the correct status of *D. cervicornis* as *D. bartayresiana* var.  $\beta$  has never been validly published. The remaining *D. cervicornis* specimens were filed as *D. pardalis*, a widely accepted synonym of the previous.

Specimens — *Weber-van Bosse s.n.* (L 936.74-122B), Jolo, Sulu Archipelago, 2–3.7.1899; *Weber-van Bosse s.n.* (L 936.74-128), Hansisi, Semaui, Timor, 27.6.1899; *Weber-van Bosse s.n.* (L 936.74-139), Ujung Pandang, 9.1888; *Weber-van Bosse s.n.* (L 936.74-142), Ambon, 16.11.1899; *Weber-van Bosse s.n.* (L 936.74-143), Sawu, 24.4.1899; *Arnoldi s.n.* (L 936.74-145), Kep. Seribu, Java, 18.3.1909; *Arnoldi s.n.* (L 936.289-110), Treal, Kep. Kai, 27.4.1909; *Weber-van Bosse s.n.* (L 936.289-111), Lumu-Lumu, Makassar Strait, 10–11.6.1899; *Arnoldi s.n.* (L 936.289-123), Dobo, Kep. Aru, 20.5.1909; *Weber-van Bosse s.n.* (L 936.289-124), Batjoelmati, Java, 11.3.1899; *Weber-van Bosse s.n.* (L 936.289-125), Birakeke, Sulawesi, 10.1888; *Weber-van Bosse s.n.* (L 936.289-126), Parepare, Sulawesi, 10.1888; *Weber-van Bosse s.n.* (L 936.289-128), Selat Buton, 20.9.1899; *Weber-van Bosse s.n.* (L 936.289-130), Geser, 27.8.1899.

*Dictyota cervicornis* Kütz. forma *pseudohamata* (Cribb) De Clerck & Coppejans, *comb. nov.*

Basionym: *Dictyota pardalis* Kütz. forma *pseudohamata* Cribb (1954, Pap. Dept. Bot. Univ. Queensland 3 (3): 22, pl. 3, f. 10)

*Dictyota pardalis* is generally considered to be a growth form of *D. cervicornis* with a typical reflection of one branch (Price et al., 1978: 110; Hörnig et al., 1992: 59). However, this is not completely true; the type specimen of *D. pardalis* (L 936.289-158) contains no reflexed branches. Therefore, Cribb (1954: 22) described *D. pardalis* f. *pseudohamata*. Hörnig et al. (1992: 59) treated such specimens as a growth form of *D. cervicornis*, but the new combination was not in agreement with art. 33.2 of the International Code of Botanical Nomenclature (Greuter, 1994: 33). Hence the new combination is fully established here. Only one specimen matched the definition of *D. cervicornis* f. *pseudohamata*.

Specimens — *van Weel s.n.* (L 936.289-113), Kep. Seribu.

*Dictyota ceylanica* Kütz.

Kützting (1859) 11, pl. 25, f. 1; Jaasund (1970) 77, f. 1E, 2F.

Specimens named *Dictyota fasciola* (Roth) J.V. Lamour. by Weber-van Bosse represent low cushion-like tufts with narrow individual straps, a completely unilayered medulla, and without stolonoids near the base. In fact *D. fasciola* is characterized by the presence of repent stolonoids and at least contains a multilayered medulla at the base [Feldmann, 1937: 309, as *Dilophus fasciolus* (Roth) Howe]. Specimens similar to those in the Weber-van Bosse collection were previously often referred to as *D. divaricata* J.V. Lamour. [= *D. dichotoma* (Huds.) J.V. Lamour. var. *intricata* (C. Agardh) Greville]. Hörnig & Schnetter (1988: 285) showed that an interbreeding barrier exists between tropical Atlantic and Mediterranean specimens of *D. dichotoma*

var. *intricata*. Hence, the tropical Atlantic specimens were described as *D. pulchella* Hörnig & Schnetter. Up to which extent the Indo-Pacific specimens are conspecific with the Mediterranean *D. dichotoma* var. *intricata* or the Caribbean *D. pulchella* is unknown at present as no cross-fertilisation experiments have been carried out yet. Therefore the specimens are referred to as *D. ceylanica*, a species originally described from Sri Lanka and very representative for the Indian Ocean specimens of the *D. dichotoma-linearis-divaricata* complex.

Specimens — *Weber-van Bosse s.n.* (L 936.289-133), Waingapu Bay, Sumba, 21–22.4.1899; *Weber-van Bosse s.n.* (L 936.289-120), Lumu-Lumu, Makassar Strait, 10–11.6.1899; *Weber-van Bosse s.n.* (L 936.289-131), Sanana Bay, Sula Besi, 14.9.1899; *Weber-van Bosse s.n.*, Donggala, Sulawesi, 18–19.6.1899, unnumbered alcohol preserved specimen.

***Dictyota ciliolata* Sond. ex Kütz. — Fig. 6**

Kützling (1859) 12, pl. 27, f. 1–2; Zanardini (1872) 132–133, pl. 2, f. 1–3 as *D. beccariana*; Taylor (1960) 223, pl. 32, f. 3.

Weber-van Bosse was aware of the strong resemblance between *Dictyota beccariana* Zanardini and *D. ciliolata* (as *D. ciliolata* J. Agardh). She distinguished both taxa based on the placement of the spores. Spores of *D. ciliolata* should be confined to the central part of the straps leaving a sterile fringe near the margins while *D. beccariana* should bear spores on the whole surface. However, most *Dictyota* species have a sterile fringe along the margins, but this character becomes more apparent with increasing density of the spores, a highly variable character (Foster et al., 1972: 100). Another difference to distinguish *D. beccariana* from *D. ciliolata* should be the length-width ratio of the medullary cells (Ml/Mw). Cell measurements and their ratios often provide useful information to distinguish certain species in the genus *Dictyota* (Weber-Peukert, 1985). According to Weber-van Bosse (1913: 185) the Ml/Mw of *D. ciliolata* is 1.5 whereas *D. beccariana* shows a Ml/Mw of  $\approx 1$  (“plutôt carré”). Measurements of specimens of *D. ciliolata* from various regions were compared with specimens identified as *D. beccariana*. Ml/Mw of the *D. beccariana* material ranged from 1.75–2.34. This agrees fairly well with the Ml/Mw of *D. ciliolata* from other regions and the results of Weber-Peukert (1985: 127)  $2.17 \pm 0.2$ . The Ml/Mw of the type specimen of *D. beccariana* as illustrated by Zanardini (1872: tab. 2) is rather low:  $\approx 1.5$ . However, because of the overall similarity of the type specimen (FI s.n.) we consider *D. beccariana* as a synonym of *D. ciliolata*.

Specimens — *Weber-van Bosse s.n.* (L 936.74-120), Tello, Ujung Pandang, 10.1888; *Weber-van Bosse s.n.* (L 936.74-121), Sawu, 24.4.1899; *Weber-van Bosse s.n.* (L 936.74-122A), Jolo, Sulu Archipelago, 2–3.7.1899; *Weber-van Bosse s.n.* (L 936.74-124), Boeka Bay, Roti, 27.1.1900; *Weber-van Bosse s.n.* (L 936.74-125A), Pidjot Bay, Lombok, 25.3.1899; *Weber-van Bosse s.n.* (L 936.74-134), Atjatuning, Irian Jaya, 10.1899; *Weber-van Bosse s.n.* (L 936.74-136), Kabala-dua, Makassar Strait, 12–13.6.1888; *Weber-van Bosse s.n.*, Ambon, unnumbered alcohol-preserved specimen.

***Dictyota crispata* J.V. Lamour. — Fig. 7, 8, 10**

Lamouroux (1809) 44; Vickers (1908) 38, pl. 12 as *D. bartayresii* J.V. Lamour.; Jaasund (1970) 72, f. 1D, 2C as *D. bartayresii*; Allender & Kraft (1983) 112, f. 21E, F, 22D, 23A as *D. bartayresii*; Coppejans et al. (1995) 180, f. 8 as *D. bartayresiana*.

The Siboga specimens of *Dictyota crispata* were originally identified by Weber-van Bosse as *D. apiculata* J. Agardh. The presence of surface proliferations and involucrate sporangia, which often appear to be placed on equidistant rows in the apical parts, provide good evidence that the specimens do not belong to *D. apiculata*, which is a growth form of *D. dichotoma* (Huds.) J.V. Lamour. according to Womersley (1987: 194, 196). These specimens may have apiculate apices but the sporangia are never surrounded by involucre as in *D. crispata*. They correspond very well with the description of *D. bartayresiana* as illustrated by Vickers (l.c.) and Jaasund (l.c.). However, verification of the type specimen (Fig. 9) in the herbarium of Lamouroux (CN) proved that *D. bartayresiana* sensu J.V. Lamour. contains no surface proliferations nor involucrate sporangia. A correct substitute name for *D. bartayresiana* sensu Vickers was also found in the Lamouroux Herbarium: *D. crispata*. The type specimen of this species (Fig. 10), collected by Thuiller in the Caribbean Sea, represents a gametophyte and corresponds with all the characters formerly attributed to *D. bartayresiana* sensu Vickers. Consequently *D. neglecta* Hörnig & Schnetter (Hörnig et al., 1992: 56, f. 5), which was meant to include the specimens of *D. bartayresiana* auct. non Vickers, becomes a superfluous name and thus a synonym of *D. bartayresiana* J.V. Lamour. of which the lectotype is shown in Figure 9. The lectotype (LD 48931) of *D. patens* J. Agardh (1882: 93) also belongs to *D. bartayresiana* J.V. Lamour.

*Dictyota apiculata* var. *jedanensis* Weber Bosse was described as a new variety (Weber-van Bosse, 1913: 183–184), strongly resembling *D. apiculata* sensu Weber Bosse, but differing by the rounded apices and the widening aspect of the interdichotomies. After examination of the holotype specimen of *D. apiculata* var. *jedanensis* (Fig. 8) we conclude that it represents a not uncommon, broad growth form of *D. crispata*. A somewhat similar specimen was identified as *D. beccariana* Zanardini.

Note — Womersley (1967: 208) designated a lectotype of *Dictyota apiculata*, LD 48813 (Wilson, 29.xii.1887, Port Phillip, Victoria, Australia). However, the original description of J. Agardh (1894: 67) only mentions a single specimen, LD 48811 (Harvey, 9–28.xii.1854, Western Port, Victoria, Australia), which should be considered as the holotype of *D. apiculata*. Therefore, the lectotype designated by Womersley has no status.

Specimens — *Weber-van Bosse s.n.* (L 936.74-95), Tello near Ujung Pandang, Sulawesi, 10.1888; *Weber-van Bosse s.n.* (L 936.74-96), Tello near Ujung Pandang, Sulawesi, 9.1888; *Weber-van Bosse s.n.* (L 936.74-113), Jedan Islands, 23–26.12.1899; *Weber-van Bosse s.n.* (L 936.74-126), Bantaeng, Sulawesi, 10.1888; *Weber-van Bosse s.n.* (L 936.74-132), Ujung Pandang, Sulawesi, 16.5.1899; *Weber-van Bosse s.n.* (L 936.74-133), Tello near Ujung Pandang, Sulawesi, 9–10.1888; *Arnoldi s.n.* (L 936.74-129), Ujir, Kep. Aru, 11.5.1909.

### *Dictyota dumosa* Børgesen — Fig. 11

Børgesen (1935) 37–38, pl. 6.

A single Weber-van Bosse specimen filed under *Dictyota beccariana* in L is somewhat different from the others: very narrow branching angle, absence of dentate margins, and presence of narrow proliferations near the base. Examination of the type material of *D. dumosa* in C showed that the above mentioned specimen from Indonesia corresponds very well with this species in its overall habit as well as in cell measurements. Among the Indian Ocean species *D. dumosa* is most similar to *D. cilio-*

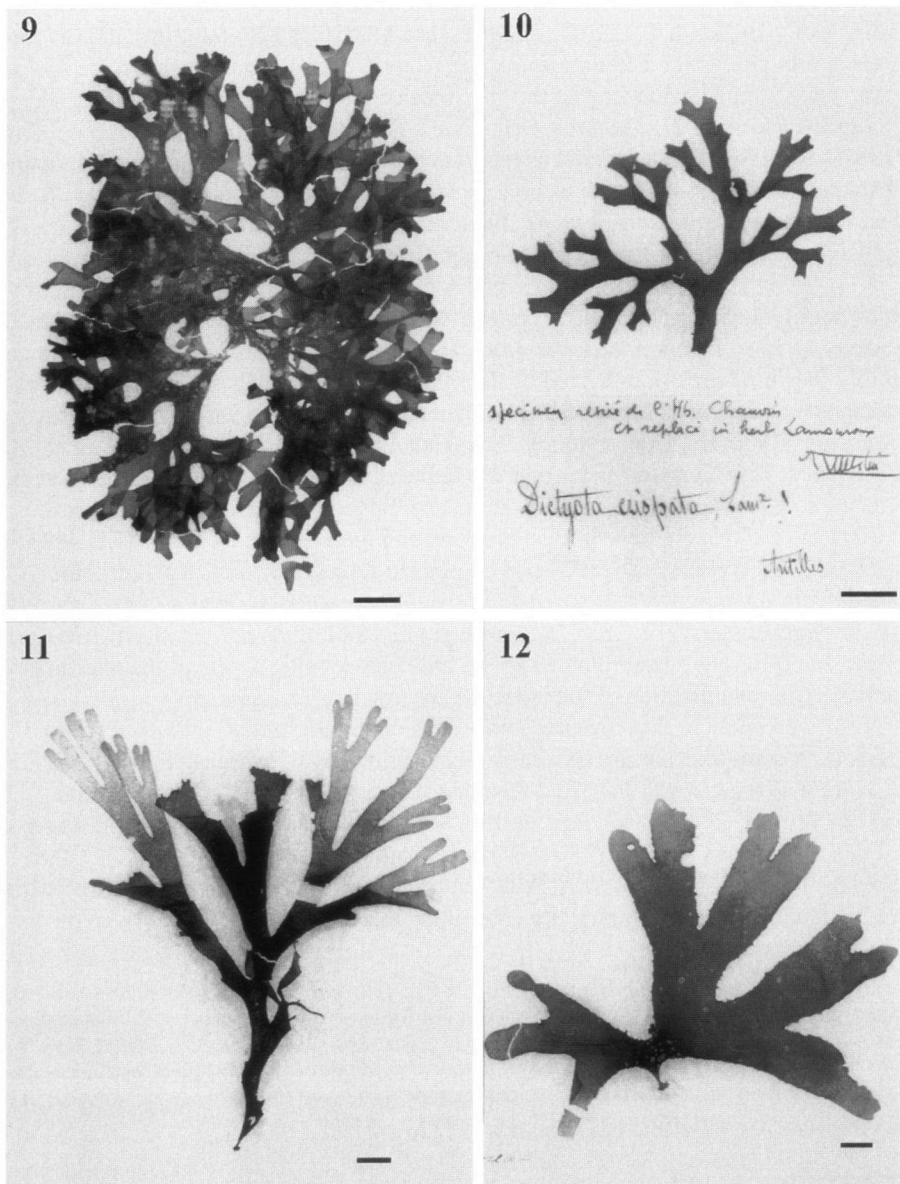


Fig. 9. *Dictyota bartayresiana* J.V. Lamour. Lectotype, habit (CN C7F99); scale bar = 1 cm. — Fig. 10. *D. crispata* J.V. Lamour. Syntype, habit (CN C7F80); scale bar = 1 cm. — Fig. 11. *D. dumosa* Børgesen. Habit (L 936.74-125); scale bar = 1 cm. — Fig. 12. *D. robusta* sensu Weber-van Bosse. Habit (L 936.289-134); scale bar = 1 cm.

*lata*, but in the first species the margins are not dentate and the base is not stupose, but consists of a turfy mass of slender subterete proliferations.

Specimen — *Weber-van Bosse s. n.* (L 936.74-125B), Pidjot Bay, Lombok, 25.3.1899.

***Dictyota friabilis* Setchell**

Setchell (1926) 91–92, pl. 13: f. 4–7; pl. 20: f. 1.

Originally the material from the Siboga Expedition belonging to this taxon was described as a new variety, *D. ceylanica* Kütz. var. *rotundata* Weber Bosse (1913: 185, pl. 3, f. 7) and later erroneously considered to be conspecific with *D. adnata* Zanardini (Weber-van Bosse, 1925: 209). This was corrected by Coppejans (1990: 376). Hörnig et al. (1992: 57) considered the Siboga material to be conspecific with *D. humifusa* Hörnig, Schnetter & Coppejans, a species from the Caribbean Sea and East African coast. However, cell measurements of the Siboga material differ considerably from those of *D. humifusa* and the typical olive-green colour and membranaceous texture of dried specimens are not present either. The specimens agree much better with *D. friabilis*, a prostrate species typically growing on coral branches. The ecology indicated by Weber-van Bosse, dredged 20–30 vademus deep (20–50 m), also corresponds better with that of *D. friabilis*. *Dictyota humifusa*, on the contrary, typically grows in shallow lagoons. Additionally no convincing records of *D. humifusa* have been reported for the Malayan region, whereas *D. friabilis* is a common species in the Indo-Malayan as well as in the Pacific region.

Specimens — *Weber-van Bosse s.n.* (L 936.74–115), NE point of Timor, 15–17.1.1900; *Weber-van Bosse s.n.* (L 936.74–100A), Daram (Valsche Pisang), Misool, Irian Jaya, 20–22.8.1899; *Arnoldi s.n.* (L 936.74–114), Kep. Banda, 26.4.1909.

***Dictyota prolifera* J.V. Lamour.**

Lamouroux (1809) 42; non *D. prolifera* Suhr (1839) 66, pl. 1, f. 39; non *D. prolifera* sensu Womersley (1967) 210 and (1987) 190, f. 63A, 64A–D.

*Dictyota prolifera* J.V. Lamour. is closely related to *D. crispata* and *D. cervicornis* as sporangia are surrounded by involucre and proliferations arise from the thallus surface. However, the branching pattern is alternate to monopodial and the apices are typically acute, not apiculate as in *D. crispata*. Such specimens were invariably identified as *D. pinnatifida* Kütz. (1859: 16, pl. 39, f. 1) in the Weber-van Bosse collection. The examination of the holotype of *D. pinnatifida*, MEL 537282 (Smith?, 1853, Antigua, Lesser Antilles) revealed a species with a multilayered medulla, becoming unilayered in the centre of the straps towards the apices but remaining multilayered near the margins. In the Atlantic Ocean such specimens have traditionally been referred to as *Dilophus alternans* J. Agardh (1882: 108), until Hörnig et al. (1992) considered *Dilophus* as a synonym of *Dictyota* and recombined *Dilophus alternans* as *Dictyota alternans* (J. Agardh) Hörnig, Schnetter & Prud'homme van Reine. The older name *D. pinnatifida* however has priority. Weber-van Bosse (1913: 182) herself doubted about the distinction of *D. pinnatifida* (now correctly identified as *D. prolifera*) and *D. bartayresiana* var.  $\beta$  (now considered as a synonym of *D. cervicornis*), but kept both as distinct species. The difference between these species is not always easy to tell but until enough evidence has been provided showing transitions between *D. prolifera* and *D. cervicornis* we also prefer to consider them as separate species.

The Australian species Womersley (1987: 190, f. 63A, 64A–D) refers to as *D. prolifera* may superficially resemble *D. prolifera* J.V. Lamour., but it is fundamentally distinct by the presence of basal stolonoids, the absence of an involucre surrounding the sporangia and the grouping of sporangia in block-like sori. Therefore, *D. prolifera* sensu Womersley should be referred to as *D. radicans* Harvey (1855: 536; 1859: pl. 119).

Specimens — *Weber-van Bosse s.n.* (L 936.289-112), Kamaragi Bay, Tanahjampea, 4–5.5.1899; *Weber-van Bosse s.n.* (L 936.289-114), Teluk Bima, Sumbawa, 1888; *Weber-van Bosse s.n.* (L 936.289-119), Kamaragi Bay, Tanahjampea, 4–5.5.1899; *Weber-van Bosse s.n.* (L 936.289-127), Sarassa, Kep. Sabalana, 1888; *Weber-van Bosse s.n.*, Kamaragi Bay, Tanahjampea, unnumbered alcohol preserved specimen.

### *Dictyota* sp.

Five specimens could not be identified. Some represent fragmentary material, others juvenile thalli of which accurate identification is impossible.

Specimens — *Weber-van Bosse s.n.* (L 936.74-100B), Daram (Valsehe Pisang), Misool, Irian Jaya, 20–22.8.1899; *Weber-van Bosse s.n.* (L 936.289-122), Barang, Ujung Pandang, 24.5.1899; *Arnoldi s.n.* (L 936.74-135), Kep. Kai, 20.4.1909; *Weber-van Bosse s.n.* (L 936.289-136), Moearas Reef, Borneo, 22.6.1899.

A single collection with three duplicate sterile specimens was identified by Weber-van Bosse (1913: 184, pl. 3, f. 3) as *Dictyota robusta* J. Agardh (Fig. 12). This species is characterised by a multilayered medulla at least near the thallus margins (Phillips, 1992: 689, f. 20a–h) whereas the Siboga material has a unilayered medulla all over the thallus. A precise identification could not be made but the specimens possibly represent a broad growth form of *D. ciliolata*. Alcohol-preserved specimens of *D. robusta* sensu Weber-van Bosse were much narrower and represent the archetypic *D. ciliolata*.

Specimen — *Weber-van Bosse s.n.* (L 936.289-134), Atjatuning, Irian Jaya, 23–25.8.1899.

## DISCUSSION

A total of 49 specimens of *Dictyota* present in the Rijksherbarium Leiden (L) were examined. Most of these (40) were collected by Weber-van Bosse herself during two trips to Indonesia (1888–1889 and 1899–1900). An additional 9 specimens were sent to her by Arnoldi (7 specimens), Van Weel (1 specimen) and Mortensen & Jensen (1 specimen). All the material referred to in Weber-van Bosse (1913: 182–186) was retrieved except the specimens of *D. bartayresiana* J.V. Lamour. var. *denticulata* Kütz., which have not been found.

Specimens were assigned to 9 different species of which 1 species contains two growth forms: *D. adnata*, *D. canaliculata*, *D. ceylanica*, *D. cervicornis* f. *cervicornis*, *D. cervicornis* f. *pseudohamata*, *D. ciliolata*, *D. crispata*, *D. dumosa*, *D. friabilis* and *D. prolifera*.

*Dictyota canaliculata* is described as a new species on the basis of a unique combination of characters: canaliculate straps, resupinate growth, crisp texture. The speci-

men from the Siboga Expedition is not mentioned in Weber-van Bosse (1913), but was preserved in alcohol in L. *Dictyota dumosa* is reported for the first time from Indonesia. The specimen was originally identified as *D. beccariana* (= *D. ciliolata*) but lacks a dentate margin, branches subdichotomously and the branching angle is generally narrower. Specimens of *D. fasciola* are now referred to as *D. ceylanica*, but it should be noted that uncertainty exists on the status of the latter species. It possibly is conspecific with *D. pulchella* or *D. dichotoma* var. *intricata*. More research is needed to come to a definite answer. Examination of the type material of *D. pinnatifida* revealed that it is conspecific with *D. alternans*, over which it has priority. Specimens in the Weber-van Bosse collection referred to as *D. pinnatifida* are considered to be identical with *D. prolifera* J.V. Lamour. Study of the type collection of *D. bartayresiana* J.V. Lamour. also revealed that this species has no involucrate sporangia, nor proliferations on the surface, in contrast to the description of Vickers (1908: 38, pl. 12) and Hörnig et al. (1992: 56). The correct name for this entity is *D. crispata*. *Dictyota neglecta* and *D. patens* are treated as synonyms of *D. bartayresiana* J.V. Lamour.

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