

**Correcting an historical oversight: *Chondria atropurpurea* Harvey (*Rhodomelaceae*, *Rhodophyta*) is present in the northeastern North American flora**

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Samples were collected from an abundant population of *Chondria* (CWS 22-9-1, silica dried subsample EC094) in the tidal creek outflow of a salt marsh wetland behind Pleasure Beach in Waterford, Connecticut, and eastern Long Island Sound, USA (41.308925°, -72.147086°) on 2 July 2022 (Fig. 1). The tidal creek collection site is considered marine as the only freshwater input to this salt marsh is by aperiodic precipitation. An isolate from this southern New England population was quick-dried in silica gel, and its DNA extracted following Saunders & McDevit (2012). Polymerase chain reaction (PCR) amplification and sequencing of the chloroplast *rbcL*-3P gene were performed as detailed in Saunders & Moore (2013). After a BLAST search in GenBank (<https://blast.ncbi.nlm.nih.gov/Blast.cgi>), the Connecticut sequence (GenBank OP800352) was found to be a 100% match over 800 bp of the *rbcL*-3P gene with two Florida *C. atropurpurea* Harvey sequences (KF564782, MH388516), one from Pensacola near the syntype locality of Apalachicola on the Gulf of Mexico coast, the other from Biscayne Bay on the Atlantic coast. Prior to now, this species had never been reported as occurring in Connecticut (Schneider & al. 1979, Guiry & Guiry 2022), and remained a species not presently considered part of the macroalgal flora of the northeastern coast of North America, covering the region of United States cold-temperate waters north of Cape Hatteras, North Carolina, to Ellesmere Island in the high Canadian Arctic (Mathieson & Dawes 2017).

*Chondria atropurpurea* is characterized by a habit that is sub-pyramidal in outline, dark purplish-red pigmentation as the epithet implies (Littler & al. 2008: 78), with specimens often drying almost black on herbarium paper (Fig. 1). The axes are somewhat devoid of branches in lower portions, but above are beset with numerous intermixed short and long branches to several orders, alternately and irregularly arranged. The ultimate branches of *C. atropurpurea* are single or clustered in fascicles, linear fusiform in shape, narrow at the base, and gradually taper to acute apices (Harvey 1853: 22, pl. XVIII E; Schneider & Searles 1991: 438, fig. 510). The larger species of *Chondria* with acute and acuminate apices are notoriously difficult to distinguish morphologically, with many species sympatric with other members of the genus. In southern New England, *Chondria baileyana* (Montagne) Harvey and *C. capillaris* (Hudson) M.J.Wynne are somewhat similar in morphology to one another (see Farlow 1881, the latter as *C. tenuissima*), forming an intergrading complex, with only the most typical specimens being easily identified to species (Schneider 2002). These two species differ from *C. atropurpurea* by their overall habits, feature measurements, lack of fasciculate ultimate branches and lighter pigmentation. Interestingly, Harvey (1853: 19, pl. XVIII G) illustrated fasciculate ultimate fusiform branches for *C. sedifolia* Harvey, similar to the branching we have seen in the Connecticut population of *C. atropurpurea*, but this is a species with club-shaped ultimate branches (Harvey 1853, Taylor 1957). Some workers have considered *C. sedifolia* as conspecific with *C. dasyphylla* (Woodward) C.Agardh (Farlow 1881: 166, as *Chondriopsis dasyphylla* var. *sedifolia* (Harvey) J.Agardh; Schneider & Searles 1991: 446; Schneider 2002: 116). Specimens of *C. sedifolia* from the type locality (Key West, Florida) need to be sequenced to further sort out this taxonomic complex in our area.

*Chondria atropurpurea* is presently known as a warm temperate to tropical species from Bermuda and North Carolina to Brazil in the western Atlantic with syntype localities of Charleston, South Carolina, and the Apalachicola, Florida peninsula (Harvey 1853: 22, pl. XVIII E). Although Schneider (2002) made no mention of *C. atropurpurea* in the macroalgal key to *Chondria* species covering the northeastern coast of North America, as was also the case for Mathieson & Dawes (2017) in the most recent flora of the region, earlier workers had discussed it in their floras. This species was reported by Farlow (1881: 167, as *Chondriopsis atropurpurea* var. *fasciculata* Farlow) from New York in his flora of New England its adjacent coast to the south, but he was uncertain about his identification saying his new variety could perhaps be representative of *Chondriopsis nidifica* (Harvey) J. Agardh (= *Neochondria nidifica* (Harvey) S. Sutti, T. Abe, K. A. Miller & K. Kogame). When Taylor (1957) completed his flora of northeastern North America, he stated in a footnote under *C. tenuissima* (Goodenough & Woodward) C. Agardh [= *C. capillaris* (Hudson) M. J. Wynne] that “Early reports of ... *C. atropurpurea* ... are doubtful, although a specimen ascribed to [it] ... derived from NY does seem correctly identified, whatever its origin.”

Of interest, two 19<sup>th</sup> century specimens of *Chondria atropurpurea* (Figs 2, 3) collected in New York City (NYC) were discovered on the Macroalgal Herbarium Consortium Portal (<https://macroalgae.org/portal/index.php>) and are mounted alongside each other on the same Farlow Herbarium (Harvard University) sheet [FH 00788583, FH 00788584]. Both are cystocarpic specimens from Ft. Hamilton (Brooklyn), and one collected on 30 June 1864 is likely a specimen Farlow had in hand when reporting this species in his 1881 flora. When Farlow (1873) earlier reported a list of the marine algal species from southern New England, *C. atropurpurea* was not included, so the above-mentioned specimens could possibly have been the first collections made in the Northwest Atlantic. The two FH 1800s specimens are good morphological matches to our recent collections made in Waterford, Connecticut, including the fasciculate ultimate branches, overall habit and dark pigmentation (Figs 1–3). Although unreported in the literature, three specimens from 1964–1973 in the University of North Carolina Herbarium (NCU), originally identified as *C. tenuissima* (= *C. capillaris*) from Woods Hole on southern Cape Cod, and Martha’s Vineyard, Massachusetts, found on the Macroalgal Herbarium Consortium Portal [NCU-A-0006158, NCU-A-0006175, NCU-A-0006206] appear to have been correctly annotated by Max H. Hommersand in 2013 as *C. atropurpurea*. Of note, one hundred years ago, when Bradley M. Davis (1913) compiled his catalogue of marine algae from Woods Hole, he did not include *C. atropurpurea* among the *Chondria* species in the area.

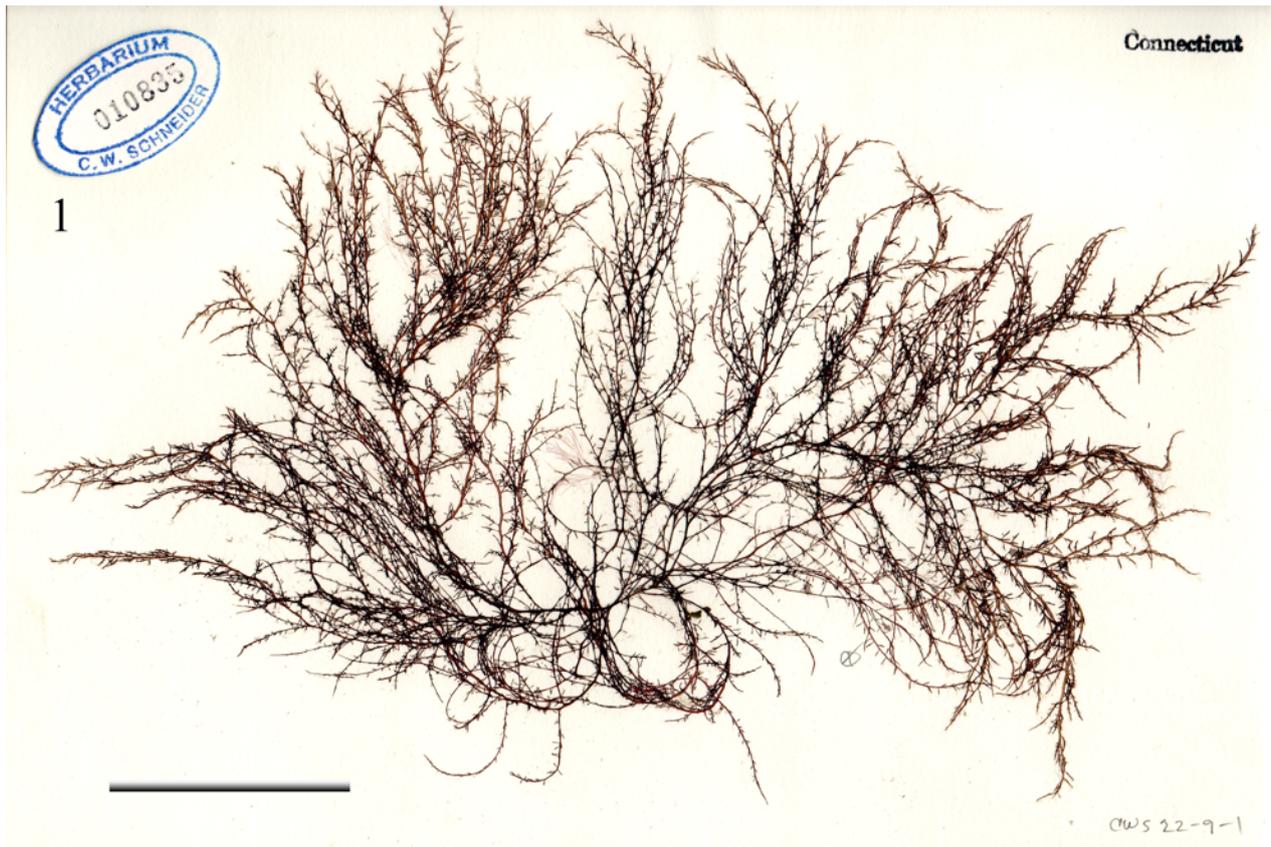
It appears to be likely that *Chondria atropurpurea* has been a present, yet overlooked, species in northeastern North America since its first report by Farlow over 140 years ago. At this stage, the genetic match of the Connecticut isolate with two Florida *C. atropurpurea* sequences in GenBank, one from near a syntype locality, solidifies this species’ presence in the marine macroalgal flora and corroborates the identification made by Farlow (1881). The present established range of *C. atropurpurea* in New England and adjacent areas appears to be from NYC to the southern coast of Cape Cod, Massachusetts, the usual barrier to many warm water species residing during the summer months in this region (Setchell 1922, Griffith & al. 2017). Certainly, populations between the known ranges of southern New England/New York and North Carolina/Bermuda to Brazil would appear to be possible during the warmer water months in the North Atlantic. As surface water temperatures continue to warm in cold water latitudes in the western Atlantic, poleward movement of species will continue slowly, perhaps allowing for *C. atropurpurea* to push north of Cape Cod.

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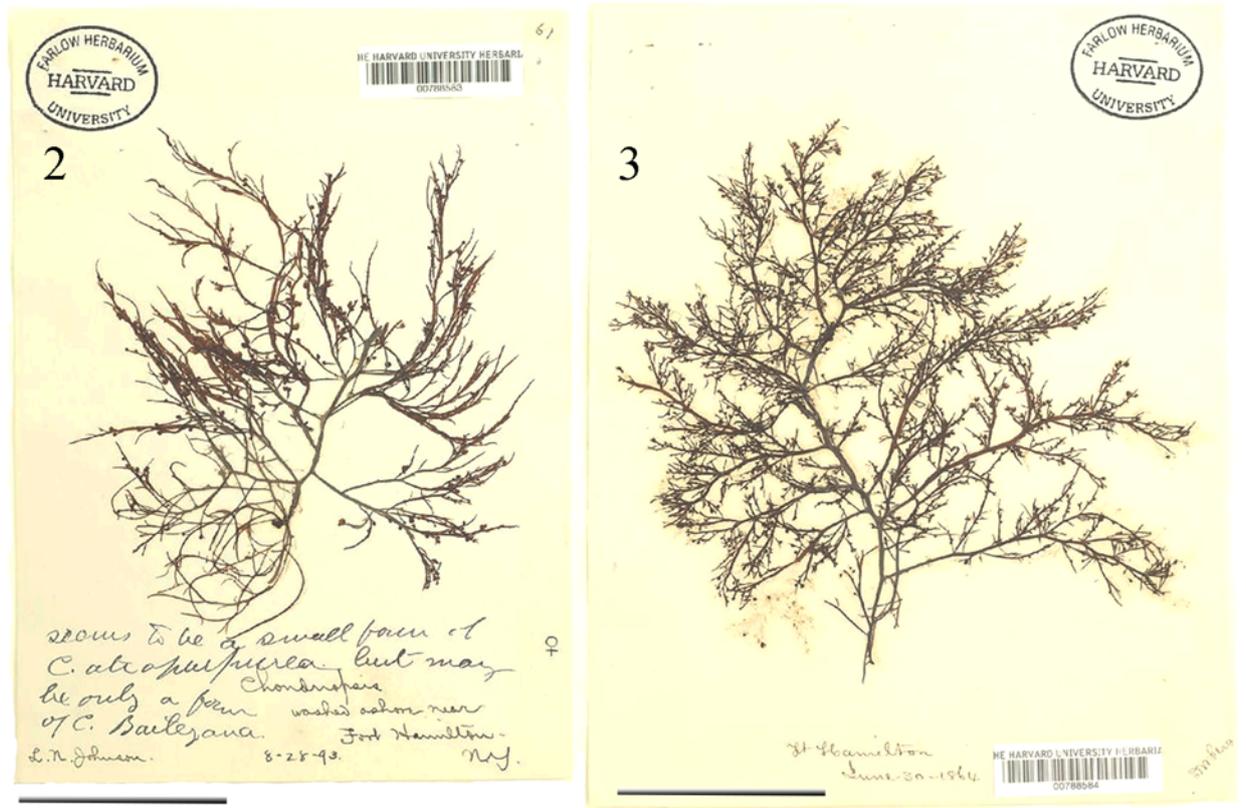


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**Fig. 1.** *Chondria atropurpurea* Harvey. Tetrasporangial sample from an abundant recent Connecticut, USA, collection, coll. *C.W. Schneider* 22-9-1, tidal creek outflow of salt marsh wetland behind Pleasure Beach, Waterford, 2 July 2022 [Herb. C.W. Schneider 010835]. Scale bar = 5 cm.



**Figs 2, 3. *Chondria atropurpurea* Harvey.** Nineteenth-century specimens from Ft. Hamilton, New York. **Fig. 2.** Cystocarpic specimen, coll. L.N. Johnson, 28 Aug. 1893 [FH 00788583]. **Fig. 3.** Cystocarpic specimen, coll. 30 June 1864 [FH 00788584]. Scale bars = 5 cm.