

Illustrated catalogue of types of species historically assigned to *Lessonia* (Laminariales, Phaeophyceae) preserved at PC, including a taxonomic study of three South-American species with a description of *L. searlesiana* sp. nov. and a new lectotypification of *L. flavicans*

Aldo ASENSI & Bruno de REVIERS*

Muséum national d'histoire naturelle, Département Systématique et évolution (UMR 7138 Systématique, adaptation, évolution, UPMC, MNHN, CNRS, IRD, ENS), Case Postale n° 39, Bâtiment de Cryptogamie, 57, rue Cuvier 75231 Paris cedex 05, France

(Received 3 November 2008, accepted 7 July 2009)

Abstract — Specimens of *Lessonia* from Fuegia and types housed at PC, as well as specimens from Kerguelen Islands were examined with special reference to anatomical features. When separating *L. flavicans* from *L. vadosa* (Searles, 1978), the name *L. flavicans* had been assigned to a deep water species without cortical lacunae because the lacunae present in Bory de Saint-Vincent's type material had been overlooked. Actually, lacunae of the cortex are present in type material of both *L. flavicans* Bory de Saint-Vincent in Dumont d'Urville and *L. vadosa* Searles. On this basis and considering the other morphological features as well, Bory's type material corresponds actually to the species currently named *L. vadosa* and not to the one named *L. flavicans*. *L. vadosa* becomes thus a taxonomic synonym of *L. flavicans* and *L. flavicans* sensu Searles (1978) has no name anymore; the new species *L. searlesiana* is thus proposed for it and a holotype is designated among Searles' original material. Furthermore, the specimen previously designated as the lectotype of *L. flavicans* among the material collected during the Coquille expedition was actually not eligible as possible syntype and a new lectotype is therefore designated here. Type material of taxa historically assigned to the genus *Lessonia* and preserved at PC is illustrated.

brown algae / kelp / *Lessonia flavicans* / *Lessonia fuscescens* / *Lessonia searlesiana* nov. sp. / *Lessonia vadosa* / *Lessonia* / lectotype

Résumé — Catalogue illustré des types conservés à PC des espèces historiquement placées dans le genre *Lessonia* (Laminariales, Phaeophyceae), incluant une étude systématique de trois espèces sud-américaines avec une description de *L. searlesiana* et une nouvelle lectotypification de *L. flavicans*. Des spécimens argentins du genre *Lessonia* provenant de Terre de Feu et les types de ce genre conservés à PC, ainsi que des spécimens provenant des îles Kerguelen ont été examinés, en particulier au plan anatomique. Lors de la distinction entre les deux espèces *L. flavicans* et *L. vadosa* (Searles, 1978), le nom *L. flavicans* avait été attribué à une espèce dépourvue de lacunes corticales et vivant en eau profonde car les lacunes présentes dans le

* Correspondence and reprints: reviers@mnhn.fr; Both authors contributed equally to this work.
Communicating editor: Frederik Leliaert

matériel type de Bory de Saint-Vincent étaient passées inaperçues. Or, des lacunes corticales existent aussi bien dans le matériel type de *L. flavicans* Bory de Saint-Vincent in d'Urville que dans celui de *L. vadosa* Searles. Par cette caractéristique comme par les autres, le matériel type de Bory correspond en fait à l'espèce actuellement nommée *L. vadosa* et non à l'espèce nommée *L. flavicans*. *L. vadosa* devient donc un synonyme taxinomique de *L. flavicans* et *L. flavicans* sensu Searles (1978) n'a donc plus de nom; en conséquence, l'espèce nouvelle *L. searlesiana* est proposée pour ce taxon et un spécimen holotype est désigné parmi les spécimens de Searles. En outre, le spécimen qui avait été désigné comme le lectotype de *L. flavicans* parmi le matériel rapporté du voyage de la Coquille ne pouvait en fait pas être éligible au statut de syntype; un nouveau lectotype a donc été désigné dans cet article. Le matériel type des espèces historiquement placées dans le genre *Lessonia* et conservé à PC est illustré.

algues brunes / Laminariales / *Lessonia flavicans* / *Lessonia fuscescens* / *Lessonia searlesiana* sp. nov. / *Lessonia vadosa* / *Lessonia* / lectotype

INTRODUCTION

Among the nine species currently recognized in *Lessonia* (Villouta & Santelices, 1986; Hay, 1987, 1989; Cho *et al.*, 2006; Table 1), four are commonly recognized in South America: *L. flavicans* Bory de Saint-Vincent in Dumont d'Urville, 1825 (= *L. fuscescens* Bory de Saint-Vincent, 1826, see the nomenclatural section below), *L. nigrescens* Bory de Saint-Vincent, 1826, *L. trabeculata* E. Villouta *et* B. Santelices, 1986, and *L. vadosa* Searles, 1978. Searles (1978) considered *L. berteroa* Montagne, 1842, *Laminaria scissa* Suhr, 1841, and *Chordaria spicata* Suhr, 1839, from Chile, as synonyms of *L. nigrescens*. Searles (1978, p. 375) described the new species *Lessonia vadosa*, which he differentiated from *L. flavicans* by its narrow blades, less wide blade base angle relative to the blade width, lacunate cortex (i.e. with spherical or

Table 1. Currently recognized species of *Lessonia* and binomials currently excluded from the genus (alphabetical order).

<i>Currently recognized species of Lessonia and synonyms</i>
<i>Lessonia adamsiae</i> C.H. Hay, 1987, p. 296, figs 1-14. Holotype: WELT A17070. Isotypes: WELT A17067, A17068, A17069, A17071, CHR 400418, NSW A3741, BM. Type locality and collector: "Collected by C. H. Hay with SCUBA at 8 m depth on 2 December, 1985, from the wall of Cod Cavern immediately north of Seal Point, on the main island of the Snares Islands, New Zealand (48°00.9'S; 166°36.6'E on NZMS 272/1)."
<i>Lessonia berteroa</i> Montagne, 1842, p. 250, n° 56. Holotype PC0062753. Note: Searles (1978) considered <i>L. berteroa</i> as synonym of <i>L. nigrescens</i> ; however the holotype of <i>L. berteroa</i> has narrow, acute strips contrasting with those of <i>L. nigrescens</i> (and this may possibly be the result of a different mode of growth), a cortex filamentous with clusters of ramified filaments (rather than a homogeneous cortex in <i>L. nigrescens</i>), elongated epidermal cells, and a more northern distribution. Further investigations on fresh material are therefore needed to assess whether or not <i>L. berteroa</i> and <i>L. nigrescens</i> are different taxa. Type locality and collector: "Hab. Ad Coquimbo in Chile à Bertero <i>et</i> cel. [celebrissime] Gaudichaud lecta." Note: Carlo Giuseppe Bertero (1799-1831) is likely the collector and would have had the specimen to Gaudichaud-Beaupré.
<i>Lessonia binderi</i> Sonder: considered synonym of <i>L. nigrescens</i> : see this entry, below.

Table 1. Currently recognized species of *Lessonia* and binomials currently excluded from the genus (alphabetical order).

Lessonia brevifolia J. Agardh, 1894, p. 88. Note: Papenfuss (1964, p. 21) wrote "It is not unlikely that this species is the same as *Lessonia variegata* J. Agardh [1877, p. 6]"; these two species both occur in Auckland Islands. Type locality and collector: "Hab. Ad insulas Auckland a Capt. Fairchild lecta; specimina a Ferd. v. Müller mihi missa."

Lessonia corrugata Lucas, 1931, p. 410. Type locality: "I obtain the plant by dredging in 4-5 fathoms in Port Arthur, and gathered younger ones in deep rock pools at Southport. It probably occurs at all round the South Coast of Tasmania."

Lessonia flavicans Bory de Saint-Vincent in Dumont d'Urville, 1825, p. 23 (Synonyms *vide* Searles, 1978: *L. frutescens* Skottsberg 1907, p. 78, pl. 8; *L. fuscescens* Bory, 1826, p. 322; *L. ovata* J.D. Hooker et Harvey in J.D.Hooker 1847a, p.153, and 1847b, p. 459, pls 167; 168; fig. B; 171: fig. C). [Note: Skottsberg (1921, pp. 48-49) suspects that *Lessonia frutescens* might be only a local form of *L. nigrescens*, not of *L. flavicans*]. Collector: Dumont d'Urville; type locality: Falklands ["(...) sur les côtes de l'île aux Pingouins (...)]. Considered here synonym of *L. vadosa* Searles.

L. frutescens Skottsberg, considered synonym of *L. flavicans*, see this entry. Syntype localities and collectors: A complete specimen from Port Stanley collected by S. Birger and fragments from a few ones gathered from Berkeleysound by Skottsberg himself ["Zu meiner Verfügung standen ein ganzes Individuum, das an einem von S. BIRGER in Port Stanley gesammelten Exemplar von *Macrocystis* mitkam, sowie Stückchen eines exemplars aus dem Berkeleysound, das ich selbst gesammelt hatte; doch konnte ich von letzterem keine brauchbaren Masse erhalten."]

L. fuscescens Bory de Saint-Vincent, considered synonym of *L. flavicans*, see this entry. Collectors: Lesson and Dumont d'Urville, and syntype localities: Concepción, Chile and Falklands ["Cette espèce nous fut d'abord communiquée par Lesson qui l'avait recueillie à la Conception du Chili et par Durville qui l'a rapportée des îles Malouines, où elle croît en grande quantité à quelques distance du rivage."]

Lessonia nigrescens Bory de Saint-Vincent, 1826, p. 322 (Synonyms [*vide* Searles, 1978]: *L. nigrescens* f. *montagnei* Skottsberg, 1921, p. 48; *L. suhrrii* J. Agardh, 1841, p. 4, *nom. illeg.* (the comb. nov. *Lessonia scissa* should have been made) typified by *Laminaria scissa* Suhr, 1841, p. 7 (279), pl. I, fig. 2, type locality: "Valparaiso"; *Chordaria spicata* Suhr, 1839, p. 47, f. 41, type locality: Valparaiso "Valparaise", collector: Lucas). Note: Kützing, 1849, p. 582, indicates a further synonym: "*L. binderi* Sonder [without any reference], in oceano australi": *Nomen herbariorum?*, likely invalid. At last, as already pointed out by Silva et al. (1996), *Lessonia nigrescens* Hohenacker, 1854 [1852-1862]: no. 162 is a misapplied name for *Ecklonia maxima* (Osbeck) Papenfuss; these specimens have a hollow stipe which makes them easily distinguishable from any *Lessonia*. Type locality: Cape Horn ["Elle est originaire du cap Horn, et nous fut communiquée en 1824 par notre collaborateur Lamouroux et par Chauvin, zélé botaniste de Caen, qui la nommait *Laminaria ramosissima*."]

Lessonia ovata: see the entry *L. flavicans*. Type locality: "HAB. Hermite Island, Cape Horn, and the Falkland Islands; very abundant."

Lessonia suhrrii J. Agardh *nom. illeg.*, considered synonym of *L. nigrescens*, see this entry.

Lessonia tholiformis C.H. Hay, 1989, pp. 462, 464, figs 1-9. Holotype: WELT A18257 A-G. Isotypes: WELT A18258 A-E, A18259 A-C, A18260 A-B, CHR 401349 A-I, 401350, 401351, NSW A3742, BM. Type locality and collector: "Collected by C. H. Hay with SCUBA from 3.5 m depth on 7 November 1986 from the southern end of Hanson Bay, 1 km west of Manukau Point near Owenga, Chatham Island (44°01.9'S; 176°20.2'W)."

Table 1. Currently recognized species of *Lessonia* and binomials currently excluded from the genus (alphabetical order).

<p><i>Lessonia trabeculata</i> E. Villouta et B. Santelices, 1986, p. 82, figs 1-5, 6 (<i>pro parte</i>). Holotype: "Adult sporophyte collected by Mr Julio Vásquez in April 1982 at 7 m depth in La Herradura de Guayacán, Coquimbo (29°58'S; 71°22'W) in Central Chile and deposited at the type collection of the Museo Nacional de Historia Natural in Santiago de Chile (MNHN SGO 102908)". Isotype: "At the collection of the Sala de Sistemática of the Pontificia Universidad Católica de Chile (SS/UC 5735-10)".</p> <p><i>Lessonia vadosa</i> Searles, 1978, pp. 375-379, figs 9, 11 (Synonym: <i>L. nigrescens</i> f. <i>lacunifera</i> Skottsberg, 1921, p. 48). Holotype: US "No. 73-3-1c, Punta Conway, Isla de los Estados, 54° 43.8' S, 64° 13.9' W, exposed, depth 15-30 ft, May 1973. Leg. Searles, Leister, Brauner." Isotypes: BM, DUKE, PC, UC. Considered here synonym of <i>Lessonia flavicans</i> Bory de Saint-Vincent in Dumont d'Urville.</p> <p><i>Lessonia variegata</i> J. Agardh ex Laing, 1894, pp. 304-310, pls XXXIX, XL. <i>Lessonia variegata</i> J. Agardh, 1877, p. 6 is invalid (<i>nomen nudum</i>) but was validated by Laing (1894), (see also <i>L. brevifolia</i>). Syntype localities and collectors: "New Zealand: Colenso; Lyalls Bay, Cooks str.: Lyall;" Lyalls bay, Hokianga: Berggren.</p>
<p>Binomials currently excluded from the genus <i>Lessonia</i></p>
<p><i>Lessonia ciliata</i> Postels & Ruprecht 1840, p. 9, pl. XXXVIII: fig. g. Dubious species, loosely resembling <i>Macrocystis pyrifer</i> without pneumatocysts, which requires further investigations. Type locality: "Ad insulam Sitcha." Collector: "Unicum tantum Tab. cit. repraesentatum specimen a D. Kastalsky lectum fuit."</p> <p><i>Lessonia dubia</i> Gain, 1912, p. 48, fig. 50; current name <i>Ascoseira mirabilis</i> Skottsberg, 1907, p. 149, figs 178-187; pl. 36. Type locality and collector: Deception island, Antarctica, collected by Gain himself ["Nous avons trouvé le <i>Lessonia dubia</i> en décembre 1909, rejeté à la côte sur une plage rocheuse de l'île Déception, en regard du détroit de Bransfield."]</p> <p><i>Lessonia fuscescens</i> var. <i>linearis</i> Reinsch, 1890: 416; current name <i>Ascoseira mirabilis</i> Skottsberg, 1907, p. 149, figs 178-187; pl. 36. Type locality: South Georgia ["Klippen nächst der Station (Südseite der Landzunge) Januar 1883" und "Strand unterhalb der Station, durch Sturm ausgeworfen Mai 1883".]</p> <p><i>Lessonia grandifolia</i> A. Gepp & E.S. Gepp, 1905, p. 105, pl. 470: fig. 6 = <i>Phyllogigas grandifolius</i> (A. et E.S. Gepp) Skottsberg, 1907, p. 63, figs 73-80; pl. 6. Current name: <i>Himantothallus grandifolius</i> (A. Gepp & E.S. Gepp) Zinova, 1959, p. 48; pl. 34. Type locality: in their 1905 paper, Gepp & Gepp described <i>L. grandifolia</i> from specimens belonging two different collections. In their 1906 paper they realized that these collections actually corresponded to two different taxonomic entities and created <i>Lessonia simulans</i> for the second one (see the corresponding entry below). Therefore, only part of the 1905 paper (p. 106) is relevant: "[...] Also from Cape Adare and Coulman Island, Brit. Antarct. Exped." This is precised in 1906 (p. 425): "[...] in the Antarctic region: (1) complete plants of enormous size from Cape Adare and Coulman Island, collected by members of the staff of the 'Discovery' [...] the type of <i>L. grandifolia</i> is the 'Discovery' plant."</p> <p><i>Lessonia laminariaeformis</i> see the entry '<i>L. laminarioides</i>', below.</p> <p><i>Lessonia laminarioides</i> ('<i>laminariaeoides</i>') Postels et Ruprecht, 1840, p. 9, pl. XXXVIII: fig. e (= <i>L. laminariaeformis</i>' Ruprecht 1850, p. 157). Type locality and type specimen: "In mare Ochotensi [Okhotshean Sea, Northwestern Pacific Ocean, between Sakhaline Island (West), Kurile Islands (South East), and the Kamchatka Peninsula (East)] secundum specimen in Herb. Acad. Sc. Petrop." [Saint Petersburg, HERTZ]. The new genus <i>Pseudolessonia</i> was created by Cho <i>et al.</i> (2006) for this species which is no thus longer included in <i>Lessonia</i>.</p>

Table 1. Currently recognized species of *Lessonia* and binomials currently excluded from the genus (alphabetical order).

Lessonia littoralis [Farlow *et* Setchell *ex*] Tilden, 1900, p. 342; current name *Lessoniopsis littoralis* (Tilden) Reinke, 1903, pp. 25-28, fig. 8. Type locality: “Baird point, Strait of Juan de Fuca, Vancouver island, British Columbia.”

Lessonia quercifolia Bory de Saint-Vincent, 1826, p. 322 is the basionym of the alga currently named *Myriodesma quercifolium* (Bory de Saint-Vincent) J. Agardh 1848, p. 192. Collector: Lesueur [“Elle nous fut communiquée anciennement par Lesueur qui la rapporta de son voyage aux terres Australes” (Bory, 1826, p. 322); type locality: Southern Australia [“Nous la croyons de Nouvelle-Hollande [Southern Australia]; du moins Chauvin nous en a-t-il en 1825 communiqué un échantillon donné comme venant de ce pays.”

Lessonia repens Ruprecht, 1850, p. 159 (351) = *Laminaria repens* Ruprecht, 1850, p. 158 (350)-159 (351), both names being proposed by Ruprecht as possible alternatives. This species is dubious and requires further investigation. Type locality : “Ochtoskichen Meer” [Okhotsk Sea].

Lessonia simulans A. *et* E.S.Gepp, 1906, pp. 425-426 = *Phyllogigas grandifolius* (A. *et* E.S.Gepp) Skottsberg, 1907, p. 63, figs 73-80; pl. 6. Current name: *Himantothallus grandifolius* (A. Gepp *et* E.S. Gepp) Zinova, 1959, p. 48; pl. 34. Type locality and collector: “[...] specimen from the South Orkneys, collected by Mr. Rudmore Brown of the ‘Scotia.’ [p. 425] / Hab. South Orkneys, Scotia Bay, near surface, Apr. 1904, R.N. Rudmose Brown. [p. 426]”

Lessonia sinclairi Harvey *ex* J.D. Hooker *et* Harvey 1847a, p. 154 and 1847b, p. 460 = *Laminaria sinclairii* (Harvey *ex* J.D. Hooker *et* Harvey) Farlow, Anderson & Eaton, 1878: no. 118 *vide* Abbott & Hollenberg, 1976, p. 231. Type locality: “[...] from California [...]”.

elliptical cavities) and a shallow, subtidal habitat. Both *L. vadosa* and *L. flavicans* are furthermore distinguished from *L. nigrescens* by having basal ramified haptera rather than a solid, massive base, one primary stipe rather than several and a deeper habitat.

We examined specimens of *Lessonia* from Argentina (Fuegia) and Kerguelen Islands (southern Indian Ocean), and re-examined herbarium specimens, including types, preserved in the Cryptogamic Herbarium of the *Muséum national d'histoire naturelle* (PC), Caen (CN) and Duke algal herbarium (ABSM), most of them already studied by Searles (1978). When doing this study, we also discovered that the specimen of *L. flavicans* previously designated as the lectotype by Searles (1978) actually cannot be considered syntype material and therefore could not be designated as lectotype.

The aims of the present paper are 1) to re-examine presence versus absence of lacunae, an anatomical features diagnostic of *L. vadosa* and *L. flavicans* in order to clarify the taxonomy of these two species with respect to Bory's type material; 2) to designate a new lectotype for *L. flavicans*; and 3) to provide an illustrated checklist of *Lessonia* type material preserved at PC.

MATERIALS AND METHODS

Herbarium abbreviations follow the on-line *Index Herbariorum* (<http://sciweb.nybg.org/science2/IndexHerbariorum.asp>). At PC, numerous specimens were first numbered with a code including two letters and an incremented

sequence of numerals corresponding to the order in which the specimens were preserved at the time; then it was decided to add a label composed of a barcode associated to a unique randomized PC number (PC plus a unique random number). The specimens already computerized in the PC database bears the PC number and generally the old number; other specimens bear only the ancient number. The old number appears on the herbarium specimens illustrated in this article but only the PC number should be quoted for specimens preserved in PC.

Plates of the present paper are referred by “Fig.” with a capitalized F, whereas figures from other studies are referred to by “fig.” without any capitalized letter.

Herbarium specimens PC0062744 (previously designated as lectotype of *L. flavicans*), PC0062750 (designated here as new lectotype of *L. flavicans*), PC0062749 (isolectotype of *L. flavicans*), PC0062748 (*L. flavicans*), PC0062752 (isolectotype of *L. nigrescens*), and PC0062746 (isotype of *L. vadosa*) were studied anatomically through sectioning. Further unnumbered specimens from Fuegia and Kerguelen Islands were also examined, as well as a fragment of a specimen of *L. flavicans* sensu Searles (1978), collected in scuba by Andres Mansilla (May 2005, Fuerte Bulnes, Chile) and specimens from the Duke Algal Herbarium 16 175, 16 176, 16 183.

Fragments of herbarium specimens for sectioning were rehydrated in a 5% formalin/seawater solution and embedded in paraffin wax after dehydration in ethanol and toluene. Sections for light microscopic examination were cut at a thickness of 5 and 10 μm and stained with toluene blue and fast green. Permanent slides were studied and photographed using a Nikon type D70 digital camera mounted on a Nikon type Eclipse 600 light microscope. After standardization with a micrometer, measures and scales were done on drawings made with a camera lucida.

RESULTS

Nomenclature of *Lessonia flavicans* and designation of a new lectotype

The name “*L. flavicans*” first appeared in the separate (‘book form’) of the *Flore des îles Malouines* by Dumont d’Urville (1825). It appeared p. (584) and p. (589) in the narrative part written by Dumont d’Urville, then p. (594) in the section *Cryptogamia* written by Bory de Saint-Vincent in Dumont d’Urville. This name was accompanied by a first description [p. (589)], in French, by Dumont d’Urville who clearly gratifies Bory de Saint-Vincent for the name so that, as already pointed out by Searles (1978, p. 368), Dumont d’Urville cannot be considered an author of this taxon. Dumont d’Urville’s description is succinct and carries unlikelinesses as to the length “8 à 10 mètres” and the thickness of the stipe “de l’épaisseur de la cuisse”. A locality is indicated by Dumont d’Urville: “[...] les côtes de l’île aux Pingouins”. By contrast, no collecting locality was indicated in the short Latin diagnosis supplied by Bory de Saint-Vincent p. (594) and one has to refer to the place indicated by Dumont d’Urville p. (589) which is the only locality published in this study. This 1825 publication is the first description of the genus *Lessonia* in the literature, with *L. flavicans* as the sole species, and it is validly published. The protologue of *L. flavicans* appears based only on the specimens collected by Dumont d’Urville in “l’île aux Pingouins”.

In his *Dictionnaire classique d'Histoire naturelle* (Vol. 9, I-O; 1826), Bory de Saint-Vincent provided, pp. 321-322, a description of the genus *Lessonia* with three species: *L. fuscescens*, *L. nigrescens* and *L. quercifolia* [currently *Myriodesma quercifolium* (Bory de Saint-Vincent) J. Agardh]; it seems very unlikely that he had another concept (monotypic) of the genus when he wrote the section *Cryptogamia* of 1825. Furthermore, Bory, p. 322, stated: "Nous en possédons trois espèces dont aucun auteur n'avait encore parlé"; when he writes these words, he thus believes that his dictionary will appear before Dumont d'Urville's *Flore des îles Malouines*. In the entry "*L. fuscescens*", he told "Cette espèce nous fut d'abord communiquée par Lesson qui l'avait recueillie à la Conception du Chili et par Durville qui l'a rapportée des îles Malouines, où elle croît en grande quantité à quelques distance du rivage." The protologue of *L. fuscescens* was therefore based both on a collection by Lesson in Conception, Chile, and on a collection by Dumont d'Urville in "Malouines" (Falklands). He also stated: "Elle sera figurée dans la relation du voyage de la Coquille" (1826-1829). Unfortunately, the Dictionary (Bory de Saint-Vincent, 1826) appeared after Dumont d'Urville's *Flore des îles Malouines* (1825) and, since in 1826 Bory de Saint-Vincent did not explicitly create the new genus *Lessonia* and did not make any reference to *L. flavicans*: *L. fuscescens* was validly published and he actually added three new species in the genus *Lessonia* previously created by himself in Dumont d'Urville (1825).

Later, in the proceedings of the *Voyage de la Coquille* (1826-1829), about *L. fuscescens*, Bory de Saint-Vincent gave the reference of his dictionary and listed Dumont d'Urville in second position with the name "*Lessonia* (*flavicans*)" (*sic*), so clearly stating that he considered *L. flavicans* as a synonym of *L. fuscescens*. No herbarium specimen labelled "*L. flavicans*" in Bory's handwriting is present in the Bory de Saint-Vincent herbarium preserved at PC and "*flavicans*" was written between brackets in the proceedings of the *Voyage de la Coquille*: it is likely that the name *L. flavicans* was a lapsus for *L. fuscescens*, either from Bory de Saint-Vincent or from Dumont d'Urville, both epithets meaning brown in Latin.

While it is extremely clear that, in Bory's mind, *L. flavicans* and *L. fuscescens* are one and the same species, some authors like Hariot (1889) kept them as two separate taxa. It is extremely clear also that the name wished by Bory de Saint-Vincent was *L. fuscescens* and not *L. flavicans*, unfortunately, Dumont d'Urville's *Flore des îles Malouines* appeared before Bory's dictionary and has priority. Later, the synonymy between *L. flavicans* and *L. fuscescens* was usually acknowledged, but both names were in use and the question of which of the two names was valid long remained unclear: for instance Papenfuss (1964) followed Bory in considering *L. flavicans* as a synonym of *L. fuscescens*. However, *L. fuscescens*, superfluous, is actually a *nomen illegitimum* (ICBN Art. 52.1, McNeill *et al.*, 2006). Since it is impossible to know with certainty whether or not Bory considered the genus *Lessonia* as monotypic (although this was probably not the case) when he wrote the diagnosis of *L. flavicans*, and since only one species was described, one is thus obliged to admit a monotypic concept in 1825. Therefore, the description of the species validates the genus, according to ICBN (Art. 42; McNeill *et al.*, 2006). Bory de Saint-Vincent in Dumont d'Urville, 1825, p. 594 [collecting locality, p. 589], is thus the correct reference to be associated to the genus *Lessonia* as well as to the species *L. flavicans*; the name *L. fuscescens* should be rejected because it is superfluous. Another possibility would be to propose *L. fuscescens* for conservation against *L. flavicans* since it was the name intended by Bory; however *L. flavicans* is currently in use and this would go

against nomenclatural stability (ICBN, art 14.2; McNeill *et al.*, 2006). Furthermore, it is hard to believe that Bory did not accept the name '*flavicans*' in 1825, and therefore Art. 34 and recommendations 23A.3.(i) and 34A of ICBN (McNeill *et al.*, 2006) cannot be invoked to reject this epithet.

The *Coquille* had been in Falklands for about one month, from 18 November 1822 to December 1822, and in Talcahuano near Concepción (Chile), on 20 January 1823 (Brosse, 1998). As explained above, Bory's description of *L. fuscescens* (1826) is based on both the collection by Dumont d'Urville in Falklands (as "Malouines") and the collection by Lesson in Chile (Concepción), by contrast, the sole locality indicated for *L. flavicans* by Dumont d'Urville (1825) is "l'île aux Pingouins" (Falklands), none being indicated by Bory. However, among the material collected during the *Coquille* expedition, only specimens collected by Dumont d'Urville in Malouines and specimens collected by Lesson in Chile should be considered as having been used to establish the protologues of *L. flavicans*, according to Dumont d'Urville (1825).

Three specimens from the Bory de Saint-Vincent Herbarium are part of the original material of the *Coquille* expedition and are preserved in PC, within the Thuret-Bornet Herbarium (PC0062750, PC0062749, by Dumont d'Urville from l'île aux Pingouins: Figs 1, 2 and PC0062747 by Lesson from Chile: Fig. 3). Neither Dumont d'Urville nor Bory de Saint-Vincent explicitly designated a type specimen and it is thus necessary to designate a lectotype (ICBN, Art. 9.9; McNeill *et al.*, 2006). Searles (1978) designated a specimen from the Bory de Saint-Vincent herbarium, given later by Thuret to the *Muséum national d'histoire naturelle* and preserved in the General Herbarium. The specimen chosen by Searles as the lectotype (now numbered PC0062744: Fig. 4, held in the General Herbarium and not the Montagne herbarium as indicated in Searles, 1978, p. 372) is said by Bory: "jeunes individus". It was collected by Lesson in Falklands ("Malouines") as explicitly indicated by Bory himself on the sheet. This collection was clearly collected during the *La Coquille* (1822-1825) expedition, under the command of Louis-Isidore Duperey, but among this material, only specimens from Falklands collected by Dumont d'Urville can be considered type material of *L. flavicans*; consequently the specimen previously designated by Searles is not eligible as syntype of *L. flavicans* and could not be designated as lectotype. No syntype specimen was collected after 1822 (see above) but the labelling "given by Lesson in 1825" does not mean that it was collected in 1825: it was likely collected previously. When living, G. Thuret, who acquired the Bory de Saint-Vincent Herbarium, gave some specimens to the PC herbarium (General Herbarium) but kept the specimens he considered the main ones.

Since Searles's lectotype is actually not syntype material, a new lectotype should thus be designated. The two syntypes PC0062750 and PC0062749 (Figs 1 & 2) were clearly used to prepare plate 3 (reproduced Fig. 5) of the *Atlas* (1826) of the *Voyage de la Coquille* (1826-1829); one of them should have logically been designated the lectotype of *L. flavicans*. One specimen (PC0062750) was used for the drawing of the gross morphology, transverse section and longitudinal section of the stipe, the second (PC0062749) was used for the drawing of the blades. These two specimens were clearly used by Bory de Saint-Vincent to describe the species. However, only one specimen should be indicated as the lectotype. As the specimen PC0062750 contains all the parts used for the drawing (except for the blades) and contains some blades, we designate it here as the lectotype. Furthermore the specimens used for plate 3 of the *Atlas* of the *Voyage de la Coquille* (1826-1829) were associated by Thuret, or Bornet, or perhaps by Bory de Saint-Vincent himself, to a semitone preprint of plate 3. At last, someone



Fig. 1. Lectotype specimen of *Lessonia flavicans* PC0062750. "TA 6084" refers to the old numbering system.



Fig. 2. Isolectotype specimen of *Lessonia flavicans* PC0062749. “TA 6085” refers to the old numbering system.

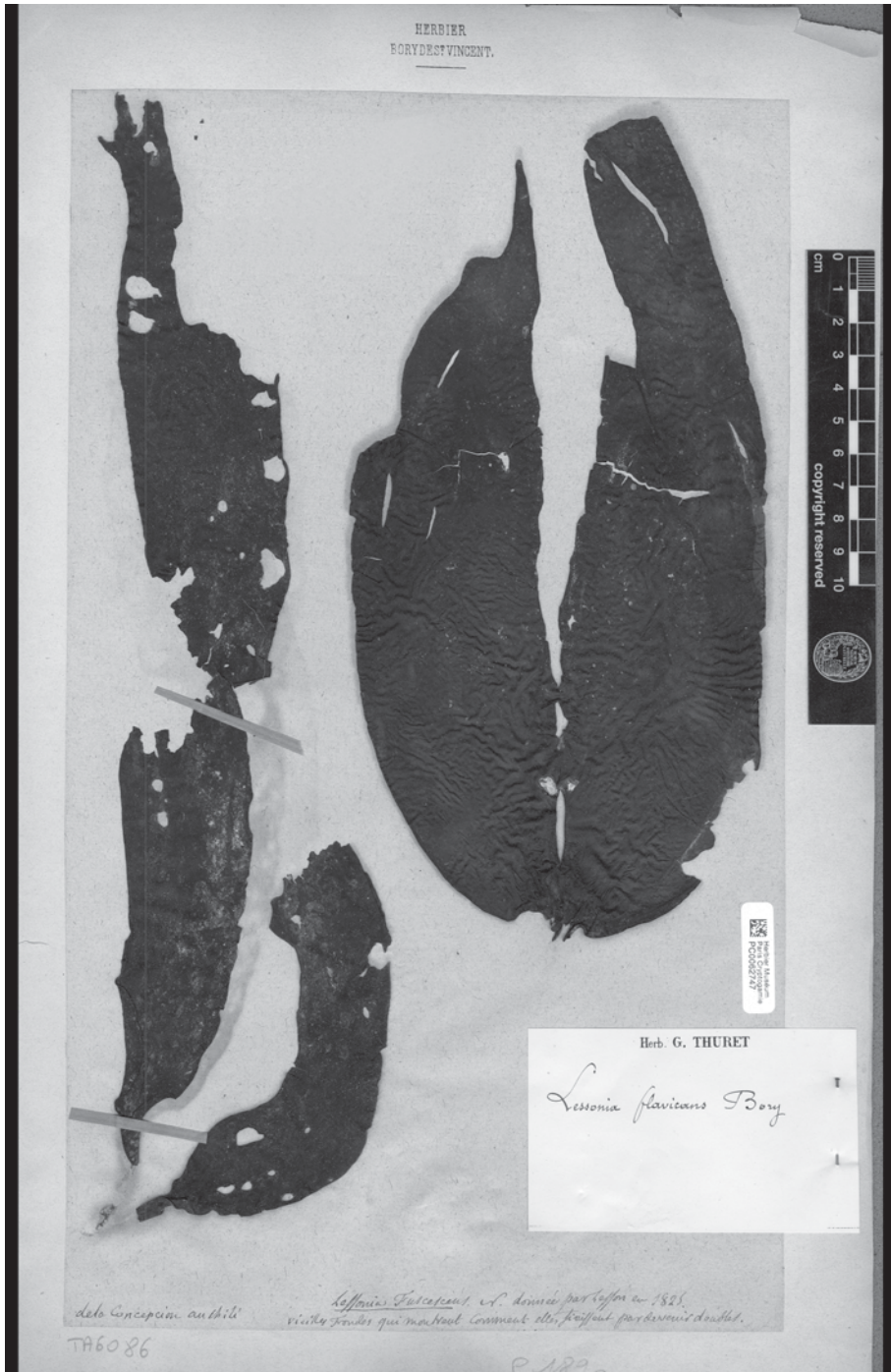


Fig. 3. Specimen of *Lessonia fuscescens* PC0062747 (no status but collection from Conception by Lesson given to Bory de Saint-Vincent). "TA 6086" refers to the old numbering system.

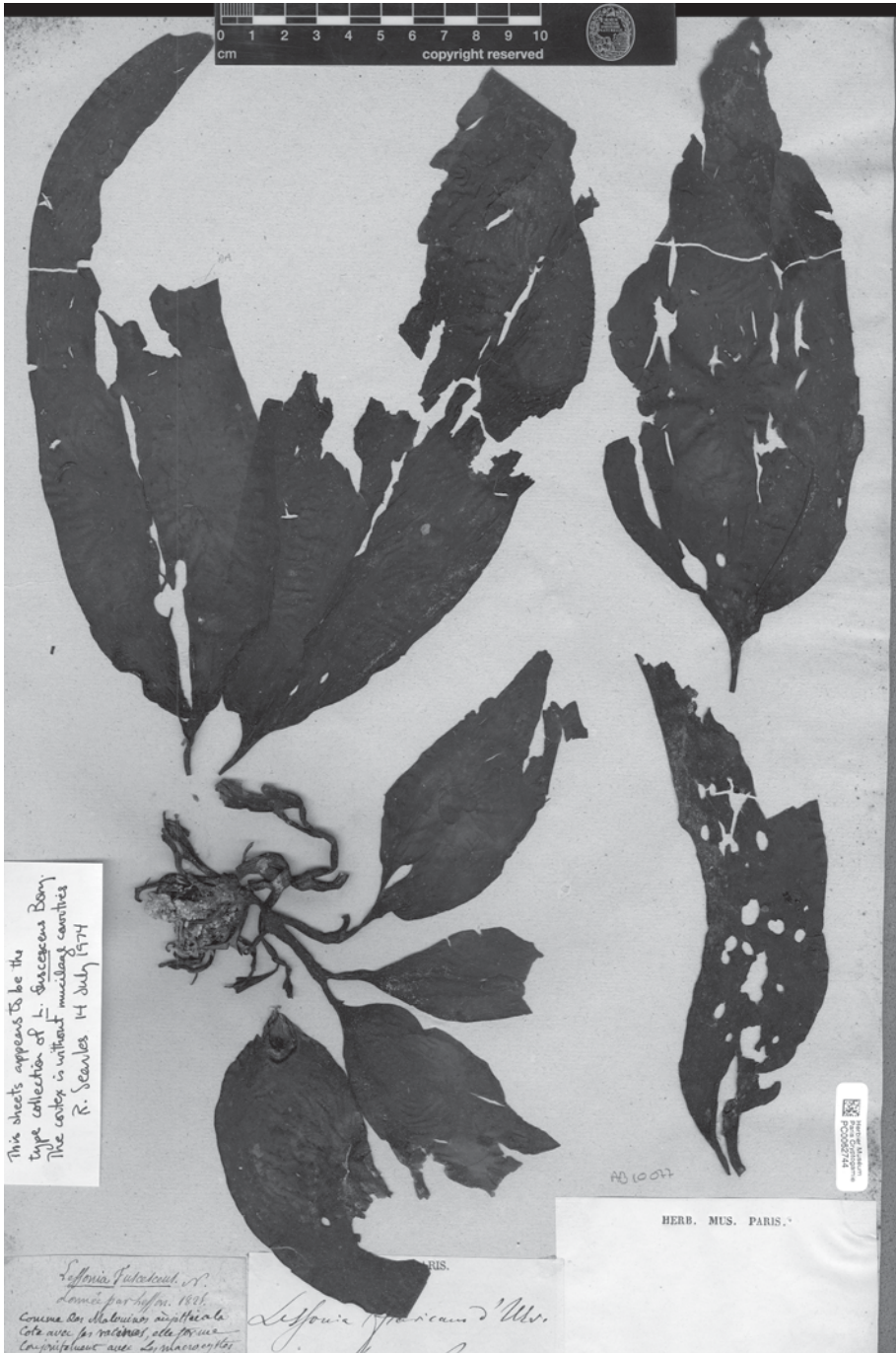


Fig. 4. Specimen of *Lessonia fuscescens* PC0062744 (no status but collection by Lesson given to Bory in 1825 previously and erroneously designated the lectotype of *L. flavicans*). "AB 10077" refers to the old numbering system.

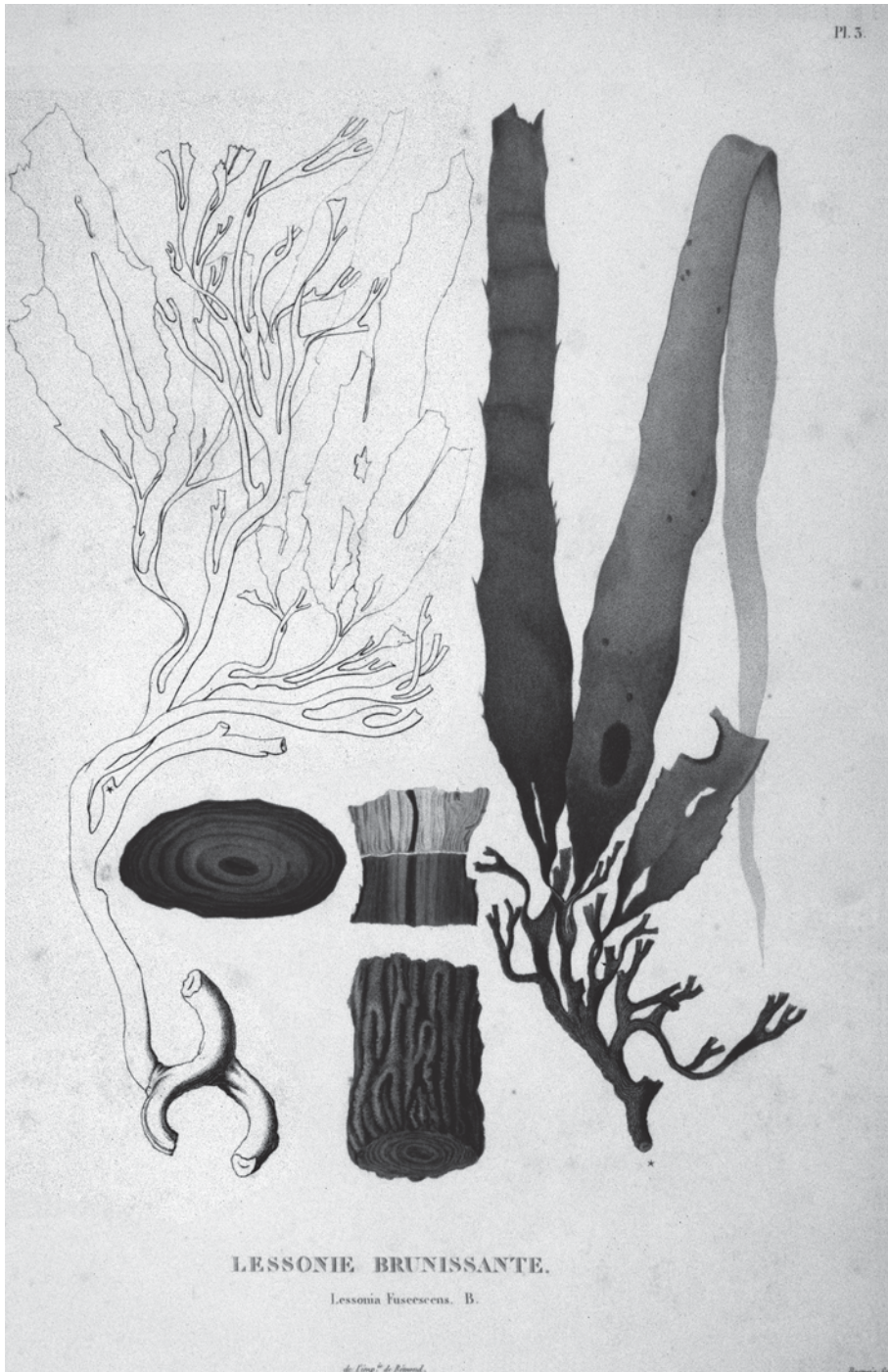


Fig. 5. Plate 3 of the *Atlas* (1826) of the *Voyage de la Coquille* (1826-1829).

(anonymous) had already added on the sheet the small label “type” (Fig. 1) frequently used in the past as a standard at PC. The specimen PC0062749 would then become an isoelectotype since these specimens are from the same collection than the one quoted by Dumont d’Urville (1825).

A further specimen of *L. flavicans* with a label in Bory’s handwriting, preserved in BM, is illustrated by Zaneveld (1993, pl. LXXIII) but Dumont d’Urville is not indicated and Bory de Saint-Vincent stated on the label that the species is present in Falklands and Chile without telling explicitly where the specimen was collected; it should thus not be considered syntype.

Anatomical study

Lacunae were clearly observed as well in Bory’s original material of *Lessonia flavicans* (*sub fuscescens* in herb. Thuret PC0062750, PC0062749, PC0062748) (Figs 6, 7, 8), as in the ‘lectotype’ of *L. flavicans* designated by Searles (1978, fig. 6, preserved in the General Herbarium PC0062744) (Fig. 9) contrary to previous observations by Searles (*loc. cit.*), as well as in the isotype of *L. vadosa* deposited by Searles in PC (PC0062746) where circular to ovoid numerous lacunae are present and sometimes reach the surface of the thallus (Fig. 10). In the Kerguelen Islands, one species of *Lessonia* is present (Papenfuss, 1964, *sub L. fuscescens*); we observed sections of specimens from this area collected on November 2nd, 1973: lacunae were clearly visible and numerous (not shown). In an isoelectotype (see the section ‘*Lessonia* type material preserved at PC’ below) of *Lessonia nigrescens* (PC0062752), no lacunae were found (Fig. 11). In the specimen of *L. flavicans* sensu Searles (1978), collected by Andres Mansilla, lacunae were absent too, as well as in the specimens 16 175, 16 176 and 16 183 from the Duke Algal Herbarium (Fig. 12).

DISCUSSION

Taxonomy of *Lessonia flavicans* and *Lessonia vadosa*

In literature, authors often did not make any distinction between “mucilage ducts” (elongated pipes), “mucilage cavities” (with secretory cells) or “lacunae” (without secretory cells); in *Lessonia* there are no real ducts but rather spherical or elliptical cavities without secretory cells (Searles, 1978) contrary to what is observed in e.g. *Laminaria* (Fritsch, 1945). According to Guignard (1892) very large “canaux mucifères” (actually lacunae) are present in both the stipe and the blade of *L. fuscescens*. In *L. nigrescens*, amazingly, Guignard found lacunae in some specimens and no lacunae in other ones. In *L. laminarioides*, he found lacunae in the blade, not in the stipe. Etcheverry (1951) stated that lacunae are abundant in blades and stipes of both *L. flavicans* and *L. nigrescens*, however, his figure 11 illustrating a section in *L. nigrescens*, although schematic, shows a very thin thallus which is likely referable to *L. flavicans*. Therefore, he may have made some confusion when identifying the species. Furthermore, this author (Etcheverry, 1951) indicated lacunae in specimens of *L. frutescens*, currently considered a synonym of *L. flavicans*. Scrosati (1991) observed lacunae in *Lessonia* from Patagonia and decided thus

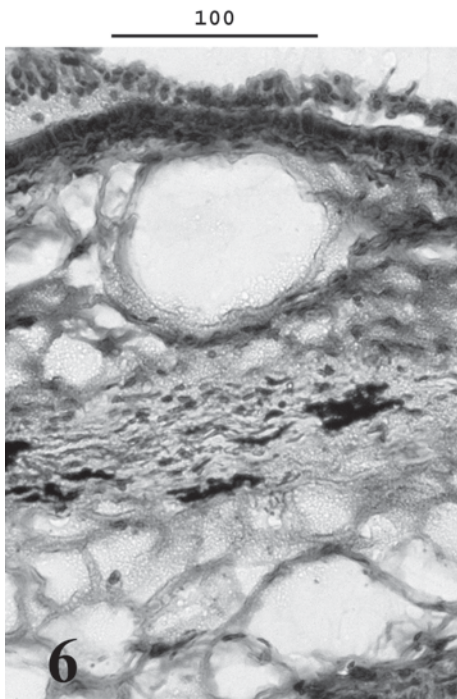


Fig. 6. Section of the new lectotype of *Lessonia flavicans* Bory de Saint-Vincent (PC0062750) showing a cortical lacuna.

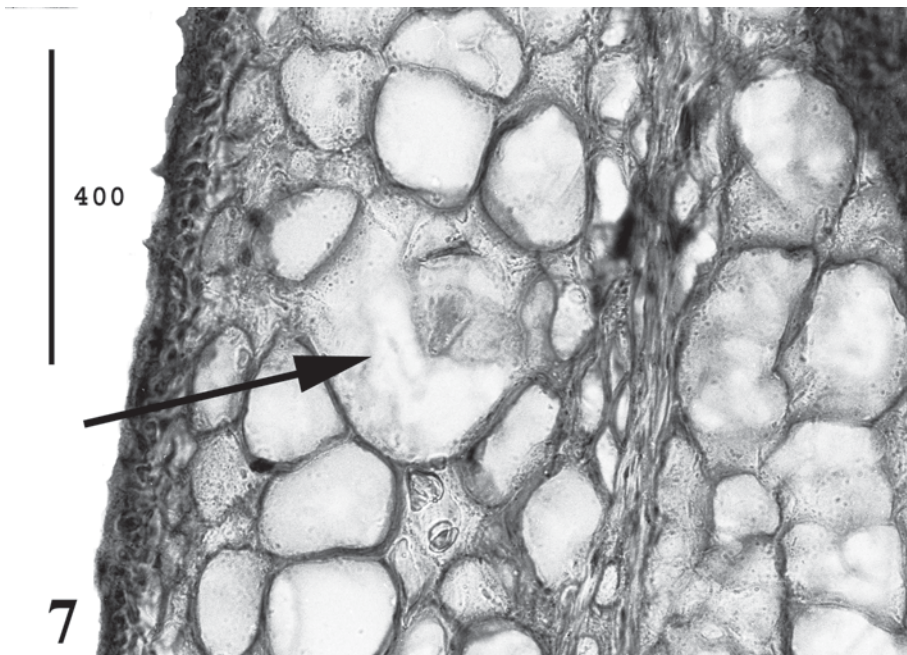


Fig. 7. Section of the isolectotype PC0062749 of *Lessonia flavicans* Bory de Saint-Vincent showing a young cortical lacuna (arrow).



Fig. 8. Specimen of *Lessonia fuscescens* PC0062748 (no status but collection by Lesson given to Bory in 1825). "TA 6087" refers to the old numbering system.

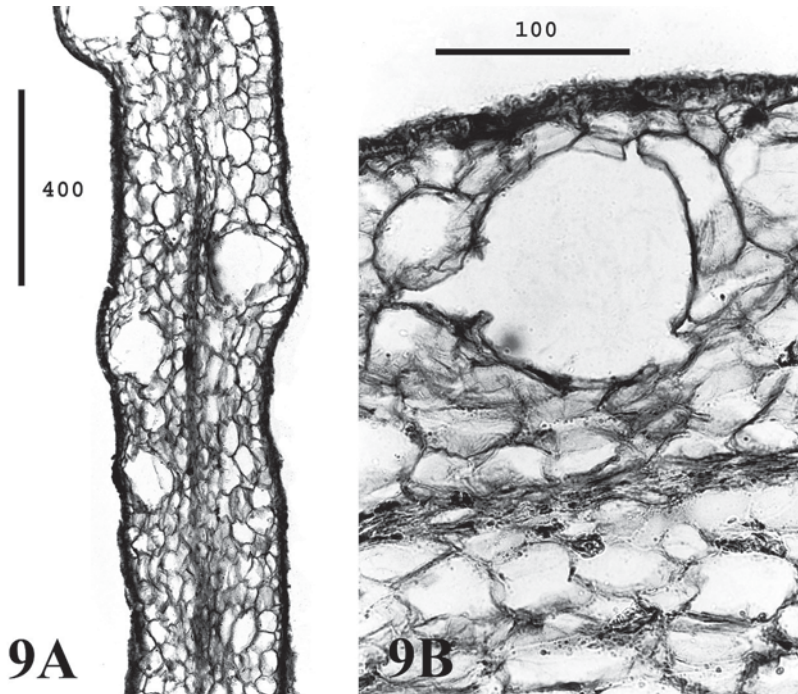


Fig. 9. Section of specimen PC0062744, previously designated the lectotype of *Lessonia flavicans* Bory de Saint-Vincent. A. Note several cortical lacunae. B. Detail of a lacuna.

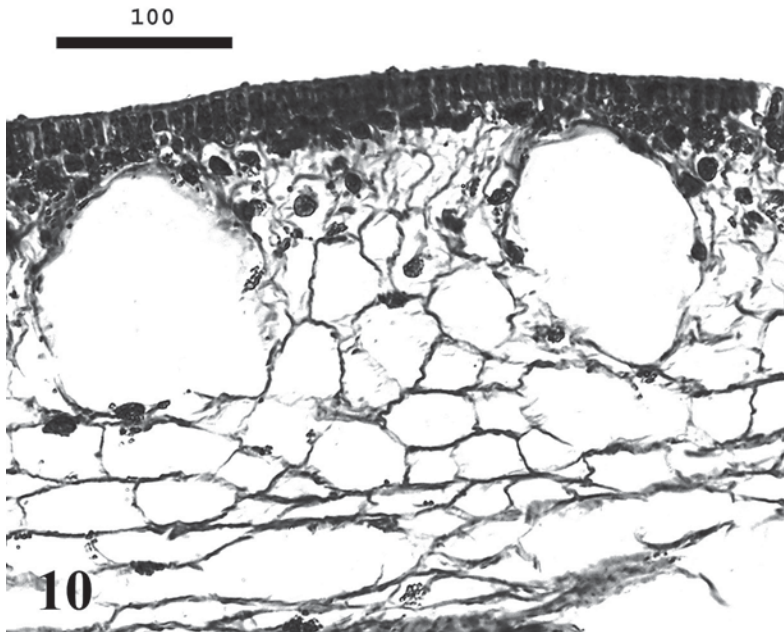


Fig. 10. Section of the isotype of *Lessonia vadosa* Searles (PC0062749). Note two cortical lacunae.

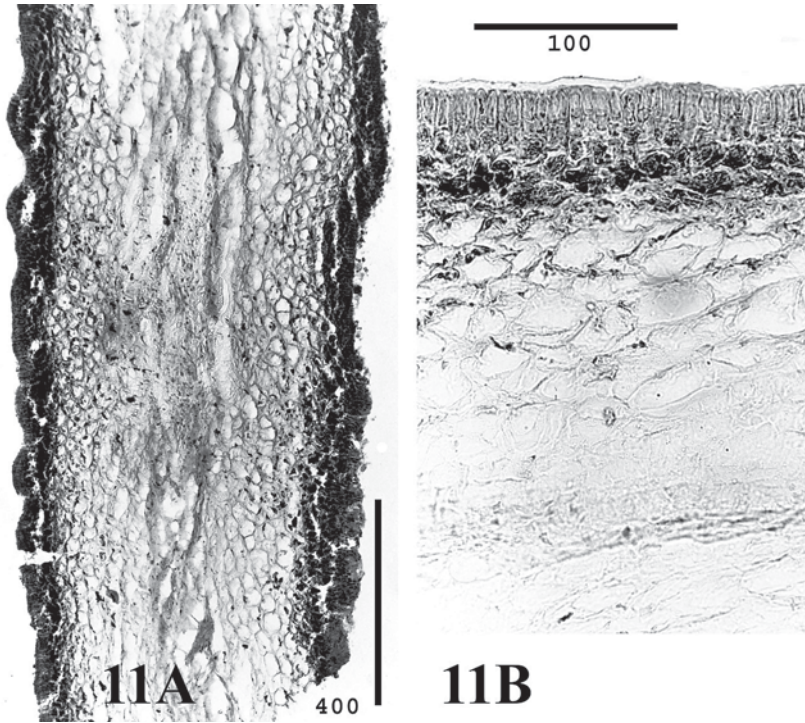


Fig. 11. Section of the isoelectotype PC0062752 of *Lessonia nigrescens* Bory de Saint-Vincent. A. Note the absence of cortical lacunae. B. Detail of the cortex.

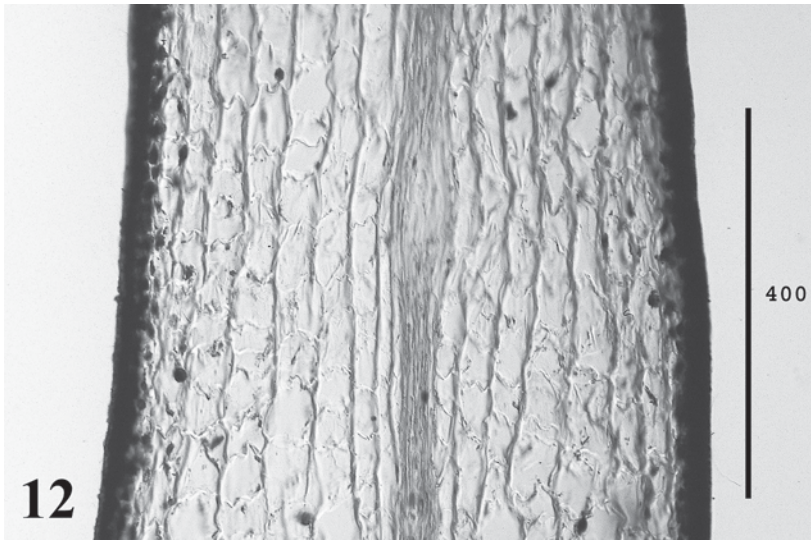


Fig. 12. Section of the holotype of *Lessonia searlesiana* nov. sp. Duke 16175/PC0124194. Note the absence of cortical lacunae.

to assign it to *L. vadosa*. Venegas *et al.* (1992) confirm the absence of lacunae in both blades and stipes of *L. nigrescens*. Our own results show clearly that lacunae, considered as the main diagnostic character by Searles (1978), are present in both type material of *L. flavicans* and *L. vadosa*. Further, according to Searles (1978), *L. vadosa* has narrow blades and less wide blade base angle relative to the blade width, features which are present in the type material of *L. vadosa* and in Bory-de-Saint-Vincent's original material as well. Searles (1978) also found some correlation between depth and blade width, length and thickness, basal angle, marginal teeth and presence vs absence of lacunae. According to him (1978, table II, p. 365), the more algae are exposed to strong wave action the more blades are long, thick and narrow (and, consequently, the basal angle is narrower too), with larger marginal teeth. In shallow areas, blades are wider, thinner and shorter (and, consequently with a wider basal angle), with few or no teeth. Lacunae are present only in blades less than 6 cm wide. Plants collected more deep than 11 metres (an area supposed to be shallow) do not possess lacunae. Therefore, these characters might be linked to environmental factors as well as to be of genetic inheritance. Strong, thick, short, narrow blades offer better resistance to wave action than wide, thin, long blades, furthermore, lacunae probably still render them more resistant. There is thus a possibility that the lacunae develop only in shallow areas. In Thetys Bay, in Fuegia, a comparable phenomenon is known in the southern genus *Durvillaea*: alveoli of the medulla do not develop in shallow habitats (Asensi, unpublished results). Yoon *et al.* (2001) however, obtained different Rubisco sequences for these two species and populations of the two taxa are morphologically and ecologically distinguishable in the field (J. Correa, S. Faugeron and A. Mansilla, pers. com.). Genetic sequences analysis is extremely useful for studying relationships between taxa in Laminariales (Saunders & Druehl, 1993; Druehl *et al.*, 1997; Boo *et al.*, 1999; Yotsukura *et al.*, 1999; Boo & Yoon, 2000; Kraan & Guiry, 2000; Kraan *et al.*, 2001; Yoon *et al.*, 2001; Lane *et al.*, 2006). Clearly, molecular sequences of types would be very useful. DNA was successfully extracted from the isotype of *L. vadosa* but, unfortunately, all attempts to amplify it by PCR failed, probably due to inhibitors carried by anti-insect treatment. No DNA was obtained from type material of *L. flavicans*. No genetic sequence comparison between type material of *L. flavicans* and *L. vadosa* was thus possible.

When separating *L. flavicans* from *L. vadosa*, Searles (1978) assigned the name *L. flavicans* to the deep water species without cortical lacunae because he overlooked the lacunae present in Bory's type material. However, according to the present morphological study, examined type material of both *L. flavicans* Bory de Saint-Vincent *in* Dumont d'Urville, 1825 and *L. vadosa* Searles (1978) showed the same morphological features (presence of cortical lacunae and narrow blade base angle relative to the blade width). Bory de Saint-Vincent did not let any information about the depth at which his material was collected, but it is likely that, at that time, members of the expedition rather collected specimens easily available at low tide than deep water specimens. In other words, Searles (1978) should have assigned the name *L. flavicans* to the species he named *L. vadosa*, not to the deep water species. *L. vadosa* and *L. flavicans* are thus taxonomic synonyms and *L. flavicans* has clearly priority upon *L. vadosa*. However, *L. flavicans* sensu Searles is a species clearly different from *L. flavicans* Bory as confirmed by sequence data analyses of Yoon *et al.* (2001) which has thus no name anymore. Therefore, the new species *L. searlesiana* is proposed here for it, the ending of the name follows ICBN REC 60 C1 (McNeill *et al.*, 2006).

***Lessonia searlesiana* Asensi et Reviers, sp. nov.**

Diagnosis: *Species Lessonia, e meridiei regione quae ultra Oceanum spectat, denso cortice parenchymato instructa, in lamina tamquam in stipite, qua re a Lessonia berteroaana differt, cujus cortex filis instructus est, differtque a Lessonia flavicanti lacunis absentibus, quibus lacunis illius speciei propriis, differtque tandem a Lessonia nigrescenti in systemate hapterorum quod stipitem unum gignit pro mole solida, quae nonnullos gignit; lamina angulusque ab ima laminae parte latius patent quam in Lessonia flavicanti et species altius quam Lessonia flavicans crescit.*

South-American *Lessonia* species with a solid parenchymatous cortex of blades and stipe, not filamentous like *L. berteroaana* and lacking the lacunae typical of *L. flavicans*; with only one stem originating from ramified haptera, not numerous ones from a massive holdfast like in *L. nigrescens*. Wider blades and wider blade base angle, compared to *L. flavicans*; vertical distribution extending deeper in subtidal than in *L. flavicans*.

Misapplied name: *L. flavicans* sensu Searles (1978) *British Phycological Journal* 13: 361-381.

Holotype: PC0124194 (Figure 13) (Duke University Algal Herbarium 16175 given by R.B. Searles to PC)

Type locality: “Just west of Punta Conway on Isla de los Estados, Argentina”

Collectors: R.B. Searles, G.L. Leister and J.F. Brauner on 4 May 1973.

Paratypes: Duke University Algal Herbarium 16176, Puerto Parry, North side of Isla de los Estados, Argentina, 6 May 1973, and 16183, Bahia Valentin, South-East side of Tierra del Fuego, Argentina, 11 May, 1973.

Etyymology: the epithet is in honour of R.B. Searles who first depicted the species.

Note about the lectotype of *Lessonia nigrescens* Bory and lectotypification of Bory's taxa

Searles (1978, pp. 368-369 and fig. 5) designated an unnumbered specimen preserved in Caen as the lectotype of *L. nigrescens* Bory de Saint-Vincent. Contrary to what was claimed by this author, this specimen does not appear clearly as pieces of the plant illustrated by Bory de Saint-Vincent in Pl. 5 of the *Atlas of the Voyage de la Coquille* (1826-1829) (Fig. 14). The specimen illustrated there is preserved at PC (PC0062751, Fig. 15) and it is a real pity that this specimen was not designated the lectotype. The specimen is labelled in Bory's handwriting: “*Lessonia Nigrescens*. N. [*Nobis*] / du Cap Horn. Par Lamouroux. 1824”. Like for the new lectotype of *L. flavicans*, someone (anonymous) had already added on the sheet the small label “type” (Fig. 15) frequently used in the past as a standard at PC. There is another such syntype given by Lamouroux to Bory (PC0062752, Fig. 16). The two specimens housed in PC are thus isolectotypes. *Fide* Searles (1978, p. 369), further specimens are preserved in Lund and Copenhagen and are possibly either also isolectotypes (not “isotypes” as written by Searles 1978) or syntypes.

Since the specimen preserved in the Lamouroux herbarium in Caen was a syntype wearing Bory's handwriting, we did not consider necessary to modify Searles' lectotypification. However, in the future, lectotypes should better be chosen in Bory's herbarium because there is clear evidence that Bory de Saint-Vincent always kept the main, most complete, specimens in his herbarium and gave to other authors specimens that he considered of less value. The specimen

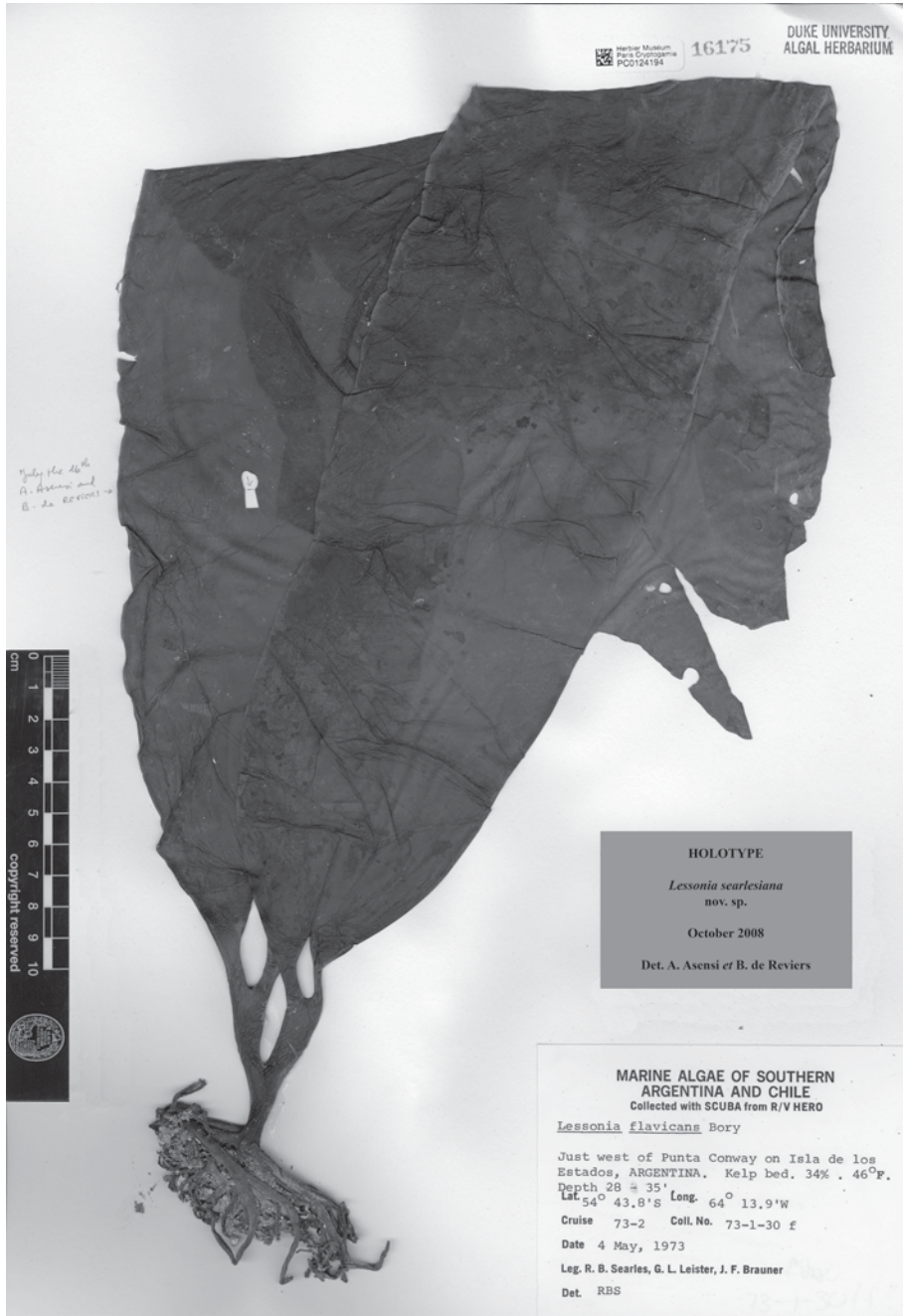


Fig. 13. Holotype of *Lessonia searlesiana* PC0124194 (Duke University Algal Herbarium 16175 given by R.B. Searles to PC).



Fig. 14. Plate 5 of the *Atlas* (1826) of the *Voyage de la Coquille* (1826-1829).

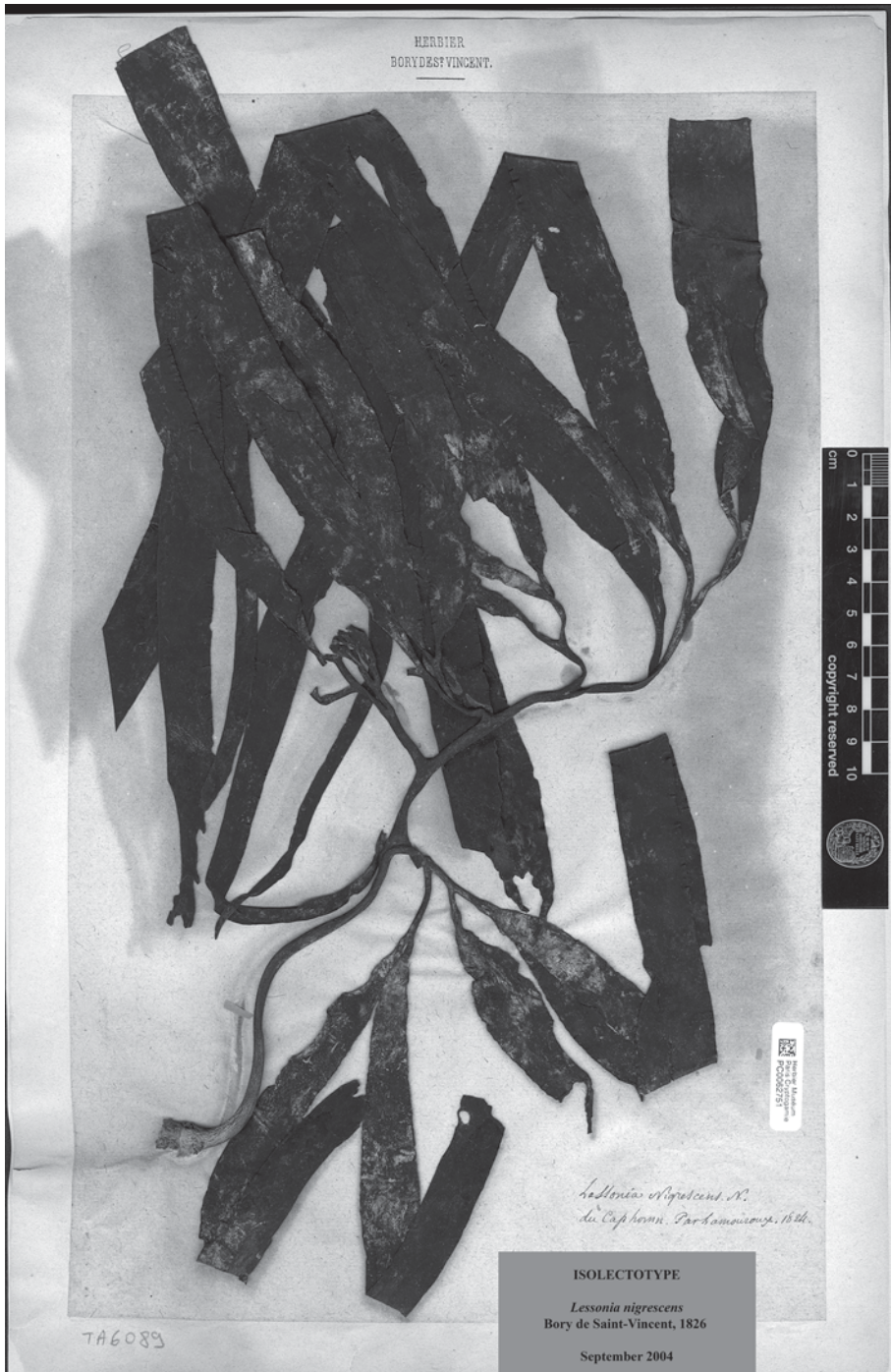


Fig. 15. Isolectotype of *Lessonia nigrescens* PC0062751. “TA 6089” refers to the old numbering system.

preserved in BM, illustrated by Zaneveld (1993, pl. LXVII) is not the holotype as claimed by this author; by contrast, it is a further isolectotype.

CATALOGUE OF *LESSONIA* TYPE MATERIAL PRESERVED AT PC

The organisation of algal collections in PC was presented in details by Woelkerling in Woelkerling & Lamy (1998, pp. 280-283). These collections were thoroughly searched for type material of the genus *Lessonia*. Type material of *Lessonia* is abundant in PC [four holotypes, two isotypes (holotype fragments), one lectotype, three isolectotypes and three syntypes for 85 specimens (15.29 %)], but few have been explicitly identified as such. A complete list is therefore presented below.

Lessonia berteriana Montagne, 1842

PC0062753 (Fig. 17) is the unique type specimen preserved in the Montagne Herbarium, this specimen should be considered the Holotype. Whether or not *Laminaria scissa* Suhr (Table 1) is really the same species than *L. berteriana* Montagne will probably remain a mystery since the type was preserved in B and was destroyed during the second world war. The left label bears, in Montagne's handwriting: "N° 1 / *Lessonia* [only the lower part of the letter s is visible] *Suhrii* / J. Ag. / *Chordaria spicata* / Suhr / Bory coq. [Bory de Saint-Vincent, *Voyage de la Coquille*] / Coquimbo (Chili) / Ex dono cl. [clarissime] *Gaudichaudii*". The right label bears, in Montagne's handwriting: "*Lessonia Berteroana* / Montag. [Montagne] / Chili / M. [Monsieur] *Gaudichaud*". Two further labels, in Searles' handwriting, are present: one identifies the specimen as type material but without more precise indication "*Lessonia suhrii* J. Ag. / TYPE of *Lessonia berteriana* Mont. / Det. R. Searles Date 14 July 1974", the other one is a *determinavit*: "Synonym of *Lessonia nigrescens* / Bory / R. Searles Oct [October] 1975". Sampling by R. Searles and A. Asensi are indicated respectively by pen 'RBS' and '19/04/2004'. An original drawing by Montagne of this species (Fig. 18), is preserved at the Library of Botany (MNHN, Paris) (CRY MS 435, p. 5156).

Lessonia brevifolia J. Agardh, 1894

PC0062758 (Fig. 19) is a syntype from *Algae Mullerianae*. One can read in J. Agardh's handwriting: "*Lessonia brevifolia* J.Ag. / Auckland Is." To our knowledge, no lectotype has been designated yet.

Lessonia dubia Gain, 1912 [currently *Ascoseira mirabilis*]

PC0062754 (Fig. 20) is the holotype designated by Gain (1912). The label bears, in Gain's handwriting: "*Lessonia dubia* n. sp. / Typus. / N° 647. / Trouvée rejetée à la côte sur / la plage de l'entrée ouest de l'île / Déception, Décembre 1909. / Deuxième Expédition Antarctique Française / (1908-1910) / L. Gain". PC0062756 (Fig. 21) and PC0062755 (Fig. 22) are isotypes consisting of fragments

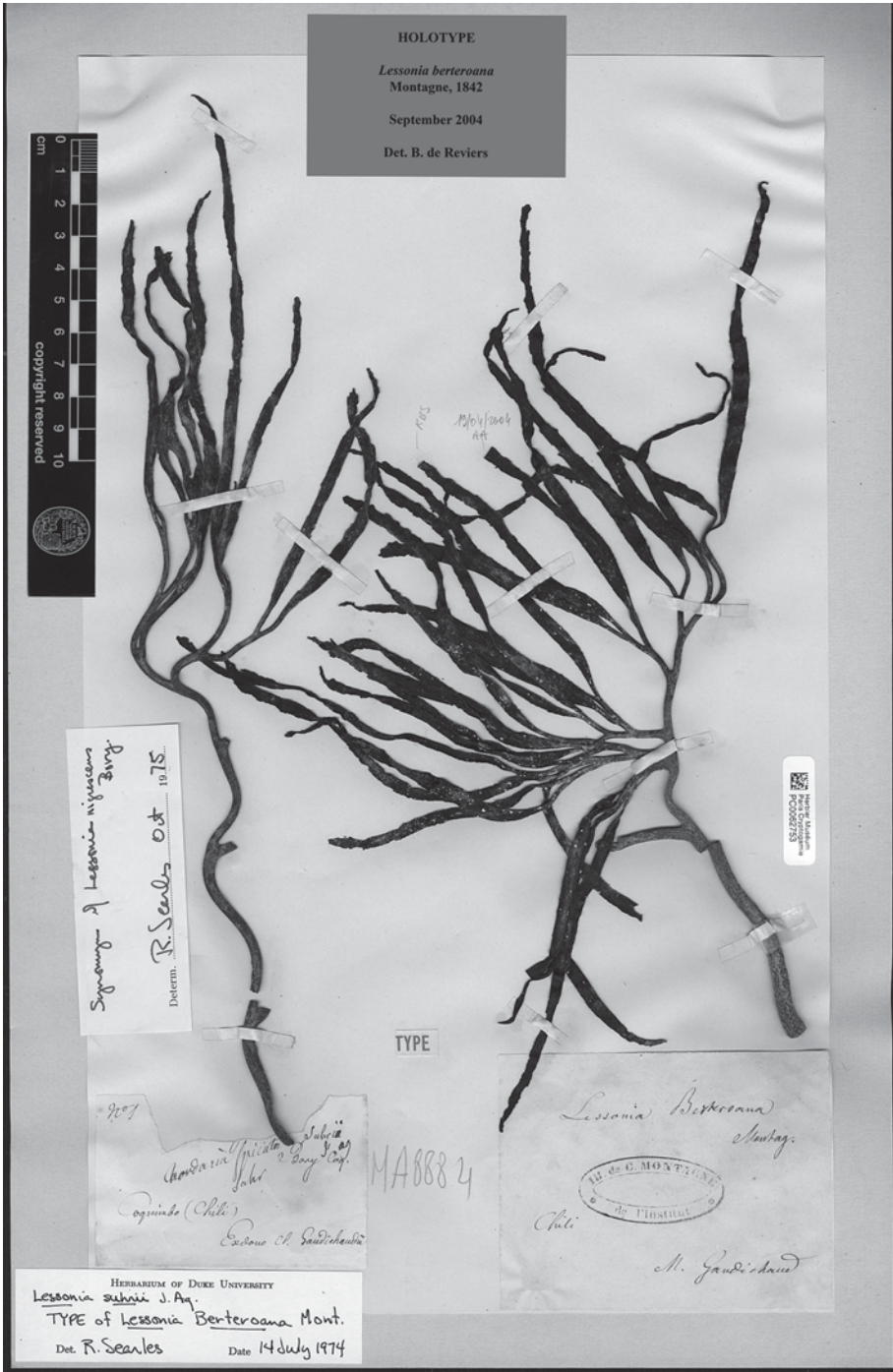


Fig. 17. Holotype of *Lessonia berteroaana* PC0062753. "MA 8884" refers to the old numbering system.

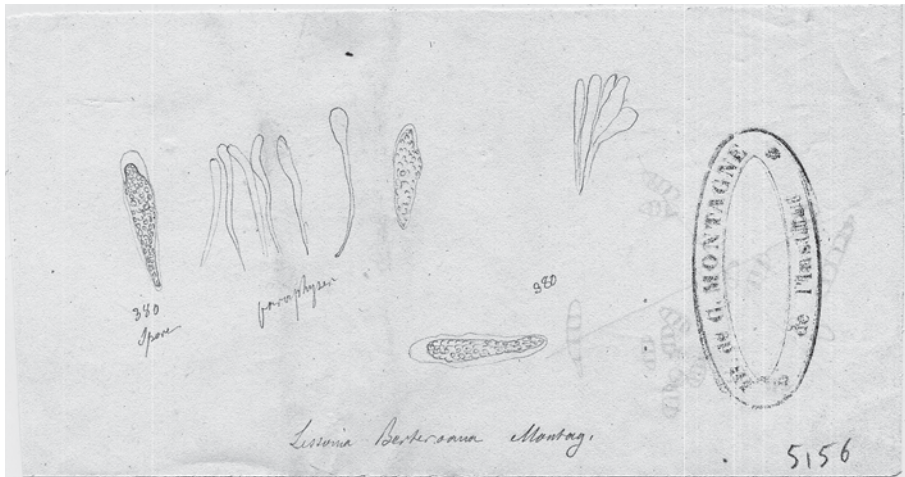


Fig. 18. Montagne's original drawing CRY MS 435, p. 5156 of sporangia from *Lessonia berteroaana* from PC0062753.

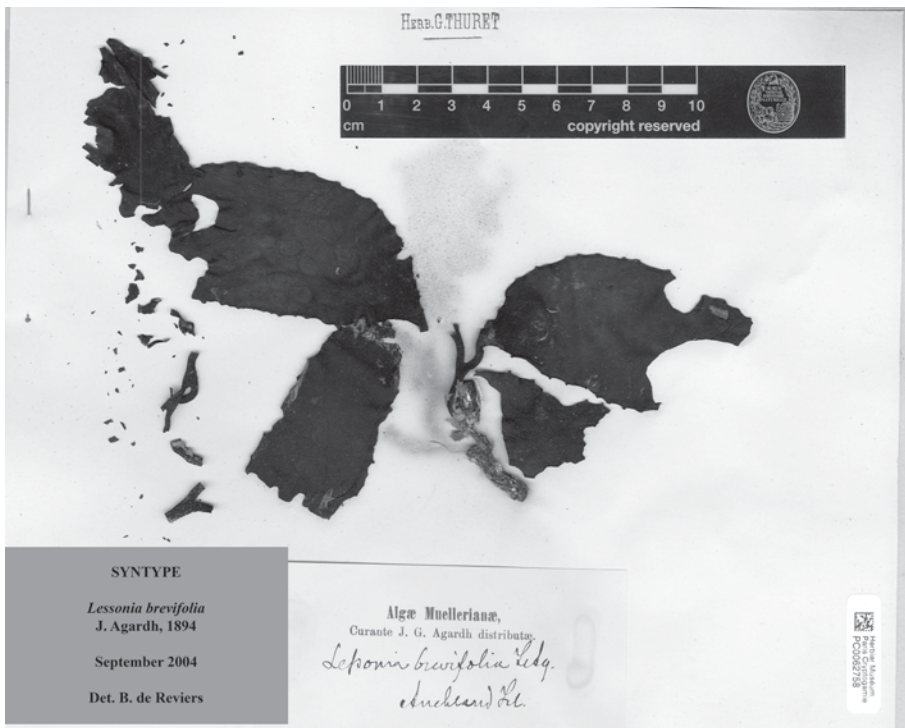


Fig. 19. Syntype of *Lessonia brevifolia* PC0062758. "TA 6100" refers to the old numbering system.



Fig. 20. Holotype of *Lessonia dubia* PC0062754. "AB 10063" refers to the old numbering system.



Fig. 21. Isotype (fragment removed from the holotype) of *Lessonia dubia* PC0062756. “AB 10061” refers to the old numbering system.



Fig. 22. Isotype (fragment removed from the holotype) of *Lessonia dubia* PC0062755. “AB 10062” refers to the old numbering system.

removed from the holotype (PC0062754) designated by Gain (1912). The label of PC0062756 bears, in Gain's handwriting: "Lessonia dubia L. Gain / Typus. / N° 646 Fronde détachée du N° 647. / Rejetée sur la plage de l'entrée ouest de / l'île Déception. Décembre 1909. / Deuxième Expédition Antarctique Française / (1908-1910) / L. Gain". The label of PC0062755 bears, in Gain's handwriting: "Lessonia dubia n. sp. / Typus. / N° 646 Fronde détachée du pied / du N° 647. / Rejetée à la côte, l'île Déception, / Décembre 1909. / Deuxième Expédition Antarctique Française / (1908-1910) / L. Gain".

***Lessonia flavicans* Bory de Saint-Vincent in Dumont d'Urville, 1825**

PC0062750 (Fig. 1) is a syntype designated here the new lectotype of *Lessonia flavicans* (see above). One can read, in Bory's handwriting: "Lessonia Fuscescens. V. Coq. [Voyage de la Coquille] Pl. 3. / Des cotes [côtes] de l'île [île] aux Pingouins, l'une des Malouines [Falklands]. / Par Durville [Dumont d'Urville]". Sampling for anatomical studies, by R. Searles ("RBS") and us ("AA3 18/10/1995") are indicated by pen. "P189a" refers to the number of a black and white negative preserved at Library of botany (MNHN, Paris).

PC0062749 (Fig. 2) is an isotype; in Bory's handwriting, one can read: "Lessonia Fuscescens. V. Coq. [Voyage de la Coquille] Pl. 3. / de la cote [côte] de l'île [île] aux Pingouins / l'une des Malouines [Falklands]. Par Durville [Dumont d'Urville] - 1825." Both are preserved in the Thuret-Bornet Herbarium in cabinet 63, portfolio 12. Sampling for anatomical studies, by R. Searles ("RBS") and us ("AA4 18/10/1995") are indicated by pen. "P189b" refers to the number of a black and white negative preserved at Library of botany (MNHN, Paris).

The specimen numbered PC0062744 (Fig. 4) and preserved in the General Herbarium is a collection by Lesson [erroneously designated as the lectotype of *L. flavicans* by Searles (1978), see above]. One can read, in Bory's handwriting: "Lessonia Fuscescens. N. [Nobis] / donnée par Lesson. 1825. / comme des Malouines où jettée[jetée] a[à] la / cote[côte] avec les racines, elle forme / conjointement avec les macrocystes / de gros amas en perruques épaisses / Jeunes individus. [signed] Bory de Saint-Vincent". This specimen was given to the Herbarium of the *Muséum national d'histoire naturelle* by G. Thuret the year 1847, another associated label is in Thuret's handwriting: "Lessonia flavicans D'Urv. / lecta [means 'given', by Thuret rather than by d'Urville or, possibly, given by d'Urville who received it from Lesson] / [signed:] Thuret". The signature is difficult to read but consistent with other autographs by Thuret. Sampling for anatomical studies by us ("AA") is indicated by pen in the upper left part of the sheet.

PC0062747 (Fig. 3), also preserved in the Thuret-Bornet Herbarium, is material of *L. fuscescens* / *flavicans* collected by Lesson during the Coquille expedition. On PC0062747, one can read: "Lessonia Fuscescens. V. [Voyage de la Coquille] donnée par Lesson en 1825. / de la Conception au Chili vieilles frondes qui montrent comment elles finissent par devenir doubles." On the label printed "Herb. G. THURET", the words "Lessonia flavicans Bory" are in Édouard Bornet's handwriting. "P189c" refers to the number of a black and white negative preserved at Library of botany (MNHN, Paris).

PC0062748 (Fig. 8) is a collection of *L. fuscescens* by Lesson in 1825. In Bory's handwriting, one can read: "Lessonia Fuscescens. N. [Nobis] / donnée par Lesson. en 1825. / comme de la plage des / Malouines où elle est jettée[jetée] /

conjointement avec les ma- / crocystes. Jeunes individus. / [signed] Bory de Saint-Vincent". On the label printed "Herb. G. THURET", the words "Lessonia flavicans Bory" are in Édouard Bornet's handwriting. Sampling for anatomical studies, by R. Searles ("RBS") and us ("AA1 09/1995", AA2 18/10/1995") are indicated by pen. "P189d" refers to the number of a black and white negative preserved at Library of botany (MNHN, Paris). This specimen was perhaps used by Bory when he established the protologue, however, like the specimens of *L. fuscescens* preserved in the General Herbarium and numbered PC0062744 (Fig. 4), PC0116421, PC0116422 and PC0116423 (not shown) seem correspond to collections by Lesson in Malouines (where he was together with Dumont d'Urville, during the *voyage de la Coquille*) there is however no reason to believe that Bory used them to write the protologue of 1826 since Lesson is only acknowledged for *La Conception* in Chile; therefore, these specimens have no status; furthermore, PC0116423 might be *Macrocystis* rather than *Lessonia*.

PC0116424 (not shown) is a specimen of historical importance but is not type material. It corresponds to no. 131 of Charles Gaudichaud-Beaupré, collected in Falklands [îles Malouines] in 1820. The ship *L'Uranie* was shipwrecked and stayed in Falklands on February 1820. Gaudichaud's herbarium got wet: Gaudichaud dried it. The expedition supplied with fresh provisions in the *Île aux pingouins*. On April 1820, the *Mercure*, an American ship, put into port in Falklands, take them on board and drop them in Montevideo. On May the 8th, 1820, the *Mercure* becomes *La Physicienne*, and the expedition goes off again. Charles Gaudichaud-Beaupré was NOT on board in the *Coquille*, this specimen was not used by Bory to establish the protologue. There is a later indication referring to the name *L. flavicans* by Rostafinski, who made a survey of the Herbarium in 1877.

PC0116425 *L. fuscescens* corresponds to Gaudichaud's N° 22 collected in Callao: "Ex itin. [itineris]" refers to the *Herminie* (1831-1833) expedition.

***Lessonia laminarioides* Postels et Ruprecht, 1840**

Although from "Mare Ochotensi", specimens PC0116427, PC0116428 and PC0116429 preserved in the General Herbarium have no status, the type was explicitly designated by Postels & Ruprecht (1840; "[...] secundum specimen in Herb. Acad. Sc. Petrop.") as being in the herbarium of Saint Petersburg. Both the specimen PC0116427 of the General Herbarium, and the specimen PC0044727, preserved in the Montagne Herbarium, are labelled *Lessonia laminariaeformis* var. *membranacea*. This variety seems to be a *nomen herbariorum* and is therefore invalid.

***Lessonia littoralis* Farlow et Setchell ex Tilden, 1900 [currently *Lessoniopsis littoralis*]**

PC0062757 (Fig. 23) is a syntype distributed by Tilden in her *American Algae*. The *determinavit* written by pen is probably in Gontran Hamel's handwriting. To our knowledge, no lectotype has been designated yet.

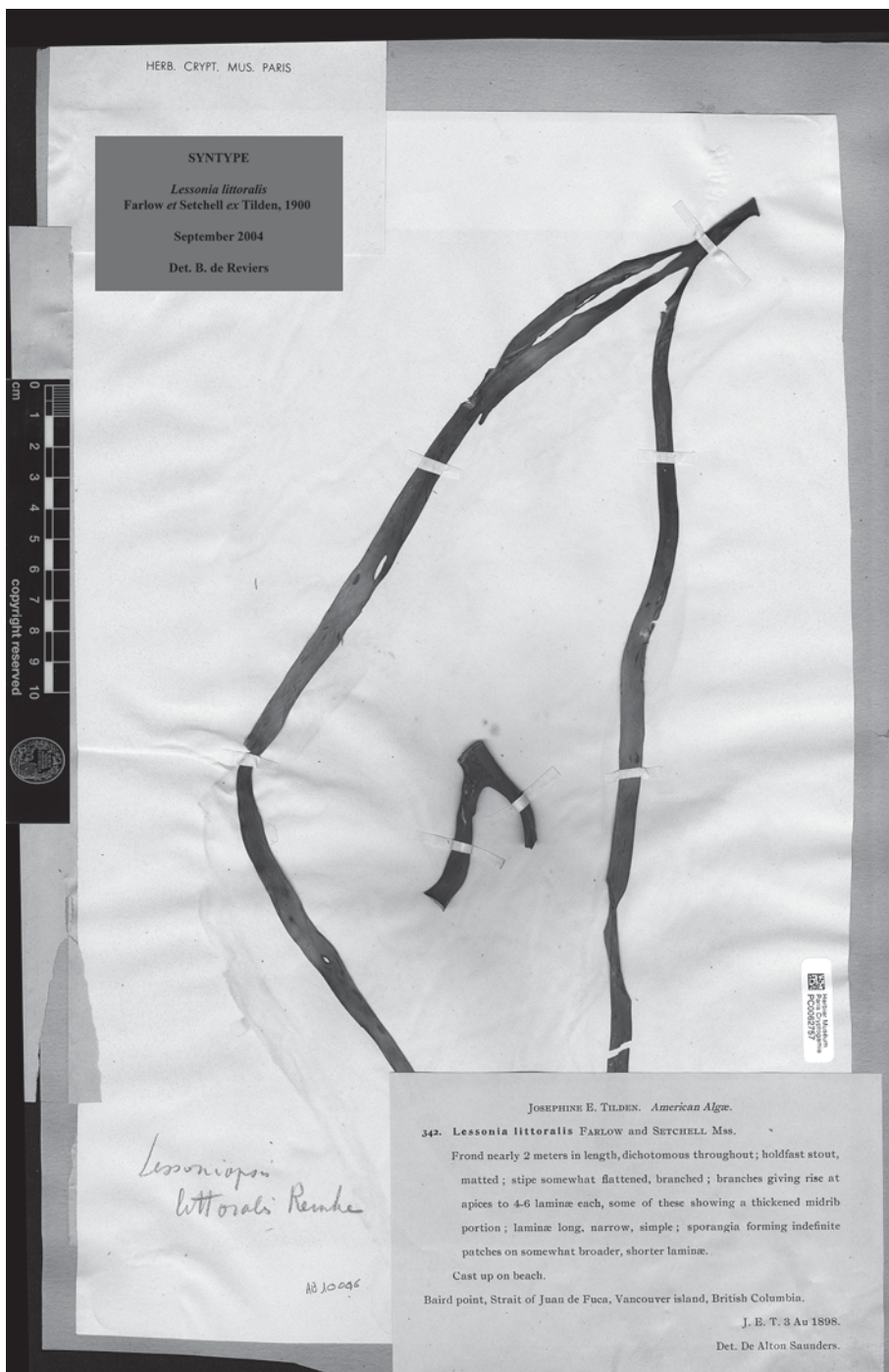


Fig. 23. Syntype of *Lessonia littoralis* PC0062757. "AB 10006" refers to the old numbering system.

***Lessonia nigrescens* Bory de Saint-Vincent, 1826**

The lectotype, preserved in Caen (unnumbered), was designated and illustrated by Searles (1978, fig. 5), it is labelled in Bory de Saint-Vincent's handwriting: "Lessonia nigrescens. Nova sp / du Cap Horn". A further, pink, label wears, in Bory de Saint-Vincent's handwriting: "Lessonia nigrescens Cap Horn". Two isolectotypes are preserved at Library of botany (MNHN, Paris) in the Thuret-Bornet Herbarium in cabinet 63, portfolio 12: PC0062751 (Fig. 15) and PC0062752 (Fig. 16). "P223", written on both specimens refers to the number of a black and white negative preserved at PC.

On PC0062751 one can read in Bory's handwriting: "Lessonia Nigrescens. N. [*Nobis*] / du Cap Horn. Par Lamouroux. 1824".

On PC0062752 one can read in Bory's handwriting: "Lessonia Nigrescens. N- [*Nobis*] / (Lamouroux. 1824.)", and, in Lamouroux's handwriting: "Laminaria Hermosa / terre de feu"; Cape Horn is not explicitly indicated but it is situated in the Chilean part of Fuegia. Sampling for anatomical studies, by us ("AA") are indicated by pen.

PC0116432 (not shown), preserved at PC in the Sauvageau Herbarium, is from Cape Horn but has no status since there is no evidence that it was seen by Bory de Saint-Vincent.

PC0116426 (not shown) is from the *Voyage de la Coquille* (the *Coquille* did not stop in Cape Horn) and Lamouroux is not quoted in any way, there is thus no evidence that the specimen was used to establish the protologue and the specimen has no status.

***Lessonia quercifolia* Bory de Saint-Vincent, 1826 [currently *Myriodesma quercifolium*]**

PC0062759 (Fig. 24) is the unique type specimen preserved in Bory's herbarium (within the Thuret-Bornet Herbarium, cabinet 68) and likely the sole used to establish the protologue, this specimen should thus be considered the holotype. On the left side, one can read, in Bory's handwriting: "échantillon donné / Par M^t Chauvin / de Caen. 1825." And, on the right side, "des Côtes du Sud de la nouvelle Hollande / Par Leprieur. 1803." Bornet's handwriting can be seen on the label of the Gustave Thuret Herbarium: "Lessonia quercifolia Bory / Dict. Class. D'hist. Nat. 9, p. 322. / Voy. De la Coquille, p. 79, pl. 4. / Myriodesma quercifolium J. Ag."

***Lessonia searlesiana* Asensi & Reviere sp. nov.**

Holotype PC0124194 designated in the present study / Fig. 13.

***Lessonia suhrii* J. Agardh, 1841 nom. illeg. (see Table 1)**

No type material was found in PC. PC0116433, PC0116430 and PC0116431 (not shown) are from Valparaiso, the type locality, some are perhaps from the original collection, but there is no evidence that they were seen by J. Agardh: even if they are part of the original material, they would have thus no status.



Fig. 24. Holotype of *Lessonia quercifolia* PC0062759. "TA 6936" refers to the old numbering system.

***Lessonia vadosa* Searles, 1978**

One isotype, given by Searles, is preserved in the General Herbarium under the number PC0062746 (Fig. 25). Sampling for anatomical studies, by us (“AA” [in the middle which refers to “AA 9/4/1996” written on the left side]) and for attempting molecular biology by Florence Rousseau (“FR 11/10/2004”) are indicated by pen.

***Lessonia variegata* J. Agardh ex Laing 1894**

J. Agardh (1877, p. 6) did not describe his “*Lessonia variegata* mnsr.”; it is therefore invalid. Laing (1894) made a description based on specimens from the Cook Strait.

PC0062745 (Fig. 26) from the Sauvageau Herbarium, preserved in cabinet 16 is a Syntype, collected by Laing in 1893 and labelled in Robert Malcolm Laing’s handwriting. To our knowledge, no lectotype has been designated yet.

The specimens distributed under n° 260 of *Algae nova zelandicae* are topotypes.

Furthermore, PC0044740 and probably PC0044741 (not shown) were invalidly named *Lessonia pedata* by Montagne in his herbarium [*Lessonia pedata* Montagne *nomen herbariorum* (invalid)]. These two specimens seem to be, but without certainty, *Macrocystis* of very small size.

Acknowledgements. We are grateful to Chantal Billard for communicating photocopies of specimens of *Lessonia* preserved in Caen and further details about them, to Denis Lamy for his invaluable help in communicating autograph letters of several phycologists or collectors for their handwriting expertise, and to Bill Woelkerling and Bruno Dennetière for fruitful discussion concerning the nomenclature and ICBN. Marguerite Czarnecki’s translation of the Latin diagnosis was greatly appreciated. We thank Florence Rousseau for attempting to generate sequences from the isotype of *L. vadosa*, Bill Woelkerling and Wendy Nelson for supplying Laing’s article not available in France, Alain Changy for its help with preparing a first version of the plates and Lionel Kervan for adding numbers and barcodes on specimens as well as for entering data corresponding to the specimen studied in this study in the PC database. We thank Sung Min Boo, N.G. Klochkova, T.N. Krupnova and Ga Youn Cho for sharing unpublished (at that time) results. We are very grateful to Andres Mansilla for sending pieces of *L. flavicans* sensu Searles and photographs in the field of both *L. flavicans* sensu Searles and *L. vadosa*. Robert Searles kindly sent on loan *Lessonia* specimens from Duke Algal Herbarium and generously gave us the one designated the holotype of *L. searlesiana* in order it is deposited at PC. J. Correa and S. Faugeron provided useful field informations.

REFERENCES

- ABBOTT I.A. & HOLLENBERG G.J., 1976 — *Marine algae of California*. Stanford, California: Stanford Univ. Press, pp. vii-xii + 1-827.
- AGARDH J.G., 1841 — In *historiam algarum symbolae*. *Linnaea* 15: 1-50, 443-457 (Continuatio prima).
- AGARDH, J.G., 1848 — *Species genera et ordines algarum [...]. Volumen primum. Algas fucoideas complectens*. Lund [Lund]: Gleerup, VIII + 363 p.
- AGARDH J.G., 1894 — *Analecta algologica. Continuatio II*. Lundae: Typis expressit E. Malmström, 1-98, Explicatio Iconum [99], 1 pl.
- AGARDH J.G., 1877 — De Algis Novae Zelandiae marinis. *Lunds universitets Års-Skrift, Afdelningen for matematik och naturvetenskap* 14 (4): 1-32.



Fig. 25. Isotype of *Lessonia vadosa* Searles PC0062746. "AB 10106" refers to the old numbering system.



Fig. 26. *Lessonia variegata* PC0062745. Syntype. "SA 3721" refers to the old numbering system.

- BOO S.M., LEE W.J., YOON H.S., KATO A. & KAWAI H., 1999 — Molecular phylogeny of Laminariales (Phaeophyceae) inferred from small subunit ribosomal DNA sequences. *Phycological research* 47: 109-114.
- BOO S.M. & YOON H.S., 2000 — Molecular relationships of giant kelp (Phaeophyceae). *Algae* 15: 13-16.
- BORY DE SAINT VINCENT J.-B.G.M., 1825 [“1826”] (1822-1831) — Lessonie. *Dictionnaire classique d'histoire naturelle par une société de naturalistes, ouvrage dirigé par M. Bory de Saint-Vincent, et dans lequel on a ajouté, pour le porter au niveau des sciences, un grand nombre de mots qui n'avaient pu faire partie de la plupart des dictionnaires antérieurs.* [Rey et Gravier; Baudoïn, Paris, 17 volumes.] 9: 321-322.
- BORY DE SAINT-VINCENT J.-B.G.M., 1829 [1826-1829] — Cryptogamie. In: L.I. Duperrey, *Voyage autour du monde, exécuté par ordre du Roi, sur la corvette de sa majesté La Coquille, pendant les années 1822, 1823, 1824 et 1825, sous le ministère et conformément aux instructions de s. e. M. le marquis de Clermont-Tonnerre, ministre de la Marine; et publié sous les auspices de son excellence Monseigneur le Comte de Chabrol, ministre de la Marine et des Colonies, par M. L. I. Duperrey, capitaine de frégate, chevalier de Saint-Louis et membre de la Légion d'honneur, commandant de l'expédition. Botanique, par MM. d'Urville, second de l'expédition, Bory de Saint-Vincent et ad. Brongniart.* Paris. 301 p. [pp. 1-96 (1827), 97-200 (1828), 201-301 (1829)], Atlas (1826). *Histoire Naturelle, Botanique*, pls 1-13, 13 bis, 14-38.
- BROSSE J., 1998 — *Les tours du monde des explorateurs. Les grands voyages maritimes 1764-1843.* Paris: Larousse-Bordas [1]-288. (First impression Paris: Bordas, 1983).
- CHO G.Y., KLOCHKOVA N.G., KRUPNOVA T.N. & BOO S.M., 2006 — The reclassification of *Lessonia laminarioides* (Laminariales, Phaeophyceae): *Pseudolessonia* gen. nov. *Journal of phycology* 42: 1289-1299.
- DRUEHL L.D., MAYES C., TAN I.H. & SAUNDERS G.W., 1997 — Molecular and morphological phylogenies of kelp and associated brown algae. In: Bhattacharya, D. (ed.), *Origins of algae and their plastids.* Wien, New York: Springer, pp. 221-235. ISBN 3-211-83036-7 [Note: also edited as supplement 11 of *Plant systematics and evolution*, ISBN 3-211-83035-9].
- DUMONT-D'URVILLE J., 1825 — *Flore des îles Malouines.* Paris: De Lebel, [i], [1]-56. [Cryptogamia by Bory de Saint-Vincent J.-B.G.M.] Note: Dumont d'Urville's *Flore des îles Malouines* also appeared later (1829) in the journal *Mémoires de la Société Linnéenne, Paris* 4: 572-624 [Cryptogamia by Bory de Saint-Vincent J.-B.G.M.]. (Stafleu & Cowan, 1976, p. 697, entry 1555).
- ETCHEVERRY H., 1951 — Generos algológicos Chilenos. I. Genero *Lessonia* Bory, 1825. *Revista de biología marina* 3 (1-2): 53-69.
- FARLOW, W.G., ANDERSON, C.L. & EATON, D.C., 1878 (1877-1889) — *Algae exsiccatae Americae borealis. Fasc. I-V.* Boston, Massachusetts, USA.
- FRITSCH F.E., 1945 — *The structure and reproduction of algae.* Vol. II, Cambridge: Cambridge University Press, [i]-xiv, [1]-939 p., 2 folding maps.
- GAIN L., 1912 — La flore algologique des régions antarctiques et subantarctiques. In: J. Charcot (Ed.), *Deuxième Expédition Antarctique Française (1908-1910). Documents scientifiques: Sciences Naturelles,* Paris: Masson et C^{ie}, 218 p., 8 pls. [Note: also appeared as Thèse de doctorat ès sciences naturelles, n° 1466, Faculté des Sciences de Paris, Masson et C^{ie}, Paris, 218 p. et 3 pls.]
- GEPP A. & GEPP E.S., 1905 — Antarctic algae. *Journal of botany* 43: 105-109.
- GEPP A. & GEPP E.S., 1906 — A new species of *Lessonia*. *Journal of botany* 44: 425-426.
- MCNEILL J. (chairman), BARRIE F.R., BURDET H.M., DEMOULIN V., HAWKSWORTH K., MARHOLD K., NICOLSON D.H., PRADO J., SILVA P.C., SKOG J.E., WIERSEMA J.H. (Members) & TURLAND N.J. (Secretary of the Editorial Committee), 2006 — *International Code of Botanical Nomenclature* (Vienna Code) adopted by the Seventeenth International Botanical Congress, Vienna, Austria, July 2005. *Regnum vegetabile* 146. A.R.G. Gantner Verlag KG. XVI, 568 p.
- GUIGNARD L., 1892 — Observations sur l'appareil mucifère des Laminariacées. *Annales des sciences naturelles, botanique*, 7^e sér., 15: 1-46.
- HARIOT P.A., 1889 — Algues. In: *Mission scientifique du Cap Horn. 1882-1883. Vol. 5. Botanique.* Paris: Gauthier-Villars et fils, pp. 3-110, pls 1-9.
- HARVEY W.H. & HOOKER J.D., 1847a [‘1845’] - Algae. In J. D. Hooker (ed.), *The cryptogamic botany of the Antarctic voyage of H.M. Discovery Ships “Erebus” and “Terror” in the years 1839 and 1843 under the command of Captain Sir James Clark Ross, Kt., R.N., F.R.S &c.. Vol. I. Cryptogamia antarctica. Part 1, Botany of Lord Auckland's Group and Campbell's Island* [i]iv + pp. 5-88 *Algae*, pp. 63-81. *Part 2, Botany of Fuegia, the Falklands, Kerguelen's Land, etc. Algae*, pp. 148-213, 237-241, pls 165-194. London: Reeve brothers, Fortin, Paris: Masson et C^{ie} [258 p. et pls 57-80, 151-198]. [Note: title page is dated 1845, but volume is

- thought to have appeared in 1847; pp. [i-iv] are a special t. p. and introduction (Stafleu & Cowan 1979: 271-272)].
- HARVEY W.H. & HOOKER, J.D., 1847b — Algae. In: Hooker J.D. (ed.), *The Botany of the Antarctic Voyage*. Vol.1. Flora Antarctica. London: L. Reeve, pp. 175-193, 454-519.
- HAY C.H., 1987 — *Lessonia adamsiae* sp. nov. (Phaeophyta: Laminariales) from the Snares Islands, New Zealand. *New Zealand journal of botany* 25: 295-308.
- HAY C.H., 1989 — *Lessonia tholiformis* sp. nov. (Phaeophyta: Laminariales) from the Chatham Islands, New Zealand. *New Zealand journal of botany* 27: 461-469.
- HOHENACKER R.F., 1854 (1852-1862) — *Algae marinae exsiccatae*. Esslingen. Fasc. 4: 151-200.
- KRAAN S. & GUIRY M.D., 2000 — Sexual hybridization experiments and phylogenetic relationships as inferred from RUBISCO spacer sequences in the genus *Alaria* (Phaeophyceae). *Journal of phycology* 35: 190-198.
- KRAAN S., RUENESS J. & GUIRY M.D., 2001 — Are North Atlantic *Alaria esculenta* and *A. grandifolia* (Alariaceae, Phaeophyceae) conspecific? *European journal of phycology* 36: 35-42.
- KÜTZING F.T., 1849 — *Species algarum*. Lipsiae [Leipzig]. VI + 922 p.
- LAING R.M., 1894 ('1893') — On the algae of New Zealand. On *Lessonia variegata*, J.Ag., Mscr. *Transactions and proceedings of the New Zealand institute* 26: 304-310.
- LANE C.E., MAYES C., DRUEHL L.D. & SAUNDERS G.W., 2006 — A multi-gene molecular investigation of the kelp (Laminariales, Phaeophyceae) supports substantial taxonomic reorganization. *Journal of phycology* 42: 493-512.
- LUCAS A.H.S., 1931 — Notes on Australian marine algae. VI. *Proceedings of the Linnean society of New South Wales* 56: 407-411, pls XXIII-XXVII.
- MONTAGNE [J.F.] C., 1842 — Troisième centurie de Plantes cellulaires exotiques nouvelles, par C. Montagne D.M. Decades I à IV. *Annales des sciences naturelles, Botanique, 2^e série*, 17 (2): 119-128.
- PAPENFUSS G.F., 1964 — Catalogue and bibliography of antarctic and subantarctic benthic marine algae. In: Biology of the Antarctic seas. *American geophysical union, Antarctic research series* 1: 1-75.
- POSTELS A. & RUPRECHT F., 1840 — *Illustrationes algarum*. Petropoli [Saint Petersburg]: typi Eduardi Pratz, (VI +) IV + 22 p., XL pls.
- REINKE J., 1903 — *Studien zur vergleichenden Entwicklungsgeschichte der Laminariaceen*. Kiel: Druck von Schmidt & Klaunig, pp. [1]-65.
- REINSCH P.F., 1890 — Zur Meeresalgenflora von Süd-Georgien. In: Neumayer G. (Ed.), *Internationale Polarforschung, 1882-1883. Die deutschen Expeditionen und ihre Ergebnisse. Vol. 2. Beschreibende Naturwissenschaften*. Berlin, pp. 366-449, pls I-XIX.
- RUPRECHT, F.J., 1850 — *Algae ochotenses. Die ersten sicheren Nachrichten über die Tange des Ochotskischen Meeres*. Saint Petersburg: Buchdruckerei der Kaiserlichen Akademie der Wissenschaften, pp. [1], 2 (194)-243 (435), pls 9-18.
- SAUNDERS G.W. & DRUEHL L.D., 1993 — Revision of the kelp family Alariaceae and the taxonomic affinities of *Lessoniopsis* Reinke (Laminariales, Phaeophyta). In: Chapman A.R.O., Brown M.T., Lahaye M (eds), 14 Int. Seaweed Symp., Brest (France), 16-21 August 1992, *Hydrobiologia* 260-261: 689-697.
- SCROSATI R.A., 1991 — Estudios anatomicos en *Lessonia vadosa* (Phaeophyta, Laminariales) de la Argentina. *Boletín de la sociedad Argentina de botánica* 27 (3-4): 165-171.
- SEARLES R.B., 1978 — The genus *Lessonia* Bory (Phaeophyta, Laminariales) in southern Chili and Argentina. *British phycological journal* 13: 361-381.
- SILVA P.C., BASSON P.W. & MOE R.L., 1996 — *Catalogue of the Benthic Marine Algae of the Indian Ocean*. University of California Publications in Botany, volume 79. Berkeley, Los Angeles, London, University of California Press, pp. [i]-xiv, 1-1259 (1 fig., p. [8]).
- SKOTTSBERG C., 1907 — Zur Kenntnis der Subantarktischen und Antarktischen Meeresalgen I. Phaeophyceen. In O. Nordenskjöld (Ed.), *Wissenschaftliche Ergebnisse der Schwedischen Südpolar-Expedition, 1901-1903*, 4 (6), pp. [1] 172, pls 1-10, 1 map. Stockholm (Kungl. Boktryckeriet. P.A. Norstedt & Söner).
- SKOTTSBERG C., 1921 — Botanische Ergebnisse der Schwedischen Expedition nach Patagonien und dem Feuerlande 1907-1909. VIII Marine Algae I: Phaeophyceae. *Kongl. Svenska vetenskapskademiens handlingar* 61 (11): 1-56, Stockholm.
- STAFLEU F.A., & COWAN R.S., 1976 — *Taxonomic Literature Vol. I: A-G*. 2nd Ed. Utrecht: The Netherlands, Bohn, Scheltema and Holkema, xl + 1136 p. [Note: *Regnum vegetabile* 94].
- STAFLEU F.A., & COWAN R.S., 1979 — *Taxonomic Literature Vol. II: H-L*. 2nd Ed. Utrecht, The Netherlands, Bohn, Scheltema and Holkema, xviii + 991 p. [Note: *Regnum vegetabile* 98].
- SUHR J.N. von, 1839 — Beiträge zur Algenkunde. [N^o3.] *Flora* 22 (5): 65-75, pls I-IV [figs 22-37].
- SUHR J.N. von, 1841 — Beiträge zur Algenkunde. *Verhandlungen der kaiserlichen Leopoldinisch-Carolinischen Akademie der naturforscher* 18 (suppl. 1): [1-3], 4 (276)-16 (288), pls I-III.

- TILDEN J.E., 1900 (1894-1909) — American algae [Exsiccatae]. Vol. Centuries 1-7 (Centurie 4), Fasc. 1. pp. 301-400. Minneapolis.
- VENEGAS M., TALA F., FONCK E. & VASQUEZ J., 1992 — Sporangial sori on stipes of *Lessonia nigrescens* Bory (Laminariales, Phaeophyta): a high frequency phenomenon in intertidal populations of Northern Chile. *Botanica marina* 35: 573-578.
- VILLOUTA E. & SANTELICES B., 1986 — *Lessonia trabeculata* sp. nov. (Laminariales, Phaeophyta), a new kelp from Chile. *Phycologia* 25: 81-86.
- WOELKERLING Wm. J. & LAMY D., 1998 — *Nongeniculate coralline red algae and the Paris Muséum: systematics and scientific history*. Paris: Publications scientifiques du Muséum national d'Histoire naturelle, Service des publications scientifiques, 767 p.
- YOON H.S., LEE J.Y., BOO S.M. & BHATTACHARYA D., 2001 — Phylogeny of Alariaceae, Laminariaceae, and Lessoniaceae (Phaeophyceae) based on plastid-encoded RuBisCo spacer and nuclear-encoded ITS sequence comparisons. *Molecular phylogenetics and evolution* 21: 231-243.
- YOTSUKURA N., DENBOH T., MOTOMURA T., HORIGUCHI T., COLEMAN A.W. & ICHIMURA T., 1999 — Little divergence in ribosomal DNA internal transcribed spacer-1 and -2 sequences among non-digitate species of *Laminaria* (Phaeophyceae) from Hokkaido, Japan. *Phycological research* 47: 71-80.
- ZANEVELD, J.S., 1993 — *Iconography of Antarctic and Sub-Antarctic Benthic Marine Algae. Part II. Phaeophycophyta*. Cryptogamic Studies Vol. 4. Stuttgart, Jena, New York: Gustav Fischer, 2 cartes + 125 p. incluant 98 pl.
- ZINOVA A.D., 1959 — O dvukh burykh vodoroslyakh iz Antarktiki - *Phyllogigas* i *Humantothallus* [on two brown algae from the Antarctic — *Phyllogigas* and *Himantothallus*]. *Botanicheski zhurnal (Moskva & Leningrad)* 44: 372-379.

