Cryptogamie, Algologie, 2013, 34 (3): 263-271

The validation of the names *Pseudobranchioglossum* and its type species *Pseudobranchioglossum senegalense* (Delesseriaceae, Rhodophyta)

Michael J. WYNNE[*]

University of Michigan Herbarium, 3600 Varsity Drive, Ann Arbor, Michigan 48108, USA

Abstract – *Pseudobranchioglossum* gen. nov. and the sole species *Ps. senegalense* sp. nov., names proposed but not validated by Bodard, are herein validated with descriptions, the required citation of the Holotype, and the place where it has been deposited (PC). This new taxon of Delesseriaceae is known from locations on the coast of Senegal, West Africa.

Ceramiales / Delesseriaceae / Holotype / *Pseudobranchioglossum* / Rhodophyta / Senegal / taxonomy / validation

INTRODUCTION

Bodard (1971) attempted to describe a new genus and species of Delesseriaceae (Rhodophyta), namely, *Pseudobranchioglosssum senegalense*, based on his collections from Senegal, West Africa. Although his description of both female/cystocarpic and tetrasporophytic thalli was certainly adequate and accompanied by illustrations and photographs, there was a failure to indicate a single holotype. As the online resources of *Index Nominum Algarum* (Silva, 2013) and *AlgaeBase* (Guiry & Guiry, 2013) indicate, the lack of a designation of a Holotype resulted in Bodard's names being invalid. Article 40 of the Melbourne Code (McNeill *et al*., 2012) lays down strict requirements in regard to the valid publication of names, Art. 40.1 stating that "Publication on or after 1 January 1958 of the name of a new taxon of the rank of genus or below is valid only when the type of the name is indicated…" Bodard's (1971) account refers to multiple female collections ("Bodard 2310-2315") and a single tetrasporophyte ("Bodard 1262"), but there was no designation of a Holotype nor an indication where the specimens had been deposited.

Bodard (1971) stated that his new taxon occurred in the infralittoral of Senegal, reaching its maximum development at M'Bour. A subsequent publication by Bodard & Mollion (1974) reported detailed observations on the marine algal flora of a stretch of coastline referred to as "la petite côte sénégalaise" and included collections made by dredging to a depth of 25 m. *Pseudobranchioglossum senegalense* was stated to have a range from Yenne in the north to M'Bour in the south. The seabed was described as being covered by a so-called "prairie" consisting of *Hypnea* (mostly *H. cervicornis* J. Agardh) and *Pseudobranchioglossum senegalense* south of Cap Blanc to M'Bour (Bodard & Mollion, 1974; John & Lawson, 1991).

* Corresponding author : mwynne@umich.edu

doi/10.7872/crya.v34.iss2.2013.263

Harper & Garbary (1997) have included the name *Pseudobranchioglossum senegalense* in their checklist of Senegal, but there was no indication that they had made new collections. Likewise, John & Lawson (1991), Lawson *et al.* (1995), and John *et al.* (2004) indicated the presence of *Ps. senegalense* on the coast of subtropical Africa and tropical western Africa. Apparently this taxon is known only from Senegal.

The purpose of this note is to validate the names *Pseudobranchioglossum* and the only species in this genus, *Ps. senegalense*, by providing a description, figures, and the designation of a Holotype and its location. Unaware that the name *Pseudobranchioglossum senegalense* was invalid, Wynne (1989) gave an account of this alga based upon a specimen sent to him by Dr. Bodard. Wynne's (1989) observations and figures confirmed the placement of this alga in the "*Hypoglossum* Group", later the tribe Hypoglosseae (Wynne, 2001).

MATERIALS AND METHODS

The materials used in this study include a collection sent on loan by M. Bodard, Université de Lille (LIP) to the author: Yenn, Senegal, 27 April, 1967, coll. *M. Bodard 2469*. This collection was used by Wynne in making his observations in an earlier paper (Wynne, 1989) and in the preparation of this paper. That collection was returned to Francis Magne (PC) because of the death of Marcel Bodard in 1988. Three collections in PC were uncovered by Mr. Bruno Dennetiere, and these specimens (*Bodard 2310, 2469* and *2470*) were scanned and the images sent as TIFF files to the author. Herbarium designations follow Thiers (2013).

RESULTS

Pseudobranchioglossum gen. nov. M. Bodard *ex* M.J. Wynne

Thalli consisting of a cluster of erect blades, usually branched only to one order (Figs 1-2); blades with a well developed midrib which passes proximally into a thick stipe; lateral nerves developed by second-order cell rows undergoing periclinal divisions; blade monostromatic in regions away from midrib and lateral nerves; growth by means of a transversely dividing apical cell; all cells of second-order rows bearing third-order cell rows; initials of third-order cell rows all reaching the blade margin (Figs 3-4); intercalary cell divisions absent; marginal branching resulting from the conversion of initials of second-order rows into the primary initials of lateral branches (Fig. 4); branches occasionally developed by proliferation from the midrib of old, denuded primary blades (Fig. 2); procarps and cystocarps located along the primary cell rows of non-modified blades; tetrasporangial sori arranged in interrupted patches along both sides of the midrib; tetrasporangia tetrahedrally divided.

Type and only species: *Pseudobranchioglossum senegalense*

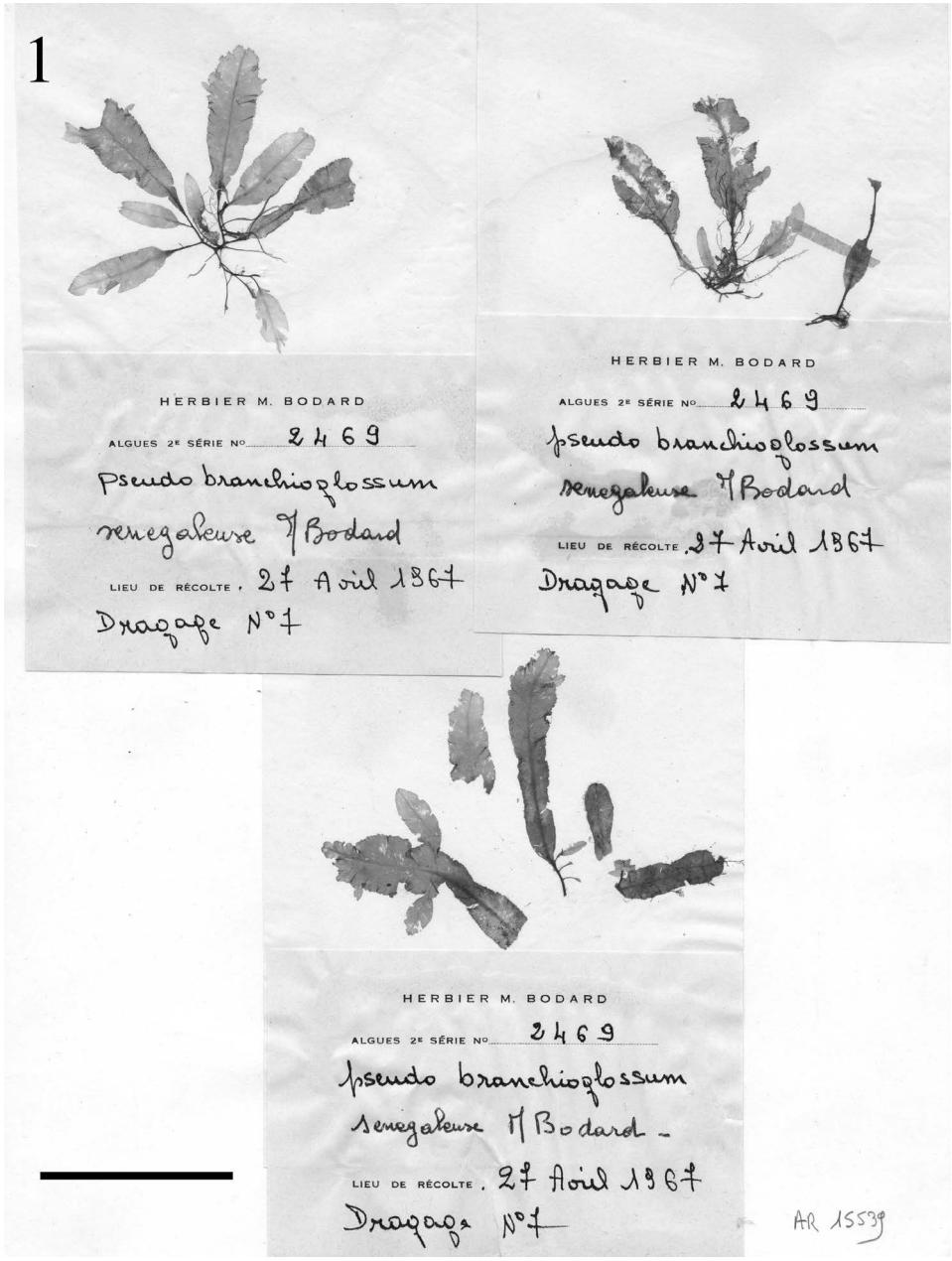


Fig. 1. *Pseudobranchioglosssum senegalense* sp. nov. Holotype: Collector M. Bodard 2469 [PC0543752]. Scale bar: 4 cm.

Pseudobranchioglossum senegalense sp. nov. M. Bodard *ex* M.J. Wynne

Thalli flat, membranous blades, 6 cm in height, 5-6 mm broad, branched from the margins; secondary blades 2 cm in length, 3-4 mm in width; thalli cuneate at the base; stipitate; secondary blades also arising by the outgrowth of branches from the eroded proximal stipes.

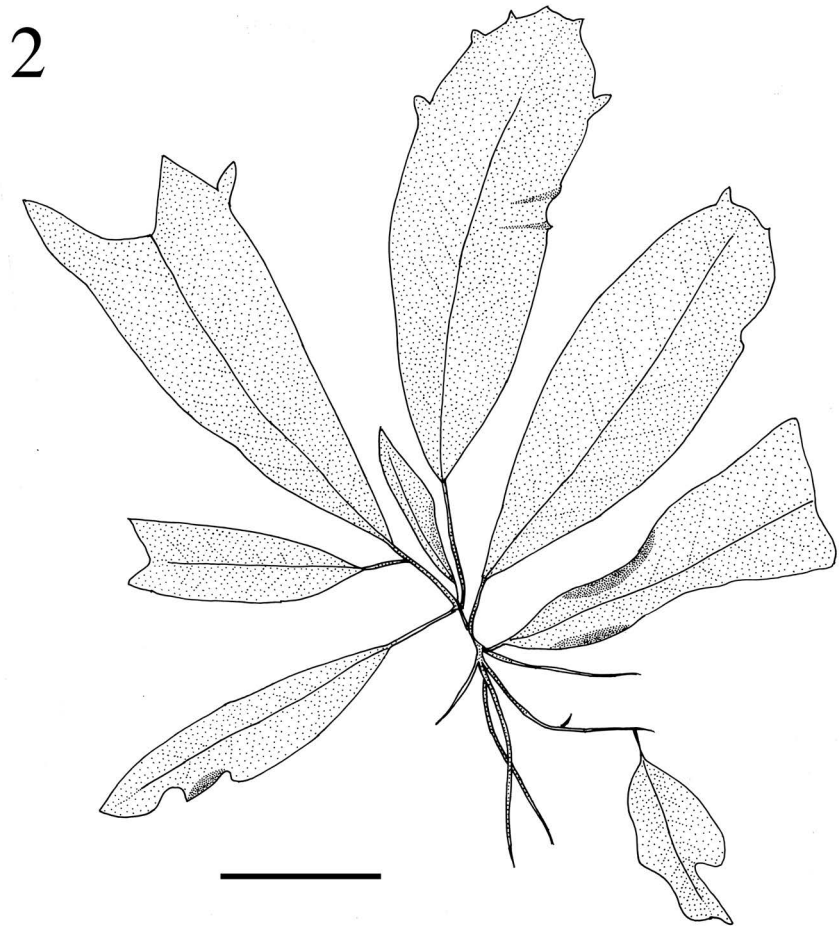
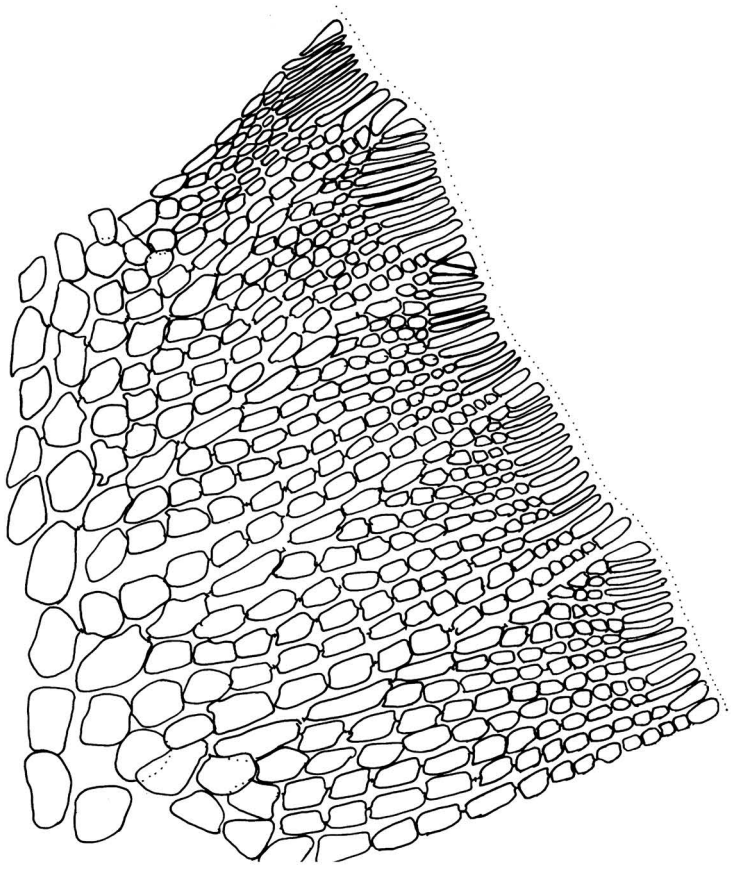


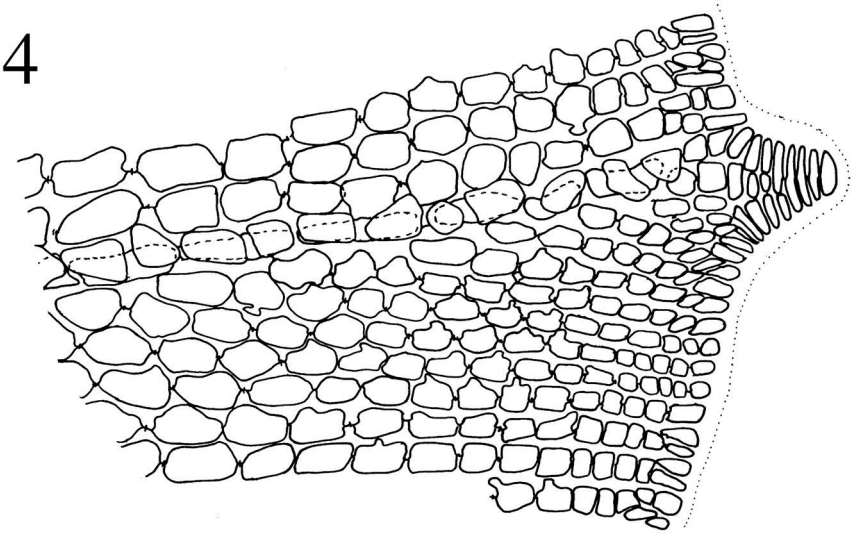
Fig. 2. *Pseudobranchioglosssum senegalense* sp. nov. Sketch of a portion of the Holotype collection. Scale bar: 2 cm.

Figs 3-4. *Pseudobranchioglosssum senegalense* sp. nov. **3.** Camera-lucida drawings of marginal region of young blade. **4.** Camera-lucida drawing of blade margin with new branch emerging from a second-order cell row, which is slightly thickened into a lateral vein. [Holotype]. Scale bar: 50 µm.

3



4



Holotype: Collector M. Bodard 2469 [PC0543752], Yenn, coast of Senegal, West Africa, "*27 Avril 1967, dragage N°7*"; dredged, substratum of sand and shells. In PC. Fig. 1.
Isotypes: 2470 [PC0543754]."*27 Avril 1967, dragage N°7*". In PC.
Paratype: Collector M. Bodard 2310 [PC0543753], N'Gaparou, coast of Senegal, West Africa, 31 January, 1967; dredged, substratum of mud and shells. Attached to small shells. In PC.

Additional figures of *Pseudobranchioglosssum senegalense* can be found in Bodard (1971) and Wynne (1989). Although according to Bodard (1971) cells of the second-order rows can undergo cell division, no such divisions were observed in the present study. It is believed that the production of cortical cells to form the lateral veins is what may have given the false impression that those cells are derived from intercalary divisions.

DISCUSSION

The tribe Hypoglosseae (Delesseriaceae) includes a total of 12 currently recognized genera: *Bartoniella* (Kylin, 1924), *Branchioglossum* (Kylin, 1924), *Chauviniella* (Papenfuss, 1956), *Duckerella* (Wynne, 1982), *Frikkiella* (Wynne & Schneider, 1996), *Hypoglossum* (Kützing, 1843), *Phitycolax* (Wynne & Scott, 1989), *Phitymophora* (J. Agardh, 1898), *Pseudobranchioglossum* (this paper), *Tsengiella* (Zhang & Zia, 1987), *Yoshidaphycus* (Mikami, 1992), and *Zellera* (Martens, 1868). The genera assigned to this tribe share a structure of a laminar blade and an apical organization in which there is a single prominent transversely dividing apical cell terminating each indeterminate axis, with second-order rows growing outward to the blade margin, and initials of third-order rows ALL reaching the blade margin. In addition, exogenous branching, which is a hallmark of the two genera in the Caloglosseae, *Caloglossa* and *Taenioma* (Papenfuss, 1944, 1961), is absent in the Hypoglosseae. Kylin's (1956) distinction of the "Hypoglossum Gruppe" [now the tribe Hypoglosseae] from the "Caloglossa Gruppe" [now the tribe Caloglosseae] was that in the former tetrasporangial initials arise from the cortical cells, forming two or more layers of tetrasporangia, whereas in the latter tribe tetrasporangial initials arise from the central, or primary, cells, forming a single layer of tetrasporangia. It was later discovered that in some species of Hypoglossum [*H. geminatum* Okamura, *H. minimum* Yamada, *H. protendens* (J. Agardh) J. Agardh, and *H. sagamianum* Yamada] tetrasporangia are formed from primary cells (Mikami, 1987; Womersley & Shepley, 1982; Yoshida & Mikami, 1986). So that distinction has not held up as a reliable character to separate these tribes from one another.

Pseudobranchioglossum shares with *Branchioglossum* several generic-level characteristics, such as the origin of branches from the blade margins by the outgrowth of second-order initials being converted into primary initials and the monostromatic nature of the blades. *Pseudobranchioglossum* is different because of the presence of lateral nerves (absent in *Branchioglossum*) and by the additional production of blades from the midrib of old, denuded primary blades; this does not happen in *Branchioglossum*. Kylin (1924), Edding (1988), and Wynne (1988, 1989) have shown that lateral nerves are absent in

Branchioglossum. Like all members of the tribe Hypoglosseae (Wynne, 2001), *Pseudobranchioglossum* has an apical organization in which third-order initials reach the blade margin.

Frikkiella also has monostromatic blades that branch from the blade margins, but in that genus such branching happens from random marginal cells (Wynne & Schneider, 1996), whereas in *Branchioglossum* and *Pseudobranchioglossum* branching always occurs when a second-order row is converted into a primary (indeterminate) axis. *Bartoniella* shows marginal branching, but the blades are polystromatic throughout (Wagner, 1954; De Clerck *et al*., 2005). Thalli of *B. crenata* (J. Agardh *ex* Mazza) Kylin can also branch by proliferations from the midrib, especially when reproductive (Stegenga *et al.,* 1997).

Tsengiella has narrow, polystromatic blades with finely serrulate margins and with branching by means of outgrowths from the blade margins (Zhang & Xia, 1987). Both *Chauviniella* and *Phitymophora* have polystromatic blades that branch by proliferations from the midrib. This pair of genera can be separated from one another in that in *Chauviniella* all cells of second-order rows bear third-order rows and branching is neither frequent nor imbricate, whereas in *Phitymophora* not all cells of second-order rows bear third-order rows and branches are frequent, closely set, and imbricate (Wagner, 1954; Womersley, 2003).

A unique organization of sinistrally spiralling, distichously branched blades is shown in *Duckerella*, with branching from the blade margins (Wynne, 1982, 1989). In *Hypoglossum* branching occurs endogenously from the midrib (Kylin, 1923; Womersley & Shepley, 1982; Wynne & Kraft, 1985; Wynne & Ballantine, 1986). *Yoshidaphycus* is unusual in having several modes of branching: endogenously from axial cells with the branch lying in plant of parent blade and exiting at blade margin; exogenously by the conversion of an initial of a second-order row; and adventitiously from the thallus margin (Mikami, 1992). *Zellera* also shows a distinctive habit because of the fusion of branches, this union resulting in a net with quadrangular meshes (Martens, 1868; Itono, 1986; Wynne 1989). *Phitycolax* is a genus parasitic on *Phitymophora* (Wynne & Scott, 1989).

Acknowledgements. I am very grateful to Mr. Bruno Dennetiere of the Muséum national d'histoire naturelle, Paris. I also thank Mr. Lionel Kervran and Dr. Bruno de Reviers for their assistance in this project.

REFERENCES

AGARDH J.G., 1898 — *Species, genera et ordines algarum*. Vol. 3(3). De disposition Delesseriearum. [iii] + 239 p. Lund, Gleerups.

BODARD M., 1971 — Sur un genre nouveau de Delesseriacées: *Pseudobranchioglossum senegalense*, algue de l'infralittoral sénégalais. *Bulletin de l'institut fondamental d'Afrique noire*, *sér. A*, 33: 20-31.

BODARD M. & MOLLION J., 1974 — La végétation infralittorale de la petite côte sénégalaise. *Bulletin de la société phycologique de France* 19: 193-221.

DE CLERCK O., TRONCHIN E.M. & T. SCHILS T., 2005 — *Red algae. Rhodophyceae. In*: De Clerck O., Bolton J.J., Anderson R.J. & Coppejans E. (eds), *Guide to the seaweeds of KwaZulu-Natal*. *Scripta Botanica Belgica* 33: 131-267.

EDDING M.E., 1988 — *Branchioglossum* Kylin 1924. (Rhodophyta: Delesseriaceae). Morphological and taxonomic aspects in Chile. *Gayana, Botanica* 45: 153-161.

GUIRY M.D. & GUIRY G.M., 2013 — AlgaeBase. World-wide electronic publication, National University of Ireland, Galway. http://www.algaebase.org; searched on 06 June 2013.

HARPER J.T. & GARBARY D.J., 1997 — Marine algae of northern Senegal: the flora and its biogeography. *Botanica marina* 40: 129-138.
ITONO H., 1986 — New records of marine algae from southern parts of Japan. *Japanese journal of phycology* 34: 74-82.
JOHN D.M. & LAWSON G.W., 1991 — Littoral ecosystems of tropical Western Africa. *In*: Mathieson A.C. & Nienhuis P.N. (eds), *Intertidal and littoral ecosystems*, Amsterdam, New York, Elsevier, pp. 297-322.
JOHN D.M., PRUD'HOMME VAN REINE W.F., LAWSON G.W., KOSTERMANS T.B. & PRICE J.H., 2004 — A taxonomic and geographical catalogue of the seaweeds of the western coast of Africa and adjacent islands. *Beihefte zur Nova Hedwigia* 127: 1-339.
KÜTZING F.T., 1843 — *Phycologia generalis oder Anatomie, Physiologie und Systemkunde der Tange.* Leipzig. xxxii + 458 p., 80 pls.
KYLIN H., 1923 — Studien über die Entwicklungsgeschichte der Florideen. *Kungliga Svenska vetenskapakademiens handligar* 63(11): 1-139.
KYLIN H., 1924 — Studien über die Delesseriaceen. *Lunds universitets Årsskrift, ny följd, avdelningen 2*, 20(6): 1-111.
KYLIN H., 1956 — *Die Gattungen der Rhodophyceen*. Lund, Gleerup, 673 p.
LAWSON G.W., WOELKERLING W.J., PRICE J.H., PRUD'HOMME VAN REINE W.F. & JOHN D.M., 1995 — Seaweeds of the western coast of tropical Africa and adjacent islands: a critical assessment. IV. Rhodophyta (Florideae) 5. Genera P. *Bulletin of the natural history museum, London (Botany)* 25: 99-122.
MARTENS G. VON, 1868 ['1866'] — *Die Tange. Die Preussische Expedition nach Ost-Asien…* Botanischer Theil. Berlin, 152 p., 8 pls.
MCNEILL J., F. R. BARRIE F.R., BUCK W.R., DEMOULIN V., GREUTER W., HAWKSWORTH D.L., HERENDEEN P.S., KNAPP S., MARHOLD K., PRADO J., PRUD'HOMME VAN REINE W.F., SMITH G.F., WIERSEMAN J.H. & TURLAND N.J. (eds), 2012 — *International Code of Nomenclature for algae, fungi, and plants (Melbourne Code) adopted by the Eighteenth International Botanical Congress Melbourne, Australia, July 2011.* Königstein, Koeltz scientif books [*Regnum Vegetabile* 154].
MIKAMI H., 1987 — Studies on *Erythroglossum pulchrum* Yamada and *Hypoglossum sagamianum* Yamada (Delesseriaceae, Rhodophyta). *Japanese journal of phycology* 35: 124-129.
MIKAMI H., 1992 — *Yoshidaphycus* gen. nov., based on *Branchioglossum ciliatum* Okamura (Delesseriaceae, Rhodophyta). *Japanese journal of phycology* 40: 385-391.
PAPENFUSS G.F., 1944 — Structure and taxonomy of *Taenioma*, including a discussion of the phylogeny of the Ceramiales. *Madroño* 7: 193-214.
PAPENFUSS G.F., 1956 — On the nomenclature of some Delesseriaceae. *Taxon* 5: 158-162.
PAPENFUSS G.F., 1961 — The structure and reproduction of *Caloglossa leprieurii*. *Phycologia* 1: 8-31.
SILVA P.C., 2013 — Index Nominum Algarum. Bibliographia Phycologica Universalis. http://ucjeps.berkeley.edu/INA.html
STEGENGA H., BOLTON J.J. & ANDERSON R.J., 1997 — *Seaweeds of the South African West Coast*. Cape Town, 655 p. [*Contributions of the Bolus Herbarium* 18].
THIERS B. 2013 [and continuously updated] — Index Herbariorum: A global directory of public herbaria and associated staff. New York Botanical Garden's Virtual Herbarium. http://sweetgum.nybg.org/ih/
WAGNER F.S., 1954 — Contributions to the morphology of the Delesseriaceae. *University of California publications in botany* 27: 270-346.
WOMERSLEY H.B.S. & SHEPLEY E.A., 1982 — Southern Australian species of *Hypoglossum* (Delesseriaceae, Rhodophyta). *Australian journal of botany* 30: 321-346.
WOMERSLEY H.B.S., 2003 — *The marine benthic flora of southern Australia - Part IIID Ceramiales – Delesseriaceae, Sarcomeniaceae, Rhodomelaceae.* Canberra and Adelaide, Australian Biological Resources Study & State Herbarium of South Australia, 533 p.
WYNNE M.J., 1982 — *Duckerella*, a new genus of Delesseriaceae (Rhodophyta) from Madagascar. *Phycologia* 21: 236-242.
WYNNE M.J. & KRAFT G.T., 1985 — *Hypoglossum caloglossoides* sp. nov. (Delesseriaceae, Rhodophyta) from Lord Howe Island, South Pacific. *British phycological journal* 20: 9-19.
WYNNE M.J. & SCHNEIDER C.W., 1996 — *Frikkiella* gen. nov. (Delesseriaceae, Rhodophyta) from Bermuda and the Caribbean Sea. *Systematic Botany* 21: 77-84.
WYNNE M.J. & D.L. BALLANTINE D.L., 1986 — The genus *Hypoglossum* Kützing (Delesseriaceae, Rhodophyta) in the tropical western Atlantic, including *H. anomalum* sp. nov. *Journal of phycology* 22: 185-193.
WYNNE M.J., 1988 — Notes on *Branchioglossum* Kylin (Delesseriaceae, Rhodophyta) in the eastern Pacific. *Cryptogamie, Algologie* 9: 53-64.

WYNNE M.J., 1989 ['1988'] — A reassessment of the *Hypoglossum* group (Delesseriaceae Rhodophyta), with a critique of its genera. *Helgoländer Meeresuntersuchugen* 42: 511-534.
WYNNE M.J. & SCOTT F., 1989 — *Phitycolax*, a new genus of adelphoparasitic red algae from Ile Amsterdam, southern Indian Ocean. *Cryptogamie, Algologie* 10: 23-32.
WYNNE M.J., 2001 — The tribes of the Delesseriaceae (Ceramiales, Rhodophyta). *Contributions from the university of Michigan herbarium* 23: 407-417.
YOSHIDA T. & MIKAMI H., 1986 — Observations on morphology of *Hypoglossum minimum* Yamada and *H. geminatum* Okamura (Delesseriaceae, Rhodophyta). *Japanese journal of phycology* 34: 177-184.
ZHANG J. & XIA B., 1987 — *Tsengiella*, a new genus of Delesseriaceae (Rhodophyta) from China. *Chinese journal of oceanology & limnology* 5: 124-133.