Recognition of the genetically distinct *Odonthalia comosa stat. nov.* (*Rhodomelaceae, Florideophyceae*) as a new species in the Northeast Pacific with notes on additional members of the *Odonthalia floccosa* complex

Gary W. Saunders[1] & Craig W. Schneider[2]

[1]*Centre for Environmental and Molecular Algal Research, Department of Biology, University ofNew Brunswick, Fredericton, New Brunswick, Canada E3B 5A3* (correspondence: gws@unb.ca)
[2]*Department of Biology, Trinity College, Hartford, Connecticut, 06106, USA*

The status of *Odonthalia floccosa* (Esper) Falkenberg *sensu lato* as a single species has been of late questioned in the literature (Gabrielson & Lindstrom 2018), and there has also been an issue in ongoing DNA barcode surveys of the NE Pacific flora by the Saunders lab. In generating COI-5P data for these surveys (Saunders 2005), it was noted that this marker was unexpectedly variable within this species and that there were morphological and biogeographical [British Columbia (BC) vs California (CA)] components to this variation that at times fell into what is called the "grey zone" (~1–2%) for species divergence with this marker (see Saunders 2008). Over the years of the ongoing surveys, COI-5P data were generated (Saunders & Moore 2013) for 77 specimens: 46 for *O. floccosa* (42 for BC, 4 for CA) and 31 for *O. floccosa* f. *comosa* Setchell & N.L.Gardner (29 for BC, 2 for CA) and as such, this marker clearly indicates that these two genetic entities represent distinct species (Table 1). Additional specimens were assigned to these genetic groups using *rbc*L or *rbc*L-3P (n = 20) the two forms differing at 26 bp across 1291 bp (2%). Furthermore, unexpectedly high COI-5P variation within *O. floccosa sensu stricto* between BC and CA prompted the generation of sequence data for the internal transcribed spacer region (ITS) of the nuclear ribosomal cistron following Saunders & Moore (2013). This marker was difficult to acquire in this species complex owing to variable mononucleotide runs, but extended ITS1+ITS2 sequences (alignment = 862 bp) were generated for eight specimens with the short, more conservative ITS1 (alignment = 280 bp) generated for 21 additional specimens (Table 1). All sequences generated for this study are available in the dataset DS-ODONCOM1 on the Barcode of Life Data Systems (BOLD), which also includes their GenBank accession numbers and collection details.

Table 1. Levels of within and between forma level variation for *Odonthalia floccosa* and *O. floccosa* f. *comosa* using COI-5P (only full-length sequences lacking ambiguities included in the calculations), partial ITS1+ITS2, partial ITS1 only. Nd indicates insufficient comparative data.

Group	**COI-5P**		**ITS long**		**ITS1 only**	
	Intra-specific	**Nearest neighbour**	**Intra-specific**	**Nearest neighbour**	**Intra-specific**	**Nearest neighbour**
O. floccosa BC	0–3 bp (0.5%), n=29	3–9 bp (0.5%) *O. floccosa* CA	Nd, n=1	15–16 bp (1.7%) *O. floccosa* CA	0 bp (0%), n=13	4 bp (1.4%) *O. floccosa* CA
O. floccosa CA	0–4 bp (0.6%), n=4	3–9 bp (0.5%) *O. floccosa* BC	1 bp (0.1%), n=2	15–16 bp (1.7%) *O. floccosa* BC	0 bp (0%), n=3	4 bp (1.4%) *O. floccosa* BC
O. floccosa f. *comosa* BC	0–2 bp (0.3%), n=23	5–9 bp (0.8%) *O. floccosa* f. *comosa* CA	0 bp (0%), n=4	4 bp (0.5%) *O. floccosa* f. *comosa* CA	0 bp (0%), n=11	1 bp (0.4%) *O. floccosa* f. *comosa* CA
O. floccosa f. *comosa* CA	3 bp (0.5%), n=2	5–9 bp (0.8%) *O. floccosa* f. *comosa* BC	Nd, n=1	4 bp (0.5%) *O. floccosa* f. *comosa* BC	0 bp (0%), n=2	1 bp (0.4%) *O. floccosa* f. *comosa* BC

O. floccosa (BC+CA)	0–9 bp (1.4%), n=33	28–36 (4.2%) *O. floccosa* f. *comosa*	1–16 bp (1.9%), n=3	19–21 bp (2.2%) *O. floccosa* f. *comosa*	0–4 bp (1.4%), n=16	2–5 bp (0.7%), *O. floccosa* f. *comosa*
O. floccosa f. *comosa* (BC+CA)	0–9 bp (1.4%), n=25	28–36 (4.2%) *O. floccosa*	0–4 bp (0.5%), n=5	19–21 bp (2.2%) *O. floccosa*	0–1 bp (0.4%), n=13	2–5 bp (0.7%), *O. floccosa*

The high COI-5P values within *Odonthalia floccosa sensu stricto* were largely due to specimen GWS021295 from CA, which allies closely to other specimens of *O. floccosa* from CA in ITS (one of the two long ITS reads for this group). In combination, these data may indicate that the BC and CA populations of *O. floccosa* are distinct species with low COI-5P variation between them indicating some past mitochondrial introgression and or incomplete lineage sorting. While the overall COI-5P variation (0.5%) between the BC and CA populations rests at the lower border of the grey zone for differentiating two species (Saunders 2008), the ITS data are high relative to levels of divergence observed in other sibling species complexes consistent with distinct species (*e.g.*, Saunders & Millar 2014). The BC and CA populations of *O. floccosa* f. *comosa* had similar levels of COI-5P variation as the previous species indicating possible past genetic isolation, and again one of the specimens from CA was the main contributor (GWS021939). However, in this case the ITS data are more similar indicting a collapse in past isolation between the BC and CA populations with the data more consistent with a single genetic species (Table 1). Therefore, the data indicate that *O. floccosa* in BC and CA may represent different species, whereas *O. floccosa* f. *comosa* is likely a single genetic entity. More critically for the present report, both markers (as well as *rbc*L) indicate that *O. floccosa* f. *comosa* is unequivocally distinct from both BC and CA populations of the nominate *O. floccosa* regardless of whether the latter is a single or two separate species and deserves recognition as a distinct species (Table 1).

Setchell & Gardner (1903: 334) described *Odonthalia floccosa* f. *comosa* as having a more luxuriant morphology than the nominate forma with more numerous slender branchlets lending a "compact, shaggy appearance to the whole plant". Although they provided an image, it is unclear as to the actual specimen upon which this drawing is based. As Setchell & Gardner (1903: 334) did not designate a type for *O. floccosa* f. *comosa* and merely listed multiple syntype specimens from Alaska, Washington State and California, we here designate a lectotype for this forma from their original material (ICN Art. 9.3) in conformity with ICN Art. 9.11 and Art. 9.12 (Turland & al. 2025).

Odonthalia comosa (Setchell & N.L.Gardner) G.W.Saunders & C.W.Schneider, *stat. nov.*
Basionym: *Odonthalia floccosa* f. *comosa* Setchell & N.L.Gardner 1903. *University of California Publications in Botany* 1: 334, pl. 27: fig. 50, 1903.
Registration (of name): http://phycobank.org/106597
Lectotype here designated (of *Odonthalia floccosa* f. *comosa*): **NY** 03355171, *N.L. Gardner* no. 96, July 1898 (Fig. 1).
Registration (of lectotype): http://phycobank.org/106601
Type locality: West coast of Whidbey I., Island County, Washington, USA.
Notes: Of all the many syntype specimens listed under Setchell & Gardner's (1903) *Odonthalia floccosa* f. *comosa*, only *N.L. Gardner* no. 96 specimens were located on the Macroalgal Herbarium Consortium Portal. They were originally distributed to various herbaria (**F**, **MICH**, **NY, WTU**) from **UC** as "*O. floccosa* f." where Gardner brought them to Setchell. These specimens demonstrate the characteristic densely branched axes of *O. comosa*. The lectotype in **NY** was originally deposited in **F** and later transferred to **NY** in 2015. Oddly, *N.L. Gardner* no. 29 specimens, as well as all the noted Setchell specimens listed under the forma (Setchell & Gardner 1903), are not shown on the portal. The description, as well as the lectotype assigned herein, is a good morphological match to

the genetic group that we assign to this name including a genetically verified specimen (*rbc*L-3P; GenBank PX892793) from near the lectotype locality (Fig. 2).

Numerous members of the Saunders lab have contributed to the collection of specimens used here and are sincerely thanked (collectors listed with each specimen in the online dataset DS_ODONCOM1). K. Cripps, G. Filloramo, B. Hermann, L. Le Gall, D. McDevit, and T. Moore, among others, are thanked for generating the sequence data used in this study. We are sincerely grateful to Michael Guiry and Michael Wynne for their helpful review of our manuscript. This research was supported by grants to GWS from the Natural Sciences and Engineering Research Council of Canada, the Canada Foundation for Innovation and the New Brunswick Innovation Foundation.

Gabrielson, P.W. & Lindstrom, S.C. (2018). *Keys to the seaweeds and seagrasses of southeast Alaska, British Columbia, Washington and Oregon*. Phycological Contribution 9: [i]–iv, 1–180.

Saunders, G.W. (2005). Applying DNA barcoding to red macroalgae: a preliminary appraisal holds promise for future applications. *Philosophical Transactions of the Royal Society B* 360: 1879–1888.

Saunders, G.W. (2008). A DNA barcode examination of the red algal family Dumontiaceae in Canadian waters reveals substantial cryptic species diversity. 1. The foliose *Dilsea-Neodilsea* complex and *Weeksia. Botany* 86: 773–789.

Saunders, G.W. & Millar, K.R. (2014). A DNA barcode survey of the red algal genus *Mazzaella* in British Columbia reveals overlooked diversity and new distributional records: descriptions of *M. dewreedei* sp. nov. and *M. macrocarpa* sp. nov. *Botany* 92(3): 179–186.

Saunders, G.W. & Moore, T.E. (2013). Refinements for the amplification and sequencing of red algal DNA barcode and RedToL phylogenetic markers: a summary of current primers, profiles and strategies. *Algae* 28: 31–43.

Setchell, W.A. & Gardner, N.L. (1903). Algae of northwestern America. *University of California Publications in Botany* 1: 165–419, pls. 17–27.

Turland, N.J., Wiersema, J.H., Barrie, F.R., Gandhi, K.N., Gravendyck, J., Greuter, W., Hawksworth, D.L., Herendeen, P.S., Klopper, R.R., Knapp, S., Kusber, W.-H., Li, D.-Z., May, T.W., Monro, A.M., Prado, J., Price, M.J., Smith, G.F. & Zamora Señoret, J.C., eds (2025). *International code of nomenclature for algae, fungi, and plants (Madrid Code).* Regnum Vegetabile, Vol. 162, pp. [i]–xlvii, 1–303. The University of Chicago Press, Chicago & London.

Figs 1, 2. *Odonthalia comosa* (Setchell & N.L.Gardner) G.W.Saunders & C.W.Schneider, *stat. nov*. **Fig. 1.** Lectotype of *O. floccosa* f. *comosa* Setchell & N.L.Gardner, *N.L. Gardner* no. 96, Whidbey I., Washington, USA, July 1898 [**NY** 03355171]. **Fig. 2.** Tetrasporophytic specimen from near the lectotype locality, *G.W. Saunders & C.W. Schneider*, Red Rock Beach (west), Rosario Beach, Fidalgo I., Washington, USA, 3 August 2024 [**UNB** GWS049480]. Scale bars = 5 cm.