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Darwin notes on *Beagle* plants

Duncan M. Porter (Editor)

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For Gordon Chancellor -
with kindest regards,
Duncan Porter

Darwin's notes on *Beagle* plants

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Contents

Acknowledgements	148
Introduction	149
The Plant Notes	152
Coralline and other Algae	186
Plants in Spirits of Wine	218
Literature Cited	231

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Introduction

Charles Darwin is not usually thought of as a botanist, even though later in life he published several books on different aspects of plant life, based in part on personal experiment. Some of his recollections of early childhood, however, indicate an early interest in the plant kingdom. For example, in his autobiography (Barlow, 1958: 22–23) he wrote that at age eight, when he began to attend school in Shrewsbury:

my taste for natural history, and more especially for collecting, was well developed. I tried to make out the names of plants, and collected all sorts of things, shells, seals, franks, coins, and minerals. The passion for collecting, which leads a man to be a systematic naturalist, a virtuoso or a miser, was very strong in me, and was clearly innate, as none of my sisters or brother ever had this taste.

This 'passion for collecting' continued through the voyage of HMS *Beagle* (December 1831–October 1836) and beyond, but following the voyage it turned from collecting specimens to collecting information.

Although his primary interests on the voyage were geology and zoology, Darwin collected plants and made observations on vegetation as well (Porter, 1980a). In his first letter to his mentor, the Revd John Stevens Henslow (1796–1861, Professor of Botany at the University of Cambridge), Darwin wrote on 18 May 1832 from Rio de Janeiro, Brazil: 'Geology & the invertebrate animals will be my chief object of pursuit through the whole voyage.' (Burkhardt & Smith, 1985b: 237). Indeed, he kept to this bearing throughout the voyage. On 20 July 1834, Darwin wrote to his sister Catherine (Emily Catherine Darwin, 1810–66) from the *Beagle*, 'a hundred miles South of Valparaiso', Chile: 'You ask me about the specimens which I send to Cambridge I collect every living creature, which I have time to catch & preserve; also some plants.' (Burkhardt & Smith, 1985b: 391). The collections were sent to Henslow in Cambridge, who was to hold them for Darwin's return (Porter, 1985).

Concerning the plant collections, Henslow wrote on 30 January 1836 to William Jackson Hooker (1795–1865, then Regius Professor of Botany at Glasgow University), who was helping Henslow to identify Darwin's plants: 'Darwin's letters contain very little Botanical allusion, as he is no Botanist—His collections were made to please me—' (Porter, 1984: 109). This point is emphasized in Henslow's letter to Darwin of 15–21 January 1833. Having received the first consignment of specimens from South America, Henslow is full of advice on collecting methods. Besides instructions on geology, zoology, and botany, he includes, 'Most of the plants are very desirable to me', and 'The Lichens are *good things* as scarcely any one troubles himself to send them home—' (Burkhardt & Smith, 1985b: 293, 294). Perhaps this helps explain why Darwin went out of his way to collect so many plant specimens while on the voyage.

Besides merely collecting specimens, Darwin kept notes on these specimens and made observations on places visited and objects seen. He kept several kinds of records, which are well discussed by Burkhardt & Smith (1985b: 545–548). The *Field Notebooks* are small pocket notebooks, used for notes and initial impressions while travelling. The *Diary*, or *Journal* as it was called by Darwin, contains day-by-day discussions of where he went, what he did, and what he saw. It was sent home to his family periodically, but it did not substitute for letters, which are now printed *in toto* in Burkhardt's & Smith's (1985b) magnificent work. Darwin wrote to his sister Caroline (Caroline Sarah Darwin, 1880–88) on 25 April 1832 from Rio de Janeiro (Burkhardt & Smith, 1985b: 226, 227):

I send in a packet, my commonplace Journal.—I have taken a fit of disgust with it & want to get it out of my sight, any of you that like may read it.—a great deal is absolutely childish: Remember however this, that it is written solely to make me remember this voyage, & that it is not a record of facts but of my thoughts.—& in excuse recollect how tired I generally am when writing it.— . . .

Be sure you mention the receiving of my journal, as anyhow to me it will of considerable future interest as it [is] an exact record of all my first impressions & such a set of vivid ones they have been, must make this period of my life always one of interest to myself.—If you will speak quite sincerely,—I should be glad to have your criticisms. Only recollect the above mentioned apologies.—

In spite of Darwin's reservations about his diary, it still bears reading, and relevant passages are cited later in this paper. It was the main source to Darwin for his *Journal of Researches* (Darwin, 1839, 1845), and it has appeared in slightly edited (Barlow, 1933) and facsimile (Darwin, 1979) editions. Excerpts below are from his granddaughter Lady Barlow's version of the *Diary*.

The zoological and geological observations made by Darwin were recorded in a *Zoological Diary*¹ and a *Geological Diary* and *Geological Notes*. Although these have not been published as written, the first was used extensively for the five volume *Zoology of the Beagle* (Darwin, 1838–43), and the others for the three volumes subtitled *The Geology of the Voyage of the Beagle* (Darwin, 1842, 1844, 1846). A number of the early papers, particularly the geological ones reprinted in Barrett (1977), also originated in these notes.

One surprising thing about the *Zoological Diary* is that about twenty per cent of its 368 pages are devoted to notes on plants, including fungi and lichens. Most of these notes describe and discuss plants collected by Darwin; others are general observations on vegetation. Those relevant to the present paper are printed below in discussions of the specimens to which they refer.

Finally, there are 10 notebooks devoted to specimens collected on the *Beagle's* voyage. The four *Geological Specimen Notebooks* enumerate the fossil and mineralogical specimens collected. The six *Specimen Notebooks* are in two series. Three are titled *Printed Numbers*, the other three *Catalogue for Specimens in Spirits of Wine*. The latter are numbered independently of the first two. Specimens with paper labels (dried specimens) were entered into either the *Geological Specimens Notebooks* or the *Printed Numbers Notebooks*, depending upon whether they were inanimate or animate, fossil or recent. Specimens fixed in spirits were given metal labels, placed in bottles or jars, and entered into the *Specimens in Spirits of Wine Notebooks*. The latter, the *Printed Numbers Notebooks*, and the *Field Notebooks* are now in the Darwin collection at Down House, Darwin's residence in Downe, Kent, as is the *Diary*. The Darwin Archives at the Cambridge University Library house the *Zoological Diary* (DAR 30, 31), *Geological Diary* (DAR 32, 33), the *Geological Notes* (DAR 34 to 38), and the *Geological Specimen Notebooks* (DAR deposit).

For some time, I have wondered why Darwin kept so many and such detailed series of notes on his collections and observations on his travels while on the voyage. He had previously kept a short notebook of observations dated March and April 1827 on marine invertebrates and on the pollen and floral anatomy of a geranium (reprinted in Barrett, 1977), written while he was a student at the University of Edinburgh. According to Bailey & Gosse (1960), there are also two items in the Darwin Archives, which I have not examined, that bear on this subject: *Zoological walk to Porto bello* [c. 1826]^{CD} (DAR 5) and *Diary for 1826, with entries about birds, beasts and flowers seen on walks*. (DAR 129). However, there is no evidence that similar notebooks were compiled while he was a student at Cambridge during 1828–31, in spite of his increasing interest in entomology and geology.

Perhaps he was compelled to begin again by information sent him by his sister Caroline in a letter dated 20–31 December 1831 (Burkhardt & Smith, 1985b: 188), although it was not received by him until 5 April 1832 in Rio de Janeiro:

I find Mr Bruce's brother has been almost as great a traveller as you are going to be—having passed seven years in Arabia, Egypt, Nubia &c these Bruces are related to the Bruce which I did not know before. Mr Bruce asked a great many particulars about you & begged I would tell you what happened

¹Actual title 'Diary of observations on zoology of the places visited during the voyage'.

to his brother who after 5 years travelling, & collecting & writing, was shipwrecked & all his papers destroyed & who never ceased regretting that he had not kept duplicates and sent off his journals & papers by every safe opportunity—he hoped you would profit by the hint.

'Mr Bruce's brother' presumably is James Bruce (1730–94), explorer of the Nile; *the Bruce* is Robert the Bruce (1274–1329), King of Scotland.

Advice on the keeping of good records was also offered Darwin by his cousin William Darwin Fox (1805–80), who had been a fellow student at Christ's College, Cambridge and one of his early instructors in entomology. Fox wrote on 30 June 1832 (Burkhardt & Smith, 1985b: 244–245):

I have often regretted one trait of your Character which will I fear prevent your making so great an advantage you might do from your present travels, and which I regret also very much on my own account, as I might perhaps get the perusal of it;—I allude to your great dislike to writing & keeping a daily methodical account of passing events, which I fear (tho' I have also hopes the other way from the overwhelming influence of every surrounding object) will prevent you from keeping a Regular Journal.—If you do not do this, the vast crowd of Novelty which will surround you, will so jostle about ideas, that to say nothing of the many that will be lost altogether, the vivid reality & life which a memorandum taken at the moment give to every passing event & thing is done away with.—With this one exception (which I dare say you have overcome) I know of no one so fitted altogether for the expedition you are engaged in.

Darwin received Fox's letter in Montevideo, Uruguay in late October 1832. Neither it nor Caroline Darwin's of 20–31 December 1831 were published before their appearance in Burkhardt & Smith (1985b). Since both letters arrived in Darwin's hands several months after he had started on the voyage and begun the various series of notes, however, they probably served more as a stimulus for, rather than a commencement of, serious notekeeping. Nevertheless, scholars should be grateful to Darwin's sister and his cousin for having offered him this advice.

The present paper is divided into three parts, each of which discusses a different group of plants. As the reader will see, however, there is a certain amount of overlap between these parts. A broad definition of plants also is used, algae, fungi, lichens, and cyanobacteria being so classed, as they were by Darwin and his contemporaries.

The first part discusses the plants listed in Darwin's *Plant Notes*, prepared for Henslow, who was to identify the dried specimens. These are mostly vascular plants, ferns and flowering plants. The second part enumerates the algae, particularly the corallines, in which Darwin was keenly interested. Notes on the corallines were prepared by Darwin for the Irish botanist William Henry Harvey. The third part discusses the plants preserved in spirits; the majority of these are fungi. There is abundant evidence that a list of plants in spirits of wine was prepared, but it has not been found in spite of much searching.

For those who are surprised that Charles Darwin was such an assiduous and careful collector and recorder of specimens and observations while on the *Beagle* voyage, we need turn no further than the last sentence in his *Diary* entry for 5 March 1832, written soon after he arrived in Bahia, Brazil:

It is a new & pleasant thing for me to be conscious that naturalizing is doing my duty, & that if I neglected that duty I should at same time neglect what has for some years given me so much pleasure.'

The Plant Notes

During the latter part of the *Beagle's* voyage, Darwin and his servant Syms Covington (1816?–61) compiled a series of lists of collections of the various groups of organisms gathered by Darwin. The disposition of these lists and the collections they describe are discussed in Porter (1985). Sulloway (1982, 1983) has elegantly worked out that the lists were compiled between 18 June and 12 August 1836, while the *Beagle* sailed between the Cape of Good Hope and Pernambuco, Brazil. The lists were intended for the use of the taxonomists who were expected to identify the specimens included. Darwin marked the *Specimen Notebooks'* original inked entries with pencilled notations: A (mammal), B (bird), I (insect), S (shell), and P (plant) for the dried specimens and those in spirits; R (reptile or amphibian), C (crustacean), and F (fish) were added to the specimens in spirits. Theoretically, then, there should be 13 lists; all have been found except for plants in spirits and crustacea in spirits. There are several other lists for specialists that were compiled by Darwin after his return to England. That on the coralline algae is discussed in the next section of this paper.

Occasionally, Darwin added a pencilled 'Copy' or a reference to a page in the *Zoological Diary*. The latter referred to a longer discussion of the collection than was possible to give in the *Specimen Notebooks*. Usually, but not always, this was added to the information from the *Specimen Notebooks* in compiling the lists. Covington did most of this compilation, but several lists are all or mostly in Darwin's hand. Darwin also commonly corrected Covington's misspellings in the lists.

All of the known lists are deposited either in the Darwin Archives of the Cambridge University Library, or in the General Library and Entomology Library of the British Museum (Natural History). With one exception, these lists have been known for some time, although their purpose was only recently recognized. The exception is the *Plant Notes*, found in the archives of the Cambridge University Herbarium in 1980 (Porter, 1981, 1982).

In early December 1980, Mrs Rita l'Ons, then an Assistant in the Herbarium, brought to my attention two notebooks that Henslow had compiled on Darwin's *Beagle* plant collections. They were in a folder marked 'Darwin—2 Books of Lists of S. American Plants'. One notebook was titled 'C. Darwin's Plants from S. America', the other 'Darwin and Henslow's S. American Plants'. Lieutenant George Henslow (dates unknown), J. S. Henslow's nephew, collected plants in South America in 1827–28. This notebook compares his and Darwin's specimens, and those of Hugh Cuming (1791–1865), with species reported from South America and the South Pacific by Hooker and Arnott (1833). This series of papers ran through 1841, and all species enumerated are included in the 37 pages of the notebook. However, Darwin's collections are noted only on the first four pages.

Tied with string in the back of the second notebook were Darwin's *Plant Notes*. In fact, the grey paper cover of the notebook is identical to the covers that remain on several of the other lists. Darwin has written '—Plants—' on the outside cover, as he did the names of the organisms on the extant covers of the other lists. Thus, Henslow's notes have been inserted into Darwin's covers, and not vice versa.

Inside the front cover of the notebook Darwin wrote:

Red = 1000
Green = 2000
Yellow = 3000

This is a note to the user that a specimen with a yellow label bearing the number 645 is actually

number 3645. This notation, or a similar one, is on the inside front cover of the other Darwin lists still retaining the original grey paper covers. Below the above Darwin added:

(980)
2377
1346 Curious Cryptogamic Plants.—
1590
2056
Name of filam Lichen at Galapagos

As was true for the other lists, these were specimens the names of which Darwin wanted so that they could be included in his *Journal of Researches* (Darwin, 1839, 1845).

Some of the dried plant, algal, or fungal specimens Darwin collected are not included in the *Plant Notes*, probably because they did not survive to be sent to Henslow, or they did not survive the trip back to England. An example of the latter is a collection of the mold *Mucor* (Mucoraceae), of which Henslow wrote to Darwin on 21 January 1833:

'For goodness sake what is No. 223 it looks like the remains of an electric explosion, a mere mass of soot—something very curious I daresay—' (Burkhardt & Smith, 1985b: 294).

Of this collection, Darwin wrote in the *Zoological Diary* (page 20):

1832 February St. Jago [São Tiago, Cape Verde Islands] to Fernando Noronha [Brazil]

[*Mucor* in margin] *Mucor*. Linn: growing on a lime [i.e., *Citrus aurantiifolia* (Christm.) Swingle, Rutaceae] from St. Jago length .1 of inch ['(a)' in margin] brown colour: pedicel hollow. simple transparent. diameter .006. [i.e., inches]—at extremity ball containing sporules. diameter .007.—Sporules varying in size. very minute. about .0009 in diam: When the mould was placed in water. the balls burst longitudinally. & sent forth the sporules.—at same time globules of air passed down the pedicel.—This took place with such violence. that the recoil on the ball. gave it sufficient motion to be visible to the naked eye.—The same results occurred with greater force. when Spirits of Wine was used instead of water.—Was it not a similar observation. that first led Dutrochet to the discovery of the laws of Endosme?

Henri Dutrochet (1776–1847), a French scientist, in the 1820s had published on the phenomenon of endosmosis, osmotic movement into cells. Note (a) is given on page 19, *verso*:

(a) No. 223 not in Spirits

(a) Observed the same species growing on gum dissolved in vinegar.—(March 23) found a sort very like this on old paste; the colour was yellow, & the stalks rather longer in proportion were the only differences I could perceive

This latter collection is noted on page 29 of the *Zoological Diary*:

[*March 23d* in margin] *Mucor* growing on green ginger [presumably *Zingiber officinale* Rosc., Zingiberaceae]; colour yellow [*Mucor* in margin] length from 1/20 to 1/15 of an inch.—Diameter of stalk .001, of ball at extremity .006.—Stalk transparent, cylindrical for about 1/10 of length, near to ball, it is flattened. angular & rather broader: Terminal spherule full of grains, .0001 in diameter & sticking together in planes; When placed in water the ball partially burst & sent forth with granules large bubbles of air.—A rush of fluid was visible in the stalk or cylinder.—If merely breathed on, the spherule ['was' marked out] expanded itself & three conical semitransparent projections were formed on surface—; (Much in the same manner as is seen in Pollen) These cones in a short time visibly were contracted & drawn within the spherule.—

The page is crossed in pencil and 'Copied' is noted opposite the next entry. The *Beagle* was at sea on 23 March 1832, between the island of Fernando Noronha and Bahia, Brazil. The ginger on which this mold was growing presumably had come aboard the ship at an earlier stop, probably in the Cape Verde Islands.

Later in the *Zoological Diary*, there is another entry for a fungus not included in the *Plant Notes* (page 190):

1833 [May marked out] June Maldonado [Uruguay]

[*Lycoperdium* 664' in margin] This curious fungus, consists of a dark brown bag, containing powder, like a common *Lycoperdium*: but instead of growing on the ground, it is seated on a circular flat disk (of a lighter colour) the superior & inferior edges of which are cracked & crushed.—They would seem like sphere burst through, especially the lower one: which latter is slightly attached to the soil.—Grow in damp & rather shady places:—

This collection was cited by Berkeley (1842: 447) as '*Geaster saccatus*, Fr. Darw. No. 664. 1493. Damp, rather shady places. Maldonado. June 1832.' There is a specimen at Kew filed under this name; the correct year is 1833. Darwin's entry for this member of the Geastraceae (*Geastrum saccatum* Fr.) Has 'Copied' written in pencil in the margin by Covington. This, along with Berkeley's notation of its habitat, indicates that there may have been a separate list of fungi prepared for Berkeley and sent to him with the specimens. This list would be analogous to the *Plant List* and the other lists discussed above.

Another list that has not surfaced is that prepared for Henslow of the Cocos-Keeling Islands plants. Many of those enumerated in Henslow's (1838) paper on Darwin's collections have comments on them attributed to Darwin. For example, in his discussion of *Ochrosia parviflora* (Forst. f.) Hemsl. (= *Neisiopsisparma oppositifolia* (Lam.) Fosberg & Sacht, Apocynaceae; see number 3596 below), Henslow wrote that:

'Mr. Darwin's specimens were accompanied by the following note: "Forms straight handsome trees, with smooth bark, which are commonly dispersed two or three together. The fruit is bright green, like that of the walnut."' (Henslow, 1838: 345).

This information is not in the *Plant Notes* or the *Zoological Diary*, leading me to conclude that it must have been in a separate list, probably prepared after the *Beagle* returned to England, like that for the coralline algae discussed in the following section.

The 11 pages of the *Plant Notes* are in Covington's handwriting, with a number of additions and corrections by Darwin. Henslow also made several additions when he was identifying Darwin's collections after the latter returned to England in October 1836. In addition, there are two names on the last page added by Joseph Dalton Hooker (1817–1911, then Assistant at the Royal Botanic Gardens, Kew) in the early 1840s when he was identifying Darwin's Galápagos Islands plants. These additions and corrections are noted below.

In the following account, the *Plant Notes* are given as written, additions and corrections included. Differences from what appears in the *Specimen Notebooks* are indicated. Sections from the *Diary* or the *Zoological Diary* are added where pertinent, as are my own comments. Scientific names and families are given for the specimens that I have identified; those that have been discussed in the literature are indicated, and the names ascribed to them given. All the vascular plants Darwin collected on the *Beagle* voyage are discussed in detail elsewhere (Porter, 1986). Specimens that I have found are indicated, and the herbaria in which they were found are given. The standard herbarium abbreviations (Holmgren *et al.*, 1983) are used: BM (British Museum (Natural History)), CGE (Cambridge University Herbarium), E-GL (Glasgow University Herbarium specimens at the Royal Botanic Garden, Edinburgh), FI-W (Webb Herbarium of the University of Florence), GL (Glasgow University Herbarium), K (Royal Botanic Gardens, Kew), and MANCH (University Museum, University of Manchester).

The *Plant Notes*

[page] (1)

1832.

Plants.

196. Fruit from the great *Adansonia*. N.E. of Porto-Praya ['St. Jago.—' added by Darwin]

Adansonia digitata L. (Bombacaceae); I found no specimens of this tropical tree.

This impressive tree caught Darwin's eye, and he commented on it several times in his *Diary* (Barlow, 1933). The *Beagle* visited São Tiago, Cape Verde Islands during 16 January–8 February 1832 and 31 August–4 September 1836. Darwin's *Diary* entry for 20 January 1832 begins:

I took a long walk with Maccormick into the interior. Although in such a country the objects of interest are few, yet perhaps from this very reason, each individual one strikes the imagination the more. We followed one of the broad water courses, which serves as a road for the country people; by the greatest good luck it lead us to the celebrated Baobob trees. I had forgotten its existence, but the sight immediately recalled a description of it which I had formerly read. This enormous tree, measured 36 feet 2 inches at the height of 2 feet 8 in. from ground. Its altitude in no way corresponds with its great thickness. I should not suppose it was 30 feet high. This tree is supposed to be one of the longest lived that exists. Adanson supposed that some reached to the age of 6,000 years. This one bears on its bark the signs of its notoriety; it is as completely covered with initials & dates, as any one in Kensington Gardens.

Dr Robert MacCormick (1800–90) was Surgeon on the *Beagle* until Rio de Janeiro, Brazil was reached in April 1832. MacCormick was sent back to England because of personality problems with Captain Robert FitzRoy (1805–65) and John Clements Wickham (1798–1864), First Lieutenant. Michel Andanson (1727–1806), for whom Linnaeus named the genus *Adansonia*, was a French botanist and explorer.

In his *Diary* entry for 24 January, Darwin added:

After our one o'clock dinner, Wickham, the Captain & myself walked to the famous Baobob tree & measured it more accurately. Cap. FitzRoy first took an angle by a pocket sextant & afterward climbed the tree & let down a string, both ways gave the same result, viz. 45 feet in height. Its circumference measured 2 feet from the ground (there being no projecting roots) gave 35. Its form is oval, & its greatest visible diameter was 13 feet. So that in an accurate drawing its height would be 3·4 of its breadth. Cap. FitzRoy made a sketch, which gave a good idea of its proportion, yet in this the height was only about 2·4 of [its] breadth. Proving, what one so often observes, that a faithful delineation of nature does not give an accurate idea of it. We returned home after our merry & pleasant walk, just as it was dark.

The *Beagle* returned to Porto Praia in early September 1836, a month before her return to England. Darwin returned to the subject of the Baobab in his *Diary*:

Our old friend the great Baobab tree, was clothed with a thick green foliage, which much altered its appearance. As might be expected, I was not so much delighted with St Jago as during our former visit: but even this time I found much in its Natural History very interesting.

'St Jago' is Darwin's version of São Tiago.

200. 2 sorts of *Fucus*. ['V. 14. (b).'] marked out by Darwin.]

Presumably, species of brown algae, Phaeophyta; I found no such specimens. 'V. 14. (b).'] is a note to see Note b on page 14 of the *Zoological Diary*. The relevant part of page 14 reads:

1832 Feb: St. Jago
 ['(b)' in margin, referring to Note b, given below.] *Bacillariées* (Dic. Class.) growing on Jania. Vide ['Bacillariées' in margin] Pl. 3. Fig. 2.—drawn 200 times natural size.—Fig. 3.—on a Fucus: Fig. 4. in the sea invisible to naked eye.

This and to the top of the page has been marked out. Page 13 *verso* reads '(b) . . . 200 not spirits. Fucus'. That is, number 200 is a dried specimen of *Fucus*. 'Bacillariées' are diatoms, Chrysophyta; 'Dic. Class.' is a reference to the *Dictionnaire Classique d'Histoire Naturelle* (17 volumes, 1822–31), a copy of which was on the *Beagle* and which proved quite useful to Darwin in his studies of marine organisms; and 'Jania' is a genus of coralline algae, Rhodophyta. The latter are discussed in the following sections of this paper. The references to figures and plates are to Darwin's drawings, which accompany the *Zoological Diary*.

269. The commonest tree in the island [i.e., São Tiago], growing in the valleys; the juice abounds with gallic acid making all things directly black.

I found no specimen with this number. Gallic acid is a widespread compound in plants, and this could be one of a number of tree species. I found no mention of this plant in either Darwin's *Diary* or in any of his *Beagle* notebooks. There is a pencilled cross in the margin next to this entry, which refers to a query regarding the name of the plant. While he was writing his *Journal of Researches* (Darwin, 1839), Darwin wrote to Henslow in May 1837 (Barlow, 1967: 128):

There are ['one *del*' added by Barlow] about half a dozen plants of which if I do not know the names of genus or something about them, I must strike out long passages in my journal.—Will you have the kindness to tell me, a week or ten days before you leave Cambridge; so that those questions which are most indispensable to me, perhaps you would not grudge one day in answering.—This in case I publish before autumn, otherwise when you return will be soon enough for me.

Presumably the crosses were added by Darwin before the *Plant Notes* were sent to Henslow, although they might have been added later by Darwin or Henslow himself. Unfortunately for Darwin, Henslow never was able to answer his queries, and the first edition of the *Journal of Researches* contains much less botanical information than Darwin wished (Porter, 1980a).

['NB.' added in the margin by Darwin] The following plants [numbers 270–303] collected at St. Jago ['Cape de Verd. Islands' added by Darwin] from Jan y. 16th to Feb. 8. [lines added around numbers 270–303]

270. Near stream at St. Domingo. ['a little town in St. Jago' added by Darwin; 'Nº. 412 of JSH' added by Henslow]

Christella dentata (Forsk.) Brownsey & Jermy, (Polypodiaceae); specimen at CGE.
 Darwin visited São Domingos on 2 February 1832. He wrote in his *Diary*:

As the road approaches the sides of the hill or precipice, the town & valley of St Domingo are seen. I can imagine no contrast more striking than that of its bright vegetation against the black precipices that surround it. A clear brook gives a luxuriance to the spot that no other part of the island would lead you to expect. Nothing has surprised me so much as the very dark green of the oranges; some tropical forms can easily be imagined either from hot-house specimens or from drawings, such as Bananas; but I do not think any adequate idea of the beauty of Oranges or Cocoa Nut trees can be formed without actually seeing them on their own proper soil. . . . We were told there was a lake about 2 miles from St Domingo: after dinner we started to see, & followed a path by the side of a brook: on each side were flourishing Bannanas, Sugar Cane, Coffee, Guavas, Cocoa Nuts & numberless wild flowers. None can conceive such delight but those who, fond of Natural history, have seen such scenes.

This fern and numbers 276, 277, 280, and 281 below probably were collected on this part of his journey from Porto Praia to São Domingos and return.

271. 272. Plants.

No collections bearing these numbers were found.

273. Ribeira. Grande.

This collection was not found.

In his *Diary*, Darwin describes a visit to the town of Ribeira Grande on 26 January 1832:

The road to Ribeira for the first six miles is totally uninteresting & till we arrived at the valley of St Martin the country presented its usual dull brown appearance: here our eyes were refreshed by the varied & beautiful forms of the tropical trees. The valley owes its fertility to a small stream & following its course Papaw trees, Bananas & Sugar cane flourished. I here got a rich harvest of flowers, & a still richer one of fresh water shells.

His entire entry for the 27th is, 'Employed in working at yesterday's produce.'

274. 275. Plants.

Both are *Chenopodium murale* L. (Chenopodiaceae); specimens at CGE.

276. 277. Water cress and other plants from St Domingo.

'276. *Achyranthes argentea*. JH)' added by Henslow

Number 276 is *Ocimum americanum* L. (Lamiaceae). The number also (according to Henslow's notation) was given to *Achyranthes aspera* var. *pubescens* (Moq.) C. C. Townsend or *A. aspera* var. *sicula* L. (Amaranthaceae). Number 277 is *Equisetum ramosissimum* Desf. (Equisetaceae). All specimens are at CGE. No collections of watercress, presumably *Nasturtium officinale* R. Br. (Apiaceae), were found.

Ocimum americanum, a tropical American species, is sometimes cultivated as basil (*Ocimum basilicum* L.)

278. 279. Plants.

Number 278 was not found. Number 279 is the type of *Campanula jacobaea* C. Sm. ex Webb (Campanulaceae); specimens at CGE and K.

280. St. Domingo, damp, place.

Tagetes patula L. (Asteraceae); specimens at CGE, FI-W, and K.

This ornamental native of Mexico, the French marigold, is naturalized in many parts of the world.

281. D°. [i.e., ditto: 'St. Domingo, damp, place']

'410 of J. H. *Adiantum Capillus*', apparently added by Hooker

Adiantum capillus-veneris L. (Adiantaceae); specimens at CGE, GL and FI-W.

282. St. Jago. ['(*Achyranthes argentea* JH)' added by Henslow]

Achyranthes aspera var. *pubescens* (Moq.) C. C. Townsend or *A. aspera* var. *sicula* L. (Amaranthaceae); specimens at CGE.

One herbarium sheet at Cambridge bears a mixed collection of these two varieties; one specimen presumably is number 282, the other number 276.

283. Dry places.

No specimen with this number was found.

284. St. Martin.

No specimen with this number was found.

In his *Diary*, Darwin recorded being in 'the valley of St. Martin' (São Martinho) on 26 January 1832. See the entry for number 273 above.

285. Plant.

No specimen with this number was found.

286. The two lowest ['(in the Page)' added by Darwin] plants are the commonest on desert places. The bush smells sweet.

No collections bearing this number were found. The addition 'in the Page' refers to the entry in the *Specimen Notebook*.

287. 288. Plants.

Both numbers are types of *Dalechampia senegalensis* Juss. ex Webb (Euphorbiaceae); specimens at CGE.

289. Quail Island.

No specimen with this number was found.

Darwin records visiting Quail Island, Ilhéu de Santa Maria, near Porto Praia, on 17, 18, 22, 25, and 30 January 1832. He mentions geologizing and the collection of marine animals, but does not mention the plants seen or collected thereon.

290. 291. D°. [i.e., 'Quail Island']

Number 290 was not found, but 291 is *Asteriscus vogelii* (Webb) Walpers (Asteraceae), and is the type of *Odontospermum vogelii* var. *darwinii* Webb, a synonym; specimens at CGE and K.

292. Plant with stalks. on rocks near sea.

No collection with this number was found.

293. 294. St. Domingo.

No collections bearing these numbers were found.

295. 296. 297. 298. 299. 300. St. Martin.

Numbers 296, 298, and 299 were not found. Numbers 295 and 297 are *Potamogeton pusillus* L. (Potamogetonaceae); specimens at CGE and FI-W. Number 300 is *Argemone mexicana* L. (Papaveraceae); specimen at CGE.

The *Potamogeton* presumably was collected in the stream mentioned by Darwin in the valley of São Martinho cited under number 273 above. The prickly poppy is a weed introduced from the Americas.

301. 302. 303. St. Jago.

Number 303 was not found. Number 301 is *Melhania ovata* (L.) Spreng. (Sterculiaceae); specimen at CGE. Number 303 is *Datura metel* L. (Solanaceae); specimen at FI-W.

309. Lichen, from the highest peak of Fernando Noronha.

Number 309 was not found. However, Berkeley (1842: 445) cited '*Cora pavonia*., Fr., Darw. No. 347. Highest peak of Fernando Noronha.' (i.e., *C. pavonia* (Web.) Fr.). Berkeley (or someone else) must have mistakenly labelled this *Cora* (Thelephoraceae) 347, which is the next number in the *Plant Notes*.

In describing this island off the coast of Brazil, Darwin wrote in his *Diary* for 20 February 1832:

I spent a most delightful day in wandering about the woods. The whole island is one forest, & this is so thickly intertwined that it requires great exertion to crawl along. The scenery was very beautiful, & large Magnolias & Laurels & trees covered with delicate flowers ought to have satisfied me. But I am sure all the grandeur of the Tropics has not yet been seen by me. We had no gaudy birds, no humming birds, no large flowers: I am glad that I have seen these islands. I shall enjoy the greater wonders all the more from having a guess what to look for. All the trees either bearing some fruit or large flower is perhaps one of the most striking things that meet one whilst wandering in a wood in these glorious regions.

Unfortunately, he collected only a few of these plants that he described.

347. Fuci. D°. [i.e., 'Fernando Noronha']

Presumably, a brown alga, Phaeophyta; no such collection was found.

384. A leafless tree bearing beautiful pink flowers.

1832.

Plants.

[page] (2

at Fernando Noronha, an essential character in landscapes.

Tabebuia roseo-alba (Ridley) Sandwith (Bignoniaceae); specimen at CGE.

This certainly is the 'trees covered with delicate flowers' referred to by Darwin in his *Diary* entry for 20 February 1832, quoted above under number 309.

392. Conferva. [i.e., 'Conferva' misspelled by Covington] V ['P.' added by Darwin] 32. March.

'Conferva' is a filamentous alga; no such specimen was found.

'V P. 32' is a note to see page 32 of the *Zoological Diary*. This page is headed, '1832 March Ar[changed from 1]bolhos Shoals' (i.e., Arquipelago de los Abrolhos, Bahia province, Brazil). The relevant section reads:

[*Conferva* in margin] On 28th, 10 miles West of Abrolhos; there came up with the lead (17 fathoms) a piece of Fucus.—on which were growing numerous minute tufts on a Conferva ['32 not spirits' in margin].—Stems simple cylindrical white transparent jointed: end truncate; length 1/10 of inch. diameter 2/3000.—on this minute

1832

March

Abrolhos Islands

[page] 33

[*Conferva* and (b) in margin] plant & on a small coralline were crowded together a forest of numerous species of Bacillareés. & Anthrodieés.

A pencilled line is drawn through page 32, and the lines on page 33 are marked out by pencilled lines. Note b on page 32, *verso* is '(b) 393. not spirits'; it refers to the 'small coralline', presumably a coralline alga, Rhodophyta. 'Bacillareés' are diatoms, Chrysophyta; 'Anthrodieés' are coelenterates.

Page 34 of the *Zoological Diary* has an entry on the vegetation of the islands:

1832 ['Abrolhos Islands Gen: observ.' in margin] The Abrolhos islands seen from a short distance are of a bright green colour.—The vegetation consists of succulent plants & gramina, interspersed with few bushes & Cactuses.—['(b)' in margin].

Note b on p. 33 *verso* reads:

(b) Small as my collection of plants is from the Abrolhos. I think it contains nearly every species then flowering.—

Darwin repeated this last comment in a letter to Henslow of 15 August 1832 from Montevideo, Uruguay.

463. Lichens. Mosses &c on trees chiefly oranges, old trees. May. Rio de Janeiro. [Above this is a line across the page with 'Rio de Janeiro' under it on the upper right added by Darwin.]

No lichens or mosses with this number were found, but two fungi bearing this number were cited by Berkeley (1842): '*Schizophyllum commune*, Fr., Darw. No. 463. On orange-trees. Rio Janeiro. May.' (p. 444; Schizophyllaceae), and '*Radulum palmatum*, n.s. . . . Darw. No. 463. On orange-trees. Rio Janeiro. May.' (p. 445; Hydnaceae; specimen at K). No specimens of the *Schizophyllum* were found.

464. Lichens. D°. [i.e., 'Rio de Janeiro']

No lichens with this number were found. However, Berkeley (1839: 291) listed '*Polyporus sanguineus*, Mayer (No. 464). Rio Janeiro. May.' The correct name for this fungus is *Pycroporus sanguineus* (L. ex Fr.) Murr. (Miller & Farr, 1975). It is a member of the Polyporaceae.

On p. 39 verso of the *Zoological Diary*, Darwin made the following entry:

On May 5th & 17th there was a good instance of an appearance, which I had frequently witnessed with surprise on the Rio Macaë.—In [~~'both'~~ marked out] all cases for some hours the country had been drenched with rain; as soon it ceased a most extraordinary evaporation commenced.—At 100 feet elevation the wooded hills were almost hidden in the clouds of vapour, which rising like columns of smoke from beds [~~'of'~~ marked out] not to be distinguished from the surrounding Cumuli.—The most thickly wooded parts produced the greatest quantity.—I suppose this fact is owing to the great surface [~~'extent'~~ marked out] of heated foliage.—The atmosphere itself was not very damp DP [i.e., dew point] 71. Temp 78. Diff: 7

Darwin made his trip to the Rio Macaë, in the province of Rio de Janeiro, between 8 and 24 April 1832.

575. Cryptogam[~~'ou'~~ added by Darwin]s plant, like a hollow horse hair on a dead tree in the forest. June. R. de Janeiro

No specimen with this number was found. However, Berkeley (1839: 293) listed: 'Two other species are in the same collection [i.e., Darwin's] which I am unable to determine . . . the other an important *Thamnomycetes* (Probably *T. chordalis*) from Rio Janeiro, No. 575.'

581. Feon, [i.e., 'Fern', misspelled by Covington] hanging from tree. D° [i.e., Rio de Janeiro]

Asplenium mucronatum K. Presl. (Aspleniaceae); specimen at CGE.

On page 41 of the *Zoological Diary*, Darwin has entered some information on temperature extremes he has observed:

- 1832 June Rio de Janeiro

[*Meteorology*]: i.e., 'Meteorology' in margin] The thermometer (at same time) exposed on white cotton to the sun was at 2 PM 115°.—The night was cloudless & a copious dew was falling. Therm on the open turf fell to 61°.—So that the vegetation even in the winter season undergoes a range of 54 degrees.—

582. 583. Leaves and flowers of Palm tree. D°. [i.e., 'Rio de Janeiro']

Geonoma schottiana Mart. (Arecaceae); specimens at CGE.

584. Stem of D°. [i.e., 'Palm tree'] True height 9 feet; circumference at bottom 3 1/3 inches; at top 2 2/3. On the trunk there were 305 rings. Do these mark the year? shaded forest on hill.

Geonoma schottiana Mart. (Arecaceae); I did not find this specimen. Darwin's *Diary* for 18 June 1832 includes the following entry:

King came & spent the day with me; we both on horseback started for the old forest. He shot some birds & as is generally the case I found many interesting animals of the lower classes. We found a little Palm tree, only a few inches in circumference, which I believe to be 305 years old. I judge of this from its number of rings, each of which I imagine marks a year.

These 'rings' however, were leaf scars, formed when a leaf dehisces and drops from the stem. This happens far more than once a year. 'King' was Philip Gidley King (1817-1904), Midshipman on the *Beagle*.

Darwin noted in the *Zoological Diary*, p. 64:

1832 April: May: June Rio de Janeiro

[*'General observ.'* in margin] Whilst I ascended the Concorvado.— I measured some of the trees; the circumference.

[page] 65

1832 April: May: June Rio de Janeiro

[*'General Observations'* in margin] of the greater number of trees, as in the interior is not more than from 3 to 4 feet.—I only saw one 7ft & another the largest 9ft & 7 inches.—One of those remarkable trees, which have plates [i.e., buttresses] running running from the roots up the trunk, had an apparent diameter of 7ft 3 inch—One of the plates projected a mean distance of 3 feet & was not above 2 or 3 inches thick.—This fact has been noticed by all travellers.—I could not help noticing how exactly the animals & plants in each region are adapted to each other.—Every one must have noticed how Lettuces & Cabbages, suffer from the attacks of Caterpillars & Snails.—But when transplanted here in a foreign clime, the leaves remain as entire, as if they contained poison.—Nature, when she formed these animals & these plants knew they must reside together.—

In his *Diary*, Darwin records ascending the Corcovado, a 704 m. high mountain immediately west of Botafogo, on 25 and 30 May 1832. He measured its height as 2,225 feet on the latter day, during which he also made the measurements of trees given above.

585. Cryptogam[ous] added by Darwin]; Cascade Tijenka [changed by Darwin from Covington's 'Tjenka']

Selaginella jungermannioides (Gaud.) Spring (Selaginellaceae); specimens at CGE. The *Diary* entry for 16 June 1832 is:

Started early in the morning of Tijeuka to see the waterfalls. Neither the height or the body of water is anything very imposing; but they are rendered beautiful by the dampness so increasing the vegetation, that the water appears to flow out of one forest & to be received & hidden in another below. On the road the scenery was very beautiful; especially the distant view of Rio. As a Sultan in a Seraglio I am becoming quite hardened to beauty. It is wearisome to be in a fresh rapture at every turn of the road. And as I have before said, you must be that or nothing.

The Pico de Tijuca and Rio Tijuca are in the province of Guanabara, several miles west of Darwin's base in Botafogo.

586. 587. 588. Cryptogam[ou] added by Darwin]; plants on Cancovado, about 2000 feet

above the sea; Cloud['e' marked out by Darwin]s generally resting on it, the dampness produces innumerable Cryptogam['ou' added by Darwin]s plants. These were procured. May 30th

No specimens bearing these numbers were found.

589. Tea, tree. Botanic Garden.

Camellia sinensis (L.) O. Kuntze (Theaceae); specimen at CGE
Darwin recorded a visit to the Rio de Janeiro botanic garden on 27 May 1832:

Walked to the Botanic Garden; this name must be given more out of courtesy than anything else; for it really is solely a place of amusement. The chief & great interest it possesses, is the cultivation of many plants which are notorious from their utility. There are some acres covered with the Tea tree. I felt quite disappointed at seeing an insignificant little bush with white flowers & planted in straight rows. Some leaves being put into boiling water, the infusion scarcely possessed the proper tea flavour.

Descriptions of other plants that he saw follow, but this appears to be the only one he collected.

590. Cryptogam['ou' added by Darwin]; plant. Cancovado.

I found no specimen with this number. There are several unidentified mosses at CGE labelled 'Rio Janeiro, June 1832 S. America, C. Darwin', but none are numbered.

591. D°. [i.e., 'Cryptogamous; plant. Cancovado.'] growing in numbers on the old trees, on arid planes, near the sea, giving a most fantastic appearance to them.

No specimen bearing this number was found.

596. 597. 598. 599. 600. Cryptogamus; plants, chiefly on rotten trees, in forest. June.

Number 598 was not found, but the others all are fungi. A specimen was found only for number 599, the others were cited in papers by Berkeley (1839, 1842). Number 596 was cited by Berkeley (1842: 447) as '*Sphaeria polymorpha*, Pers. . . . On rotten trees in forest. Rio Janeiro. May.' This is now *Xylaria polymorpha* (Fr.) Grev. (Xylariaceae).

Numbers 597, 599, and 600 were cited by Berkeley (1839) as 'Rio Janeiro. June'. Number 597 is '*Polyporus sanguineus*, Meyer', cited as '*Polyporus sanguineus*, Fr.' by Berkeley (1842); according to Miller & Farr (1975), the correct name for the taxon is *Pycnoporus sanguineus* (L. ex Fr.) Murr. (Polyporaceae). Number 599 was given to two collections: '*Polyporus pinisitus*, Fr.' (specimen at K), according to Miller & Farr (1975) the correct name is *Coriolus pinisitus* (Fr.) Pat. (Polyporaceae); and '*Thelyphora lobata*, Kz.', according to Corner (1968), the correct name is *Stereum lobatum* (Kze.) Fr. (Stereaceae). Number 600 is '*Polyporus australis*, Fr.', *Fomes australis* Fr. (Polyporaceae). Berkeley (1839: 291) cited *Stilbum lateritum* Berkeley as 'With the last.' (i.e., *Polyporus sanguineus*), type at K (Phleogonaceae).

686. Lichen, growing on stones near summit of Mount. The Mount is 450 feet high.

Usnea densirostra Taylor (Usneaceae). This type specimen is at BM.

On 28 July 1832, Darwin recorded in his *Diary* his first visit to this locality in Uruguay:

Landed early in the morning on the Mount. This little hill is about 450 feet high & being by far the most elevated land in the country gives the name Monte Video. The view from the summit is one of the most uninteresting I ever beheld. Not a tree or a house, or trace of cultivation give cheerfulness to the scene. An undulating green plain & large herds of cattle has not even the charm of novelty. Whoever has seen Cambridgeshire, if in his mind he changes arable into pasture ground & roots out every tree, may say he has seen Monte Video. Although this is true, yet there is a charm in the unconfined feeling of

walking over the boundless turf plain. Moreover if your view is limited to a small space, many objects possess great beauty; some of the smallest birds are more brilliantly coloured, much more so than those in Brazil. The bright green turf being browsed short by the cattle, is ornamented by dwarf flowers; amongst which to my eyes the Daisy claimed the place of an old friend. The only other plants of larger size are tall rushes & a thistle, resembling much the *Acanthus*; the latter with its silvery foliage covers large spaces of ground.

In spite of these descriptions of flowering plants, I found no such specimens that Darwin collected in Montevideo. He also wrote of collecting on 'The Mount' on 20 November, but mentions only lizards, not plants.

761. Succulent plant; covering large tracts of pampas, and looking at a distance like our heaths; grows chiefly in salt plains overflowed occasionally by the sea. *Septr. B. Blanco*.

Allenrolfea patagonica (Moq.) O. Kuntze (Chenopodiaceae), type specimens at CGE and K. This entry is marked with a pencilled cross in the margin by Darwin. Darwin's specimens are dated 14 and 21 September on their labels. In his *Diary* entry for 14 September 1832 he wrote:

Whilst shooting, I walked several miles within the interior; the general features of the country remain the same, an undulating sandy plain, covered with coarse herbage, & which as it extends, gradually becomes more level. The bottoms of some of the vallies are green with clover; it is by cautiously crawling so as to peep into these that the game is shot.

For the 'clover', see number 791 below.

The *Diary* entry for 21 September reads: 'In the morning there was a great deal of wind; so that I did not leave the ship.' Therefore, it is doubtful that he collected on that day. The *Beagle* was at Bahía Blanca, Argentina from 5 September through 18 October 1832.

762. A very abundant grass, growing in tufts ['and' marked out by Darwin.] on sandy plains. D°. D°. [i.e., 'Septr. B. Blanco']

Poa ligularis Nees ex Steud. (Poaceae), specimen at CGE.

[page] (3)

1832

Plants

763. *Oxalis* in great numbers. *B. Blanco*. Flowers bright pink.

Oxalis floribunda Lehmann (Oxalidaceae), specimens at CGE and E-GL. Darwin has marked a pencilled cross in the margin of this entry.

The *Diary* entry for 11 October 1832 is:

Took a long walk in a straight line into the interior; uninteresting as the country is, we certainly see it in by far the best time. It is now the height of Spring; the birds are all laying their eggs & the flowers in full blossom. In places the ground is covered with the pink flowers of a Wood Sorrell & a wild pea, & dwarf Geranium. Even with this & a bright clear sky, the plain has a dreary & monotonous aspect.

This collection is the 'Wood Sorrell.' The 'wild pea' probably is *Lathyrus crassipes* Gill. ex Hook. & Arn. (Fabaceae), unnumbered specimens at CGE), and the 'dwarf Geranium' the *Erodium* discussed below (number 792).

764. Bush, very common; growing in tufts like our Gass [Covington's reading of Darwin's 'Grass'] banks ['NB.' added by Darwin] *Septr. 23rd* All these plants were in full flower. D°. [i.e., 'B. Blanco']

Discaria longispina (Hook. & Arn.) Miers (Rhamnaceae), specimens at CGE and K. There is a pencilled cross in the entry margin.

On 23 September 1832, Darwin recorded in his *Diary*:

A large party was sent to fish in a creek about 8 miles distant; great numbers of fish were caught. I walked on to Punta Alta to look after fossils; & to my great joy, I found the head of some large animal, imbedded in a soft rock. It took me nearly three hours to get it out. As far as I am able to judge, it is allied to the Rhinoceros. I did not get it on board till some hours after it was dark.

It was the skull of *Megatherium*, an extinct ground sloth. It made a great impression on Darwin and led him to search for and collect a number of fossil vertebrates here and elsewhere on the voyage.

791. Clover, very common. This plant [‘characterizes’ added by Darwin] all the low, and more fertile spots; mingled with grasses and the Geranium (792) it forms a thick mass of herbage, in places nearly a yard deep; Sept. 15th to Octob. 1st. It is said the cattle [‘do not eat it’ added by Darwin] B. Blanco.

Melilotus indica (L.) All. (Fabaceae), specimens at CGE and K. Darwin has pencilled a cross in the margin of this entry.

This is the ‘clover’ referred to in the *Diary* entry for 14 September 1832 (see number 761 above).

792. Geranium, very abundant, in flower middle of Septemr D°. [i.e., ‘B. Blanco’]

Erodium cicutarium (L.) L’Her. (Geraniaceae), specimen at CGE. There is a pencilled cross in the margin of this entry.

This is the ‘dwarf Geranium’ referred to in the *Diary* entry for 11 October 1832 (see number 763 above).

793. A low Bush, common near the sea. Octobr. D°. [i.e., ‘B. Blanco’]

Ephedra ochreatea Miers (Ephedraceae), type specimens at CGE and K. This is the only gymnosperm collected by Darwin that I have found.

794. D°. [i.e., ‘A low bush’] flowers smelling sweet growing near the sea. D°. [i.e., ‘Octobr.’] D°. [i.e., ‘B. Blanco’]

Lycium chilense Miers ex Bert. (Solanaceae), specimens at CGE.

839. Phytocalla; (a large tree) Buenos. Ayres. [This is all marked out by Darwin.]

Phytolacca dioica L. (Phytolaccaceae). I found no specimens of this species.

This is the *ombú*, mentioned in the *Diary* entry for 19 September 1833 while passing across the pampas to Buenos Aires: ‘here and there the solitary Estancia [i.e., small farm], with its Ombu tree.’

924. Lichen. from very summit of Mount. M. Video.

Parmelia fistulosa Taylor (Parmeliaceae), type specimen at BM.

Darwin was back in Montevideo, Uruguay in November 1832. He records collecting on ‘the Mount’ on the 20th. The label of a fern specimen at K [*Cassebeera triphylla* (Lam.) Kaulf. (Simopteridaceae)] states, ‘with No. 924 a Lichen’.

Tierra del Fuego. 1833. Jan y.

976. Plant, *chief origin of the* [underlining added by Darwin] peat bogs.

Astelia pumila (Forst. f.) Gaud. (Lilaceae), specimen at CGE.

[‘V. 155.’ added by Darwin]

‘V. 155.’ is a note to see page 155 of the *Zoological Diary*.

['N.B.' added in margin by Darwin] At the height of above 1400 feet I found dwarf Beech trees, (about a foot high,) in sheltered corners ['(a)' in margin added by Darwin] the main line of separation between the trees and grass is perhaps 2 or 300 feet lower. Within the *Beagle* channel this line was so horizontal and wound round in the vallies in so straight a direction as to resemble the high water mark on a beach. The extreme dampness of the climate favours the course luxuriance of the vegetation; the woods are an entangled mass where the dead and ['&' in *Zoological Diary*] the living strive for mastery. Cryptogamio ['Cryptogamic' in the *Zoological Diary*] plants here find a most congenial site. Fe['rn' added by Darwin]s however are not abundant. The Fuegians inhabit the same spot for many years;

[page (4

1833.

Plants. Tierra del Fuego

in one place I found 10 inches of fine vegetable mould over the layer of muscle and ['&' in *Zoological Diary*] limp['e' added by Darwin] shells; in consequence of this, these mounds may be told at a distance by the bright green of the vegetation. ['1276' marked out by Darwin] ['amongst' in the *Zoological Diary*] The concomitant plants are mostly the wild celery ['(1076)' added by Darwin], scurvy grass, (984) (985) black currants tree; these, although not used by the Fuegians, are the most useful plants in ['(B)' added in margin by Darwin] the country and seem placed to attract attention.

The following was added by Darwin on p. 3, verso:

(a) It was in January in these very hills, about 1400 feet high, that, a snow storm destroyed two of M^r Banks party and caused so much suffering to the whole of them.

He added on p. 4, verso:

(B) Jemmy Button said 'when leaves yellow, snow all go.'—Captain FitzRoy states that in April the leaves of the trees which grow on the lower parts of the hills turn colour; but not those high up.—I recollect having read a paper to show that in England warm Autumns hastened the falling of the leaves; that the process is a [not in *Zoological Diary*] regular part of the vegetation: This fact would seem to show the same law.

The above additions came from pages 154, 155 and 154, verso of the *Zoological Diary*, where they were indicated marginally as 'General Observations' (p. 154) and 'General Observation Vegetation' (p. 155). In the margin opposite each was written 'Copied' in pencil by Covington. The additional notes were on page 154, verso and were marginally indicated 'a' and 'B' in ink by Darwin. Opposite B was 'Not Copied', added in ink by Covington. Number 984 is *Oxalis enneaphylla*, 985 is *Senecio acanthifolius*, and 1076 *Apium australe* (see below).

Page 155 of the *Zoological Diary* continues with a different pen:

['Peat' in margin] In every part of the country which I have ['1833' added in pencil in margin by Darwin] seen, the land is covered by a thick bed of peat.—It is universal on the mountains, above the limits [of] the Beech; & everywhere, excepting in the very thickest parts of the woods it abounds.—The beech often grows out of it & hence great quantities of timber must annually be imbedded.—['It flourishes' marked out] It increases most on the sides of hills & is I think of great thickness: the only section I saw varied from 6 to 12 feet. In more level sites the surface is broken up by numberless [i.e., numberless] pools, which have an artificial appearance as if dug for the sake of peat.—These are often close to each other & yet of

1833 Jan & Feb. Tierra del Fuego

['Peat' in margin] different levels; showing how impervious the peat is when acted on by water.—At the bottom of these shallow pools there is a great quantity of brown flocculent matter in which *Conferva* flourish & *very little* moss.—The great agent, which ['1075 & 976' in margin] forms the peat is a small ['p' changed to 's'] plant, with thick leaves & of a bright green colour (No' 976).—['(not spirits)' in margin, marked out] The plant grows on itself; the lower leaves die, but yet remain attached to the tap root.—this latter penetrate in a living state to the depth of a foot or two.—& from the surface to the bottom the succession of leaves can be traced from their perfect state to one almost entirely disorganized.—Subterranean streams are common, these & [changed from 'by'] the ['pools of' marked out] ['stagnant' added in pencil] water, by breaking up the upper peat & ['dissolving' marked out] macerating the ['dea' marked out] rotten leaves helps to form the more compact parts.—

On page 155, *verso*, there are two notes not keyed into pages 155 and 156:

(a) The appearance of these ['woods' marked out] forests brought to my mind the artificial woods at Mount Edgecombe: the greenness of the bushes & the twisted forms of the trees, covered with Lichens, in both places are caused by strong prevalent winds & great dampness of climate.—

(b) It would be difficult to find a spade full of earth in Tierra del F. excepting in the spots, where the Fuegians have long frequented, & on the remnants of ancient alluvial formation, described in Geological notes; but even in this latter ground, is in some places, covered with peat as in Goree Sound.—

977. Parasite plant on the beach [i.e., beech] Jan-y.

Myzodendron brachystachyum DC. (Myzodendraceae), specimens at CGE and K. There is a pencilled cross in the margin of this entry.

This angiosperm parasite was collected from a tree of Antarctic beech (*Nothofagus betuloides* (Mirb.) Oerst., Fagaceae), see number 1013 below.

978. The infusion made a pleasant drink, much used by the Sealors [changed from Covington's 'Sailors' by Darwin] instead of tea; ['grows' added by Darwin] on the hills; Bea[rs] added by Darwin] a pale pink berry; with a fine sweet Juniper flavour; the plant is said by the sealers to be diuretic. Feb.

Myrteola nummularia (Poir.) Berg (Myrtaceae), specimens at CGE and K. Marked with a pencilled cross in the margin. Commented on in the *Zoological Diary*, see number 1073 below.

979. Cryptogamio; when alive partly enveloped in gelatinous matter. Feb.

No specimens bearing this number were found. The identity of this cryptogam, presumably a fungus, is unknown.

980. (same as 503. spirits) ['a' added by Darwin]

This is an unidentified liverwort; specimen at CGE. The following was copied by Covington from page 145 of the *Zoological Diary*, although it is not indicated as such. There it is marginally indicated, 'Cryptogamic Plant 503 & 980 (not spirits)' in pen by Darwin, and 'Copied' in pencil by Covington.

light brown sporule, ['a' added in margin by Darwin] diameter 1/2000 [changed from 1/4000 in *Zoological Diary*] of an inch; with these were bits of fibres, resembling necklace (each bead being about 1/4 of ['size of' added by Darwin] the sporule) I should think these acted as placenta to the sporules. Capsule opens into four longitudinal pieces, which curl backwards. When placed in Alcohol, no action but the specimens ['specimen' in

Zoological Diary] was not fresh. The immature capsula, ['capsule' in *Zoological Diary*] when first bursting from sheath, appear ['appears' in *Zoological Diary*] involved in gelatinous matter; Grow in tufts, in wet places, near a cascade, in mountainous woods. Hermit Isle. Decr. 25th.

There is a note on page 4, *verso* in Darwin's handwriting:

a In general habit resembling a moss; colour pale green, pendule of capsule transparent, ['colourless' added in *Zoological Diary*] capsule ['oval' added in *Zoological Diary*] dark brown tough containing an infinite number of globular light brown sporules & &—

981. Growing generally near the wigwams

Epilobium ciliatum Raf. (Onagraceae), specimens at CGE and K. Marked in the margin with a pencilled cross.

In his *Diary* entry for 27–29 December 1832, Darwin wrote:

In most of the coves there were wigwams; some of them had been recently inhabited. The wigwam or Fuegian house is in shape like a cock of hay, about 4 feet high & circular; it can only be the work of an hour, being merely formed of a few branches & imperfectly thatched with grass, rushes &c. As shell fish, the chief source of subsistence, are soon exhausted in any one place, there is a constant necessity for migrating; & hence it comes that these dwellings are so very miserable. It is however evident that the same spot at intervals, is frequented for a succession of years. The wigwam is generally built on a hillock of shells & bones, a large mass weighing many tuns. Wild celery, Scurvy-grass, & other plants invariably grow on this heap of manure, so that by the brighter green of the vegetation the site of a wigwam is pointed out even at a great distance.

These caves were on 'islands at the back of Hermite's.' Isla Hermite, prov. Magallanes, Chile is immediately north of Cape Horn. 'Wild celery' is *Apium australe* (Apiaceae), and 'Scurvy-grass' *Oxalis enneaphylla* (Oxalidaceae). See numbers 1076 and 984 below, and 976 above.

982. Plant very Alpine.

Senecio darwinii Hook. & Arn. (Asteraceae), type specimen of *S. darwinii* var. *laxa* Hook. & Arn. at CGE.

Darwin wrote in his *Diary* entry of 20 December 1832 of ascending 'some of the mountains in order to collect Alpine plants & insects.' This was in the vicinity of Bahía Buen Suceso, Terr. Tierra del Fuego, Argentina.

983. Pretty pink flower growing near to a cascade.

No collection bearing this number was found.

984. Scurvy grass (very good) growing near the wigwams ['V. 155.' marked out by Darwin]

I found no specimens bearing this number, but *Oxalis enneaphylla* Cav. (Oxalidaceae) is called 'Scurvy-grass' in the nearby Falkland Islands (Moore, 1968). This is probably the plant to which Darwin was referring.

The entry is marked with a pencilled cross. See numbers 976 and 981 above.

1833

Plants. Tierra del. Fuego

[page] (5)

985. Generally growing near wigwams. Feb.

Senecio acanthifolius Homb. & Jacq. (Asteraceae), specimen at CGE. Marked with a pencilled cross.

- 985.(bis) Currant bush, generally near to the wignms

Ribes magellanicum Poir. (Grossulariaceae), specimens at CGE and K.
Marked with a pencilled cross. See number 976 above.

986. Lichen universal on rocks summit of mountains. Feb.

I found no collection bearing this number.

In his *Diary* entry for 20 December 1832, Darwin described his successful climbing of 'Bank's Hill', above Bahia Buen Suceso 'I hailed with joy the rocks covered with Lichens and soon was at the very summit.'

987. Lichen, mountain by S. Bay.

I found no collection bearing this number. 'S. Bay' probably means 'Good Success Bay', Bahia Buen Suceso, visited by Darwin in December 1832.

1013. Beech, foliage yellowish green [':Beeche 1013 & 1014' added by Darwin in substitute for '1014', which has been marked out by him.] These Beech trees are the only ['ones' marked out and 'trees' added in pencil by Darwin; 'ones' in the *Specimen Notebook*] which grow on the mountains in this district (Hardy Peninsula). The first is by far the most general, almost universal, and grows to a larger size; the other ['1014' added in pencil by Darwin] follows ['1014' marked out by Darwin] the course of a rivulet or more sheltered rock ['nook' in *Specimen Notebook*] the contrast of the two greens, is at all times striking. Feb.

Nothofagus betuloides (Mirb.) Oerst. (Fagaceae), specimens at CGE and K. Marked with a pencilled cross.

In his *Diary*, Darwin recorded crossing the 'Hardy Peninsula', Peninsula Hardy, Isla Hoste, prov. Magallanes, Chile on 13 February 1833.

1014. Bright green (Beech). as above. [i.e., number 1013] D°. [i.e., 'Feb.']

Nothofagus antarctica (Forst. f.) Oerst. (Fagaceae), specimen at CGE. Marked with a pencilled cross.

Darwin commented on the Antarctic beech in his *Diary*:

This tree is an evergreen, but the tint of the foliage is brownish yellow; hence the whole landscape has a monotonous sombre appearance; neither is it often enlivened by the rays of the sun.

This was in his entry for 19 December 1832.

1045. Plant in habits much resembling the common rush in England. March.

Marsippospermum grandiflorum (L. f.) Hook. (Juncaceae), specimens at CGE and K. Marked with a pencilled cross. Probably collected in January or February, as Darwin was in the Falkland Islands throughout March 1833.

1052. Lichen, common on mountain, ['and' marked out by Darwin] on rocks. D°. [i.e., 'March']

I did not find this collection.

1055. Excrescences of Fungi; (edible) on the Beech same as in spirits (528).

Cyttaria darwini Berk. (Cyttariaceae), type specimens at CGE and K. Marked with a pencilled cross. See number 528 in the section on plants in spirits of wine.

1056. Junctions of parasite bush with the Beech of Tierra del Fuego, same as in spirits (532–534)

Myzodendron sp. (Myzodendraceae), no specimens with this number were found.

1073. A square piece cut out of the peat whilst forming. Tierra del Fuego. V. 156. March.

No such specimen was found.

In a letter (copy in the Darwin-Hooker correspondence at Kew, number 4, page 8) written in late January or early February 1844, Darwin advised J. D. Hooker that:

Ehrenberg is further anxious for any earth or more especially peat from T. del Fuego or the Falkland Islands. I had specimens of peat, showing the process of its formation, by plants like *Astelia*, &c., &c., I do not know whether they were sent to you—I fear they are probably lost, but I daresay a little peaty earth could be shaken off some of the little peat-loving plants of T. del Fuego. I know you will not grudge some little trouble for so great a naturalist as Ehrenberg.

Christian Gottfried Ehrenberg (1795–1876), Professor of Natural Sciences at the University of Berlin, studied Darwin's diatom specimens (see the next section of this paper). Page 156 of the *Zoological Diary* reads in part:

['(1073)' not spirits' in margin] Specimen (1073) is cut out of the surface of a peat Bog: This [changed from 'The'] ['above' added in pencil] plant is eminently social; few others grow with it: some small creeping ligneous plants, bearing berrys (978&c) [*Myrteola nummularia*]; another in its form, habits & colour, strikingly resembling the European heaths (1077) [*Empetrum rubrum*]; & a third equally resembling our rush (1045) [*Marsippospermum grandiflorum*] ['It would appear to be necessary under similar circumstances, that the landscape should possess the same forms & tints.—' marked out in pencil] These latter plants & some others doubtless add their effects; But the plant (976) [*Astelia pumila*] & not any sort of moss, is the main agent: (on the sides of hills, where it mostly abounded the surface ['of the peat often' added in pencil] was convex.— By these gradual changes of level, water rests on different parts & thus completes the disorganization of the plant & consolidates the whole.

Page 157 continues, under 'General Observations':

1833 Jan. & Feb. Tierra del Fuego

Upon considering these facts, which show how inhospitable the climate of Tierra del Fuego is, we are the more surprised to hear from Capt. King that Humming birds have been seen in St of Magellan sipping the flowers of the Fuchsia [*Fuchsia magellanica*, Onagraceae] ['(b)' in margin] & Parrots feeding on the seeds of the Winters bark [*Drimys winteri*, Winteraceae].— I have seen the latter South of the parallel 55°—

The note on page 157, *verso* is

(b) The tropical resemblance given by these birds & Plants is continued in the sea; by the stony branching Corallines, the large. Volutans, Balanidae & Patelliform shells.—

'Corallines' are coralline algae, 'Volutans' a group of gastropods, 'Balanidae' acorn barnacles, and 'Patelliform shells' limpets.

Page 158 has another 'General Observation' regarding plants:

1833 Jan. & Feb. Tierra del Fuego

In the hottest part of the year, the mean maximum (during 37 days) was 55.34 & the thermom often rose to about 60°.—yet there were no Orthoptera, few diptera, still fewer butterflies & no bees, this together with absence of flower feeding beetles (Cychgues) [?] throughly convinced me how poor a climate, that of Tierra del F is.—

'Orthoptera' are grasshoppers, and 'diptera' flies.

A second collection of peat is discussed on page 200, *verso*, under the heading 'Maldonado':

(a) *Turf or Peat* is not generally supposed to be formed within the Tropics; as the Latitude of this place is under 35°. I thought it worth while to enquire ['1386 The two *Sorts*', in margin] respecting its occurrence.—In many marshy places, the earth is very black, & contains much vegetable matter, on one place reposing on this there was another of much less specific gravity & so penetrated by roots & fibres. as almost to be capable of burning.—(leaving however great quantities of ashes).—This I was assured. by a person well capable of judging was the nearest approach he had ever seen to the Turf of Ireland. As there are an abundance of situations, favourable for the production [of] this substance, its existence. only in the above imperfect state shows. that this Latitude is too low for it.—

Like number 1073, this was not found.

1074. A very abundant bush in Tierra del Fuego. D^o. [i.e., 'March'] Does not reach above 4 or 500 feet up the mountains; bears a very pleasant but bitter berry; colour and size varies, from white to dark red; I eat great numbers of them.

Pernettya mucronata (L. f.) Gaud. ex Spreng. (Ericaceae), specimens at CGE and K. Marked with a pencilled cross.

In spite of the 'March' date, Darwin was in Tierra del Fuego in December 1832 and January and February 1833. In March, he was in the Falkland Islands.

1075. Bog plant, same as (976) March. ['do', i.e., 'Tierra del Fuego', added by Darwin]

Astelia pumila (Forst. f.) Gaud. (Liliaceae), specimen at CGE. See number 976 above.

1076. Celery, generally growing near the wigwams; very good flavour when boiled in soups &c.

Apium australe Thours (Apiaceae), specimens at CGE and K. Marked with a pencilled cross.

Regarding wigwams, Darwin wrote in his *Diary* entry for 29 December 1832:

Yesterday the Captain went to reconnoitre the bays formed by the many islands at the back of Hermit's. I accompanied him, but the weather is so bleak & raw, as to render boating rather disagreeable. We ascended some of the hills, which as usual, showed us the nakedness of the land.

In most of the coves there were wigwams; some of them had been recently inhabited. The wigwam or Fuegian house is in shape like a cock of hay, about 4 feet high & circular; it can only be the work of an hour, being merely formed of a few branches & imperfectly thatched with grass, rushes &c. As shell fish, the chief source of subsistence, are soon exhausted in any one place, there is a constant necessity for migrating; & hence it comes that these dwellings are so very miserable. It is however evident that the same spot at intervals, is frequented for a succession of years. The wigwam is generally built on a hillock of shells & bones, a large mass weighing many tons. Wild celery, Scurvy-grass, & other plants invariably grow on this heap of manure, so that by the brighter green of the vegetation the site of a wigwam is pointed out even at a great distance.

Also, see numbers 976, 984, and 986 bis above.

1077. Plant, growing in the peat and closely resembling in general habit and tint our heaths. March. ['do' i.e., 'Tierra del Fuego' added by Darwin]

Empetrum rubrum Vahl ex Willd. (Empetraceae), specimens at CGE and K. Marked with a pencilled cross. Also see number 976 above.

1833

Plants.

1154. Lichen growing near the sea very common Falkland Island. March.

Perhaps *Pseudocyphellaria crocata* (L.) Vainio (Stictaceae), specimen at BM.

This is the only lichen specimen of Darwin's from the Falkland Islands that has been found. However, it is just as likely to be numbers 1166 or 1167 as this one.

1155. Parasitic plant on Beech [*Nothofagus* sp.] Tierra del Fuego

Myzodendron brachystachyum DC. (Myzodendraceae). No specimen with this number was found.

1156. Grass. Wollaston Island and other unfrequented places. D°. [i.e., 'March']

I found no specimen with this number, and no grass labelled as collected on Isla Wollaston. It is probably one of the many species labelled 'S part of Terra del Fuego 1833'.

The *Beagle* was at Wollaston Island on 18 and 19 February 1833.

1157. Syngenesia plant, on sand dunes [i.e., 'dunes'] Wollaston Island; also Falkland Island. D° [i.e., 'March']

Senecio candidans DC. (Asteraceae), specimen at CGE.

'Syngenesia' is an old name for a member of the Asteraceae.

1158. Alga. Wollaston Island. D°. [i.e., 'March'] [I found no such specimen.] The 4 last [i.e., 1155, 56, 57, 58], from South part of Tierra del Fuego.

1162. The common grass which so universally covers the whole island, growing on the peat. ['Falkland's' added by Darwin] March.

Cortaderia pilosa (D'Urv.) Hack. (Poaceae), specimen at CGE. Marked with a pencilled cross.

The *Diary* entry for 3 March 1833 is

Took a long walk; this side of the Island is very dreary: the land is low & undulating with stony peaks & bare ridges; it is universally covered by a brown wiry grass, which grows on the peat. In this tract, very few plants are found, & excepting snipes & rabbits, scarcely any animals. The whole landscape from the uniformity of the brown color, has an air of extreme desolation.

On the 24th he added:

For the sake of the fossil shells, I paid a visit of three days to the town. In a long ride I found the country no ways different from what it is in the neighbourhood of the ship. The same entire absence of trees & the same universal covering of brown wiry grass growing on a peat soil.

Port Louis, East Falkland Island was 'the town.'

1163. This is the largest tree [underlined in the *Specimen Notebook*], sometimes growing 2 or 3 feet high. D° [i.e., 'March'] ['Falklands' added by Darwin]

Chilotrimum diffusum (Forst.f.) O. Kuntze (Asteraceae), specimens at CGE and E-GL. Marked with a pencilled cross.

Darwin was being a bit facetious in calling this a 'tree'. Moore (1968) states that in the Falkland Islands it reaches a height from 20 to 200 cm.

On his second trip to these islands, in March 1834, when discussing relationships between the islands and Tierra del Fuego, Darwin observed on page 237 of his *Zoological Diary*: 'The plants & insects might easily be transported from Tierra del in the SW furious gales ['(b)' in margin].—'

The note on page 237, *verso* is

saw which appeared about 20 feet high & thick in proportion.—They grow at Pan de Azucar: on the West bank of the Uruguay they are not found until you ['cross' marked out] arrive at the Arroyo del Palmas [Prov. Entre Rios, Argentina]

The note on page 199, *verso* reads:

(a) These Palms & some semi-aquatic trees, which follow the courses of the streams, are nearly the only exceptions, to the general & entire absence: it is said that forest timber does not occur for a long distance N of Rio Plata.—In the mountainous country on the Northern half of the Laguna ['del' marked out] de las Patas there is an abundance.— [i.e., Lagoa dos Patos, prov. Rio Grande do Sul, Brazil]

He continues on page 200:

1833 May. June Maldonado

in Latitude 32°. Here likewise a sandy granitic soil commences.—This would appear to be adapted to them.—

Unfortunately, none of these palms seems to have been collected by him. Earlier, he had under 'Ornithology', written (p. 186):

1833 May. June. Maldonado

The birds generally are very numerous in the Camp: [i.e., 'campo', countryside] especially *Cassicus* & *Lanius* (or more properly *Tyrannus*).—It is impossible not to be struck with great beauty: the most general colour is yellow. & it is worth noting, that from the prevalence of certain flowers this is the general tint of the pastures.—

Cassicus are caciques (Icteridae), *Lanius* are shrikes (Laniidae), and *Tyrannus* are kingbirds (Tyrannidae).

1346. [marked with an inked cross in the margin] *Sycopodium* [underlined by Darwin and 'erdon': added above; given as *Lycopodium* in *Specimen Notebook*.] and Lichen. D° [i.e., 'E. Falkland Island'] July. The *Sycopodium* often grows in open camp [i.e., 'campo' or country] to three or four times the size of this one; but always, in the same singular shape.

1833 Plants. [page] (7)

The Lichen grows on damp indurated bare, not very pure sand near the dunes [changed from 'dumes' by Darwin]. It has a very singular appearance, where there is much of it.

Lycopodon is the genus of puff-balls. Probably collected in the vicinity of Maldonado, Uruguay, rather than the Falkland Islands, given the date of collection as July 1833. I found no specimens of either fungus or lichen bearing this number.

1391. Grass. Cape Blanco [i.e., Cabo Blanco, prov. Santa Cruz, Argentina?]; plant from R. Chupat, [i.e., Rio Chubut, prov. Chubut, Argentina], root eat for liquorice.

I found no specimen bearing this number, nor any answering this description. There is no evidence that Darwin was at Cabo Blanco. Lt. Wickham, however, had been on the Rio Chubut in February 1833. Perhaps he collected this plant and gave it to Darwin.

1590. Sort of Lichen, growing on the dry sandstone plains of Rio Negro. The patches are circular from size of shilling to half a crown; the ground is blistered, that is the patches are convex and partly hollow underneath. It is abundant.

Probably *Disciseda cervina* (Berk.) Holl. (Lycoperdaceae). I found no specimens of this fungus. Berkeley (1842) based this name on a Darwin collection.

Darwin recorded in his *Diary* entry for 4 August 1833 that he:

Crossed the river and took a long walk to examine the South Barranca; the country is a level plain, which on the coast forms a perpendicular cliff about 120 feet high. Having walked several miles along the coast I with difficulty found a pass to ascend to the plain above. This plain has a very sterile appearance; it is covered with thorny bushes & a dry looking grass & will for ever remain nearly useless to mankind. It is in this geological formation that the Salinas or natural salt-pans occur; excepting immediately after heavy rain no fresh water can be found. The sandstone so abounds with salt, that all springs are inevitably very brackish. The vegetation from the same cause assumes a peculiar appearance; there are many sorts of bushes but all have formidable thorns which would seem to tell the stranger not to enter these inhospitable plains.

The river was the Rio Negro. As here he was on its south side, he was in the province of Rio Negro, Argentina.

1593. Bearded wheat, injured by the Pulvilho. V. 208.

Triticum aestivum L. (Poaceae), no specimens found.

'V. 208', of course, is a note to see page 208 of the *Zoological Diary*. Unfortunately, this page is missing. However, Henslow (1844) published a 'Memorandum' of Darwin's that either reflects or actually reprints this information. That the latter is probably the case can be deduced from Henslow's referring to the *Plant Notes* as 'Darwin's memoranda' in a letter to J. D. Hooker of 9 September 1843 (Porter, 1980a). Darwin's comments and Henslow's introduction to them follow, as they are not included in Barrett's (1977) anthology of Darwin's published writings:

RUST IN WHEAT

It was good advice which I once heard given by a dealer in objects of natural history to a friend who had offered to procure specimens for him in some foreign country he was about to visit—'If you really wish to serve me,' said he, 'do not send me pretty specimens, nor yet anything that you may fancy particularly curious. I am already overstocked with such objects. Just keep a jar at hand, filled with spirits of wine or gin, and whenever you see some very common looking reptile or insect, put it into the jar. The chances are, that everything you may consider least worth preserving will be of most service to me.' The fact is, that persons who are not naturalists are no judges of what objects are most likely to be of interest in a strictly scientific point of view. Botanists would rather receive one of our most common weeds from a newly-discovered or newly-explored country than a new species of an already known genus. There are higher departments of botany than mere collectors of specimens are aware of. To ascertain the geographical distribution of a well-known species is a point of vastly superior interest to the mere acquisition of a rare specimen. My friend Darwin well understood this (but then he is an accomplished naturalist), when he so often stepped aside from his geological and zoological pursuits, to preserve specimens of plants for me; though botany formed no portion of his immediate studies. I suppose there are few persons possessing a healthy taste for the details of real adventure, who have to by this time read his most interesting 'Journal of the Voyage of the Beagle;' and from what they must there have seen of his appetite for observation, they will not be surprised to hear that I have just received from him two blighted ears of Wheat, which few persons would have thought it worth while to carry with them round the world, but which he brought home upon the chance of their affording some information on the cause of those extraordinary and devastating blights to which the crops are occasionally subject in South America. As the memorandum he has made upon the subject will possess an interest in the eyes of agriculturists, I shall here present it to your readers; and then mention the cause to which these blights must be ascribed:—

MR. DARWIN'S MEMORANDUM

'Northern Bank of the Plata, Nov. 26-30, 1833.

'No. 1593—Bearded Wheat materially injured by a blight called the 'Polvillo.' When a field is attacked, it seems, even at a distance, burnt up, and of a red appearance. On walking amongst the Corn, the shoes and trowsers become covered with a fine rust-coloured powder: hence the name. The powder is lodged in minute oblong patches, beneath the epidermis, which may at first be seen partially raised, and a forming a scale. It attacks all parts indiscriminately. If the leaves are a little infected, the grains of Corn are light and dry; but if the ear and stalk are attacked, the crop is entirely spoiled. The blight is not observed before the grain is pretty full, and its attacks are very rapid—three or four days being sufficient to spoil a whole field. It is endemic in the whole district, though not equally destructive throughout. From this cause, last year, when the weather was wet, no grain was gathered. Hence an immense importation of flour took place from North America. This year, the weather being fine and dry, the blight will destroy or injure the greater part of all the crops. Fields thrown up in Buts, clear of weeds on high ground, are equally attacked with those of less favoured aspect. It is here attributed to the sun's action after heavy dews. Crops grown from grain of the country, from the Cape of Good Hope, and from Rio Negro in Patagonia, were all more or less affected. It is remarkable that the Wheat at Rio Negro itself (which is grown on low diluvial lands) produced, even last year, its immense crop uninjured. This blight is a prodigious evil to the country, and most mortifying to the agriculturist, who does not know that all his labour will be lost, till within a week or fortnight of the time when he was expecting to reap the fruits of it.'

Henslow states that he sent a specimen of this 'rust or red-gum' to Berkeley, who identified it as '*Uredo linearis*' (*Puccinia graminis* Pers., Pucciniaceae), common wheat rust.

1641. Lichen common on pebbles. June. P. Desire.

I found no specimens with this number.

Darwin was not in Puerto Deseado, prov. Santa Cruz, Argentina in June 1834. He was there from 23 December 1833 through 4 January 1834, and 20 through 22 January 1834. In his *Diary* entry for 24 December he recorded:

Took a long walk on the North side; after ascending some rocks there is a great level plain, which extends in every direction but is divided by vallies. I thought I had seen some desert looking country near B. Blanca; but the land in this neighbourhood so far exceeds it in sterility, that this alone deserves the name of a desert. The plain is composed of gravel with very little vegetation & not a drop of water.

Bahia Blanca is in the province of Buenos Aires.

1930. Gum-resin, exuded from the bosses of the *Hydrocotyle gummip[era]* added by Darwin who also underlined the word] [*for* added by Darwin] chemical analysis [*Falklands* added by Darwin]

Bolax gummifera (Lam.) Spreng. (Apiaceae), no specimens found.

The *Beagle* visited the Falkland Islands for the second time in March and early April 1834.

River S. Cruz [added by Darwin]

2039. Very sweet smelling, plant; with a rather biting [*S. Cruz*' added in margin by Covington, parentheses placed around it by Darwin, as are lines above and below: (*S. Cruz*)] aromatic taste; used for making tea by the seamen.

Satureja darwinii (Benth.) Briq., Lamiaceae, type specimens at CGE and K. Marked with a pencilled cross.

[‘NB’ added by Darwin in margin] As all these plants were collected during end of April and beginning of May; they are late Autumnal plants. I collected every one in flower; as indeed I have done every-where in Patagonia. Country same dry sterile shingle bed as before [‘from the sea to the Andes at the sources of S. Cruz’, added by Darwin.]

During 18 April to 8 May 1834, Darwin, Captain Robert FitzRoy, and a number of officers and men of the *Beagle* travelled by boat up the Rio Santa Cruz in an effort to reach the eastern slopes of the Andes. They failed to do so by only a few miles, but were driven to return because of a lack of provisions. Darwin covered several pages of his *Diary* with entries on this trip, but the comments on plants are few. However, he did make the following observations in the *Zoological Diary* (p. 260):

1834 May & April. Zoology. S. Cruz

[‘S. Cruz’ in margin] During the expedition up the river I [‘noticed’ marked out] found the same animals, birds, insects & plants, which I have collected near to the coast: this extreme similarity in the productions of the sterile plains of shingle is a very striking feature in the whole of S. Patagonia. The geology likewise being similar, one view can hardly be told from another.— . . .

. . . (I suspect Patagonia has but few productions of its own.—is the Botany sufficiently known to tell.—[‘(c)’ in margin] The extreme infertility, even close to running water, has

Page 260, *verso* continues:

has often much surprised me.—At different times I have attributed this general sterility, to the salt [‘to’ marked out] contained in the sandy clay.—the extreme dryness of the climate, (which is an undoubted fact).—the poorness of the soil of the gravel beds.—& to no creation having taken place. since this country was elevated (I yet think this applies to the Northern parts): I am now most inclined to attribute it all to the poorness of the soil.—Yet in the Lava country, where there was water, it was but little better!—

2040. Plant, on the dry banks; (flowers minute?) High up the river; interior D° [i.e., ‘River S. Cruz’]

Euphorbia portulacoides L. emend. Spreng. (Euphorbiaceae), specimen at CGE.

- 2041–2042. Plants, 140 miles up [‘The’ in *Specimen Notebook*] river; grows rather near river; character of country same, as at coast; as these plants, I never saw to the coast are they not cordilleras plants crawling downwards. D° [i.e., ‘River S. Cruz’]

Number 2041 is *Quinchamalium chilense* Mol. (Santalaceae), specimens at CGE, E-GL, and K. Number 2042 is *Oreopolis glacialis* (Poepp. & Endl.) Ricardi (Rubiaceae), specimen at CGE. Marked with a pencilled cross.

According to Darwin’s *Diary* entry for 4 May, the highest up the Rio Santa Cruz that they travelled was 140 miles. These specimens, then, were collected there on that date.

2043. Very adhesive, abundant about the lava cliffs, 8 or 900 feet above the sea; in the interior. D° [i.e., ‘River S. Cruz’]

Senecio tricuspoidatus Hook. & Arn. (Asteraceae), type specimens at CGE, E-GL, and K. Marked with a pencilled cross.

2044. Same locality; shady nooks amongst the rocks. D° [‘River S. Cruz’]

Sisymbrium magellanicum (Juss. ex Pers.) Hook. f. (Brassicaceae), specimens at CGE and K. Marked with a pencilled cross.

2045. Plant, interior. D° [i.e., ‘River S. Cruz’]

Galium richardianum (Gill. ex Hook. & Arn.) Endl. ex Walp. (Rubiaceae), specimens at CGE. Marked with a pencilled cross.

Plants.

- 1834
2046. Grass; this characterizes all the arid plains of South Patagonia. D° [i.e., 'River S. Cruz'] S. Cruz.

Stipa speciosa Trin. & Rupr. (Poaceae), specimens at CGE and K. Marked with a pencilled cross.

2047. Plant, interior. D° [i.e., 'S. Cruz']

Descraineria appendiculata (Griseb.) O.E. Schultz (Brassicaceae), specimens at CGE and K. Marked with a pencilled cross.

2048. D° [i.e., 'Plant, interior'] on the wet shingle; river side. D° [i.e., 'S. Cruz']

Arenaria lanuginosa (Michx.) Rohrb. (Caryophyllaceae), specimens at CGE and K.

The *Beagle* visited the Isla de Chiloé, prov. Chiloé, Chile from 28 June through 13 July 1834. While Darwin entered no collections from the island in the *Plant Notes*, he made the following entries in the *Zoological Diary* under 'Ornithology'
Page 265:

1834 July Chiloe

... The commonest site, where these birds may be found, is on marshy open ground where a Bromelia (?). (a plant bearing -pine-apple sort of ['edible' in margin] fruits with long toothed leaves) forms thickets.—

Page 266:

1834 July Chiloe

... There are at this time of year, scarcely any flowers. & none whatever where the above plants grow.—

Page 265, verso:

['(a)' in margin] These forest, wear from the climate a gloomy look; yet in many respects they have a more Tropical appearance, than the latitude would lead one to expect.—The woods contain various sorts of trees: they are very thickly placed together: they are much covered with parasitical plants, many of them monocotyledonous.—An Arborescent grass ['jointed like Bamboo' in margin], which intertwines the trees to the height of 30 feet is very abundant: the Ferns are singularly large.—I no where saw the Beech tree which forms the whole forests of T. del Fuego.—the Winters bark is common to both countries.—

Opposite this entry is written 'Cop ornithology' in pencil by Darwin. An edited version was entered into the *Ornithological Notes* (see Barlow, 1963, p. 253). 'Winters bark' is *Drimys winteri* Forst. (Winteraceae), which Darwin mentioned several times in his *Diary*, but which he seems never to have collected.

Apples (*Malus pumila* Mill. (Rosaceae), no specimens found) are not mentioned for the Isla de Chiloé in the *Diary* but he wrote the following in the *Zoological Diary* under 'Apple Trees' (p. 266):

1834 July Chiloe

In Chiloe the inhabitants have a mode of propagating trees so that in three years it is possible to have an orchard of large fruit-bearing trees.—At the lower part of every branch, there are small (2 or 3 1/10th of inch) conical, brown, wrinkled projecting points; these are roots, as may be seen when any mud has fallen on the tree.—A branch, as thick as a man's thigh is chosen, & is cut off, just beneath a group of points; this

1834 July Chiloe

is done in *very early* spring: the extremities of all the sub-branches ['are' marked out] being lopped off. it is placed about 2 feet deep in the ground with a support.—the ensuing summer it throws out very long shoots, & sometimes bears a few apples (I saw one which had most unusually produced as many as 23): the 2d summer, the former shoot threw out others: in the third summer it bears a good deal of fruit & is (as I have seen) a well wooded tree.—Are the incipient roots present in ['ap trees in' added] any part of England? or is this whole process owing to the extremely damp nature of the climate? it is a most valuable method where applicable.—I have noticed that in the Apples, not above one in a hundred will have any seeds in its core.—

A shortened version, with some additional information is given in Darwin (1839, pp. 363–364).

2377. Lichen. *Conferva*. [i.e., 'conferva'; no such specimen was found.] consists of bunches of slightly branched hairs. coloured [changed by Darwin from 'colored'] 'Reddish orange'; grows commonly on the dead twigs of trees, here at Chonos and in Tierra del Fuego. The hairs when examined in ['the' added by Darwin] ca['bin' added by Darwin] (from hygometrical ['hygrometical' in *Zoological Diary*] properties ?) moved and started. The hairs have their extremities rounded truncate [changed from 'touncate' by Darwin], when examined in water, seem to consist of an outer vessel, containing an inner with a red fluid; this fluid is divided transversely, apparently in very same manner as the green matter in *Conferva* ['conferva' in *Zoological Diary*]; each compartment is composed of 3 or 4 little sph[e' added by Darwin]res of the red, matter, which either only touch or run into each other more or less. On the hairs there are irregular lumps, which contain a particle of the red matter, separate from the column. These [changed from 'There' by Darwin] are buds and thin young b['ra' added by Darwin]nches may be seen rising from them. Decemr. Chonos. Archipelago.

The above description is copied from page 287 of the *Zoological Diary*, where it has been marked out by a vertical pencilled line. 'Lichen = *Conferva* 2377 Plate 14: Fig. 4 much magnified' is written in the margin of the *Zoological Diary* opposite this entry.

Jan-y. 1835.

2475. Little plant, very abundant, on hills. This [underlined in *Specimen Notebook*] and the bog plant of Tierra del Fuego, (& grass) here form great beds of peat. ['& the' added in *Specimen Notebook*] Latitude 45°!! December. 1834. ['V. 314' in *Specimen Notebook*, see below] Chonos. Archip. Midship. Bay.

Donatia fascicularis Forst. & Forst. (Donatiaceae), specimens at CGE and K. Marked with a pencilled cross.

Darwin was in the Archipiélago de los Chonos, provinces of Aisén and Chiloé, Chile from 13 December 1834 through 15 January 1835. Midship Bay is unidentified. He made the following observations in his *Zoological Diary* under 'Vegetation' (p. 313):

1835 Jan: Chonos Archi: Gen: Observ:

...

... ..

At S. Pedro. (SE point of Chiloe) I first noticed the Antarctic Beech ['(a)' in margin] of T del Fuego [i.e., *Nothofagus* spp.] but at a considerable elevation ['&' marked out] very stunted in its form.—In Midship Bay (Chonos) Lat: 45°–46. This tree grew to a fair size. at the Waters edge ['&' marked out] formed nearly 1/5th of the Wood.—From this point it doubtless continues to augment. till in T-del Fuego we find the woods essentially composed of it alone.—The arborescent grass which we see in Lowes Harbor (& perhaps in Lemoos) [i.e.,

Isla Lemuy] is not found in this Midship Bay; Hence together with the numbers of the Beech the forest bears a different aspect from what it does in Chiloe.—Here Cryptogamic flora. has reached its perfection (V Specimens) [i.e., number 2476] In T del Fuego I have remarked, that the forest appears to be too dank & cold

[page] 314

1835 Jan: Chonos Archip: Gen: Observ:

for even this order of plants: In this Latitude [^{45° S} added in pencil] also I see that level pieces of ground instead of supporting trees, become covered with a thick bed of Peat [‘Peat’ in margin]. Trees [‘never’ marked out in pencil; ‘seldom’ added in pencil] grow [‘but’ marked out] on a slope in T del Fuego: whereas in Chiloe the plains forms the densest forest. Here the climate seems more to resemble that of T del Fuego: under it. is remarked by old Navigators on this coast, that in the whole distance between Chiloe & C. Horn. there is no great difference of climate.—The peat is here formed by the plant called ‘Bog Plant’ [*Astelia pumila*, number 976; ‘in T del Fuego’ in margin]. & another [‘.’ marked out in pencil] Specimen (2475): [*Donatia fascicularis*; ‘It support’ marked out] These socialle plants support a few tufts of coarse grass, stunted little dwarf beeches & the ‘Tea Plant’ [‘of Falklands’ in margin, *Myrteola nummularia*, number 978]—The aspect of the Bog is precisely that of T del Fuego.] [bracket added in pencil]—The Lat. 45° [minutes not added]!—

The note on page 313, *verso* is

(a) These remarks about the Beech, must be taken with caution; for I see ne [none?] of the species. least common in T del Fuego is common in central forest of Chiloe]

2476. Cryptogam[ous] added by Darwin; (all ensuing ones) D° [i.e., ‘December. 1834’] D° [i.e., ‘Chonos. Archip., Midship. Bay.’]
All the Cryptogamio were gathered in 5 minutes and within a space of 10 yards square. A most wonderful profusion. [Marked with a pencilled cross] [‘How many species?’ added marginally in pencil by Darwin; also marked with a pencilled cross.]

Darwin constantly referred to mosses & liverworts as cryptogams. Specimens of the following were collected by him in the ‘Chonos Archeplago’ (Archipiélago de los Chonos, prov. Aisén, Chile) and are at the herbaria indicated.

Liverworts:

Plagiochila neesiana, Plagiochilaceae (types of *Jungermannia chonotica* Taylor at BM and CGE).

Lepidozia chordulifera (Taylor), Lepidoziaceae (type at BM).

Bazzania peruviana (Nees) Trev., Lepidoziaceae (BM and CGE).

Schistochila lamellata (Hook.) Dum., Schistochilaceae (BM and CGE).

Mosses:

Pterygophyllum anomalum (Schw.) Mitt., Hookeriaceae (BM and MANCH).

Pt. denticulatum Mitt. (BM and MANCH).

Hypopterygium arbuscula (P. Beauv.) Brid., Hypopterygiaceae (BM and MANCH).

H. didictyon C. Muller (BM).

All could have been part of this collection.

On 11 January 1844, Darwin wrote to J. D. Hooker that (Allan, 1977: 138):

My cryptogamic collection was sent to Berkeley; it was not large; I do not believe he has yet published an account, but he wrote to me some years ago that he had described & mislaid all his descriptions. Wd it not be well for you to put yourself in communication with him; as otherwise some things will perhaps be twice laboured over.—My best (though poor) collection of the cryptogam. was from the Chonos Islands.

The Reverend Miles Joseph Berkeley (1803–89) described many of Darwin's fungi and a few lichens (Berkeley, 1839, 1842, 1845), but the mosses, liverworts, and some other lichens were published on by others.

			[page] (9)
1835	Jan-y.	Plants.	Chonos. Archipelago.
2528.	Wild Potatoes [<i>Solanum tuberosum</i> var. <i>vulgare</i> Hook. f. (Solanaceae), specimens at CGE. Marked with a pencilled cross. The following description was copied by Covington from pages 314 and 314 <i>verso</i> of the <i>Zoological Diary</i> .]		

Wild plants grow in abundance on all the islands of this group; the furthest point south where Mr. Stokes saw them was at Lemoos; But Mr. Lowe tells me the wild Indians in the Gulf of Trinidad know them well, call them Aquina and eat them, and say they grow in that neighbourhood. At Lowes harbour (Lat. 44°) I visited a large bed; They appear a sociable plant; in all parts they grow in a sandy-shelly soil close to the beach, where the trees are not as close together; They are now (Jan-y 15th) in bud and flower; the tubers ['(1142) in spirits' written in the margin] are few and small, especially in the plants in the shade, with luxuriant foliage. yet I saw one, oval with the longest diameter two inches in length. They are very watery and shrink, when boiled; When raw have the smell of Potatoes of Europe; When cooked are rather insipid, but not bitter [underlined in *Zoological Diary*] or ill-tasted and may be eat with impunity. (V. Humboldt. New Spain Vol. II P. []) The stem of one plant from the ground to tip ['top' in *Zoological Diary*] of upper leaf measured exactly 4 feet!!—These plants are unquestionably here amongst these ['the' in *Zoological Diary*] uninhabited Islands in their wild state (Indians of south recognizing them and ['&' marked out in *Zoological Diary*] giving them Indian name; general occurrence on all, even very small inlets &c &c). They grow on a sandy soil, with much vegetable matter. The Climate is very humid and little sunshine. [The following was added later to the *Zoological Diary*:] The Indians of Chiloe speaking the Williche language give them a different name from Aquina, the word of ['the' marked out] west Patagonia The Potatoes has been found near Valparaiso. V. Sabine Horticultural Society?

'Mr. Stokes' is John Lort Stokes (1812–85), Mate and Assistant Surveyor on the *Beagle*. 'Lemoos' is Isla Lemu, prov. Aisen, Chile. William Lowe was Pilot of the *Adventure*, sailing and surveying with the *Beagle*; Golfo Trinidad is in the province of Magallanes, Chile. 'Humboldt' refers to his 1822 book, and 'Sabine' to his 1824 paper, both listed in the bibliography of the present paper. In the *Zoological Diary*, 'and' is given as '&', and several words are or are not capitalized that are or not here. Opposite the entry in the *Zoological Diary* has been written 'copied'. Darwin made the following entry in his *Diary* on 7 January 1835:

I think this place will soon be inhabited; there is a great abundance of muscles & oysters; wild potatoes grow in plenty, one which I measured was oval, & its longest diameter two inches. Mr. Stokes & his party cooked & ate them & found them watery but good.

Lowes's Harbour was 'this place'

			[page] (10)
1835		Plants.	
3056.	Lichen, lying, without any adhesion on the bare sand, at Iquique ['Peru' added by Darwin. This locality is now in Chile.] elevation 2–3000 feet; (where clouds often hang) sufficiently abundant in patches to give a green tint to sand seen from ['a' added by Darwin] distant ['ce' added by Darwin]; I saw one other species of minute yellow Lichen on old Bones, and a Cactus on lofty rocks on coast. Besides these three, there is neither Cryptogamio or Phanergamio, ['plants' added in margin by Darwin] on coast or for 14 leagues inland; and these [changed by Darwin from 'this'] species are only seen on the coast mountains. ['Coquimbo.' marked out by Darwin] [Marked with a pencilled cross.]		

No specimens of this lichen, nor of the other or the cactus, were found. Darwin wrote to J. D. Hooker in late April or early May 1845 (copy in the Darwin–Hooker correspondence at Kew, number 33, page 63): ‘The loose lichen was lying on the sand of the real deserts of Iquique. Henslow said it was a *Cladonia*: I suppose he sent it with rest of the *Crypt.* to Berkeley.’ In his *Diary* entry for 13 July 1835, Darwin wrote:

On the coast mountains at about 2000 ft. elevation, the bare sand was in places strewn over with an unattached greenish Lichen, in form like those which grow on old stumps: this in a few spots was sufficiently abundant to tinge the sand when seen from a little distance, of a yellowish color. I also saw another minute species of Lichen on the old bones. And where the first kind was lying, there were in the clefts of the rocks a few Cacti. These are supported by the dense clouds which generally rest on the land at this height. Excepting these, I saw no one plant.

These coastal mountains were inland from the port of Iquique.

3153. 3154. 3155. Lichen. San. Lorenzo. Lima. 1000 feet. region of winter clouds. August.

I found no specimens with these numbers, nor from this locality. Darwin wrote to J. D. Hooker in April 1845 (copy in the Darwin–Hooker correspondence at Kew, number 31, page 60): ‘The enclosed little lichens came from near summit of most barren island of San Lorenzo off Lima: What on earth made me think them worth collecting I know not—please throw them away.’ The *Diary* entry for 20 July 1835 includes the following:

The barren Isd of S. Lorenzo which forms the harbor is nearly the only secure walk. I climbed one day to the highest part, nearly 1200 ft. high. This is within the limit of the region of Clouds at this season. I there met with half a dozen different kinds of plants & an abundance of Cryptogamic vegetation; on the hills near Lima, at a little greater elevation, the ground is carpeted with moss & there are some beautiful yellow lilies called Amancaes.

Unfortunately, he seems not to have collected any of these ‘beautiful yellow lilies.’ This was ‘nearly the only secure walk’ because civil war was then raging in and around Lima.

3192. Cryptogamio, plant, same locality with number 3153 & c & c. D^o [i.e., see number 3153]

I found no specimen with this number.

Sepr. Galapagos Islands.

3233. Plants, on rocky [changed from ‘rocks’ by Darwin] most barren hill[‘s’ added by Darwin], Volcanic . . . Chatham Island.

I found no specimen bearing this number. An ‘x’ is inked in the margin, added by Darwin. Darwin’s *Diary* entry for 16 September 1835 describes his first landfall in the Galápagos, on Isla San Cristóbal (Chatham Island):

We landed for an hour on the N.W. end of Chatham Isd. These islands at a distance have a sloping uniform outline, excepting where broken by sundry paps & hillocks; the whole black Lava, *completely* covered by small leafless brushwood & low trees. The fragments of Lava where most porous, are reddish like cinders; the stunted trees show little signs of life. The black rocks heated by the rays of the Vertical sun, like a stove, give to the air a close & sultry feeling. The plants also smell unpleasantly. The country was compared to what we might imagine the cultivated parts of the Infernal regions to be.

He later (21 September) likened the landscape to ‘the iron furnaces near Wolverhampton.’

Charles Island.

3242. Herbaceous Shrub, common in the higher and inland parts, smell something like a Geranium.

Scalesia affinis Hook.f. (Asteraceae), type specimen at CGE.

Darwin's *Diary* entry for 26 and 27 September 1835 includes the comment: 'I ascended the highest hill in the Isd, 2000 feet; it was covered in its upper part with coarse grass & Shrubs.' This hill was probably the Sierra de Paja, which reaches a height of about 1,800 feet.

3243. Woody Shrub; odour like Honeysuckle.

Lantana peduncularis Anderss. (Verbenaceae), specimen at CGE.

3244. Parasite, growing on various kinds of trees.

Phoradendron henslovii (Hook. f.) Robins. (Viscaceae), type specimen at CGE.

In the *Diary* entry for 23 and 24 September 1835, the following is included:

Since leaving Brazil we have not seen so Tropical a Landscape, but there is a great deficiency in the absence of the lofty, various & all-beautiful trees of that country. It will not easily be imagined how pleasant the change was from Peru & Northern Chili, in walking in the pathways to find *black mud* and on the trees to see mosses, ferns & Lichens & Parasitical plants adhaering. Owing to an unusual quantity of rain at this time of year, I suspect we have seen the Island at its full advantage.

The 'Island' was Isla Floreana (Charles Island), and the only truly 'Parasitical plants' seen was this *Phoradendron*.

Chatham Island

3253. Common spiny bush, small scarlet flowers.

Castela galapageia Hook. f. (Simaroubaceae), type specimens at CGE and K. Marked with a pencilled cross.

This was certainly one of the plants Darwin was describing in his *Diary* when on Charles Island he entered for 19 and 20 September:

Upon first arriving I described the land as covered with leafless brushwood; & such certainly is the *appearance*. I believe, however, almost every plant or tree is now both in flower & leaf. But the most prevalent kinds are ornamented with but very few & these of a brown color.

3254. The commonest bush in the Island. grows straggling, [6' added by Darwin] to 12 feet high; leaves brownish green, very few in numbers;

Scalesia incisa Hook.f. (Asteraceae), type specimen at CGE. Marked with a pencilled cross.

3255. The largest tree; low thick, 1 to 2 feet in diameter, crooked branches, few leaves; Balsamic odour, trunk thick in proportion; common.

Bursera graveolens (HBK.) Trian. & Planch. (Burseraceae), I found no specimens of this collection, but from Darwin's description, it can be no other species. Marked with a pencilled cross.

3256. Wild cotton tree, one of the commonest shrubs.

Gossypium darwinii Watt (Malvaceae), specimen at CGE.

3257. Green thickets, bright green generally common near sea side.

Maytenus octogona (L'Her.) DC. (Celastraceae), type specimens of *M. obovatus* Hook.f., at CGE and K.

1835 Septr. Plants.

3258. C[onvolvulus' added by Darwin] like plant, on sea-sand; flower pink. Chatham Island.
[*Ipomoea maritima*' added by Hooker]

Ipomoea pes-caprae (L.) R. Br. (Convolvulaceae), specimen at CGE.

3259. One of the commonest low bushes, small yellow flower. from D^o [i.e., 'Chatham Island']

Waltheria ovata Cav. (Sterculiaceae), type specimen of *W. reticulata* Hook.f., at CGE. Marked with a pencilled cross.

—James Island. Octobr.—

3284. Cactus. Flower yellow; leaves rounded oval attached to each other in same plane generally; branches in different planes; trunk cylindrical, tapers but little 6 to 10 feet [ft. in *Specimen Notebook*] high; beset with strong spines, diverging [changed from 'deveging' by Darwin] from the [not in *Specimen Notebook*] [added by Darwin, 'p'] joints hence ['hirsute' added by Darwin] with stars. Common on rocky [underlined in *Specimen Notebook*] ground.

Opuntia galapageia Henslow (Cactaceae), type specimen at CGE. There is a drawing of this species in the margin of the *Specimen Notebook*.

Darwin's *Diary* contains several references to the feeding on plants of the endemic giant tortoise (*Geochelone elephantopus*) and one of the endemic land iguanas (*Conolophus subcristatus*). Here follow his pertinent notes from the *Zoological Diary*:

Under 'Tortoise' (page 329):

The Tortoises which live on those Islands ['(a)' in margin, marked out in pencil], where there is no water. or in dry parts of others. live chiefly on the succulent Cactus [i.e., this species of *Opuntia*, and others]: I have seen, those which live in the higher parts, eating largely of a pale green filamentous Lichen, [*Ramelina usnea* Howe (Usneaceae)] which hangs like tresses from the boughs of the trees, also various leaves & [illegible word marked out] copiously the ['berrys' marked out in pencil and 'berries' added in pencil] of [changed in pencil from 'or'] a tree (called Guayavitas) [i.e., *Psidium galapageium*, see number 3293 below] which ['a' in margin, added in pencil] are acid & Austere. ['a' added in pencil]

The note on page 329, *verso* is:

(a) The dung of the Tortoise is very large & resembles that of the S. American. ostrich

Under '*Amblyrhynchus terrestris*' (pages 338 and 339):

Those individuals & they are the greater number, which inhabit the extremely arid land, ['can' marked out] never drink water during nearly the whole year.—These eat much of the succulent Cactus, which is in evident high esteem. When a piece [changed from 'pieces'] is thrown towards them. each will try to seize & carry it away. as dogs do with a bone.—They eat however deliberately. without chewing the pieces.—The Cactus is in request amongst all animals, I have seen ['a' marked out] little birds [i.e., finches] picking at the opposite end of a piece which ['the' marked out] a Lizard was eating: & afterwards it would hop. on with complete indifference on its back.—In their stomachs ['I ha' marked out] vegetable fibres, leaves of different trees, especially the Mimosa [i.e., *Acacia* spp.] were always found. In the high damp country. their chief food is ['to' marked out] the berry. called Guayavitas; it is the same which the Torioses eat. & has an acid astringent taste.—Here also they are said to drink water.—To obtain the leaves they climb short heights up the trees: I have frequently seen them clinging to the branches of the Mimosa.—Thus their habits are as entirely herbivorous as in the black sea-kind [i.e., the marine iguana, *Amblyrhynchus cristatus*].—

On page 339, *verso* is the note:

Is any other genus, amongst the Sauriens Herbivorous? I cannot help suspecting that this genus, the species of which are so well adapted to their respective localities, is peculiar to this group of Is?—

Added to this later and then marked out in pencil is, 'The Inhabitants of Tahiti had never seen or heard of.'

Several comments on the eating of plants or seeds by birds were included on pages 340 and 341 under 'Ornithology':

I should state that all the species [of finches] (& doves) feed together in great numbers indiscriminately. their favourite resort. being in the dry long grass in the lower & dry parts of Islands. where in the soil many seeds are lying dormant.—The Icterus like Finch (3320–23) is distinct in its habits ['(a)' in margin]; its general resort is hopping & climbing about the Cactus trees picking with its sharp beak the flower or fruit.—Not infrequently however it alights & feeds with the flocks of other species on the ground.—

The 'Icterus like Finch' probably was the cactus finch (*Geospiza scandens*); *Icterus* is a genus of orioles (Icteridae). 'Gross-beaks' were large-beaked specimens of ground finches (*Geospiza* spp.). The note on page 341, *verso* is

(a) The Gross-beaks are very injurious. The [i.e., They] will stock [i.e., stalk] seeds & plants, when buried 6 inches beneath the ground

3285. Fungus, on Mimosa tree. [inked 'x' added in margin by Darwin]

Cited by Berkeley (1842) as '*Polyporus igniarius* . . . var. *scaber*, Berk.,' (Polyporaceae); this is the type, and the specimen was not found. The current name for the species is *Phellinus rimosus* (Berkeley) Pil. (Reid *et al.*, 1981), but it is not clear that the collection represents this taxon. Darwin collected no specimens of *Mimosa* in the Galapagos Islands, but he did gather two species of *Acacia*.

3293. Large, succulent, clinging plant, grows high up in damp parts [changed from 'plants' by Darwin].

Peperomia galioides HBK. (Piperaceae), type specimens of *P. flagelliformis* Hook.f., at CGE and K.

3294. Sy['n]g['ynesia' added by Darwin]; the characteristic and abundant tree in the high ground ['2000–3000 ft' added by Darwin]; grows to a good size; foliage pale bright green, trunk well formed cylindrical, branches regular.

Scalesia pedunculata Hook.f. (Asteraceae), type specimen at CGE. Marked with a pencilled cross. For 9 October 1835, Darwin described in his *Diary* a hike into the interior of Isla Santiago (James Island):

Taking with us a guide we proceeded into the interior & higher parts of the Island, where there was a small party employed in hunting the Tortoise. Our walk was a long one. At about six miles distance & an elevation of perhaps 2000 ft. the country begins to show a green color. Here there are a couple of hovels where the men reside. Lower down the land is like that of Chatham Isd,—very dry & the trees nearly leafless. I noticed, however, that those of the same species attained a much greater size here than in any other part. The vegetation here deserved the title of a Wood: the trees were, however, far from tall & their branches low & crooked. [Footnote: 'I saw some having circumference of 8 feet, & several of 6 feet.'] About two miles from the Hovels & probably at an additional 1000 ft. elevation, the Springs are situated. They are very trifling ones, but the water good & deliciously cold. They afford the only watering places as yet discovered in the interior. During the greater part of each day clouds hang over this highest land: the

vapour condensed by the trees drips down like rain. Hence we have a brightly green & damp vegetation & muddy soil. The contrast to the sight & sensation of the body is very delightful after the glaring dry country beneath. . . . The tropical character of the Vegetation is stamped by the commonest *tree* being covered with compound flowers of the order of Syngnesia.

This 'tree' was *Scalesia pedunculata*, the largest and most common species of this genus of the sunflower family.

3295. Common tree, in the intermediate ground [*Psidium galapageium*, H. f.? added by Hooker]; the berrys are eaten by the inhabitants and form main food for Tortoise and yellow Lizard, called Guyavitas, taste. acid, little sweet, astringent and turpentic

Psidium galapageium Hook. f. (Myrtaceae), type specimens at CGE and K. Marked with a pencilled cross.

3391. Lichen. Tahiti. Novembr. [inked 'x' in margin by Darwin]

Not a lichen, but a fungus. Cited by Berkeley (1842) as '*Hexagona fasciata*,' a new species of Polyporaceae, and illustrated in his plate IX. This type collection was not found.

3595. Fungus. common on the decaying trunks of the Cocoa nut tree. Keeling Island. April 1836.

This is probably the '*Polyporus lucidus*' reported by Henslow (1838: 347): 'These were sent to Mr. Berkeley. . . .' Berkeley, however, did not include the collection in any of his publications on Darwin's fungi (1839, 1842, 1845). No specimens were found of this collection. The present name for this taxon is *Ganoderma lucidum* (Leysser ex Fr.) Karst (Polyporaceae) (Miller & Farr, 1975).

3596. Fruit of a large tree; milky, green, grows by pairs or three; likewise, root, of a small plant, which is sweet, when cooked and is sometimes eaten. from D^o [i.e., 'Keeling Island'] D^o [i.e., 'April. 1836']

The fruit is *Nesiosperma oppositifolia* (Lam.) Fosberg & Sachtel (Apocynaceae), specimens at CGE and MANCH. The root specimen was not found.

3637. Moss, on dead cocoa nut trees, in woods of Keeling Islands—April.

Cited by Henslow (1838: 347) as '*Hypnum rufescens*', (*H. rufescens* Dicks. ex Brid., now *Orthothecium rufescens* (Dicks. ex Brid.) B.S.G.) (Hypnaceae), specimen at CGE.

An entry in the *Zoological Diary* for April 1835 describes how the land crab of the Cocos-Keeling Islands feeds on coconuts (page 362):

These monstrous Crabs inhabit in numbers the ['low' added in pencil] strips of dry ['coral' added in pencil] land; they live entirely on the fruit of the Cocoa nut tree. Mr Liesk [Liesk was temporarily in charge of the islands, while their proprietor, John Clunies-Ross (1786–1854), was on a voyage to Mauritius (Hughes, 1950), next stop for the *Beagle*.] informs me he has often seen them tearing fibre by fibre, with their strong forceps, the husk of the nut. This process they always perform at the extremity, where the three eyes are situated. By constantly hammering the ['eye' marked out] shell in that soft part is broken ['in' marked out in pencil] & then by the aid of their narrow posterior pincers the food is extracted. I think this is as curious a piece of adaptation & instinct as I ever heard of. These crabs are diurnal in their habits; they live in burrows, which frequently lie at the foot of trees. Within the cavity they collect a pile, sometimes as much as a large bag full, of the picked fibres of the husk & on this they ['rest' marked out] rest.—

'Copied' is written in pencil in the margin. This is the last entry in the *Zoological Diary* to refer to vascular plants.]

Coralline and Other Algae

When publishing on Darwin's coralline algae collected on the voyage of the *Beagle*, the Irish botanist William Henry Harvey (1811–66, Curator of the Herbarium, Trinity College, Dublin) quoted several extracts from Darwin's notes on them. These extracts differ from the field notes on the same collections given in the *Zoological Diary*. Harvey (1847: vii–viii) acknowledged Darwin, 'for the liberal donation to our Herbarium of all those [i.e., coralline algae] which he collected while accompanying H.M.S. 'Beagle' in her voyage round the world, and for the liberty to make the freest use of his manuscript notes respecting them.'

This led me (Porter, 1985) to hypothesise that there must have been some sort of Darwin 'Coralline algae notes' in Harvey's hands when he was writing his *Nereis australis* (Harvey, 1847). When I visited Trinity College, Dublin in November 1984, Dr John Parnell, the present Curator of the Herbarium, showed me such a document that he had found in the Herbarium archives. It is in the form of a letter from Darwin to Harvey, and is printed below, with my comments, citation of specimens, and relevant extracts from Darwin's *Diary* (Barlow, 1933), the *Zoological Diary*, and correspondence. From internal evidence, the letter was written in 1842 or later. Burkhardt and Smith (1985a) date it 7(?) April 1847, but there is no date on the letter. A short extract was published by Sloan (1985).

Darwin wrote in his autobiography (Barlow, 1958: 77–78) that on the *Beagle*:

Another of my occupations was collecting animals [and plants!] of all classes, briefly describing and roughly dissecting many of the marine ones; but from not being able to draw and from not having sufficient anatomical knowledge a great pile of MS. which I made during the voyage has proved almost useless. I thus lost much time, with the exception of that spent in acquiring some knowledge of the Crustaceans, as this was of service when in after years I undertook a monograph of the Cirripedia. [i.e., barnacles]

In spite of what he felt about these notes and drawings in 1876, when the foregoing was written, today's reader finds them quite helpful in understanding their importance in Darwin's evolution as a scientist. They soon become the detailed observations of a professional biologist.

Algal specimens were found only at TCD (Botany School, Trinity College, Dublin) and BM (Cryptogamic Herbarium, British Museum (Natural History)). All of the latter are duplicates of TCD collections. Most of the specimens are types of names published by Harvey. I have made no attempt to typify these names, as I am no expert on algal taxonomy. Several additional collections were cited by other contemporaries of Darwin. These and collections described in the *Zoological Diary* also are identified and discussed in this section of the paper. The colours given in Darwin's descriptions refer to those of Syme (1821). In a letter of 12 November 1833, Darwin wrote to Henslow (Burkhardt & Smith, 1985b: 353): 'Would it not be a good plan to send sea-weeds in Spirits, having previously noted ye colour by Werner??'

The Coralline Algae Notes

Nulliporae [underlined twice] Catalogue of Specimens, not in Spirits

[page] (1)

Note along left side of the page: 'Where depth not stated, are from tidal rocks.'

199. St Jago. ['J' is added over 'S'] C. de Verde's Arch.

TCD: 'Jania near *J. rubens* [in pencil] 199. C. Darwin St. Jago. *unique* Cape V.' The foregoing is written on the packet containing the specimen; the specimen is wrapped in paper on which is written: 'St. Jago 199 Cape Verds'. The packet bears a small, white label on which is printed '199.' Such labels were printed before the *Beagle* sailed and were to be attached to dried specimens or to the paper in which they were wrapped (Darwin, 1839: 599). The period was added in this case so that the number would not be misread as '661'.

This specimen is mounted on a sheet with nine others, including a Darwin specimen labelled 'Near *J. micrarthrodia*.' from King George Sound, West Australia. They are filled under *Jania micrarthrodia* Lamour. Darwin was on the island of São Tiago in the Cape Verde Islands from 16 January to 8 February 1832. During this time, he made several entries in his *Diary* (Barlow, 1933) regarding the collecting of littoral organisms.

197. do do

That is, 'ditto'; i.e., 'St. Jago. C. de Verde's Arch.'

99—do—do

These two collections were cited in the publication of *Melobesia mamillaris* Harvey, *Nereis austral.* 109, 1849, and are syntypes of that name: 'Hab. Bahia (Brazil) in tidal pools, *Mr. Darwin*, No. 3854, 3855, 3856; also Port Famine, Terra del Fuego, No. 1840, 99, 197; St. Jago, Cape Verde; Algoa Bay, *Herb. Bowerbank*. (v.s. in *Herb. T.C.D. comm. cl. Darwin*.). The latter indicates: 'I have it in a dried state in the Herbarium of Trinity College, Dublin, communicated by the celebrated Darwin.' Some of Darwin's comments from page four of the notes elaborated below follow Harvey's description:

In one case I found a cone (*ceramidium*) placed on one side, instead of on the summit, of a branch. The greater number of the branches have white, rounded ends, and on some of these were appearances, as if a ceramidium had once existed there, and had since scaled off. In some branches there were traces of cavities low down in them. *Colour*, on the under surfaces of the branches paler than in *Corallina officinalis*, in other parts creamy, with a tinge of flesh-red. *Darw. MSS.*

A sheet at TCD filed under *Goniolithon mamillare* (Harvey) Foslie has had the six collections pinned to it removed, with five pins and the outlines of the cards they were pinning remaining. The sheet bears Harvey's plate of the species and the annotation: 'unable to locate type H W Johansen Sept 1967'. Presumably, the specimens were lent to the Norwegian algologist M. H. Foslie (1855–1909) and were never returned (see discussion under *Darwin 3855* below). The currently accepted name for this species is *Neogoniolithon mamillaris* (Harvey) Setchell & Mason.

395. Halimeda. 20 fathoms off the Abrolhos islets, coast of Brazil

TCD: '395. C. Darwin. 20 fathoms, off Abrolhos Ids., Brazil' (two specimens). These are mounted on the same sheet as two other specimens and filed under *Halimeda opuntia* (L.) Lamour. They are not corallines, but are members of the Codiaceae (Chlorophyta). The *Beagle* was in the vicinity of the Arquipelago dos Abrolhos, 'employed in sounding & taking angles' (Barlow, 1933: 46) during 27–30 March 1832.

437. Near Cape Frio, Rio de Janeiro

This is the type collection of *Amphiroa variabilis* Harvey, *Nereis austral.* 98, 1849: 'Hab. Cape Frio, *Mr. Darwin*, No. 437. (v.s. in *Herb. T.C.D. comm. cl. Darwin*.)'

There are four mounted specimens and one packet at TCD: 'Cape Frio C. Darwin 437.'; 'Cape Frio C. Darwin 437. *Amph. variabilis*' (two specimens, one is annotated: 'It is *Arthrocardia* spp. probably *A. stephensoni* Mauza E. C. de Oliveira Filho 29. IV. 70'); 'Cape Frio C. Darwin 437. *Amph. variabilis* H' (annotated: 'Type *Amphiroa variabilis* Harv. Det. H. W. Johansen Sept 1967' and 'Resembles *Arthrocardia carinata* Kg HWJ.', the latter in pencil). The packet reads: '44. Cape Frio C. Darwin 437.'

BM: 'Cape Frio, Rio C. Darwin. 437. Amph. [the latter in pencil] Ex Herb. Trin. Coll. Dublin. Recd. 1900.' The sheet is annotated: 'V. Slide Mrs Weber = *Arthrocardia*', '*Amphiroa variabilis* Harv.', and 'Type'. It is filed with the undetermined *Arthrocardia* specimens. Under the name *Amphiroa variabilis*, De Toni (1905: 1817) cited: '*Hab.* ad 'Cape Frio' (Darwin.' According to Darwin's *Diary* (Barlow, 1933), the *Beagle* was in the vicinity of Cabo Frio, Rio de Janeiro province, Brazil on 3 April and 5 July 1832, but he does not indicate that specimens were collected on these dates. More likely they were collected during his overland trip to the Rio Macaé between 8 and 22 April, unless they were collected by someone else on the *Beagle* and given to Darwin. This happened with geological and zoological collections, but there is no firm evidence that he did not collect all the plants himself (Porter, 1985).

595. Rio de Janeiro ['(June)' and '(1525 in Spirits of wine)' added]

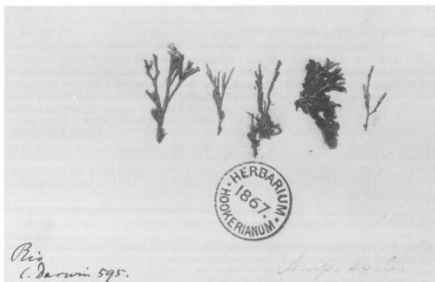


Fig. 1 Darwin 595, syntype specimens of *Amphiroa exilis* Harvey from the Enseada de Botofogo, Rio de Janeiro, Brazil, collected in June 1832.

629. do

These two collections were cited in the publication of *Amphiroa exilis* Harvey, *Nereis austral.* 95, 1849, and are syntypes of that name: '*Hab.* Rio, Mr. Darwin, 595, 629. Algoa Bay Herb. Bowerbank. ... (v.s. in *Herb. T.C.D. comm. cl. Darwin.*)'.

There are six mounted specimens and three packets on the sheet at TCD, two specimens and one packet being Darwin 3686, discussed below: 'Rio C. Darwin 629.' (two specimens); 'Rio de Janeiro 629. C. Darwin'; 'Rio C. Darwin 595.' [annotated: '*Amphiroa exilis* Harv. 1847: 95 Type Det. H. W. Johansen Sept. 1967']; '595 Darwin Rio Janeiro'; 'Rio Janeiro Darwin 595.' The packets read: 'Rio C. Darwin 595.' [annotated: 'A. exilis' in pencil]; '(43) 629. Rio Janeiro Near A. Ephedra' [annotated: 'A. exilis in pencil']; 'Rio C. Darwin 629' [annotated: 'Amp. exilis' in pencil].

The sheet at BM bears two specimens and a packet: 'Rio C. Darwin 629. Amp. exilis' (in pencil); 'Rio C. Darwin 595. Amp. exilis' (in pencil). (Figures 1 and 2.) The packet reads: 'ex Hb. Hooker 1867 C. Darwin Nos. 595 & 629.' The sheet is annotated: '*Amphiroa beauvoisii*'.

Darwin 595 was collected in the Enseada de Botofogo, Rio de Janeiro, Brazil in June 1832. Perhaps these specimens are those mentioned in his *Diary* entry for 8 June: 'Collected some Corallines on the rocks, which surround part of Botofogo Bay.'

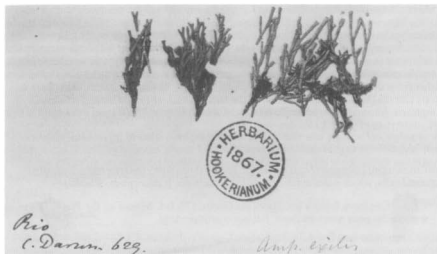


Fig. 2 Darwin 629, syntype specimens of *Amphiroa exilis* Harvey from Rio de Janeiro, collected in 1832.

There is a description of this *Amphiroa* on page 56 of the *Zoological Diary* (briefly paraphrased by Sloan, 1985: 99). It is indicated '*Amphiroa*', '282 Spirits', and '595', the latter added later in pencil, in the margin (i.e., number 282 preserved in spirits, number 595 dried). There is a drawing of a specimen at the beginning, and '(a)' and '(B)' in the text refer to this drawing. An '(a)' in the margin opposite the second line of text refers to footnote (a) on page 55, *verso*, which reads: '(a) 282 & (595 not spirits), the parentheses added later. The page has a vertical line pencilled through it.

1832 June Rio de Janeiro

Branches very much flattened; formed of arched layers (a)—these are very brittle & stony & form of parallel longitudinal fibres. ['2' in margin, referring to a footnote on page 56, *verso*. See number 3686 below.]—& appear in older branches solid.—Extreme larger, white semitransparent & so soft the least touch would injure it—no trace of terminal aperture.—Joints ['(B)' added] transparent horny & ['more' added] generally at the bifurcation of branches.—['they' marked out] it would appear that these are formed rather by an alteration than continuation of central substance.—Without these joints the coralline would be rigid.—Branches irregular, generally dichotomous.—['From' marked out] The joints are formed by a crack in outer Calcareous coat, & oral opening on each side: From the side: From the side & the terminal larger being soft, as they become, ['dry' added] they contact into hollows. V [i.e., vide] specimens (595).—I could by no means, (fresh Water, Alcohol &c), perceive any signs of irritability.—on one side of this coralline, these may be generally observed either irregularly or in in double regular rows,—rounded projecting paps.—these have a distinct minute orifice: I am at a loss what to consider, then, *by no means* could I make any animal protrude itself—These cells are not fixed deeply into the branch.—Is it impossible to be a minute Pygoma; the occurrence in double rows on one side was against this: yet it first struck me. ['to' marked out] being case.—The Coralline is in great quantity in Botofogo Bay.—

From 'Is it impossible' to 'Botofogo Bay,' has been crossed out in pencil, and two words written over this section that I cannot decipher. At this early stage in the voyage, Darwin obviously considered these algae to be animals.

Page 63 of the *Zoology Notes* has some general notes about the distribution of corallines and other organisms on the coast of Brazil:

1832 April: May: June: Rio de Janeiro

Proceeding to the Coast: the rocks, as at Bahia & other Tropical places are frequented by large bodies of *Ligia* [i.e., *Lygyda*, Isopoda, pillbugs]—Beneath the water are many species of *Pilumnus* [a genus of Brachyura, crabs].—on the Fuci [Phaeophyta, brown algae] are some Amphipoles [i.e., *Amphipholus*, Ophiuroidea, brittle stars] & many Lamodipodes.—Either from the exposed ['site' added] or [illegible word marked out] zone, there were no Stony Coralls [Madreporaria]: certainly the flexible, such as (a) *Cellaria*, *Tertularia*, *Amphiroa*. [then considered by Darwin to be corals, not coralline algae] were more abundant than in lower Latitudes.—

Note (a) is given on page 62, verso:

['(a)' in margin] I observed, cast up on the beach, those waxy looking balls. formed of flattened cells, which contain the eggs of the *Buccinum*. [Gastropoda, whelks]—

1392. 1393. *Conferva* from a smallpool on Guritti (??) Isd. Mouth of the Plata: I have some wretchedly poor notes on them, but not worth sending.

No such specimens were found. In the nineteenth century, the name '*Conferva*' was used to denote any minute freshwater filamentous alga. According to his *Zoological Diary*, Darwin collected these specimens on this island off Punta del Este, Uruguay on 23 July 1833. His 'wretchedly poor notes' cover about two pages of the *Zoological Diary* in total:

[page] 201

1833 July 23d Maldonado

['*Salmacis*' in margin] Growing in abundance in pools of water. Guritti Island. colour 'sap green'.—Diameter of filament .004 or rather more. ['1392 not spirits' in margin]—length of each ['from a little' added] greater than this. to double: Very transparent containing but little internal matter.—['(a)' in margin] The spires (with hyaline globules) close. each globule however not approximate to the others. the whole being net appearance.—There were 6 or 7 spiral lines: I could only count these by observing the apparent angle one made with a transverse line & thus guess its point of reappearance on upper surface. & then noting how many lines were included in this space. ['there were about 12 Hyaline dots in one complete spire.' in margin]—In each cell about 9 lines encircled it.—The gemmules were semi-opaque. dark green & slightly oval.—The tube. which connects the two ['the' marked out] filaments. was longer than that figured in Dic: class: [i.e., *Dictionnaire classique d'histoire naturelle*, Bory de Saint-Vincent, 1822–31] & not cylindrical. the central parts having a larger diameter; & evidently formed by two slightly ['funnel' added] ['cell' (?), marked out]—shaped tubes being joined.—The mark or lip. when these would arise. was visible in the cells with spiral lines of globules.—The necessity of the connection of two filaments. to produce gemmules was clearly proved by the occurrence of occasional cells with spires. surrounded by those with gemmules, & which had not, from the varying length, an opposite one to unite to.—The end of a filament would often contain gemmules whilst the other had not been joined & therefore remained in its original state.—

Note (a) is given on p. 201, verso:

['(a)' in margin] Having kept the plant for four days in a *dark* & warm place.—I noticed the following fact.—The gemmules are circular & much flattened. They lie on a plane in which the connecting tube is.—The stem or filament is cylindrical. In the interval of three days the gemmules had altered their position, They were now inclined in different planes, so that of course I immediately saw they were not spherical.—. I found filaments. (which appear young ones,) with the middle of each cell marked with cross lines. of a green colour & not extending whole length of cell. These cross lines were really each a part of a spire & from transparency

of stem & their shortness appear like cross lines.—They evidently [illegible word crossed out] extend till those of different cells nearly join. The number [of these lines or vessels' added] in each cell is 7 [':. Not 9 as before stated' in margin]; the hyaline points have not appeared, but even then the lip, of where junction would take place was evident.—The appearance is of a set of spiral lines, alternately erased [?] for an equal length. In some specimens these lines were quite rudimentary & short & others those of two adjoining cells were almost united. Then the filament or stem must exist previously to their perfect formation.—

Both of these pages are crossed by pencilled lines. Page 201 continues:

[*Arthrodiæ's* in margin] In same pool [as number 1392] there was a genus belonging to this family: joints or cells cylindrical, about 1/2 ['&' marked out] inch long & 1/18 in diameter [1393 not spirits' in margin]; extremities rounded: it forms a trellis work, either pentagons, hexagons or square; three limbs articulating together being most common.—

[page] 202

1833 July Maldonado

[*Arthrodiæ's* in margin] Limbs are ['transparent' added] turgid & elastic with water, appear to have no communication one with another: outer case colourless, no organization; is lined with ['thin' added] layer of soft tender gelatino-granular matter, which is grouped into small numerous irregular dots.—Colour pale yellowish green.—Floats on surface with the above *Salmacis*, in large net or trellis work pieces, several inches square.—I know not to what family this belongs

From Darwin's description this alga appears to be a species of *Halodictyon* (Chlorophyta).

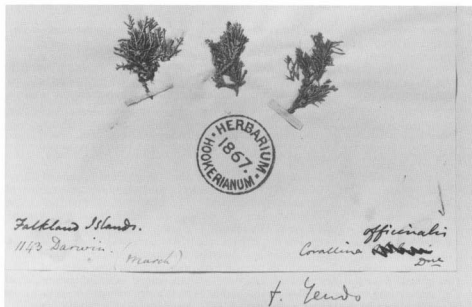


Fig. 3 Darwin 1143, specimens of *Corallina officinalis* L. from East Falkland Island, collected 25 March 1833.

1143 Falkland Islands [(March) added]

Cited by Harvey (1847: 104): '*Corallina officinalis*, *Linn.* . . . *β. caloclada* (*Amphiroa caloclada*, *Dne.*) . . . Hab. Falklands Islands (No. 1143) and Chonos, Chiloe (No. 2423) [the latter discussed below], *Mr. Darwin* (both debilitated varieties.) Cape of Good Hope. (*v.s. in Herb. T.C.D.*)'.

The sheet at TCD bears four mounted specimens and a packet: The four specimens are labelled: 'Falkland Islands. 1143. Darwin. *Corallina* ['chilensis' marked out] *Dne*'. The packet reads: 'Cor. ['chilensis' marked out and 'officinalis' pencilled above it] Falklands C.D.' The latter bears a small red tag bearing the printed number '143'. According to Darwin's numbering system, red indicated 1000.

There also is a collection at BM: 'Falkland Islands. 1143 Darwin. (March) *Corallina officinalis* ['chilensis' marked out] *Dne*', annotated: 'T. Yendo' in pencil (Figure 3). It is filed under *C. officinalis* L.

Darwin 1143 was collected on East Falkland Island on 25 March 1833. It is described, and contrasted with number 1153, in the *Zoological Diary* as follows (page 164):

1833

E. Falkland Island

['*Corallina* (inarticulata)' in margin] This species somewhat resembles in appearance that of P (161) [i.e., page 161 of the *Zoological Diary*. The collection discussed there is number 1153; see below.]. Corall exceedingly hard stony compact; a section shows no horizontal layers & ['1153 (not spirits)' in margin] no great difference of hardness in different parts: is coated by *thin* ['coat' marked out] layer of the soft cellular tissue, of which the cells are very minute.—The covering is so thin that it requires a microscope & lancet to procure any.—Superior surface. coloured. blackish 'crimson red': smooth very regular:—expansions. thick (about 1/10th or more) strong:—grows in large circular patches, when two interfere the junction rises in a crest; these were nearly the only ones which I could procure as specimens. Is not very common, chiefly distinguished from that of P 161. by the much greater thickness of expansions.—Amongst organized beings; few could be found, which. would show fewer of the signs of structure & life.—

['*Corallina* (inarticulata)' in margin] This. as that of P 161, ['most' added] abundantly coats the rocks or growing on itself forms bosses: in its structure it is likewise closely related, although different ['1153 (not spirits)' in margin] in external form.—Corall mamillary, composed of numerous small oblong pieces, with globular heads; these often grow into each other & are always close together. so that the surface is very irregular:—the summit of ['each' marked out and 'nearly all the' added] rounded head is marked by an irregular line or suture, as if originally formed by the

Page 165:

1833 March 27th. E. Falkland Islands

['*Corallina* (inarticulate)' in margin] junction of two pieces; colour pale with faint tint of purple.—Structure same as others, central parts of nearly uniform hardness; external coat of cellular tissue (or granules for I am not yet sure whether each ['grew' marked out] hexagon in a cell or grain) is thin, (but thicker at summits), but composed of rather larger cells, than the other species: If that of P 161 from its figure called to mind the Lichen, which grows on rotten wood; this is equally like to a dry. crumbling sort. which grows on stone.—

['*Corallina* (true)' in margin] Trichotomous, joints nearly cylindrical; those which give off branches triangular. others round; articulations semi-pellucid; colour same as usual; ['1143 (not spirits)' in margin] grows in small, low, tufts:—A longitudinal section of extreme part of ['by' marked out] limb, gives following appearance: beneath a thin transparent coat is a mass of. cellular tissue (such as so often described) & within this parallel longitudinal. darker coloured fibres surrounded on all sides by the cellular tissue: the extremities of these follow the same arched line as the external ['surface.' added] & it is probably by the successive

hardenings of these. that on occasional appearance of concentric lines is seen in a section of older ['joint' marked out] limb.—At base of ultimate limb. the outside part first becomes stony:—A Section of old limb, gives first a ['very' added] thin coat of cellular tissue. & I think an external transparent membrane.—then ['then' marked out] a semi-pellucid. hard stony case, which by the appearance in microscope appears to be part of cellular tissue of young extremity filled

Page 166:

1833 March 27th E. Falkland Island

['*Corallina* (true)' in margin] up with stony matter; the lines are rather transverse in it.—the central part. is white, softer, yet calcareous & with longitudinal lines; this is clearly the heavy fibres of extremities also hardened.—

The distinction between the central & external stony parts is best seen in the penultimate limb.—as the external case becomes perfect before the former.—The connection between the whole *Coralline*. must chiefly be carried on by the external soft cellular tissue: ['(Vide infra)' in margin. This section, between 'The articulations' and 'not lapidified:' is marked by a vertical pencil line in the margin.] The articulations have not much motion, & that must only be from increased elasticity: within these is a largish cavity, with arched roof & filled with a soft substance, which I imagine to be the central mass, not lapidified:—I am convinced, that it is out of the question to suppose these beings have any connection with Polypi.—What claims have they to be considered as animals?—

At the articulations the stem is contracted. & the external stony case bends in & is not continuous with that of the adjoining limb.—A Section gives the appearance of a cavity; but

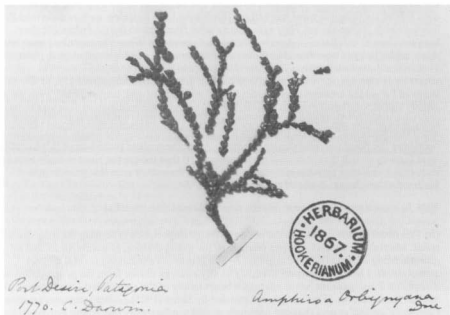


Fig. 4 Darwin 1770, syntype specimen of *Amphiroa orbigniana* Harvey ex Decaisne from Puerto Deseado, Santa Cruz province, Argentina, collected in January 1834.

is really formed of a globular mass of tough sem-pellucid inelastic matter. This at its base unites with the central softer stony part, & above articulates into an arched cavity in the next limb:—hence motion is tolerably free.—

Pages 164 through 166 are marked through with pencilled horizontal and/or vertical lines.

1770. Port. Desire, Patagonia/[*(January)—specimen 1529 in spirits' added]

Cited in the publication of *Amphiroa orbigniana*, Decaisne ex Harvey, *Nereis austral.* 100, 1847, and a syntype of that name: 'Hab. Shores of Patagonia and Chiloe, D'Orbigny: *Mr. Darwin* (1770, and part of 2423 [discussed below] (*v.s. in Herb. T.C.D. comm. cl. Darwin.*)).

The sheet at TCD bears three specimens, two packets, and a plate, one specimen and both packets (presumably) being *Darwin 2423* (which see): 'Port Desire; Patagonia 1770. C. Darwin Amphiroa orbignyana Dne'; '1770. Darwin. Port Desire, Patagonia Amphiroa orbignyana Dne.' The sheet is annotated: 'Bossiella orbigniana (Dne) Silva (= *Bossea Manza*) MAP. 28 VII 57'. However, it is filled under '*Cheilosporum orbignianum* (Decne.)'. De Toni (1905: 1829) cites under this name: 'Hab. ad oras Patagoniae et insulae Chiloes (Decaisne, D'Orbigny, Darwin).' According to Smith (1969), the correct name for this taxon is *Bossea orbigniana* (Decaisne ex Harvey) Manza.

BM: 'Port Desire, Patagonia 1770. C. Darwin Amphiroa orbignyana Dne.' Filed under '*Bossiella orbigniana* (Decne.) Silva' (Figure 4.)

Darwin 1770 was collected on the beach at Puerto Deseado, Santa Cruz province, Argentina in January 1834. See Darwin's notes to Harvey below, pp. 1–2, 6.]

Page 211 of the *Zoological Diary* reads:

1834 Jan: Port Desire

['*Halimeda* 1770 (797 Spirits)' in margin; the latter is discussed in the section on plants in spirits of wine.] Considerable quantities of this Corallina was thrown up on the beach: on each side of the [illegible word marked out] limb were little pustules; such as described P 161 [see below] & 56 [see above] They varied in number from one to four.—[when old they became white & exfoliated.—Aperture beautifully round.—When the pustules [were broken open' added] ovules were found in three states; spherical & opaque; lengthened & pointed oval. when the internal matter was clearly seen separate from the transparent case.—& 3d where this pulpy matter. was divided into distinct articulations sometimes 2, 3, or 4.—the shape of ['z' added between lines] ['articulation' marked out and 'limbs' added] even were clearly visible, one basal one was largest. ['(b)' in margin] the transparent case was in this case very delicate, the slightest touch rupturing it.—color dark 'crimson red.'—in short a small *Halimeda* ready to float forth. was indisputably evident.—the longer limb probably becoming the point [of added] attachment.—As all the pieces I picked up of this *Corallina* were furnished with these ovules it may be suspected that the parent plant is easily torn from its root & like *Fungi* perishes after reproduction.—I have now seen this process in a *Halimeda*. *Amphiroa*. & one of the inarticulates.—

Note (b) is given on page 211, *verso* [Most is given by Sloan (1985: 99–100).]:

(b) This observation appears to me of considerable importance in settling the long disputed point. whether the genus *Corallina* belongs to the grand division of plants, or to that of animals being included in the Zoophites.—The gemmules containing several distinct articulations. I believe is entirely contrary to any analogy drawn from the propagation of Zoophites: I am ignorant. what relation it bears to any of the articulated Cryptogamic plants such as the oscillaria. [This last phrase omitted by Sloan (1985).]—But, anyhow, we should ['certainly' added] expect that one gemmule would produce only one young Polypus [i.e., polyp], ['in all Zoophites' in margin] & we might as certainly expect that each ['articulation' added] one (or pair or some definite number) would contain & be formed by a Polypus

neither of these expectations are realized in the manner of propagation of the *Corallina*. Therefore I do not believe *Corallina* to have any connection with the family of Zoophytes—.

Descriptions on both page 211 and 211, *verso* are marked with a vertical pencil line. Darwin was correct in describing this as a plant, but it is not a coralline, but *Halimeda*, a green alga (Chlorophyta).

He wrote to Henslow on 24 July 1834 (not mailed until 7 November) from Valparaiso that (Burkhardt & Smith, 1985b: 399–400):

I forget, whether I mentioned, having seen something of the manner of propagation, in that most ambiguous family, the *Corallinas*: I feel pretty well convinced if they are not Plants, they are not Zoophytes: the 'gemmule' of a *Halimeda* contained several articulations united, & ready to burst their envelope & become attached to some basis. [i.e., base] —I believe in Zoophytes, universally the gemmule produces a single Polypus, which afterwards or at the same time grows with its cell or single articulation. —

This typical venture into comparative anatomy helped convince Darwin that corallines were not corals, but this evidence came from a green alga (Chlorophyta) not a true coralline alga (Rhodophyta).

[page] 2)

1840 Port. Famine. T. del Fuego

2151. Valparaiso ['August & September' added] (abundant) [parentheses added]

Both collections were cited in the publication of *Corallina chilensis* Decaisne ex Harvey, *Nereis austral.* 103, 1849: 'Hab. Chili, *Herb. Paris.* Valparaiso (No. 2151) and Port Famine (No. 1840), *Mr. Darwin.* Norfolk Island, *Herb. Hooker.* (v.s. in *Herb. T.C.D. comm. cl. Darwin.*). In his discussion, Harvey (p. 104) states: 'The Port Famine specimens have a starved look, and probably grew near high-water mark. Those from Valparaiso are more developed, and serve for the type of the species. The plant also occurs in a mixed bundle received from Mr. Darwin and marked 'S. America.' [See Darwin's notes to Harvey below, pp. 2–3.] The Norfolk Island specimens in Herb. Hooker are slightly different.' Thus, the Valparaiso specimens (*Darwin 2151*) are syntypes, from which a lectotype should be chosen, while those from Port Famine (Puerto Sacrificios, Magallanes province, Chile) are paratypes.

De Toni (1905, p. 1842) cites 'Hab. . . . 'Port Famine (Darwin)' under the name '*Corallina chilensis* Decne in Harv.', while Smith (1969) recognizes *Corallina chilensis* Decaisne ex Harvey.

TCD has two mounted collections and four packets on one sheet of *Darwin 1840* and what are probably unnumbered South American specimens from the bundle mentioned by Harvey in his discussion quoted above: 'S. America *Corallina chilensis Darwin Dne*' (two collections). The packets read: 'Cor. chilensis *Dne* Port Famine Darwin'; 'Corallina chilensis *Dne* [in pencil] 40 S. America C Darwin'; 'Cor. chilensis *Dne* S. America H (label lost) (40) C. Darwin'; 'Cor. chilensis [in pencil] 44 Port Famine CD (1840)'. The numbers '40' and '44', as well as '39' below, appear to be numbers assigned to the collections by Harvey.

A second sheet at TCD bears three mounted collections and a packet of *Darwin 2151*. These are filed in the type folder for *Corallina chilensis*: 'Valparaiso 2151. C. Darwin'; '39. Valparaiso. C. Darwin 2151.' (two sheets, one annotated: '*Corallina chilensis* Decaisne in Harvey Type or Isotype Det. H. W. Johansen Sept 1967'). The packet reads: '39 Valparaiso 2151. CD'.

In his *Diary* Darwin records being at Port Famine 1–8 June 1834, and at Valparaiso in August and September of the same year. The *Zoological Diary* (p. 279) adds:

1834 Aug. Sept Valparaiso

['*Corallina 2151*' in margin] Examined carefully extremities of branches, they were covered by delicate membrane, beneath which ['(a)' in margin] is a cellular substance, irregularly

hexagonal. each cell had a diameter from 1/3000 to 1/4000 of an inch. These cells appear gradually to become inspissated [?] with Calcareous matter till the above structure is no longer visible In plentiful on the tidal rocks.

Note (a) is given on p. 279, verso:

(a) Encrusting Corallinas are present here.

A discussion of '*Corallina* 3503' from Hobart, Tasmania follows, see below.

2365. Arch. of Chiloe.

No specimens bearing this number were found. Darwin was on the Isla de Chiloe in southern Chile from 28 June to 13 July and, 21 November to 11 December 1834 and 22 January to 5 February 1835.

2423 ——— [i.e., 'Arch. of'] Chonos (S. of Chiloe)

This was a mixed collection, as recognized by Harvey, who parcelled out the specimens into three different species. One was cited by Harvey (1847: 104) as '*Corallina officinalis*, Linn. . . β . *caloclada*' with *Darwin* 1143 (see above under this number). At TCD there is a sheet bearing six mounted specimens and a packet: '*Chonos* C. Darwin 2423.' (two specimens); '2423. *Chonos* C. Darwin'; '*Chonos* C. Darwin 2423.' (two specimens); '*Chonos*, Chiloe C. Darwin 2423.' The packet reads: '*Cor.* [in pencil] 38 *Chonos* 2423. CD.' The sheet also has a collection mounted in the upper right-hand corner labelled: 'N. Zel. 3260'. It is not a Darwin collection. '38' presumably is the number assigned to the collection by Harvey. There is a collection at BM as well: '*Chonos*. C. Darwin 2423. *Cor. officinalis*'. It is filed under *Corallina officinalis* L. (Figure 5.)

The second is a syntype of *Amphiroa orbigniana* Decaisne ex Harvey, with *Darwin* 1770 as another



Fig. 5 *Darwin* 2423, specimens of *Corallina officinalis* L. from the Archipiélago de los Chonos, Chile, collected either in December 1834 or January 1835.

(see above under this number). At TCD there are a specimen and two packets mounted on the same sheet as the latter: '2423. Chonos, Chiloe, C. Darwin Amphiroa orbignyana Dne'. The first packet reads: 'Amp. orbignyana Dne 37. Chonos 2423. CD.' The second bears no label. The sheet is filed under '*Cheilosporium orbignianum* (Decne.)'. According to Smith (1969), however, the correct name for this taxon is *Bossea orbigniana* (Decaisne ex Harvey) Manza.

The third is the type collection of *Amphiroa darwinii* Harvey, *Nereis austral.* 100, 1849: 'Hab. Chonos, Chile, Mr. Darwin, No. 2423 in part. (v.s. in Herb. T.C.D. comm. cl. Darwin.)'. There are two collections on the sheet at TCD: '2423 Chonos, C. Darwin' and '2423. Chonos C. Darwin'. The latter consists of eight specimens; the seven on the left are labelled 'A. darwinii' in pencil, that on the right 'A. orbigniana' in pencil. (This lower collection is annotated 'Bossiella Det. H. W. Johansen 21 Sept 1967'.) The upper collection is annotated 'Type *Amphiroa darwinii* Harv. Det. H. W. Johansen Sept 1967'. Filed under *Cheilosporium darwinii* (Harvey) De Toni. De Toni (1905: 1829) cited: 'Hab. ad 'Chonos' Chiloes (Darwin).'

There are two sheets at BM, both filed under *Bosiella choloensis* (Decaisne) Johansen: 'Chonos 2423. C. Darwin Amphiroa darwinii H.' (annotated: '*Cheilosporium darwinii* (Harv.) De Toni' in pencil); 'Chonos, Chiloe 2423. C. Darwin Ex Herb. Trin. Coll. Dublin. Recd. 1900.' The latter is annotated: 'see slide' and 'V. slide by Mrs. Weber' by Antony Gepp (1862–1955, handwriting kindly identified by James Price) and 'It seems impossible that the slide was prepared from this specimen. G. T. [Geoffrey Tandy 1900—] 1935', '*Amphiroa darwinii* (Ag. 16a)', '*Lithothrix aspergillis*', '*Cheilosporium* (*Amphiroa*) *darwinii* (Harv.) De Toni', and 'Isotype—type in TCD H W Johansen Sept 29, 1967'. Gepp and Tandy were cryptogamic assistants in the British Museum (Natural History) herbarium (Stearn, 1983).

The *Beagle* was sailing through the Archipiélago de los Chonos, in southern Chile, in December 1834 and January 1835.

2478. ——— [i.e., 'Arch. of'] do [i.e., 'Chonos'] do [i.e., 'S. of Chiloe']

Cited by Harvey (1847: 110) as '*Melobesia polymorpha*, Linn. . . . Hab. . . . Chonos, Mr. Darwin, No. 2478? (v.s. in Herb. T.C.D.)'. I found no such specimen.

3503. Hobart. Town. ['February' added] V. Diemen's Land.

I did not find any specimens bearing this number. Darwin was in Tasmania 5 to 16 February 1836. The collection is discussed by Darwin on pp. 3–4 of his notes to Harvey below.

3557. 3558. ['(March)' added] 4 or 5 species King George's sound; Australia

As indicated by Darwin, several species are included under this heading. No specimens could be positively identified as *Darwin 3557*, although one cited below may be this. Those listed as *Darwin 3558* are cited alphabetically following the name applied to them by Harvey (1847).

The first (Harvey, 1847: 96) was '*Amphiroa stelligera*, Lamour. . . . Hab. Australia and Tasmania. Common. King George's Sound, Darwin, No. 3558. (v.s. in Herb. T.C.D.)'. Mounted on the same sheet as four other collections and a plate at TCD is 'King George Sound 3558. C. Darwin'. The sheet annotated: 'All specimens on this sheet are *Metagoniolithon stellerum* (Lamarck) Weber-van Busse This includes the specimens C. Darwin 3558 Mrs. Mallard Port Phillip and ex Herb Areschoug, Port Phillip. S. Ducker 1/5/1979'. According to Ducker (1979), the correct name for the taxon is *Metagoniolithon stellerum* (Lamarck) Weber-van Busse.

The second (Harvey, 1847: 105) was '*Jania rosea*, Dne. . . . Hab. Coast of Australia. King George's Sound, Mr. Darwin, 3558 &c. (v.s. in Herb. T.C.D.)'. Filed under *Corallina chilensis* Decaisne ex Harvey and *C. cuvieri* Lamour at TCD is 'King George's Sound. 3558. C. Darwin.' A non-Darwin sheet at BM is annotated: 'I consider *J. cuvieri* & *J. rosea* to be the same. WHH [i.e., William Henry Harvey] 1857.' Underneath this in pencil is written: 'No. T. Yendo'.

The third (Harvey, 1847: 106) was '*Jania tenuissima*, Sond. . . . Hab. . . . King George's Sound, Darwin, No. 3558 (v.s. in Herb. T.C.D. comm. cl. Darwin.)' TCD: 'King George's Sound. 3558. Darwin. *Jania tenuissima* Sond' (the latter in pencil), on a sheet with four other collections; 'Near *J. micrarthrodia* [in pencil] 42. K G Sound C. Darwin', in a packet on a sheet with nine other collections, including *Darwin 199*, discussed above. Both sheets are filed under *Jania micrarthrodia* Lamour. '42.' presumably is the number assigned to this collection by Harvey.

A collection that may prove to be *Darwin 3557* was cited by Harvey as a new species: *Melobesia darwinii* Harvey, *Nereis austral.* 109, 1849, 'Hab. King George's Sound, Mr. Darwin. (v.s. in Herb. T.C.D. comm. cl. Darwin.)'. I found no such specimen, which would be the type of this name. Cited as '*Lithothamnion darwinii* (Harvey?) Aresch.' by Harvey (1863: xxx: 'Hab. King George's Sound, C. Darwin.') and as '*Lithophyllum darwinii* (Harv.) Fosl.' by De Toni (1905: 1781: 'Hab. in "King George's Sound" Novae Hollandiae (Darwin).'). Perhaps like number 3856 (see below), it was sent to Foslé and never returned to Trinity College, Dublin.

The *Beagle* was at King George's Sound, Western Australia, 6 to 14 March 1836. Darwin wrote of this place in his *Diary* (Barlow, 1933: 391): 'We staid there eight days & I do not remember since leaving England, having passed a more dull, uninteresting time.' Collection 3557 is described on p. 161, verso of the *Zoological Diary*:

(z) On tidal rocks at King, George's Sound, found a *Corallina* ['3557' in margin] growing in nodules to a Granite rock: color such as is universal to the family in the Atlantic & Pacific oceans, in T. del Fuego & Australia: consists of numerous, stony, cylindrical, inarticulate parallel small columns, partly adhering one to the other. Many of them show an obscure globular, necklace like structure, centre of each column, white,—some of the smaller & irregular arms, were covered on all sides by the generative bladders. These in every respect resembled, those already described: the older ones scale of [i.e., off], ['with' marked out] in form of an irregular particles of white crust.—Size of each pap or bladder rather more than the span of 1/100th of inch & the circular aperture has a diameter a shade larger than 1/1000. of inch.—I was not fortunate enough to extract an ovule: This ['sp' marked out] *Corallina* is evidently a connecting species, most closely allied to the division of Inarticulata.— [presumably a group of Cnidaria, coelenterates]

['NB.' in margin] I saw in a delicate transparent, articulate *Corallina*, than [i.e., that] the branch appeared to be composed of several, ['3557.' in margin] hollow, transparent ligamentous vessels, which in the solid parts between the articulations were filled up with Calcareous, granular matter.—Species with flattened joints. & symmetrical lateral branches

I am unable to determine which species is being described by Darwin. There is a vertical and a horizontal line drawn through this page.

3251. Galapagos Arch. 12 fathoms

Cited by Harvey (1847: 110) as '*Melobesia clacarea*, Ell. & Sol. ... Hab. ... Galapagos, in 12 fathoms, Mr. Darwin, No. 3251. (v.s. in Herb. T.C.D.)'.

I did not find any specimens bearing this name or locality. It was cited by Harvey in his *Phycologia britannica* (1846–51, pl. CCXCI: 'Probably widely dispersed; I have specimens from New Zealand (Dr. J. D. Hooker), and the Galapagos Group (Mr. Darwin).') and by De Toni (1905: 1745) as '*Lithothamnion calcareum* (Ell. et Sol.) Aresch.' ('Hab. ... insulacae Gallapagenses (sec. Harvey).'). This taxon is not reported from the Galápagos Islands by Silva (1966), who states (p. 149): 'The earliest recorded seaweed from the Galápagos Islands is an encrusting coralline alga dredged from a depth of 12 fathoms by the 'Beagle' and sent by Darwin to Harvey, who identified it (almost certainly in error) with a European species.' Darwin was in the Galápagos Islands from 15 September through 19 October 1835.

On page 335 of the *Zoological Diary*, Darwin added some information on the algae in a discussion of the endemic marine iguana (*Amblyrhynchus cristatus*):

['Ambly Rhyncus' in margin] ... I opened the stomach (or rather duodenum) of several, it was largely distended by quantities of minced pieces of sea-weed, of that kind, which grows in this foliaceous expansions of a light green & dull red color.—. I conceive the largeness of the intestine is in perfect agreement with its herbivorous appetite.—Capt Colnett states [Colnett, 1798] they go out to sea in shoals to fish: I cannot believe this is the object. Nor is it very clear what their object can be.—Does such sea-weed grow ['(B)' in margin in pencil] more abundantly a little way from the coast? ['B' added in pencil]

Note (B) is on p. 335, verso:

(B) Does not the Manatee ['of the West Indian ocean' added] feed on such seaweed? [note added later in pencil]

3638. [underlined in pencil] *Halimeda* & *Nullipora*, tidal coral reefs, Keeling Atoll, Indian Ocean

TCD: 'Tidal Coral Reef, Keeling 3638. C. Darwin.', three specimens. These are mounted on the same sheet with three other specimens, which is filed under *Halimeda macroloba* Decaisne. They are not corallines, but members of the Codiaceae (Chlorophyta). No corallines were found bearing this number. The *Beagle* was at the Cocos-Keeling Islands from 1 to 12 April 1836.

3686. Cape of Good Hope

Cited in the publication of *Amphiroa exilis* var. *crassiuscula* Harvey, *Nereis austral.* 95, 1849, and the type of that name: 'Var. β . *crassiuscula* ... Hab. ... β , Cape of Good Hope, Mr. Darwin, No. 3686. (v.s. in Herb. T.C.D. comm. cl. Darwin.)'

There are two mounted collections and one packet on the sheet at TCD: '3686. Cape. C. Darwin' (two specimens, one annotated: '*Amphiroa exilis* var β *crassiuscula* Harvey 1847:95 Det. H. W. Johansen Sept 1967'). The packet reads: '3686. C. Darwin Cape of Good Hope'. The sheet is annotated in pencil: '3686. Fragments of a specimen (remainder lost) growing abundantly on an Ascidian cast up on the beach at the C. of Good Hope June. MS. in Darwins autograph in Herb. TCD.' This is a quote from page one of Darwin's notes to Harvey, discussed below.

There is one specimen at BM: '3686. Darwin Cape of Good Hope Presd. by Trinity College Dublin per. Prof. Perceval Wright 9.1.95.' (Figure 6.) Annotated in pencil: '*Amphiroa* (*exilis* var. *crassiuscula* Harv.) *beauvisosii* Lam.'

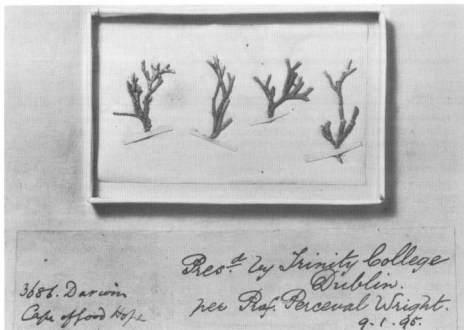


Fig. 6 Darwin 3686, isotype specimen of *Amphiroa exilis* var. *crassiuscula* Harvey, collected at the Cape of Good Hope, probably at Simon's Bay, Republic of South Africa, in June 1836.

Darwin 3686 was collected at the Cape of Good Hope, Republic of South Africa in June 1836. The *Beagle* was at anchor in Simon's Bay from 31 May through 18 June, and the specimens probably were collected there. A note on p. 56, *verso*, of the *Zoological Diary* describes this collection:

['(z)' in margin] *Corallina* growing abundantly on an mass of *Ascidia* [Urochordata, a tunicate] thrown up on a beach. June 1836. C. of Good Hope.—By accident ['3686' in margin] nearly all the specimens were lost, the fragments preserved showed on many of the cylindrical joints, the small pap, formed bladders, with little circular orifices. Being broken open. beneath the microscope, there were seen 8–12 (about) small rather light pink bodies, arrayed in a ['sort of' added] ring in a little flocculent matter; by a slight motion were easily detached & floated separately,—in form pear shaped [pencilled drawing in margin], one side rather protuberant, ['apex' marked out] one extremely pointed, the other rounded; the envelope was distinct, the central matter appeared granular & pink coloured. In size they could easily pass through the orifice of cell.—With 1/20" focal lens. could perceive no particular organization in these ova.—I examined & opened several of the paps.

3854. 3855. [numbers underlined in pencil] Bahia Brazil in tidal pools ['(August)' added]

[page] (3)

3856. I believe same species. Bahia

Cited by Harvey in his publication of *Melobesia mamillaris*, these collections are syntypes of that name (see discussion under numbers 197 and 99 above). I did not find any of the syntypes cited by Harvey. However, they may be in the herbarium of Michael Heggelund Foslie (1855–1909), Museum of the Royal Norwegian Society for Science and Letters, Trondheim. A catalog of his herbarium (Adey & Lebednik, 1967: 26) lists: 'Darwin, Brasil, Bahia, no. 3855 (marked *Melobesia mamillaris* Harv.)'. It may be that this and the other Darwin coralline specimens cited by Harvey that I did not find at TCD were lent to Foslie and were not returned following the latter's death in 1909. Numbers 3854–3856 are described below on pp. 4–5 of the notes to Harvey. The *Beagle* returned to Bahia in August 1836, and Darwin records being there from the first through the sixth. These specimens are described in the *Zoological Diary* (p. 367):

1836 August Bahia Brazil

(367)

['*Corallina* 1463 *spirits* 3854: 55 56' in margin] This species is very common encrusting the smooth surfaces of the ['granitic' added] rocks in the tidal pools.—Its colour on [changed from 'in'] the under surfaces is rather paler than that of *Corallina officinalis*, but generally it is cream-coloured, with a tinge of flesh-red.—The extremities of the short rigid branches (in 463). [The latter is discussed in the plants in spirits of wine section of this paper.] are either rounded & white or acuminate into a cone. In this latter case the summit is surmounted by a perfectly circular minute orifice, which leads by a short cylindrical ['tube' added] into a circular cavity, occupying the base of the cone. [Drawings in margin.]—['The structure of the branch shows ('by?' marked out) rectangular intersections of concentric with vertical plates, & the cavity does not appear to lie conformably with these plates.—'marked out in pencil] On breaking off the terminal cone, the cavity is seen to be occupied by a white mass, which from the disturbance ['has' marked out] appears like an intestinal mass. [It [bracket in original] is found to consist of from 20–40 separate cylindrical bodies attached by the lower extremities & embedded in a pulpy matter; ['which' marked out and 'they' added] are placed in a vertical & nearly parallel position.—These occur ['+' added] in the same cavity, *in several* [underlining in pencil] *states*; some consist of a simple elongated sack with ['a little' added] granular matter, which presently assumes ['two' marked out] one or two obscure [illegible word marked out and 'circular' added] contractions.—But the greater number & most perfect ones, are in dimensions 3/500th long & 1/500 broad [changed from 'broad']; under the

[*Corallina* in margin] microscope. they are seen to consist of an envelope ['containing' marked out and 'full of' added] a pale brown granular matter. The envelope has a necklike form. owing to three ring-like contractions. ['partially' added] dividing the little cylinder into four beads. [Drawing in margin.]—These contractions, do not appear to form true articulations, for they are far. from separating the internal granular matter:—At the lower end. the terminal [illegible word marked out] lobe has a point or navel of attached flocculent granular matter: the superior lobe is generally rather larger & more elongated than the others.—These articulate-like contractions. in the most perfect ['bodies' added] amounted to three, but in the less developed were two & even one; & lastly as I have said. an obscure sack can alone be distinguished in the enveloping matter.—I conceive these are the gemmules or seeds.—In one case. I saw one of these cones ['placed' added] on the side. but near the summit of a branch.—['Many of' marked out] The greater number of the [changed from 'these'] ['terminal points' marked out and 'extremities of the branches' added] are white & rounded. ['Are these' marked out] Have the cones been removed from these? I am inclined in some cases to think so. from marks of a slight depression & a scaling ['appea' marked out] structure. which appears general manner of healing.—I saw in section of some branches. the trace of an obliterated cavity.—

Both of these pages have a vertical pencilled line through them.

3857. Bahia: ['B' is written over 'A'] a distinct & very common species, coating smooth surfaces in tidal pools: colour much darker

Cited in the publication of *Melobesia scabiosa* Harvey, *Nereis austral.* 110, 1849, and the type of that name: 'Hab. On stones, at Bahia, Mr. Darwin. No. 3857 (v.s. in *Herb. T.C.D.*) 'A distinct and very common species, coating smooth surfaces in tidal pools: colour darkish. 'Darw.' Cited by De Toni (1905: 1748) as '*Lithothamnion* ? *scabiosum* (Harv.) Fosl. . . . Hab. in lapidibus probe Bahiam (Darwin).' I did not find any such specimens.

 The bundle marked S. America, has been injured & labels washed off; but they all come from S. America.

This must be the source of the specimens of *Corallina chilensis* labelled only 'S. America' mounted with Darwin 1840 from Puerto Sacrificios, Chile. They perhaps were wetted in the storm that almost swamped the *Beagle* off Cape Horn early in 1833, described by Darwin in a letter of 11 April to his mentor Prof. Henslow (Burkhardt & Smith, 1985b: 306):

It is now some months since we have been at a civilized port, nearly all this time has been spent in the most Southern part of Tierra del Fuego.—It is a detestable place, gales succeed gales with such short intervals, that it is difficult to do anything.—We were 23 days off Cape Horn, & could by no means get to the Westward.—The last & finale gale, before we gave up the attempt was unusually severe. A sea stove one of the boats & there was so much water on the decks, that every place was afloat; nearly all the paper for drying plants is spoiled & half of this cruizes collection.

Specimens in Spirits

No specimens preserved in spirits were found. Either those at TCD were destroyed (there is now no spirit collection of algae there), or they were sent elsewhere. If at BM, they are not listed in the catalogue to the preserved algae collections.

Nor. 1525 ['282' marked out]—Rio de Janeiro

Cited above under number 595; presumably also *Amphiroa beauvoisii*.

.. 77. St. Jago. C. de Verdes

.. 585. Falkland Islands

Page 4, although not so numbered:

1529—Nullipora. dark crimson-red. Port Desire Patagonia

Cited above under number 595; presumably also *Bossea oribigniana*.

1463. ['August' added] Bahia Brazil (2 species)

Cited below with numbers 3854, 3855, and 3856; presumably also *Melobesia mamillaris*.

1464. do Halimeda (tidal pools)

C. Darwin [signed]

N.B. Should you wish to know in what month any of these specimens were collected I can tell you.—

The next six pages of the manuscript consist of notes on some of the collections enumerated in the foregoing list. By and large, these notes are derived from the *Zoological Diary*. However, a comparison of these notes with those of the *Zoological Diary*, which are printed above, will show that they have been edited, sometimes severely.

[page] (1

3686X [Marked out by pencil, and '*Amphiroa (pustulata) exilis*' added above by Harvey.] Fragments of a specimen, (remainder lost) growing abundantly on an *Ascidia* cast up on the beach at the C. of Good Hope. *June*. [1836] The small pap-like bladders contain from about 8 to 12 small, rather-light-pink, ['ovules' marked out and 'spores' added], arranged irregularly in a ring in flocculent matter : by a slight motion were easily detached & floated away : in shape like a pointed pear, with one side a little protuberant, one end pointed, one rounded. They were small enough to pass through the circular orifice of the little bladders.—

The type of *Amphiroa exilis* var. *crassiuscula* Harvey.

1770 & (1529 spirits) Considerable quantity found cast up on beach of P. Desire [Puerto Descado, Argentina] in January. [1834]—Apertures of bladders beautifully round : when broken open, the spores were found in three states. 1st spherical & opaque, 2d lengthened, pointed oval & with the external tunic very distinct, 3d divided into, two, three or four ['articulations' marked out and 'segments' added] which in some degree seemed like the ['articulations' marked out and 'segments' added] of the parent-plant; the ['arti' marked out] segment at one end was longer than the others [& I supposed became the point of attachment, but Hooker tells me that this is all mistake.] : [Brackets in original; 'Hooker' was J. D. Hooker, now Assistant Director of the Royal Botanic Gardens, Kew.] the spores in this third state were dark crimson-red, & the case enclosing them was very delicate being ruptured on slightest touch. It struck

me with much surprise, that every specimen I picked up was well furnished with the spores, & as these had all been washed on shore & torn from their points of attachment, I suspect that there is some connection, between spore-bearing & easy detachment.] [Bracket in original.]

These are specimens of *Bossea orbigniana* (Decaisne ex Harvey) Manza, number 1770 being a syntype of this name.

At the Falkland isld. (March) [1833] I found three apparently ['distinct added] species of encrusting lichen-like Nulliporae, ['of' marked out] which are lost, or rather, as ['believe' marked out and 'I am almost sure' added], from the contents of the parcel marked outside 'S. America', of which the labels have been ['lost' marked out and 'washed off' added]. [in storm?, see above] Although I observed a multitude of specimens, I found only *one* bearing the ['spore-' added] bladders these contained ['each' added] from 30 to 40 either spherical or oval semi-opaque spores, slightly coloured, & 1/500 of inch in diameter. These spore-bladders seem never formed on the growing margin. They seem to arise by a separation of the stony layers, which appears to be [changed from 'to'] pushed up from below, & at first there is no aperture: when ['an' added] aperture is first seen it is small, but afterwards increases in diameter to 1/500 of inch. ['When the' marked out and 'After' added] spores ['are formed, a cavity (changed to 'concavity') has been for corroded in the stony layer' marked out] are expelled, the

little bladders become white & exfoliate & the concavity in which the spores rested gradually becomes filled up to the general level: a series ['of sp' marked out] showing this gradual obliteration of the ['spore' added] bladders, ['& the refilling of the concavity' added] was ['as' marked out] very evident.

This is *Darwin 1153*, presumably *Amphiroa exilis* Harvey, which is described in much greater detail in the *Zoological Diary*. Page 161 of the latter begins:

1833 March 25th. E. Falkland Island

[*Corallina* Linn: (inarticulate) 595 & 1153 (not spirits)' in margin] Coralline. stony. brittle ['inarticulate' added] encrusting rocks & sending forth *lichen*-shaped ['thin' added] expansions.—Growth concentric, shown by concentric, shown by lines & changes in the tint of colours; Colour darkish 'crimson red' or that of *Corallina officinalis*: a section shows, that the superior part is composed of horizontal layers of a stony, & slightly coloured substance.—the other softer. white. ['(b)' in margin] & of a more granular nature:—the inferior surface is rougher (for attachment) & paler ['(z)' in margin; this is a note for number 3557 (see above)] coloured than the upper: the border or extremity of the expansions is thickened; edges ['semi' added] pellucid. covered with a delicate transparent membrane. & containing a soft ['granular' added] cellular tissue; in all these ['latter' added in margin] respects; the similarity of this with *Corallina* & its subgenera is very great.—On the superior surface. & in the more central parts, one some pieces ['(a)' in margin] there are numerous. small cones or paps, with a minute circular orifice at the summit.—They precisely resemble those described at P 56 in an *Amphiroa*.—[These [bracket in original] cones are formed ['in any point' in margin] by a separation, ['in middle' added] of the ['superior' marked out] stony layers; & the upper part gradually assumes the conical shape—

Notes (a) and (b) are given on page 161, *verso*:

- (a) The ovule-bearing cones are very uncommon; I only found one specimen with them. & out of many cones, which I examined only three had the regularly formed ovules: the rarity of this generation process may perhaps ['X' in margin] explain the general ignorance of method of propagation in *Corallina*.—
 (b) For similar particulars, in an *Halimeda* V 211 [i.e., see *Zoological Diary*, page 211]

Page 161 continues [From 'If the cone' to 'laterally' on page 162 is quoted by Sloan (1985: 99).]:

At first they have no aperture:—when it first appears it is small; but in times increases to a diameter of 1/500th of inch; after this epoch, the cone becomes white & brittle & its surface exfoliates.—the concavity, on which the younger ones rest, is partially filled up & it is clear the little cone has performed its office in the economy of nature.—[bracket in original] If the cone is removed in one of the early ones, the bottom is concave & on it there is a layer of the pulpy cellular

Page 162 continues:

1833 March E. Falkland Island.

['*Corallina*' in margin] tissue or granular matter, such as occurs at the extremities of the branches.—this lies on ['(z)' in margin] the white softer substance of the *Corall*.—so that the stony layers are perforated.—At a later age, the granular matter is collected into [semi-opaque, [bracket in original] spherical or oval balls 'bulbs' in Sloan (1985:99)], with a transparent case: they [changed from 'these'] are slightly coloured & between 30 & 40 in number.—in diameter 1/500th of inch.—[bracket in original] They are ovules & the cones ovaries.—The simplicity of this generative process is shown by its ['the' marked out] similarity to ordinary growth.—the external border is *thickened* composed of precisely a similar substance & enveloped in a transparent membrane; it may be considered as formed by a juxtaposition of cones, or rather the cone & ovules owe their origin to the creative power acting on a point. ['(a)' in margin] where the growth or extension cannot take place, hence the granular matter is enveloped in a spherical case & seeks an exit through the stony layers, instead of increasing laterally.—In some specimens these cones were absent; in others there were white spots, with the surface exfoliating, & then I imagine cones to have existed.—the *Corall* abundantly coats the rock, in the pools left at low water. According to Lamouroux [Lamouroux, 1821] it would be in the III Low [?] *Ordres*. *Corallimnes* inarticulatees; but from the description of genus *Udotea* it cannot belong to it. [Sloan (1985: 100) quotes this entry from here to 'Lichens,' on page 163.]—Upon reading over description of *Amphiroa* P 56. [i.e., *Zoological Diary*, page 56] it will evident how very close a relationship, in manner of growth & cones no more [i.e., no more on this page; the description is continued below]

All the above pages are marked or marked out with pencilled lines. Presumably, this indicates that Darwin used them in writing his notes for Harvey. He often marked passages in the *Zoological Diary* in this way when the information was used for other manuscripts.

Notes (a) and (z) are given on page 162, *verso*:

- (a) It is to be remembered, that the cones do not occur near the margin, where the ['X' in margin] *Corall* is growing.—(z). [This note is quoted in Sloan (1985: 105).] Decandolle & Sprengel. *Botany*, P. 92. [DeCandolle & Sprengel, 1821] Consider that propagation in Lichens & Confervae is a kind of budding & not true generation. In *Halimeda* such certainly I think is the process.—['x in the *Inarticulata*' in margin] In the method described in *Corallina* of Hobart town of the extremities of branches, being 'laid' as branches of trees, & when from the foliaceous expansion buds appeared, perhaps in this method we see the only

kind of propagation known to those genera. ['this genus' in Sloan (1985)] in which the bladder-formed cones. have not been discovered.—

Page 163 continues:

1833 March E. Falkland Isd

['Corallina (articulata)' in margin] there exists between that Coralline & this. The absence of articulations is the chief difference: I think we may hence expect that the propagation in the whole family Corallinae will be somewhat similar to the one described.—I have never been able to perceive any Polypus or true cell. & till I do I must rank these beings as belonging to the Vegetable rather than animal world.—the simplicity of the reproduction would seem rather to favor this idea.—I suspect the strongest argument against it. is ['the' marked out and 'a false' added] analogy of form with respect to Corallines; in this case however there is a stronger one to Lichens.—

3503 Feb. 36. [1836] Hobart Town. [Hobart, Tasmania] On lifting up a fragment of sandstone which had lately fallen into a tidal pool, I found some branches of this Nullipora attached to its lower edge. These branches had been broken off by some violence from their parent tufts, & the terminal segments or ['of' in Sloan (1985)] joints having been pressed by the stone had adhered to it & ['and' in Sloan (1985)] expanded. These little foliaceous expansions had exactly the same appearance as the first growth of the [this word not in Sloan (1985)] encrusting Nulliporae; but from them, little buds were springing, evidently destined ['determined' in Sloan (1985)] to be branches, & thus to form a new tuft. [Quoted from 'On lifting' to here by Sloan (1985: 104–105).] Thinking that this manner of propagation, (comparable to laying trees), was solely the effect of the stone having accidentally fallen on lately detached, loose branches, I examined some vigorous tufts still attached to the rocks, & in them I found a few of the lateral branches, with their heads drooping outwards & with

[page] (4)

the terminal segments attached to the surrounding rocky surface & forming little expansions, whence new branches were to spring. Hence this Nullipore increases like a banyan tree. Is it not rare to find spores on the *cylindrical*-articulated Nulliporae? & may not this method of propagation partly explain it, in same manner as ['tr' marked out] plants that propagate freely by runners seed badly???—

1463 spirits (3854, 3855, 3856 doz [?]). This ['*Melobesia mamillaris*, Harv.' added between the lines by Harvey] species is very common, encrusting the smooth rocks in the tidal pools (August) [1836] at Bahia in Brazil. The branches are short & rigid; colour on the under surfaces paler than in *Corallina officinalis*, ['&' marked out] & in other parts [changed from 'patts'] creamcoloured with tinge of flesh-red. The extremities of the rigid branches are either rounded or acuminate into a cone. In this latter case, the summit is surmounted by a circular minute orifice, leading by a short cylindrical canal into a little chamber. In this chamber there ['is' marked out] are from 20 to 40 cylindrical spores, standing vertically & nearly parallel, & embedded at their lower ends in pulpy matter. These spores occur in several states, 1st as ['a' marked out] simple elongated cylindrical sacks, containing granular matter, 3/500 long & 1/500 broad. 2d. these become

[page] (5)

marked by one or two obscure constrictions, which finally become plain & are three in number, dividing the cylinder into four bead-like bodies. The upper lobe is generallr larger

& more elongated than the others. In one case, I found a cone placed on one side, instead of on the summit, of a branch. The greater number of the branches ['are' marked out] have white, rounded ends, & on some of these there were appearances, as if a cone had once existed there, & had since scaled off. In some branches there were traces of cavities lower down in them.

These specimens are syntypes of *Melobesia mamillaris* Harvey.

On several occasions having kept vigorous tufts of articulated Nulliporae in sea-water in sun-light, it appeared as if a good deal of gas was exhaled; it wd. be curious to ascertain what this is. [It would be oxygen.]

In my work on 'The Structure & Distribution of Coral Reefs'. [Darwin, 1842] p. 9. ['(& p. 24, 42,' added) I have described briefly these species of Nulliporae, which are very interesting from the part they play in the formation or rather preservation of the Coral-reefs; [On pages 9–10, 24–25, and 42 of *Coral Reefs*, Darwin discusses coralline algae he observed in the Cape Verde Islands, Cocos-Keeling Islands, and Tahiti.] they growing exactly above the level, at which true corals

[page] (6

are unable to live: they form a solid mass three feet thick. Most unfortunately I have given the specimens to the British Museum, (forgetting that they were undescribed) together with a suite of specimens, exhibiting the formation of coral-reefs. [The corals are at the British Museum (Natural History); I did not find the coralline algae there. Some of the corals were illustrated by Whitehead and Keates (1981).] Should you [i.e., Harvey] be coming to London in the course of a few months, I hope you will enquire for them, & just look at what I have said about them. But if you are not coming to London & *think it worth while*, [emphasized by underlining with two lines] I would write to the Trustees, for the chance (I think a likely one) that they would let me have them out to lend you.—[Specimens were not lent for identification until 1902 (Stearn, 1983).]

p. 86. [in Darwin (1842)] *Note*. in my work on Coral Reefs I give the ['greatest' added] depths at which I found any Nulliporae, & some facts on their abundance in several quarters of the World.—N. B. in this note, when I speak of 'Halimeda' it wd. ['have' added] been safer if I had said *flatly* articulated Nullipora, for I then thought such Nulliporae as (1770) were Halimedas.

Indeed, it is *Bossea oribigniana* (Decaisne ex Harvey) Manza.

Other algae collections made by Darwin on the Beagle and reported in the literature.

A reading of Darwin's *Plant Notes* (DAR deposit) and *Zoological Diary* (DAR 30, 31) shows that he collected a number of other algae besides the corallines discussed above. However, only a few of them have been mentioned in the literature, and I found none at Cambridge University, Trinity

College, Dublin, or the British Museum (Natural History). Either they are housed elsewhere, which is unlikely, or they deteriorated after being collected and were discarded by Darwin or others. It may be that they remain hidden in one of the three depositories, waiting to be found in the future by some dusty prober looking through the exsiccatae. Those that have been published follow, arranged alphabetically by division, and then by genus and species.

Chlorophyta

Caulerpa webbiana Montagne (Caulerpaceae). Reported from the Brazilian island of Fernando Noronha by Hemsley (1885: 29) as collected by 'Darwin.' Hemsley (1885: 9) stated that Darwin 'dried specimens of about a dozen of the plants met with, which he gave to the late Professor Henslow. They are now in the Herbarium of Cambridge University, and through the kindness of Professor Babington [Charles Cardale Babington (1808–95), Henslow's successor as Professor of Botany] we have been able to examine them.' The collection should be at Cambridge.

Chlamydomonas nivalis (Bauer) Wille (Chlamydomonadaceae). Darwin (1839, 1845) discussed (as '*Protococcus nivalis*') this wide-spread alga known as red snow. The published version is much shorter than the extensive notes in the *Zoological Diary*, which begin on page 319:

March 20th. 1835. = Red Snow. =

In the road from St Jago [i.e., Santiago] de Chili to Mendoza [Argentina] by the Portillo pass there are two distinct Cordilleras or ['chains' marked out] lines of mountains. In both of these ['ridges' marked out] at their Eastern & Western slope the road passes over ['large' marked out] masses of perpetual snow.—on these I noticed much of the substance called 'red Snow.' The elevation as calculated from Humboldt. is given in Mr Caldcleugh's travels [i.e., Caldcleugh, 1825] as 12800 ft.—Mr. Miers (in his account of the passage of the Andes) [i.e., Miers, 1826] mentions seeing both Red & Green Snow. ['?' marked out] in the [two illegible words, one above the other, marked out] ['frequented' marked out] pass of the ['Uspullala' marked out and 'Uspullata or' added] Las Cuevas: He states no particulars.—['I was not fortunate enough to meet with it in the' marked out] At the time of year I passed (April 5th). [1835] there was scarcely any snow on this road.—I first noticed the Red Snow. by the color of the impression of Mules hoofs; ['as if they had been slightly bloody' added] also in ['in' marked out] some places when the Snow was thawing ['very' marked out and 'very' again added] rapidly. The color is a fine rose with a tinge of brick red.—The surface of the Snow ['is scattered over' marked out] as seen from the [illegible word marked out] mules back to be ['appears' added] scattered over with bits of dirt. My first idea. was. that it was the dust of the red Porphyria, blown. by the strong winds from ['one' marked out and 'crumbling' added] sides of the Mountains.

Page 320 continues:

The particles look as if ['they' marked out] many were 1/10th of inch in size. This is an optical deception, owing to the magnifying powers of the ['course' marked out and 'large' added] crystals of Snow. Hence on being taken up the particles ['go' marked out] almost disappear. This [changed from 'These'] Snow ['being taken up &' marked out] crushed between the fingers or on paper communicated a red tinge, but otherwise ['as I have said' added and 'as I have' marked out] with the exception of a few places the Snow, before ['mechanical violence' (?) marked out and 'pressure' added] is not coloured.—Examining ['& with a weak pocket lens' added and 'the Snow, on which such (illegible word) particles, appeared to have adhered:' marked out] groups ['(from 10–40) added and 'of minute spheres' marked out] ['of most' added]!. minute circular atoms were clearly visible. ['They' marked out and 'Each' added] was perhaps ['about' added] 2-[illegible number] diameters apart from the others.—These These groups caused the appearance of such course particles.—I placed some of them between the leaves of my note-Book. on my return to Valparaiso, after a months interval, I examined the [changed from 'this'] paper.—The Spots

['where I had placed' marked out] were ['now' added] stained of pale dirty brown (V accompanying Specimen).—The greater number of little spores had been crushed & were not to be distinguished. I ['extracted' marked out and 'removed however' added] some tolerably perfect.—Being placed in water they became more transparent & showed with transmitted as well as reflected ['light' added] a fine Arterial Blood Red Color.—They varied in size ['& the outline is quite smooth' marked out] the largest & most perfect being exactly 1/1000 of inch in diameter. The outline is not perfectly regular or smooth [The last sentence added later?]

This description continues on page 320, *verso*:

The red centre is seen to have a thin ['trans' marked out and 'nearly' added] colourless bark: the red matter appears to be a fluid which is not miscible with water. Alcohol or Sulphuric Acid.—It would appear a fluid from being separable into various sized perfect globules.—on applying diluted Sulph. Acid. the outer coat is either destroyed or so very soft that ['the' marked out and 'on' added] the least touch falls. off. is composed [illegible pencilled comment added] of an outer most delicate tunic lined with granular matter.—This bark ['is' ?, marked out and 'was' added] ['often' marked out] torn & ragged in many of those specimens I removed from the Paper: ['The (two illegible words) red body' marked out and 'is perfectly spherical & smooth' added] [illegible phrase marked out] after remaining some minutes in the Acid. is acted [?] in two very different [illegible word]: in one case, suddenly with a start the sphere enlarges to twice or thrice its previous diameter, the color becomes much ['paler' marked out and 'less intense (& this (illegible word) to (illegible word)' added]; the whole appearing as a drop of pale red fluid, not miscible in surrounding medium. There has also further a cloud of equal more [?] minute ['circular' marked out and 'spherical' added] grains.—I believe they are ['granular' marked out and 'spherical' added] for they are but just visible with my highest power 1/20th ['inch' added] focal dist [?] lens.—In other cases ['the red ball matter contracts' marked out], the red fluid ['being' marked out and 'is owing to its contraction' added] seen to be contained in a, thin ['colourless' added] case—& ['contains' marked out and 'has' added] in ['the' added] middle a darker spot. ['In this state generally [?] strong acid appears to have scarcely any further effect:—' added] It would appear probably that in the first case, that this tunic ['must have' added] suddenly

Continued on page 319, *verso*:

[page] 4)

burst & that the cloud of granules is the dark spot in middle of red fluid.—We have then 1st. colourless outer tunic, with (2d) do [i.e., ditto] granular lining. 3d. tunic of red globule. 4th. red fluid. 5th certain most minute, scarcely visible granules.—With respect to the Red fluid, ['of course it cannot' marked out] its existance is only known after a short soaking in fluids: how it may exist in the dry ['or fresh' marked out] specimen I do not know.—['It is singular' added] In one case, the outer bark = about 1/6 in [i.e., inch] focal dist., ['=' to 'dist' circled] contained two distinct red balls.—['The [bracket in original] existance of ('red snow' marked out and 'this Crypto plant substance' added) in Lat: ('country' marked out) ('growing' added and 'the' marked out) at a great elevation in the Perpetual Snow. appears a rather common ('fact' marked out and 'instance' added) of the geographical distribution of plants.' marked out] [bracket in original] I understand the late Navigators have found Red Snow in the Antarctic regions.—The existence of this Cryptogamic plant in Lat [latitude not added] S. growing on the lower patches of Perpetual Snow. is a rather ['cur' marked out and 'interesting' added] fact in the laws of the distribution of Vegetables. Have found on many mountains in Europe and on rocks in Scotland ['Have' to 'Scotland' added much later in pencil]

Notes on page 320A have been inserted later in pencil:

Vol. IV. p. 231 Greville *Scottish Cryptogam Flora* describes [Greville, 1825–26]—balls, fine garnet colour; exact spherical nearly opaque seted [?] on substratum of gelatinous matter; for most nearly equal in size. = Smaller ones greatly surrounded by pellucid limb, gradually becomes less on globules uneven (?) in size.—in full size specimen internal surface appears granulated, from contained granules; granules 6–8 in number globose. capsule left floating after bursting of sphere.—*Protococcus nivalis* Decandolle [presumably DeCandolle & Sprengel, 1821] could not see granules only oily fluid.—

There is no notice taken of being *in* [underlined twice] groups

Think presence owing to flowing of melted snow:—Rank at higher level

On page 320, *verso* is added:

Bauer [not traced] states they are 1/100 of a line

Were [?] my Specimen going over with envelope.—

This last note refers to a letter from Darwin to Henslow from Valparaiso, written on 18 April 1835. In it, Darwin wrote (Burkhardt & Smith, 1985b: 443):

On some of the large patches of perpetual snow I found the famous Red Snow of the Arctic countries.—I send with this letter my observations & a piece of Paper on which I tried to dry some specimens. If the fact is new, & you think it worth while, either yourself examine them or send them to whoever has described the specimens from the North, & publish a notice in any of the periodicals.—

Nothing was published on these observations until Darwin's *Journal of Researches* appeared. The paper to which the specimens were attached remains with the letter in the archives at Kew.

Conferva clavata var. *darwinii* Hooker fil., *Flora Antarctica*, 2: 493 (1847). 'Hab. Cape Tres Montes, on *Sphacelaria funicularis*; *C. Darwin, Esq.*' (Cladophoraceae). Illustrated in Hooker's plate CXCII. He states: 'Of this variety we have seen but one specimen and refer it doubtfully to the *C. clavata* of the Cape of Good Hope and New Zealand, to which it is certainly very closely allied.' According to De Toni (1889), the correct name for this taxon is *Chaetomorpha darwinii* (Hooker fil.) Kützing. The specimen should be at the British Museum (Natural History).

Chrysophyta (Bacillariophyceae)

Asteromphalos darwinii Ehrenberg, *Bericht über die zur Bekanntmachung geeigneten Verhandlungen der Königlich Preussischen Akademie der Wissenschaften zu Berlin*, 9: 200 (1844). I have not seen the original publication, but presumably the name is based on a Darwin collection. Hooker (1847: 513) cited: 'Hab. In a scum floating in the ocean, in Lat. 64° S., Long. 160° W.' Most of Christian Gottfried Ehrenberg's herbarium in Berlin was destroyed during the Second World War, but his diatom types apparently are extant (Staffleu & Cowan, 1976).

On 17 April 1844 (Burkhardt & Smith, 1985a), Darwin wrote to J. D. Hooker (copy in the Darwin–Hooker correspondence at Kew, number 18, page 30) that:

I have waited in vain for Dr. Dieffenbach's [Ernst Dieffenbach (1811–55), German naturalist and geologist] answer to my queries to Ehrenberg [1795–1876, Professor of Natural Sciences at the University of Berlin] for more particulars regarding what he wanted, and therefore I am going at once to send off a cargo of little packets to Berlin. Those which I send are valueless, except to Ehrenberg, and therefore I am going to tell him *not* to return mine, and will you kindly send me a line by return of Post (to Down) [Darwin's letter was sent from London] telling me what I shall say to him about returning your more valuable cargo? Shall I tell him that the sea-weed are undescribed & that you intend describing them, which will show that you do not wish him to describe them, or say nothing?

Ehrenberg described only the diatoms, but Hooker did not describe any macroscopic 'sea-weed', only the *Conferva* discussed above. Apparently Darwin said nothing.

Cocconema lunula Ehrenberg. Reported by Hooker (1847: 511): 'In a white pigment used by the Fuegians, *C. Darwin, Esq.*' According to De Toni (1889), the correct name for this taxon is *Cymbella cistula* var. *maculata* (Kützing) Grunov. Like the species above and below, it was sent to Ehrenberg by Darwin for identification (Ehrenberg, 1845).

Pinnularia borealis Ehrenberg. Reported by Hooker (1847: 511): 'In a pigment used by the Fuegians; *C. Darwin, Esq.*' According to De Toni (1889), the correct name for this species is *Navicula borealis* (Ehrenberg) Kützing.

Darwin described the pigments in which these diatoms were found on pp. 148–149 of the *Zoological Diary*:

1833

Tierra del Fuego

[‘Fuegian Paints’ in margin] The Fuegians paint. their facies. bodies & hair. with white, red & black in various figures & quantities: The red is the oxide of Iron & is prepared by being [‘974 (not spirits)’ in margin] collected near the streams, dried & burnt. The White. is of a more curious nature. in the [‘(a)’ in margin] state fit for use it is of very little specific gravity.—it is collected from under water, is made into balls (as J Button [Jemmy Button, a native of Tierra del Fuego] expresses it. ‘all the same Ostrichs egg’) & burnt: did not effervesce with acids.— & with bit of Cobalt. gave a prominent

[page] 149

1833

Tierra del Fuego

[‘Fuegian Colors’ in margin] blue.—I suppose therefore it nearly pure alumine.—It occurs in the Slate Mountains. I imagine from the decomposition of the beds of Feldspathic rock.—The black I have not obtained: The black, is I believe only charcoal & oil:—

Note (a) is given on page 148, verso:

(a) I found some of the feldspathic greenstones decomposed into a white substance to the depth of 3/10 of inch.—

The diatoms, therefore, could have come from either the red or white pigments.

Phaeophyta

Sphacelaria funicularis Montagne (Sphacelariaceae). Reported by Hooker (1847: 469): ‘Hab. Cape Tres Montes, South Chili; *C. Darwin, Esq.*’ According to De Toni (1895), the correct name is *Stypocaulon funiculare* (Montagne) Kützing. The collection should be at the British Museum (Natural History).

Macrocystis pyrifera (Linnaeus) C. A. Agardh (Lessoniaceae). Although Darwin apparently did not collect this large, conspicuous brown alga, he noted it in the *Zoological Diary* (p. 242) because of its ecological importance:

1834 April E. Falkland Isd.

['Zoology (marine)' in margin] The Zoology of the sea, is I believe generally the same here as in Tierra del Fuego: Its main striking feature is the immense quantity & number of kinds of organic beings which are intimately connected with the Kelp.—This plant ['I believe' marked out] (The *Fucus giganteus* of Solander) is *universally* attached on rocks, from those which are awash at low water & those being in [number not filled in] fathoms water: it even *frequently* is attached to round stones lying in mud. From the degree to which these Southern lands are intersected by water, & the depth in which Kelp grows the quantity may well be imagined, but not to a greater degree than it exists.—I can only compare these great forests; to terrestrial ones in the most teeming part of the Tropics; yet if the latter in any country were to be destroyed I do not believe ['(a)' in margin] *nearly* [underlined twice] the same number of animals would perish in them, as would happen in the case of Kelp: All the fishing quadrupeds & birds (& man) hunt the beds attracted by the infinite number of small fish, which live amongst the leaves: (the *kinds* are not so very numerous, my specimens I believe show nearly all.)—...

Note (a) is on page 242, *verso*:

'(a) I refer to numbers of individuals as well as kinds'.

This discussion is continued on page 243, following another note:

If this *Fucus* was to cease living; with it would go ['many of' added] the Seals, the Cormorants & certainly the small fish & then sooner or later the Fuegian Man ['most follow.—' added] the greater number of invertebrates would likewise perish, but how many it is hard to conjecture.

A note on page 243, *verso* also addresses the distribution of *Macrocyttis*:

(c) Mr Stokes [i.e., John Lort Stokes (1812–85), Mate and Assistant Surveyor and Darwin's roommate on the *Beagle*] states that the furthest point North he has seen the Kelp on the East coast is about St Elena, in Lat 43°. [Punta Santa Elena, prov. Chubut, Argentina.]—It not uncommonly grows in 10 & 15 Fathom water.—...

Near the I of Chiloe [Chile] Lat. 42°, kelp grows with no great vigor—but it is very curious to see that here neither the numerous shells & Clytias [i.e., *Clytia*, Hydrozoa, hydroids] & Isopod [i.e., Isopoda, isopods] & Crust [i.e., Crustacea, crustaceans] are quite absent; some few encrusting *Flustra* [a genus of Bryozoa, bryozoans], but they are much rarer; & some different compound *Ascidiae* [Urochordata, tunicates].—

There is more on *Macrocyttis* in East Falkland Island on page 243:

... this island is much intersected by water (Capt Fitz-Roy [Robert FitzRoy, 1805–65, Captain of the *Beagle*] has compared it to the arms of the Cuttle fish), thus far inland seas are ['nearly' added] motionless, they seem to produce scarcely any organic beings ...

... the water instead of [illegible word: '—existing' ?] ['(a)' in margin] the elegant forms of sea-weeds & Corallines; [illegible word marked out] throws up

Continued on page 243, *verso*:

(a) a putrid mass of rubbish.—The powers however of Geology are quickly covering up these unproductive specks on this our globe.—V. 157 & 158 [i.e., see pages 157 and 158 of the *Zoological Diary*] for more particulars

On page 158 Darwin entered under 'General Observations':

1833 Jan & Feb. Tierra del Fuego

The sea is very favourable to the growth of Hydrophytes. [i.e. hydrophytes, plants growing in water] Here grows *Fucus giganteus* in 25 fathom water:—the little pools, abound with small species. ['(c)' in margin] almost to the exclusion of Corallines.—Corallina was present: & some species of *Clytia* [Hydrozoa, hydroids] (or allied to it) grew on the *F. Giganteus*.—They were the same species which I found floating in Lat 45°: V P 135.—[see above]

Two notes are given on page 158, *verso*:

(b) It will be curious to ascertain, whether the plants of Tierra del bespeak as high as a Latitude, as many of the above facts point out:—[this is opposite a discussion of insect distributions and before the above (p. 158)]

(c) The immense number of encrusting *Corallina* form the ['834' in margin] strongest exception to this remark.—I think a comparison of the Corallines of this Country & England (nearly similarly situated) would be interesting as showing a very wide difference in the leading forms.—

Throughout his notes, Darwin was suggesting such comparisons as this.

Rhodophyta

Polysiphonia berkeleyi (Montagne) Harvey (Rhodomelaceae). Reported by Harvey (1847: 47): 'Straits of Magalhaens, *Mr. Darwin*. . . (v.s. in *Herb. T.C.D. comm. cl. Hooker*.)'. There is a specimen at TCD: '*Heterosiphonia berkleyi* Mont. Cape Horn Darwin? Ex Herb. Berkeley.' However, there is some question as to whether it is the specimen cited by Harvey, or indeed if it is a Darwin specimen at all.

Darwin made extensive notes in the *Zoological Diary* on several microscopic marine algae seen on the voyage. These were printed in much abbreviated form in the *Journal of Researches* (Darwin, 1839: 14–20; 1845: 14–18). Only the first instance has pencilled lines drawn through the pages, however, indicating that it has been copied and used elsewhere. In a letter to J. D. Hooker of April 1844, in which he asked for advice regarding the second edition of the *Journal of Researches*, Darwin queried (copy in the Darwin–Hooker correspondence at Kew, number 31, page 61): 'Will you tell me, may I not leave out, without any loss, the little and imperfect account (p. 14–16) in my *Journal of the oceanic confervae*?' This account is quite similar in both editions.

Page 31 reads:

1832 March Abrolhos Shoals

['*Oscillaria*' in margin] At noon Lat 17° [changed from 37], 43' S & Long 37°. 23' W ['(a)' in margin] my attention was called by Mr. Chaffers [Master of the *Beagle*] observing that the sea was in places discoloured. [390: 391 not spirits' in margin]—Even from the Poop, the cause was visible, it was owing to the ['(c)' in margin] presence of numberless minute whitish particles, These when examined under a lens, whose focal distance was ['under' marked out] above 1/10 of inch, appeared like bits of ['chopped' added] hay, the ligneous fibres of which projected beyond the end.—

Notes (a) and (c) are on page 30, *verso*:

(a) An appearance similar to this one was seen between Canary & Cape de Verd at about 1/2 a mile distance from the ship.

(a) Nos not spirits. 390 391 [This note also refers to (a) on p. 32]

(c) Mr. Brown [i.e., Robert Brown (1773–1858), Keeper of Botany at the British Museum] seems to have observed these *Oscillaria* on the South shore of Australia. 'particles 1/20

length. composed of cohering jointed fibres, of unequal length, so that the compound particle appeared as if torn' Flinders Voyage Vol I P 92:—[i.e., Flinders, 1814; botanical comments by Robert Brown]

Page 32 continues:

1832 March Ar[changed from]bolhos Shoals

[*Oscillaria*' in margin] These particles seen under a higher ['x' in margin] power consisted of about 20 fibrils. adhering side by side & forming ['either' added] a flat or a nearly cylindrical bit of mat.—These ['cylin' marked out] fibrils or stalks were in length from .02 to .03 of inch; in diameter 1/2000: extremities round, *rather* broader, transparent; internally a tube ['(a)' in margin] containing concentric layer of ['a' marked out] greenish brown granules ['Hence appearing jointed: these layers are ('close to' marked out) numerous' added] The external tube was marked by fine circular rings. ['(??)' added in pencil] I once thought that I perceived a motion in these fibrils: from the description in Dic Class. ['(b) & 31' in margin] I suppose it is a *oscillaria*.—After being kept for an hour in water. most of them fell to the bottom of the Basin. & it appeared to me that in this state all the granules had been expelled: Figures are quite inadequate to give any idea of the numbers of these ['groups' added] of *Oscillaria* which the sea contained.—A bucket which had been lowered for some water, had its ['interior' added] sides (being left for short time at rest) literally coated with these minute particles.—I should think they extended for some distance; The sea. 3 [changed from 2] hours afterwards contained a few.—

Note (b) is on page 30, *verso*:

(b) Bory St Vincent [i.e., Bory de Saint-Vincent, 1822–31] says that the *Oscillaria* when jointed very soon lose their power of motion.—Dic Class: [i.e., *Dictionnaire classique d'histoire naturelle*]

Note (a) is on page 31, *verso*:

(a) It required a 1/30" focal lens in order to see the internal tube ['x' in margin] At noon on 31st ['30th' marked out] of March Lat. 19. 52' S. Long 38. 7' W. ['No soundings at this spot.—But 6 knots before 36 h.' in margin] the ship passed through a band of these *oscillaria* a mile in width I reexamined them.—The bundle were often cylindrical. containing from 20 . . . to 60 fibrils. a large ['one' added], taking the extreme points was in length was .03 & in breadth .009—Fibrils were perfectly straight; varied much in length; were I presume enveloped in a fluid.—as in many of the bundles the fibrils did not touch each other.—Being kept till the following morning the particles became of a much brighter green & ['a' marked out] were partially decomposed: a considerable quantity of brownish flocculent matter lying at the bottom of the cup.—The fresh *oscillaria* placed in Alcohol. uncoiled. moved [word obscured by tape] & finally burst.—These appearances are called by the Sailors Spawn.—At 4 PM we passed through another ['irregular' added] band. running E & W.—about 10 yards wide & about 2 & 1/2 miles long.—The sea was the colour of thick reddish mud.—I believe each bundle of *oscillaria* touched another.—I judged of this likewise by the thickness of the covering on some water brought up in a bucket.—(At this rate in this narrow band & at a more [?] moderate computation. in each square inch of surface there must have been 499950 fibrils or separate *Oscillaria*.—In the whole band: 323 967 600 00 000: or ['323' in margin] millions of millions &c.—?/ Perhaps in square inch about 100000 ['?' to '100000' apparently added later]

On 23 July 1832, Darwin wrote to Henslow (Burkhardt & Smith, 1985b: 251):

Every one has heard of the dislocoured [i.e., discoloured] streaks of water in the Equatorial regions.—One I examined was owing to the presence of such minute *Oscillaria* that in each square inch of surface there must have been at least one hundred thousand present.—After this I had better be silent.—for you will think me a Baron Munchausen amongst Naturalists.—

From his description, this is certainly *Oscillatoria erythraea* (Ehrenberg) Kützing (*Oscillatoriaceae*), a blue-green alga (Cyanophyta).

On 15 August 1844, Darwin wrote to J. D. Hooker regarding this collection (copy in the Darwin-Hooker correspondence at Kew, number 15, page 26):

In looking over some corals I found the enclosed sea-weed from the Galapagos Island [the 's' presumably left off by the copiest], and I believe from 12 fathoms deep; I thought perhaps you would like to have it. I also send, either for yourself or Mr. Harvey, specimens of 390 & 391 of the little conferva in bundles described at p. 14 of my Journal [i.e., Darwin, 1839]. I have not, however, looked to see whether they are preserved. [Whether they have survived preservation.] 392 is a minute attached conferva from 17 fathoms off the Abrolhos Island coast of Brazil. Please throw away these specimens if of no use.

The 'sea-weed' is not the coralline of number 3251, cited above, and it remains unidentified. Numbers 390 and 391 are this *Oscillatoria*, while number 392 also is unidentified. I can hardly imagine J. D. Hooker throwing away any of Darwin's specimens, but he may have done so if they had deteriorated while in spirits.

The next *Zoological Diary* entry of this type has been much edited. It begins on page 316:

1835 March 7-9 Chile

[*Infusoria* in margin] The sea some few leagues North of Concepcion was of a muddy color in great bands, certainly more than 1 or 2 miles long.—Again 60 miles South of Valparaiso the same appearance was very extensive; although 40 or 50 miles from the shore I thought it was owing to a current of muddy water brought down from the Mayo [i.e., the Rio Maipo, Santiago province] ['B' in margin, added in pencil] Mr. Sulivan [i.e., Bartholomew James Sulivan (1810-90), Second Lieutenant on the *Beagle*] ['however' added] having drawn some up in a glass, thought he saw by the aid of a lens moving points.—I examined the water;—it was slightly stained ['as if by' added] red ['dust' added].—& after leaving it for some time quiet, ['r' marked out] a cloud collected at the bottom, with ['a lens of one fourth of an inch' added in pencil] ['1/4' marked out] focal distance small hyaline spots might be seen darting about with great rapidity & frequently exploding. Examined with a ['much' added in pencil] high['er' added in pencil] ['1/10 & 1/20' marked out in pencil] power, their shape is oval, & contracted by a ring ['around' added] ['on' marked out] the centre from which ['line' added] on all sides ['proceed' marked out] curved little ['bristles' marked out and 'seta' added] [drawing in margin] ['proceed' added in pencil] & these are the organs of motion. ['one end of the body is narrower & more pointed than the other' added in pencil] It is very difficult to examine these [changed from 'this'] animal ['cula' added] for almost the instant motion ceases their bodies burst. Sometimes both end ['exp marked out] burst at once, sometime only one, & [added in pencil] a quantity of coarse brownish granular matter is ejected which adheres [?] very slightly. ['(a)' marked out in margin]—the ring with the seta ['sometimes retains' added in pencil in margin] ['its irritability' added and 'life sometimes' and an illegible word marked out] ['for a little while' added] after the ends have ejected ['their' added] contents, ['&' added in pencil over 'it'] continues a riggling uneven motion. The animal, an instant before bursting expands to half again its natural size; about ['fifteen' added in pencil and '15' marked out in pencil] seconds after the rapid progressive motion ['has' added in

pencil in margin] ceased., the explosions take place.—In a few cases it was preceded for a [added in pencil over 'an'] ['short' added] interval by a rotating motion on the larger axis. ['Directly' marked out] ['perhaps 2 minutes' added and marked out] about two minutes after any number were isolated in ['Very soon, perhaps' written over another phrase in pencil, then marked out]

Page 317 continues:

1835 March. Chili

['Infusoria' in margin, marked out in pencil] a drop of water. they thus perished.—The animal moves ['by the aid of the vibratory cilia' added in pencil] with ['the narrow' added in pencil] apex forwards, & generally ['with' marked out and 'by' added] rapid starts; ['The setae ('were' marked out) are rapidly vibrating around the Body.—' marked out in pencil] The immediate bursting of the body prevented any close examination; they would sometimes explode ['even' added] whilst crossing the field of vision.—They are exceedingly minute ['and quite' added in pencil in margin] invisible to the naked eye ['only' added and 'being' marked out] covering ['rather more' added in pencil and marked out] ['a trifle larger (before explosion)' marked out in pencil] ['a space' added in pencil in margin] ['than' marked out in pencil and 'equal to' added in pencil] the square of ['1/1000' marked out in pencil] .001 of ['an' added] inch. Their numbers ['are' added] infinite the smallest drop of water, which I could remove, containing very many.—We passed through ['in one day' added in pencil] two masses of water thus stained, ['to day' marked out in pencil and 'of which' added in pencil] the latter ['of the two' marked out] must have been ['B' added in pencil in margin] ['of' marked out in pencil] several miles ['in' added] extent B.) [Bracket in original. From here downward, the page is marked out by vertical pencil lines] the edge of the blue ['water' marked out in pencil] & red ['water' added in pencil] was ['quite' marked out in pencil] and 'perfectly' added in pencil] defined.—What infinite numbers of these [changed in pencil from 'this'] ['microscopical' added in pencil] animal['s' added in pencil]!—The weather had been for some days calm & cloudy.—The color of the water as seen at some distance, was that of a river which has flowed through a red-Clay district: Looking vertically downwards on the sea. in the shade, the tint was quite as deep as Chocolate.—It belongs to the family of Trichodes [i.e., *Trichodesmium*, Oscillatoriaceae] of Bory St Vincent [i.e., Bory de Saint-Vincent, 1822–31] but does not agree with any of his species: The sea at this time, I fancy owing to the Calms abounds to a wonderful degree with various animals.—This fact of sea so very extensively colored by Infusoria. appears very curious.

A note on page 316, *verso* has been added later:

(a) The granular matter is contained in a thin capsular membrane, to this membrane on the ring the transparent, tapering fillets or bristles are fixed.—The motion of these seta. is that of collapsing on the obtuse end.—the Water only appeared as it to [i.e., if it too] contained a little of the finest red dust.—

A further addition has been made on page 317, *verso*:

theme: The patches of red sea. in the Southern Latitudes owing to the Whale food or rather large red. Crust. Mac: [i.e., Crustacea Malacostraca, krill] in great shoals.—

From the description and Darwin's drawing on the margin of page 316, this is a dinoflagellate (Pyrrophyta), probably a species of *Gymnodinium* (Gymnodiniaceae) or *Gonyaulax* (Gonyaulacaceae).

A third description starts on page 349:

[*Conferva* in margin] March 18th. The ship being about 50 miles West [(B) written over 'a' in margin] from Cape Leeuwin [Western Australia], observed the sea, covered with particles, as if thinly scattered over with fine dust.—Some water being placed in a glass; with an ordinary lens, the particles appeared like equal sized bits of the fibres of any white wood.—on examination under higher powers. Each particle is seen to consist of from 10–15 [of marked out] cylindrical fibres. These are loosely attached side by side all together; their extremities are seldom quite equal, a few projecting at each end.—The bundle. was about 1/50th of inch in length, but [each marked out and 'any separate' added] fibre. rather less, perhaps 1/60th.—The color. a very pale. brownish green.—Each separate [2/3000' in margin] fibre is perfectly cylindrical & rounded off at both extremities; [its diameter is as nearly as possible 2/3000 of inch' added] the whole is divided by transverse partitions which occur at regular intervals being about half the diameter of the fibre. [Drawing in margin.] [Between marked out and 'Within' added] the cells granular matter is contained; but my microscope scarcely sufficed for this.—Extremities colourless, with little or no granular matter.—The bundles. must, I think, be enveloped in some adhesive matter. because in a glass. on touching the sides they almost always adhere.—The [number marked out and 'extent' added] [quantity marked out] of sea covered by this *Conferva* was not very [extensive marked out and 'great' added].—The morning was. calm. [a in margin]—Vide similar account near Abrolhos.—[see above]

Notes (a) and (B) are given on page 349, verso:

(a). Humboldt (Pers Narr: Vol VI. P 804.) [Humboldt, 1814–29] mentions in the W. Indian sea, that the water was covered with a thin skin. composed of fibrous particles; states is found in the Gulf Stream; channel of Bahama, & B Ayres.—Are these fibrous particles. the kind of *Conferva* here described? Did I not on coast of Brazil, however, myself see some real fibro-gelatinous particles?—a similar appearance is noticed by Capt King [i.e., Philip Parker King (1793–1856); Darwin visited him in Australia in late January 1836] on NW extremity of N. Holland [i.e., Australia]. called by Capt Cooks [i.e., James Cook (1728–79)] sailor, + + + 'sea saw dust' a very good name.—Hawkesworth. Vol III. P 248. [Hawkesworth, 1773]—& Mr. Peron. (who will describe it) Voy.. Vol II Chapt: 31. [Péron, 1816] [Humboldt's, Cook's, and Hawkesworth's books were on the *Beagle* (Burkhardt & Smith, 1985b), but Péron's was not. This note, then, was added following the return of the *Beagle* to England while Darwin was preparing his *Journal of Researches*!]

+ + +

Cooks of [?] Voy. II Vol. Chart VII. [Cook, 1777; or Cook, 1784] is described as a *Conferva*.—

(B) On passage from Mauritius to C. of Good Hope Lat 37°. 30' sea with the green flocculent tufts & sawdust. during two calm day in very great quantities Must be a most abundant marine production

This again is probably *Oscillatoria erythraea*.

The last entry, on pages 350 and 350, verso of the *Zoological Diary*, also has been heavily edited:

[*Conferva* (A) in margin] During two days before arriving at the Keeling Isds in the. Indian ocean, in many parts I saw masses of flocculent matter [of added and 'extremely pale' marked out] [a brownish green colour' added in pencil] floating in the sea. They varied in size from half to three or [changed from 'a' in pencil] four inches [square' added in pencil] [in size' marked out] [and' added in pencil in margin] [are' marked out in pencil and 'were' added in pencil] quite irregular in figure [& are colored an' marked out in pencil] [extremely

pale brownish green.' marked out in pencil] In an opaque vessel these masses ['cannot' marked out, 'can' in pencil, 'not' in ink] ['could' added in pencil] ['only with difficulty' added] be distinguished; but in a glass ['they' added in pencil] were ['very distinctly' marked out in pencil and 'clearly' added in pencil] visible. Under the microscope the [changed in pencil from 'these'] flocculent ['masses' marked out] ['matter' added in pencil and 'are' marked out in pencil] seen to consist of two kinds of Conferva, between which I am quite ignorant whether there ['be' marked out] ['is' added in pencil] any connection. Minute cylindrical bodies, conical at each extremity, are involved, in vast numbers, in a mass of fine threads. These threads have a diameter of about 2/3000th of an inch; they possess an internal lining; they are divided at irregular & *very wide* intervals, by transverse septa; Their length is extreme, so that I could never certainly ascertain the form of the extremity; They are all curvilinear & resemble in position a handful of hair, coiled & squeezed together. In the midst of these threads & probably connected by ['some' added] viscid [changed in pencil from 'viscous'] fluid. ['there' added in pencil] are innumerable, cylindrical hollow ['transparent' added] bodies: each extremity of which is terminated by a cone [drawing in margin] produced into the ['(a)' in margin] finest point.—Their diameter is tolerably

Continued on page 350, *verso*:

(a) constant between ['6 and 8/1000th' marked out in pencil and '·006 and ·008' added in pencil] of an inch. Their length varies considerably from ·04 to ·06 & even sometime to ·08.—Near to ['the' marked out and 'one' added] extremity of the cylindrical part, a green septum, ['or mass a' marked out, 'granular matter' marked out in pencil] formed of ['a' marked out] ['granular matter and' added in pencil] thickest in the middle ['as' marked out in pencil and 'may' added in pencil] generally ['to' marked out in pencil] be seen.—This I believe ['to be' marked out in pencil and 'is' added in pencil] the bottom of a ['sac' marked out] most delicate, colourless sack, composed of a ['granular or' marked out in pencil] pulpy ['matter' marked out in pencil and 'substance' added in pencil], which lines the exterior case [changed in pencil from 'casing'], but does not extend to [illegible word marked out] ['within' added in pencil] the ['depth' (?) marked out and 'extreme conical' added in pencil] points [corrected in pencil]. ['of the opposite cone.—In place of the green septum ['like' added] formed body in some I observed a small but perfect sphere of brownish granular matter;' marked out in pencil] & I ['saw' marked out in pencil] ['observed' added] ['on' marked out in pencil and 'the' added in pencil] [The following is inserted in pencil between the previous marked out lines 'In some, a small but perfect sphere of brownish granular matter supplied the place of the septum.'] curious process by which these [changed from 'this'] little balls ['is' marked out and 'are' added] produced. A) [bracket in original] The pulpy matter of the internal coating suddenly grouped itself into lines, [illegible word, 'some of?'] which assumed an obscure radiated position, then with irregular & rapid movement the lining contracted & united itself, & in a second the whole matter was collected into the most perfect little sphere, which motionless occupied the position of the septum at one end of the transparent hollow case. I can describe these motions by a simile: a bag of unequal thickness & composed of some highly elastic matter, being distended by a fluid: & then such fluid being allowed to escape, with some rapidity, the coats of the bag would contract & unite with similar movements.—This rapid process perhaps is a morbid one, owing to injury: certainly [illegible word marked out] in many cases ['with added] such injury the process commenced.—I saw several ['pair' added] of these bodies, attached to each other, cone along side cone, at that end where the Septem occurs. I do not know whether they ['constantly' added] adhere in this manner when floating in the ocean.—

A drawing showing this method of attachment ends the description. It is reproduced in the *Journal of Researches* (Darwin, 1839, 1845). This is probably another blue-green alga (Cyanophyta), but I am unable to identify the genus.

Plants in Spirits of Wine

No list of plants in spirits analogous to the *Plant Notes* has yet been found. However, it will be seen below that there is excellent evidence that such a list was prepared. Pencilled notations by Darwin in the *Specimens in Spirits of Wine Notebooks* and by Covington in the *Zoological Diary* are identical to those in the *Specimen Notebooks* and *Zoological Diary* used in compiling the *Plant Notes*. The list in this section was formed in 1976 when I went through the *Specimens in Spirits of Wine Notebooks* at Down House and copied out all the entries that were marked by Darwin with a pencilled 'P'. This was fortuitous, as the notebooks on dried and preserved biological specimens have since been misplaced. [Note added in proof: They are now once again at Down House.]

The *Specimens in Spirits of Wine Notebooks* were unpagged, so the date and locality that Darwin characteristically placed at the top of the page precedes the collection(s), listed from that page. However, if a date and locality are given further down on the page and precede the collection(s), then these are given instead. Darwin also characteristically gave the collections in order on the right-hand page, leaving the facing (left-hand) page blank for more extended or later comments. These are added as appropriate, as are relevant passages from the *Zoological Diary*, *Diary*, or correspondence. The majority of the preserved specimens are fungi. Unlike the other cryptogams, which were sent to the British Museum (Natural History) (BM) on permanent loan from the Royal Botanic Gardens, Kew (K) in 1969, Darwin's fungi remain at Kew. Most of the fungal collections were sent by Henslow to the Revd M. J. Berkeley. Berkeley's herbarium is now at Kew.

In a letter written in May 1846, Darwin reported to J. D. Hooker (copy in the Darwin-Hooker correspondence at Kew, number 62, pp. 112–113):

It has just flashed across me suddenly that I brought home a very few plants in spirits of wine (with the colours noted), namely some sea-weeds and two orchideous plants from shady parts of forests of T. del Fuego [the latter numbers 823 and 825 below]—a Calceolaria from Elizabeth Island, St. of Magellan (which at the time I thought a wonderful production of nature!) [number 811] and a salt plant from near a Salina at Port St. Julians in same jar with *Opuntia Darwinii* from do. [i.e., ditto; both the latter number 794] Has Henslow ever given you these? He is now in Cambridge and could probably find them (if you have not seen them and would like), and this is the reason I write today, though not well.

Hooker apparently inquired of Henslow about these specimens, as the latter wrote on 6 November 1846 to his father Sir William Hooker (1785–1865, Director of the Royal Botanic Gardens, Kew): 'Tell Dr. Jos. I will bring with me on the 19th (as far as London) the 2 bottles he alluded to—but one of them contains a Calceolaria which I suppose Darwin fancied was an orchid.' (Porter, 1980a: 520). Like a number of the preserved plant specimens, these have disappeared.

This list starts with the first page of the first *Specimens in Spirits of Wine Notebook*, which is unpagged. The first notebook is titled 'From Jan. 1832. to June 1833 Catalogue for Animals in Spirits of Wine Nos: 1 to 660.' on the cover in ink in Darwin's hand.

1832

Jan Specimens preserved in spirits & with tin labels ['A' in margin; the jars in which the preserved specimens were placed were labelled for each locality, beginning with A.]

1832 Feb.—March Bahia [Brazil]

136 Fungus

I found no specimen with this number.

Darwin was in and around Bahia from 28 February to 18 March 1832.

1832 April Rio de Janeiro [Brazil]

194 Fungus

No specimen was found.

This entry is marked with an 'x', indicating that Darwin wished to know its name in order to include it in his *Journal of Researches* (Darwin, 1839). His fungi were identified by the Revd Miles Joseph Berkeley (1803–89), and presumably this is a notation by Darwin for him. There is a note on the facing page: '194 Growing on wet plank in a darkish outhouse uniform colour. Within light 'reddish-brown.'—' Darwin was in Rio de Janeiro and its vicinity from 5 April through 5 July 1832.

1832 May. Rio de Janeiro

216 Fungus. colour pale. deep [?] yellow

Agaricus salebrosus Berkeley, 1842, *Ann. Mag. Nat. Hist.* 9: 444, (Agaricaceae): type specimen at K ('*Ag salebrosus* Berk. Rio Janeiro. May 1832'). Filed under '*Pleurotus salebrosus* Berk.' Illustrated by Berkeley (1842), who (p. 444) stated that it was 'on sticks, covered with bark.'

232 *Lycopodium* on turf. colour white

Rather than *Lycopodium* (a clubmoss), Darwin undoubtedly meant *Lycoperdon* (a puffball). As may be seen below, he consistently made this error. In the *Plant Notes*, Covington copied Darwin's errors in the generic names, and Darwin then corrected Covington's 'errors'!

No specimen with this number was found.

1832 June. Rio de Janeiro

245 Hymenophallus the specimen is [unknown word] in fragments from having no method of carrying V 43 [i.e., see page 43 of the *Zoological Diary*]

'Copy' added by Darwin in pencil, a note to Covington for the latter to add that information from page 43 of the *Zoological Diary* to the list of plants in spirits of wine. The specimen has not been found. Page 43 of the *Zoological Diary* includes the following:

1832 June Rio de Janeiro

['Hymen = -phallus' is written in the margin.] Growing in a very thick damp forest (June 4th) did not smell stronger than the Caninus [i.e., the dog stinkhorn, *Mutinus caninus* (Pers.) Fr.]: yet sufficient ['(b)' in margin] to be remarked by the inhabitants: the veil was inserted about 1/2 an inch beneath the cone at top.—top perforated: liquid on it yellowish brown: bag of jelly resembling impudicus [i.e., *Phallus impudicus* L., stinkhorn].—the specimen is only in fragments [In the margin is written 'Copied' in pencil by Covington, indicating that it had been added to another list.]

A note on page 42, *verso* reads:

(b) No. 245.—A *Leiodes* [i.e., *Leiodes*, Coleoptera, a round fungus beetle] (550 not spirits) flew on it as I was carrying it.—[A line has been drawn across the page from '(b)' to the '(b)' on page 43.]

On 16 June, Darwin wrote to Henslow regarding this collection: 'I found the other day a beautiful Hymenophallus, (but broke it to pieces in bringing home) & with it an accompanying Leiodes.—a most perfect copy of the Barmouth specimen.—' (Burkhardt & Smith, 1985b: 239). This latter refers to a collection from Barmouth, North Wales, a seaside resort town where the Darwin family often spent their holidays when Charles was a young man.

In a letter to his Cambridge classmate Charles Whitley (1808–95), Darwin wrote on 9 September 1831 that, 'There will be a paper published about the Fungus, all my conjectures were right.—If any more can be got, & put into gin, & sent to Shrewsbury: [Darwin's home] it will be capital' (Burkhardt & Smith, 1985b: 151). Unfortunately, there is no earlier correspondence between the two to shed more light on 'the Fungus'. However, Burkhardt and Smith (1985b: 151) provide the following footnote:

CD apparently sent the fungi to Henslow (see letter to J. S. Henslow, 28 [September 1831]). [brackets in original] A printed announcement of gifts received by the Botanical Museum and Library at Cambridge, dated 25 March 1832, lists 'Phallus impudicus, var? . . . C. Darwin Esq.' No paper by Henslow has, however, been located.

In a later letter to Whitley (23 September 1831), Darwin wrote, 'Some Fungi have arrived much obliged for them.—' (Burkhardt & Smith, 1985b: 168). On the 28th, Darwin wrote to Henslow (Burkhardt & Smith, 1985b: 170–171):

I have received another parcel of the Phalli from *Barmouth*.—& another jar of them, which I gathered the day before yesterday in a very damp shady wood: I am more than ever convinced that they are different species.—The Shropshire ones are, whiter more conical & stiffer, than the Barmouth one: the ball more dark coloured & the cap has less jelly, & that not so dark coloured: They are all preserved in gin & *brine* owing to the want of more spirit.—

In spite of Darwin's conviction, both his collection from Shropshire and Whitley's from Barmouth undoubtedly are *Phallus impudicus*. The *P. impudicus* listed on the 'printed announcement of gifts' cited above probably are these, rather than that mentioned by Darwin in his letter of 9 September to Whitley.

246 Fungus [Marked with an 'x'. I did not find this collection.]

There is a note on the facing page: '246 Growing on rotten trees in the forest.—Colour 'Amber & Chestnut brown' cup orbicular. regular & most elegant, Margin folded down'

247 Fungi on rotten wood, in forest

Laschia infundibuliformis Berkeley, 1842 *Ann. Mag. Nat. Hist.* 9:445. (Auriculariaceae); type specimen at K: 'Laschia infundibuliformis, Berk Rio Janeiro. June. 1832.'

Berkeley must have had Darwin's *Specimen Notebook* or a list of plants in spirits of wine in hand, as he cited the specimen as occurring 'On rotten wood in forest.' This phrase is found only in the notebook, not on the specimen's label. Berkeley also illustrated this collection.

267 268. Cryptogam plants in the forest on bits of stick

Berkeley (1842) cited the first as '*Lentinus villosus*, Fr. (non Klz. in 'Linn.') Darw. No. 267. On sticks. Rio Janeiro. May [This should be June.] 1832.' (Tricholomataceae), and the second as '*Nidularia plicata*, Fr., Darw. No. 268. On sticks in forest. Rio Janeiro. June 1832.' (Nidulariaceae). I did not find either collection.

286 Fucus. Botofogo

I did not find this brown alga, collected in the Enseada de Botafogo, prov. Guanabara, Brazil. As his *Diary* entry for 27 June, Darwin wrote:

This is my last day on shore; so I was determined it should not be an idle one. In the bay I found some fine Corallines; the examination of which occupied me during the whole day. Upon the whole I am tolerably contented with what I have done at Rio in Natural History; several important branches have been cut off: Geology is uninteresting, Botany & Ornithology too well known: & the sea totally unproductive excepting in one place in Botofogo Bay;—so that I have been reduced to the lower classes, which inhibit the dry land or fresh water. The number of species of Spiders which I have taken is something enormous. The time during these eleven weeks has passed so delightfully, that my feelings on leaving Botofogo are full of regret & gratitude.

The 'one place in Botofogo Bay' yielded a wealth of algae (see previous section of this paper) and invertebrates.

1832 November & Dec: Monte Video [Uruguay]

476 Chara V 119. ['Copy' added in pencil]

No specimen of this green freshwater alga (Chlorophyta, Characeae) was found, but Darwin noted the following in his *Zoological Diary* (p. 119):

['Chara' in margin] Common in running water: In the microscope could clearly perceive a slow circulation of round ['476' in margin] particles.—Branches finely straited, with distant spines, parallel to these the globules moved: In same manner as the Striae, a colourless line encircled s-irally the stem; but ['on' added] one side of this the current ascended & on the other descended, So that in the equal spaces marked by the spine on the stem; the current alternately, was

This continues on page 120:

['Chara' in margin] seen flowing upwards & downwards.—The axillae of the branches . are verticillate with pointed cylinders, in these the circulation was evident, but very obscure: Novemb: 20th M: Video

Opposite these notes on both pages, Covington has written 'Copied' in the margin in pencil. This is further evidence that a list of plants in spirits of wine, analogous to the *Plant Notes* was prepared. In his *Diary* entry for 20 November 1832, Darwin wrote (Barlow, 1933: 113): 'Went out collecting on the Mount.' Presumably this *Chara* was collected there.

1833 Tierra del Fuego

528.—Yellow excrescences of the *Fagus antarcticus*, esculent: V 147 [i.e., see page 147 in the *Zoological Diary*.]

The Antarctic beech, *Nothofagus antarctica* (Forst. f.) Oersted (Fagaceae). However, given Berkeley's notation (see below), the host of this parasitic fungus may have been *N. betuloides* (Mirbel) Oersted.

This is the type of collection of *Cyttaria darwinii* Berkeley, 1845. *Trans. Linn. Soc.* 19:40. (Cyttariaceae): 'Hab. in *Fagum betuloidem* in Tierra del Fuego. Dec.–Jun.' It is illustrated in his plate IV.

A catalogue of specimens housed in the old Botany School Museum at Cambridge University lists the following: '3766 Jan '14 [i.e., 1914, presumably the date when entered into the catalogue] XVII [i.e., the number of the case in which the collection was placed] Basid. Pezizaceae *Cyttaria darwinii* (Berk.) ['50' was added later in red pen; presumably, this indicated another case number] From Terra del fuego, brought back by C. Darwin originally dried spirit'. So Darwin's fungus, originally preserved by him in spirits, apparently was removed and dried later, probably by Berkeley, then placed in spirits again. All other of Darwin's fungal collections that I found were dried, although most were originally fixed in spirits.

The above-mentioned collection is in a jar on display at the Botany School, University of Cambridge. The label reads:

Ascomycetes Pezizinae *Cyttaria darwinii*, (*Berk.*) Some of the original specimens collected by Darwin in Terra-del-Fuego and described by him as forming one of the staple articles of food of the natives. The fungus is parasitic on the Beech (*Nothofagus*) and has a smooth surface when young, later becoming honeycombed by the formation of the numerous apothecia lined with asci. specimens with membrane still covering apothecia. Young stromata.

There is also a specimen at K in the spirit collection, plus four dried collections: '*Cyttaria darwinii* Berkeley (in L. T. xix. 37) from Tierra del Fuego C. Darwin' (the sheet also bears a printed label: '*Cyttaria darwinii* Berk. Tierra del Fuego. C. Darwin, Esq.');

'*Cyttaria darwinii*, Berk. Tierra del Fuego' (two sheets); and '*Cyttaria darwinii* fr. Revd. M. J. Berkeley' (the sheet bears a printed label: 'Herb. C. E. Broome.—Bequeathed 1886.' Christopher Edmund Broome (1812–86) was a British mycologist.). These specimens, and those at Cambridge, are types, from which a lectotype should be chosen.

Darwin made detailed notes on this species in the *Zoological Diary*, which were used by Berkeley (1845) in his paper describing the genus *Cyttaria*. Berkeley (1845: 37) introduced his paper thus:

A very interesting account is given in 'Darwin's Researches,' [i.e., Darwin, 1839] p. 298, of a production which occurs very commonly in Tierra del Fuego, on *Fagus betuloides*, and forms a very important article of food to the natives. From his description, it is clear that it is referable to the order *Fungi*, though its immediate affinities are very obscure. I was, therefore, highly gratified at having the specimens preserved by Mr. Darwin submitted to me for inspection by the kindness of Professor Henslow; and Mr. Darwin has himself been so good as to send me his original notes. . . . Previous to detailing the characters of the genus and species, I shall beg leave to give copious extracts from Mr. Darwin's notes, which, it is to be observed, are to be regarded as loose memoranda, affording merely materials for publication, but of which the value would be much impaired by a bare analysis. . . .

Darwin's notes begin on page 147 of the *Zoological Diary*. They follow, along with indications as to how Berkeley's version differs from the original:

1833 Tierra del Fuego. Edible Fungi

'[Excrescences *esulent*;' in margin and marked out in pencil] In the Beech forests. [says Mr. Darwin, speaking of Tierra del Fuego' added by Berkeley] the trees are much diseased: on the rough excrescences [grow' placed here by Berkeley] vast numbers [a' in margin, marked out in pencil] of yellow balls grow.—These are of the ['(528)' in margin] colour of yolk of an egg.—& ['and' in Berkeley] vary in size from [that of' added by Berkeley] a bullet to [that of' added by Berkeley] a small apple.—in shape [they are' added by Berkeley] globular, but a little produced towards the footstalk or [the footstalk or' deleted by Berkeley] point of attachment. They grow both on the branches & ['and' in Berkeley] stems in groups.—When young.—they contain much fluid & ['and' in Berkeley] are tasteless; but in their older & ['and' in Berkeley] altered state they form a very essential article of food for the Fuegians ['Fuegian' in Berkeley].—The boys collect them & ['and' in Berkeley] they are eaten [raw' marked out] uncooked with the fish.—When we were in Good Success Bay [Bahia Buen Suceso, prov. Tierra del Fuego, Argentina] in December. [1832] they were then young.—in this state. externally they are [externally' placed here by Berkeley] quite smooth, turgid & ['and' in Berkeley] of a bright color & [deleted by Berkeley] ['with' added] no internal cavity.—[Upon keeping one in' marked out] The external surface was marked with white spaces, as if [of' in Berkeley] a membrane covering a cell. (in this state, but rather more advanced, the specimens 528 are). [this phrase deleted by Berkeley]—Upon keeping one in a drawer. my attention was called after some interval by finding it become nearly dry.—the

whole surface honeycombed by regular cells & possessed of [~~'& possessed of'~~ changed to 'with' by Berkeley] the decided smell of a Fungus.—& [~~'and'~~ in Berkeley] with a slightly sweet mucous taste:—In this state I have found them: during Jan: & Feb [~~'January and February (1833)'~~ in Berkeley] over the whole country (with the exception of specimens 528. which were found in Feb. high amongst the mountains). [~~this phrase deleted by Berkeley~~]—Upon cutting one into two

Continued on page 148:

1833

Tierra del Fuego

[~~'Esculent excrescences'~~ in margin and marked out in pencil] halves. [~~this changed to 'Upon dividing one'~~ by Berkeley]—the centre part [~~deleted by Berkeley~~] is found partly hollow. & [~~'and'~~ in Berkeley] filled with brown cellular [~~deleted by Berkeley~~] [~~'fibrous'~~ added] matter.—this evidently merely acts as a support. for [~~'to'~~ in Berkeley] the elastic. semitransparent. ligamentous. substance. which forms the base & [~~'and'~~ in Berkeley] sides of the external cells. [~~from here to 'Some of These balls' below deleted by Berkeley~~]—The [~~changed from 'Their'~~] development of these cells would appear to be main end. to which the growth tends: It is however especially to be noted I cut open great numbers & scarcely ever found the central [~~'cellular part'~~ added] without one or more larva of the same sort.—In the young state I unfortunately neglected to examine them.—Now I am in doubt. whether it is an excrescence. formed for the nourishment of some insect or a true cryptogamic plant.—The very general occurrence [~~'of the Larva'~~ added] may be explained. by observing how universally Larva occur in the Bolete in England; [~~'Some of'~~ added in margin] These balls remain on the trees nearly the whole year. Capt. FitzRoy [~~'Captain Fitzroy'~~ in Berkeley] has seen them in June.—but great numbers fall on the ground:—[~~the last phrase deleted by Berkeley~~]

Note (a) is given on page 147, verso:

1834

(a) Feb. Port Famine. [~~'When young'~~ placed here by Berkeley] Color. 'ochre yellow, & [~~'and'~~ in Berkeley] dutch orange of the Wernerian Nomenclature'. .—when young. or central part soft & dark [?]' [~~'or'~~ to 'dark' deleted by Berkeley]; strong fungus smell. & sweet taste. [~~changed to 'smell strong; taste sweet'~~ by Berkeley]—*No larvae*. [~~underlined twice; deleted by Berkeley~~]—From the root a hollow vessel passes to the centre. from which white ligamentous rays pass [~~'extend'~~ in Berkeley] through the [~~'semi-'~~ added in margin] gelatinous mass to the bottoms [~~'bottom'~~ in Berkeley] of the cells.—I can have no doubt it is a Crypt: plant.—[~~this sentence deleted by Berkeley~~] [~~'1834 June'~~ in margin] Found some more [~~deleted by Berkeley~~] very turgid ones [~~deleted by Berkeley~~; 'ones' added], highly elastic. a section of the central parts white [~~not underlined in Berkeley~~]; [~~'and'~~ added by Berkeley] the whole under a high power looks [~~'looking'~~ in Berkeley] like a Vermicelli [~~'984'~~ in margin, see below] pudding from the number of small thread like cylinders.—at about 1 1/20th [~~'one-twentieth'~~ in Berkeley] of [~~'an'~~ added by Berkeley] inch from exterior [~~'the external'~~ in Berkeley] surface. there were placed at regular intervals small cup shaped balls 1/12th [~~'bodies one-twelfth of an inch'~~ in Berkeley] in diameter; of a bright 'dutch orange'.—the cup was filled with adhesive, elastic, colourless. quite transparent [~~not underlined in Berkeley~~] matter ([~~'and'~~ added by Berkeley, parentheses deleted] hence it first appeared hollow.)—the upper edge of [~~'the'~~ added by Berkeley] cup was divided into conical points, about 10 or 12 [~~'ten or twelve'~~ in Berkeley] in number. [There is a drawing of this in the margin.] & [~~'and'~~ in Berkeley] these terminated in an irregular bunch of the above [~~'above mentioned'~~ in Berkeley] threads; the cup was easily detached from [~~'the'~~ added by Berkeley] surrounding white substance excepting at [~~'its'~~ added in margin and 'the' marked out] [~~changed to 'the'~~ by Berkeley] fringed superior edge. [~~deleted word~~] Right [~~deleted by Berkeley~~] over the cup there

[deleted by Berkeley] was a slight pit in the exterior surface: ['This' added in margin and 'which' marked out] afterward ['afterwards' in Berkeley] becomes an external orifice to the cup. (where ['when' in Berkeley; parentheses and question mark deleted] the gelatinous matter perhaps has formed seeds(?))—*Some of the balls were attacked by Larva. but their entirely irregular course showed they had no connection with the structure.*—[this last sentence deleted by Berkeley]

In the margin of page 147 'Copied' is written in pencil and then marked out in pencil. This interesting edible fungus was discussed and illustrated by Darwin in the *Journal of Researches* (Darwin, 1839, 1845). Robert Brown also found it interesting, and Darwin in 1837 wrote to Henslow of this interest and of his concern lest Brown wanted to borrow the specimens. Darwin's concern is understandable, as Brown had been given the plant collections from the first *Beagle* voyage (1826–30) and showed no sign of identifying them; he never did. He also misplaced Darwin's specimens of *Cyttaria* after they were lent to him (Porter, 1985). No Darwin fungi were found from the British Museum (Natural History) collections now at Kew.

529 *Lycopodium* (?) [i.e., *Lycoperdon*] on do:—

i.e., 'ditto' also collected on 'the Fagus antarcticus.' This collection was not found.

532: 533: 534. The junction of the parasitical plant (977) with the Fagus

Dried collection number 977 is a specimen of *Myzodendron brachystachyum* DC. (Myzodendraceae), a flowering plant that is parasitic on *Nothofagus*. Number 977 was collected on *N. betuloides*. I did not find any of the specimens fixed in spirits.

These probably were given to Robert Brown, like the *Cyttaria* discussed above, and disappeared. Darwin wrote to Henslow on 28 May 1837 (Barlow, 1967: 131): 'If you should ever have an opportunity, will you send one of those junctions of the Parasitical bush & Beech, which I brought home for Mr. Brown.—I have always forgotten it.—'

1833 March. Falkland Island

557 *Hepatica* (Marchantia?) damp shaded rocks: Falkland

I did not find any Darwin bryophyte collections from the Falkland Islands.

In 1833 he was there from 1 March through 6 April. On 9 March he entered into his *Diary* that, 'During three days I have been wandering about the country, breaking rocks, shooting snipes, & picking up the few living productions which this island has to boast of.'

1833 May Maldonado [Uruguay]

628 *Lycopodium* [i.e., *Lycoperdon*] growing on sand dunes

This number is marked with an 'x'. I did not find this collection.

On the opposite page of the *Specimen Notebook*, Darwin noted: 'Are not uncommon on bare sand from the size of pea to that of specimen: surface rough with [unknown word] pyramids: colour nearly pure white, internal mass of larger specimen becoming soft & brown'. He was in and around Maldonado 28 April to 8 July. The *Diary* entry for 30–31 May is, 'Usual quiet occupations; one day's collecting & the next arranging.'

647 *Lycopodium* [i.e., *Lycoperdon*] or rather phallus V 189.—Copy

Clathrus crispus var. *obovatus* Berkeley, 1842 *Ann. Mag. Nat. Hist.* 9:446. (Clathraceae); type specimen at K ('*Clathrus crispus*, Turpin, var. Maldonado, May, June, 1842' [sic])

Illustrated by Berkeley in plate XI, who cited: 'On sand-dunes, Maldonado. Not. common. May and June 1832. [1833] "Salmon-coloured; brownish-green internally."' These notes on colour could only have come from Darwin's notes, presumably copied from the *Zoological Diary* by Covington and incorporated into notes on plants in spirits of wine. Page 189 of the *Zoological Diary* has the following notes, which have 'Copied' in pencil in Covington's handwriting opposite them in the

margin, just as is true for the notes incorporated into the *Plant Notes* discussed in the first part of the present paper:

1833 May June Maldonado

[‘*Lycoperdium* or *Phallus* 647’ in margin] Nearly all my specimens are in their young state.—They then look like the bulb [‘of’ marked out] from which the *Phallus* springs, only with the difference, that the outer coat is penetrated with apertures.—This outer coat seems to expand, until it becomes a bag of trellis work.—There is a fragment showing this structure.—They are of a salmon colour.—but through the aperture the internal parts, are brownish green.—They grow on the sand dunes & near to a *Phallus*, but appear to be uncommon.—Did not possess any strong odour.—

The above are the only collections in the first *Specimens in Spirits of Wine Notebook* marked by Darwin with a pencilled ‘P’. The second notebook has written in ink on its cover by Darwin, ‘Catalogue for Specimens in Spirits of Wine.—No. 661—1346’. Those collections in this notebook so marked follow.

1833 June.—Maldonado

712 *Phallus* growing on sand dunes

Marked with an ‘x’. Noted on the opposite page is, ‘712 Head with much [unknown word] & thick; fluid smell but little offensive—’. *Phallus campanulatus* Berkeley, 1842 *Ann. Mag. Nat. Hist.* 9:446. (Phallaceae): ‘On sand-dunes, Maldonado, June 1833.’ Illustrated by Berkeley on plate X, and the type specimen, but I did not find it. On the margin of this page is written ‘Halimid. V 211’; see number 807 below for a discussion of this collection.

1833

754 *Lycopodium*. [i.e., *Lycoperdon*] growing on the most dry part of the camp. [i.e., ‘campo’, country] R. Negro [i.e., along the Río Negro, Argentina]

Bovista cervina Berkeley, 1842, *Ann. Mag. Nat. Hist.* 9:447. (Lycoperdaceae); type specimen at K (‘*Bovista cervina*, Berk. Río Negro. R. Patagonia. C. Darwin’). Cited by Berkeley: ‘Driest part of plains, Río Negro, Patagonia, 1833.’ Listed by Kreisch (1967: 172) as ‘*Disciseda cervina* (Berk.) Holl.’ In 1833 Darwin was on the lower Río Negro from 3 to 11 August.

1834 Jan:

794 Cactus & plant growing near the Salinas [i.e., saltflats].—Port St. Julian [i.e., Puerto San Julián, prov. Santa Cruz, Argentina]

A note on the opposite page reads: ‘The Cactus from Port Desire [i.e., Puerto Deseado, prov. Santa Cruz]. The stamens when touched collapsed rapidly & with force on the Pistol; as also did the Petals, but in a less sudden manner.—’ The cactus is *Tephrocactus darwinii* (Henslow) Backeberg (Cactaceae), but the plant from Puerto San Julián is unidentified. I did not find either of them. In describing *Opuntia darwinii*, Henslow (1837: 467) wrote:

I have named this interesting Cactus after my friend C. Darwin, Esq. who has recently returned to England, after a five years absence, on board his H.M.S. *Beagle*, whilst she was employed in surveying the southernmost parts of South America. The specimen figured was gathered in the month of January, at Port Desire, lat. 47° S. in Patagonia. He recollects also to have seen the same plant in flower as far south as Port St. Julian in lat. 49° S. It is a small species growing close to the ground on arid gravelly plains, at no great distance from the sea. . . . He had intended to produce fresh specimens on the following day, and returned to the

ship with the one now figured, but unfortunately she sailed immediately afterwards, and he was prevented from obtaining any more.

The *Beagle* sailed from Puerto Deseado twice in January, on the fourth and on the twenty-second. Given Henslow's comment above, this cactus must have been collected on either the third or the twenty-first.

- 797 *Cellaria*: very pale "Vermillion red": ['Vermillion red' is repeated between the lines in pencil] Sea-weed (same colour. best seen near extremities of branches: Coralline [unknown word] Is. dark "crimson red" (with flat articulations.—[marked with an 'x'.]

'1529' is written in pencil between the lines; a circled 'D', indicating that these algae are preserved in jar D, and 'Port Desire' (i.e., Puerto Deseado, prov. Santa Cruz, Argentina) are written in the margin of the page. 'Cellaria' and 'Sea-weed' are unidentified, presumably red algae (Rhodophyta); if the 'Corallina' is the same as number 1529, it is *Bossea oribigniana* (Decaisne ex Harvey) Manza (described in the previous section of this paper). None of these specimens were found.

- 1834 Jan: Sts. Magellan.—

- 807 Sea-weed V 211

Perhaps this is *Polysiphonia berkeleyi* (Montagne) Harvey (Rhodomelaceae), a specimen of which is discussed in the previous section.

The collection discussed by Darwin on page 211 of the *Zoological Diary* certainly could be this species:

- 1834 Jan: Port Desire

[*Sea-weed* in margin] First narrows St. of Magellan; Branches very fine bifurcata. colour. "Hyacinth red with little Aurora" Extremities of branches finely pointed. with transverse divisions; shortly then are divided by longitudinal plates making double set of cells. as long as broad.—in mains stems. 6 or (10?) oblong cells. six times as long as ['(a) in margin] broad; [Note a is given on p. 211, verso: '(a) Stem enveloped by fine transparent epidermis seen at junction of cells.—' The page is marked with a vertical pencil line.] side by side, extremities of cells not united in a straight transverse line; at ['stem' added] junction of ends

Page 212 continues:

- 1834 Jan:

of these oblong cells. there are small globular [*Sea-weed* in margin] bodies.—Many of the branches are changed into a short. bluntly pointed. very slightly oval cases.—this at first is full of red pulpy matter. which subsequently contracts & forms only 1/4 of bulk at upper extremity.—in this state it is an aggregation of small spheres. which in a more mature state. are quadrified. that is they present the appearance of four short. mushrooms growing from a common central root, (a flattened head on short footstalk) These are enveloped in a transparent case; which nearly fills up the small vacuity between the separate divisions.—diameter ['of whole' added in margin]. 0025 or rather more than 1/500th of an inch.—color. dark red.—Are there four eggs or one singularly shaped one?—

The section on page 211 has been marked 'Copied' in pencil in the margin. The *Beagle* was in the Straits of Magellan from 26 January through 13 February 1834.

- 808 Sea-weed; 1t [i.e., first] Inarticulate, "Hyacinth with little Arterial Blood red"; 2d. with capsules or ovules on sides of branches pale "Hyacinth red." Main stems with much green: 3d. finally pinnate rather more "Art. Blood red" than in 1t.: Conferva. bright "Jap green."—

I did not find any of these specimens. The first three probably were red algae (Rhodophyta), the 'Conferva' a green alga (Chlorophyta).

- 809 It. [i.e., first] Very finely pinnate, "cochineal with "Hyacinth red"; 2d inarticulate brownish "sulphur yellow": 3rd with necklace-like stem, brownish "wax yellow": 4th a Coralline. This & former [i.e., number 808] St. Gregory Bay. [i.e., Bahía San Gregorio, prov. Magellanes, Chile] St. of Magellan February 15

None of these were found. The first and fourth certainly were red algae, the second and third brown algae (Phaeophyta).

The date probably should be 12 February, as Darwin recorded in his *Diary* that he was at Bahía San Gregorio on that date and on the east coast of Tierra del Fuego the fifteenth.

- 811 Plants. Elisabeth Island: [i.e., Isla Isabela, prov. Magellanes, Chile] [unknown word] (?) plants. "dutch orange"; hinder surface shaded ['mottled' marked out] [From the description, this is *Calceolaria darwinii* Benth (Scrophulariaceae), the type of which (not this specimen) was collected by Darwin on Isla Isabela.] with 'brownish orange' Beneath upper white tip, space [Marked with an 'x'.]

A note is written on the facing page: '811 mottled with the richest "brownish orange."—curious appearance Orchis. 5 outside petals veined with "duck green": head of stamens (?) on anterior petals (?), green on yellow margin: two [unknown word] in center of flower surrounded by space of fine yellow——'. According to Darwin's *Diary*, the Beagle was at Isla Isabela on 30 January. On 31 January he wrote:

The country in this neighbourhead may be called an intermixture of Patagonia & Tierra del Fuego; here we have many plants of the two countries, the nature of the climate being intermediate: a few miles to the South the rounded slate hills & forests of evergreen commence. The country is however, thoroughly uninteresting.

1834 Sts of Magellan

- 816 Sea-weed. dark "olive green"

A brown alga (Phaeophyta); no such specimen was found.

- 821 Esculent parasitical balls on the Beech. do [i.e., ditto, 'P. Famine', Port Famine or Puerto Sacrificios, prov. Magellanes, Chile]

Presumably a species of *Cyttaria* (Cyttariaceae); no specimen with this number was found. Darwin's *Diary* places him at or near Puerto Sacrificios from 2 through 10 February.

- 823 Orchis. Petals all white, 2 central & anterior ones spotted with purple [Marked with an 'x'.]

From the description of the petals, this is *Codonorchis lessonii* (D'Urville ex Duperrey) Lindley (Orchidaceae), one of the five species of orchids known from Tierra del Fuego (Moore, 1983).

A note is written on the facing page: '823. The orchis inhabits the darkest forests: Lichen on rock common pale green (Lichen colour) [unknown word] beautiful "Vermillion & Arterial Blood red" Port Famine'. The lichen and presumed fungus are unidentified. No specimens were found.

1834 Port Famine [i.e., Puerto Sacrificios, prov. Magellanes, Chile]

- 825 Orchis. very shady damp wood no leaves [Marked with an 'x'.]

Codonorchis lessonii (Orchidaceae).

A note on the facing page reads: '825 white. 2 central & interior petals white spotted with purple.——'

1834 May Santa Cruz [prov. Santa Cruz, Argentina]

- 964 Fucus (?). "Blackish Br." [unknown word or words] near root [?]. "Yellowish Br." This [continued on facing page: '964. curious substance was abundant in 8 Fathoms, on rock off Sts. of Magellan.—' Marked with an 'x'.]

Presumably a brown alga (Phaeophyta); I found no specimen. This and the next probably were collected during the second week in May, when the *Beagle* was in transit between Santa Cruz and Tierra del Fuego.

1834 May

969. Sea-weed. color same as common red, delicate sea-weeds: All these came from rocky bottom 8. Fathoms off Sts of Magellan.—[Marked with an 'x'.]

Noted on the facing page is '969. There are small Ascidia [bryozoans] the greater half of which are coloured pale "Vermillion R." [i.e., red].—'. None of these presumed red algae (Rhodophyta) were found.

Port Famine

- 973 Fungus on Beech trees, [Marked with an 'x'.]

A note on the facing page reads: '973. Cup shaped: bright. "Dutch with little [unknown word] O." internal surface, with down like green-gage'. Cited by Berkeley (1842: 446) as '*Exidia auriculata judae*, Fr.' and J. D. Hooker (1847: 449) as '*Exidia auriculata judae*, Fries', the correct name is *Auricularia auricula* (Hook.) Underwood (Auriculariaceae) (Miller & Farr, 1975). I did not find the specimen. The *Beagle* returned to Puerto Sacrificios on 1 June, remaining until the eighth.

1834 ['June' marked out and 'M' added]. Port Famine.—

- 984 Fungi (esculent) V 147(a).—

i.e., see note a on page 147 in the *Zoological Diary*, given above in the discussion under number 528. Like the latter, also *Cyttaria darwinii* Berkeley, but this specimen was not found.

1834 Sept.–Oct. Valparaiso [Chile]

- 1065 Edible Fungus on the Roble. [*Quercus* sp. (Fagaceae)] V 281

Cyttaria berteroi Berkeley, *Trans. Linn. Soc.* 19:41, 1845 (Cyttariaceae); I did not find this collection, which is the type.

The following notes are from page 281 of the *Zoological Diary*; they are printed, with some additions and corrections, in Berkeley (1845: 39):

1834 September Chile

['Fungus on Roble' in margin] On the hills near Nancagua & S. Fernando ['Nancagua and San Fernando' written above] there are large woods of Roble ['Roble' written above] or the Chilian oak; I was surprised to find ['I found on it' in Berkeley] a yellow fungus, ['1065 number on Specimen' in margin] very closely resembling the "edible ones" on the Beech of T. del Fuego. Speaking from memory the differences consist ['difference consists' in Berkeley] in this ['these' in Berkeley] being rather [omitted in Berkeley] paler colored, but the inside of the little [omitted by Berkeley] cups ['of' added in Berkeley] a darker orange. the greatest difference is however in the more irregular shape, in place of ['the' marked out and 'being' added in pencil] spherical ['one' marked out in pencil and 'as' added in pencil] ['of' marked out in pencil] T. del F[uego] added. ['as' to 'Fuego' omitted in Berkeley] They are also much larger: many are 3 times as large as the largest of my ['Fuegian' added in Berkeley]

specimens.—The footstalk appears longer, this is necessary from the roughness of the bark. [‘of the trees on which they grow’ added in Berkeley]—In the young state, there is an internal cavity.—The difference of tree & great difference in climate renders it certain that the Fungi must be distinct. [sentence omitted in Berkeley]—They are occasionally eaten by the poor people.—I observe these Fungi are not infested with Larva (so as to render their origin doubtful) [phrase in parentheses omitted in Berkeley] as [‘like’ in Berkeley] those of T. del Fuego.—

‘Copied’ is written in the margin in pencil, and was later marked out. This is further evidence that a list of plants in spirits of wine was prepared. In his *Diary*, Darwin recorded being in Rancagua (the correct spelling), prov. Santiago, on 6 September.

1834 Arch. of Chiloe [i.e., Archipiélago de Chiloé, Chile]

1102 Necklace-like bright green Conferva: do: [i.e., ditto, ‘C. Tres Montes’, Cabo Tres Montes, prov. Aisén, Chile]

This may be *Chaetomorpha darwinii* (Hook. f.) Kützling (Cladophoraceae, Chlorophyta) or *Stypocaulon funiculare* (Montagne) Kützling (Sphacelariaceae, Phaeophyta), both discussed in the preceding section of this paper. I did not find either collection. Cabo Tres Montes was visited on 31 December.

1834 Decemb. Id. of Inchy [i.e., Isla Ynche, prov. Aisén, Chile]

North part of Tres Montes

1111. Fungus, disc bright scarlet, bordering hairs [?] Dark: growing on wood in the west [?] within shade [?] in forest.—

Reported by Berkeley (1842: 446): ‘*Peziza scutellata*, L., Darw. No. 1111. On rotten wood in a forest. I. of Inchy, N. of Cape Tres Montes. 1834.’ The correct name is *Scutellinia scutellata* (L. ex Fr.) Lambotte (Pyronemataceae) (Miller & Farr, 1975). I did not find this collection. Darwin collected on Isla Ynche on 30 December.

1835 Jan

1142 Potatoes. (wild). Lowes Harbour Chonos A. [i.e., Archipiélago de los Chonos, prov. Chiloé, Chile. Marked with an ‘x’.]

‘1142 V 314’ is written on the facing page. Page 314 of the *Zoological Diary* discusses this collection and dried collection number 2528 (*Solanum tuberosum* var. *vulgare* Hook. f., Solanaceae) and is given above in the first section of this paper. I did not find collection number 1142. The *Beagle* was at Lowes Harbour 7 through 14 January.

Otahite [i.e., Tahiti]

13223 [i.e., 1322 and 1323] Sea-weed (& minute club-headed Coralline) growing on the reef. greenish [unknown word].

I found no specimens bearing these numbers. They are mentioned by Darwin (1842) in his discussion of the coral reefs of Tahiti. The *Beagle* was here 16 through 26 November. He visited the reef on the twenty-second.

The following collections are those marked with a ‘P’ in the third *Specimens in Spirits of Wine* notebook. It is titled ‘Catalogue for Specimens in *Spirits of Wine*’ on the front cover in ink in Darwin’s hand.

- 1835 April. Keeling Is. .—[i.e., Cocos-Keeling Islands]
- 1416 2 species of sea-weed from holes in the reef. The one with a reticulate structure grows in square pyramidal leaves or masses in little tufts. is colored with the same red; as common to Fuci: the other species. common. is of a reddish Salmon color:
I did not find either collection, which presumably are red algae (Rhodophyta).
The Cocos-Keeling Islands, which figure so importantly in Darwin's studies on coral reefs, were visited during 1–12 April.
- 1421 Seaweed. pale green: a fragment of a kind growing like a Lichen
Probably a green alga (Chlorophyta); I did not find it. It and the species of numbers 1416 are mentioned by Darwin (1842) in his discussions of the coral reefs of the Cocos-Keeling Islands.
- 1836
- 1465 Flower & leaves of a low shrubby tree growing on the hills: flower singular dirty white. petals fleshy. Cape de Verd. St. Jago. [i.e., São Tiago] August, end.
No such collection was found.
The *Beagle* visited Proto Praya during 31 August–4 September 1836, toward the end of Darwin's voyage.
The last two entries for plants are in pencil and were added at the end of the voyage. They appear to be for collections made earlier, misplaced, and refound.
- 1493 (no [i.e., number?] lost) *Lycopodium* [i.e., *Lycoperdon*] Maldonado? [Uruguay]
Geastrum saccatum Fr. (Geastraceae). Cited by Berkeley (1842: 447) as 'No. 664. 1493.' (see introduction to the first section of the present paper for a discussion of number 664).
Perhaps number 1493 was substituted for number 664 when the latter was lost from the specimen (specimens in spirits had numbered metal tags attached to them). However, it is just as likely that it was never tagged until number 1493 was attached. The specimen at K does not bear a number.
- 1497 (797) Sea-weed Port Desire [i.e., Puerto Deseado, prov. Santa Cruz, Argentina]
This probably is the 'Sea-weed' listed above under number 797, which has been separated from the two other specimens and given its own collection number. I did not find it.

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