

FIRST RECORD OF FEMALE GAMETOPHYTES OF *BONNEMAISONIA HAMIFERA* HARIOT (RHODOPHYTA, NEMALIALES) IN NOVA SCOTIA*

The occurrence of female gametophytes of *Bonnemaisonia hamifera* on the coast of Nova Scotia is reported for the first time. Plants with abundant carpogonia and rudimentary pericarps but with no development of carposporangia were located at 4.5 m below mean sea level off Bon Portage Island, Shelburne County on 4 August 1977 (NRCC 6842), and in the drift at Lawrencetown Beach, Halifax County on 7-21 October 1978 (NRCC 8416, 8417, 8419). Hitherto, all collections of reproductively mature *B. hamifera* gametophytes from the Maritime Provinces had been male (Chen et al. 1969; in herb. NRCC), and this observation was reinforced in culture studies wherein germination of tetraspores from "*Trailliella*" populations in this area yielded only male plants (Chen et al. 1969). Pericarps in the Nova Scotian collections were small, reaching only 450-610 x 380-475 μm , as opposed to the normal diameter of 2 mm (Dixon & Irvine 1977), but otherwise were structurally normal (Kylin 1956). The Lawrencetown collection is also noteworthy for the large quantity of material adrift in good condition in the shallows, as previous collections of gametophytes suggested this phase to be very meagre in our waters.

Since the discovery of *B. hamifera* in Europe near the end of the nineteenth century (Batters 1896; Buffham 1896), the life history of this alga in the North Atlantic has been problematical. Various anomalies in the observed distribution and fertility of both the tetrasporangial and gametangial phases (e.g., Kornmann & Sahling 1962; 1977) have led to the suggestion that propagation and dispersal are primarily by vegetative means instead of by the normal sequence of generations (Chemin 1929; Dixon & Irvine 1977). Additionally, developmental peculiarities in culture (Chen et al. 1969; 1970; Kornmann & Sahling 1962) suggest parasexuality in this species, and it has been speculated that sex may not be determined genetically (Bichard-Bréaud & Floc'h 1966). The absence of carposporophytes in the Nova Scotian material is consistent with reports of infertile pericarps in Massachusetts (Taylor 1957), where male plants of *B. hamifera* have not yet been reported. Given the previous incidence of males in Nova Scotian waters, however, it is interesting that fertilization was not effected in the present instances.

Simon-Bichard-Bréaud (1970) contends, on the basis of a study of herbarium specimens, that a normal sequence of gametangial, carposporangial and tetrasporangial phases in fact does occur on both sides of the North Atlantic, and that plants with sterile pericarps are merely females that continue to issue carpogonia after the disappearance of spermatangial branches. Although this view has not been universally accepted (e.g., Dixon & Irvine 1977), it should be pointed out that fertile males have been observed in Nova Scotia only in February (Chen et al. 1969; in herb. NRCC), and the females under consideration here were collected after the major incidence of fertile cystocarps, May to July, reported by Simon-Bichard-Bréaud for North Atlantic material [but see Hehre and Mathieson (1970) for records of only infertile gametophytes in April, June and July in New Hampshire]. Thus, it is conceivable that fertile male plants were extremely rare during 1977-1978, or at least isolated geographically or temporally from the females in question. The complete absence of larger, functional cystocarps emptied of carpospores, on the lower portions of the plants (c.f. Kornmann & Sahling 1961, in Helgoland) indicates that

production of carpogonia occurred entirely in the absence of spermatia. Moreover, the Lawrencetown collection, though large, was wholly female and may well have been fragments of a large clone rather than a number of individuals from a disproportionately female community. Unfortunately, the collections were preserved in formalin before their female nature was recognized, and efforts to locate similar plants for study in culture have been limited and unsuccessful.

References

- Batters, E.A.L.** 1896. Some new British marine algae. *J. Bot. (Lond.)* 34: 6-11.
- Bichard-Bréaud, J. and Floch, J.-Y.** 1966. Présence des gamétophytes mâles de *Bonnemaisonia hamifera* Hariot (Floridée, Bonnemaisoniacée) sur la côte atlantique française. *C.R. Hebd. Séances Acad. Sci., Ser. D, Sci. Nat.* 262: 1949-1951.
- Buffham, T.H.** 1896. On *Bonnemaisonia hamifera*, Hariot, in Cornwall. *J. Quekett Microsc. Club, ser. 2, 6*: 177-182.
- Chemin, E.** 1919. *L'Asparagopsis hamifera* (Hariot) Okamura et son mode de multiplication. *Rev. Algol.* 4: 29-42.
- Chen, L. C.-M., Edelstein, T., and McLachlan, J.** 1969. *Bonnemaisonia hamifera* Hariot in nature and in culture. *J. Phycol.* 5: 211-220.
- Dixon, P.S. and Irvine, L.M.** 1977. *Seaweeds of the British Isles. I. Rhodophyta. Part 1. Introduction, Nemaliales, Gigartinales.* British Museum (Natural History), London.
- Hehre, E.J. and Mathieson, A.C.** 1970. Investigations of New England marine algae. III. Composition, seasonal occurrence and reproductive periodicity of the marine Rhodophyceae in New Hampshire. *Rhodora* 72: 194-239.
- Kornmann, P. and Sahling, P.-H.** 1962. Geschlechtspflanzen von *Bonnemaisonia hamifera* Hariot bei Helgoland. *Helgol. Wiss. Meeresunters.* 8: 298-301.
- Kornmann, P. and Sahling, P.-H.** 1977. Meeresalgen von Helgoland. *Helgol. Wiss. Meeresunters.* 29: 1-289.
- Kylin, H.** 1956. *Die Gattungen der Rhodophyceen.* C.W.K. Gleerups Forlag, Lund.
- Simon-Bichard-Bréaud, J.** 1970. Les preuves anciennes de l'existence de la reproduction sexuée de *Bonnemaisonia hamifera* Hariot (Bonnemaisoniacée) en Atlantique; leurs conséquences sur l'interprétation du cycle de cette Rhodophycée. *C.R. Hebd. Séances Acad. Sci., Ser. D, Sci. Nat.* 271: 1268-1271.
- Taylor, W.R.** 1957. *Marine Algae of the Northeastern Coast of North America* (2nd ed.). Univ. Michigan Press, Ann Arbor.