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**ALGAL FLORA OF FRESHWATER
HABITATS ON ALDABRA**

by A. Donaldson and B. A. Whitton

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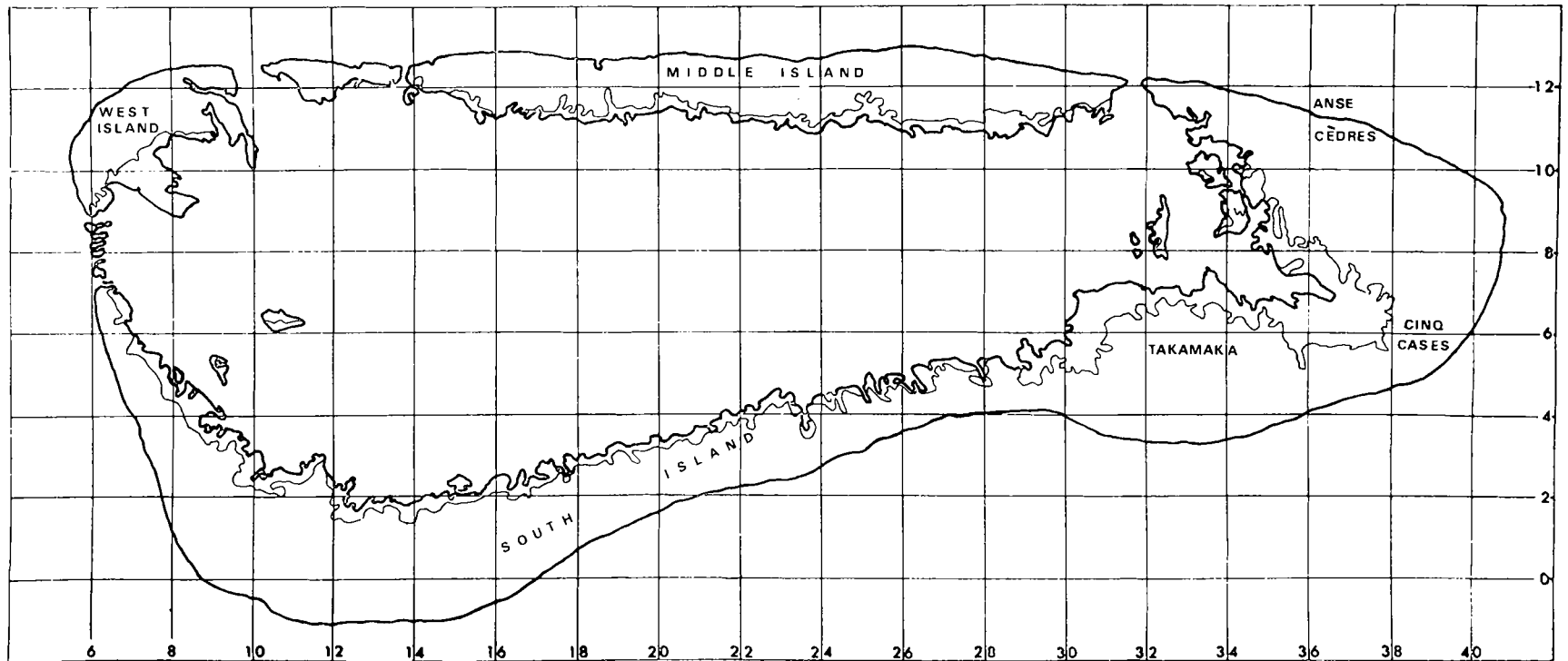


Fig. 1. Aldabra, showing location of places mentioned in text.

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ABSTRACT

An account is given of the algal flora of freshwater habitats on Aldabra, together with ecological notes for each species. The distribution of these species in 20 pools chosen for more detailed study is summarized. Based on their occurrence within these 20 pools, the most widespread species are: *Lyngbya* sp., $\leq 1 \mu\text{m}$ (20); *Calothrix parietina* (15); *Phormidium mucicola* (15); *Lyngbya nordgardhii* (14); *Oscillatoria pseudogeminata* (14); *Phacus orbicularis* (13).

INTRODUCTION

Although freshwaters cover only a small part of the surface of Aldabra, they nevertheless provide a wide variety of habitats for algae. They range, for instance, from shallow depressions holding water for only a few hours to pools permanent throughout the wet season. The physical and chemical parameters of the water may also show considerable variation, as has already been described in the previous paper (Donaldson and Whitton, 1976). Preliminary observations (Whitton, 1971) indicated that the algal flora of freshwater pools was sometimes quite rich in species, so this habitat was chosen for more detailed study in the survey carried out during the wet season. The following account summarizes the floristic observations made during this survey.

METHODS

Location of pools and sampling programme

Observations were made on pools on West Island, Middle Island and South Island. The pools chosen for especially detailed sampling

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included the 20 whose nomenclature and chemistry were described by Donaldson and Whitton (1976), together with a further 79 mostly in the Takamaka, Cinq Cases and Anse Cèdres regions. The maximum level of Cl recorded in the chemical survey of pools was 1260 mg l^{-1} in CC9 ($\pm = 2.3\%$ salinity).

It seems probable that almost all the other pools used for observations were, at any particular stage of drying out, less saline than CC9. However it also seems probable that most pools reach high salinity values towards the end of the wet season. CC9, recorded by us as 2.3% , was reported to have a salinity of 1.5% by McKenzie (1971).

Unless stated otherwise, records were made during the wet season, November 1972 - June 1973. A brief comparison is however added of observations made in December 1968 - January 1969.

The 20 pools listed in Table 1 were sampled on the following number of occasions: W1, 6; W2, 8; W3, 7; W4, 8; W5, 7; W6, 7; W7, 8; W9, 8; W10, 1; W102, 1; W103, 1; T1, 3; T2, 3; CC2, 3; CC5, 3; CC8, 2; CC9, 3; CC10, 1; CC11, 1; CC12, 1. Although only a few details are included here, quantitative plankton counts were made for pools W1, W2, W3, W4, W5, W6, W7 and W9.

Samples were taken from each obvious microhabitat within a pool. The principle microhabitats (together with abbreviations used throughout the text) were as follows:

- F floating at or near the surface (including neuston)
- P plankton
- Ep epilithic
- En endolithic
- El epipellic
- Et epiphytes
- A aufwuchs, not including true epiphytes.

Other microhabitats occurring occasionally included dead wood, leaves and structures resulting from man's activities.

The species recorded are all based on direct microscopy observations. A much fuller list would no doubt have resulted if culture techniques had been used, since under these conditions not only might a few of the rarer plankton species have had an opportunity to develop, but probably also many of the widespread terrestrial species.

Taxonomic

The eukaryotes named have been identified using the floras standard for the respective groups. Although it has so far not proved possible to name the remaining forms, this is in most cases for lack of reproductive stage or because the groups require specialist help. The authors can supply further details of these forms to any workers dealing with algae on other atolls. The separation of the two *Closterium* forms

termed here sp. A and sp. B did however cause difficulty. Sometimes the two forms were quite distinct, whereas on other occasions material was present which appeared intermediate.

The problems involved in naming the blue-green algae (Myxophyta) were rather different. There are several quite different approaches available in the literature for treating these organisms, but none are ideal for producing a descriptive account of field populations including a wide range of forms. The method used in the preparation of this account was as follows. As far as possible, a binomial was allocated using the conventional floras, in particular those of Geitler (1932), Desikachary (1959) and Starmach (1966). For some genera where the limits between species as originally described appear to be based almost entirely on rather arbitrary size (trichome width) limits, we have divided up the overall size range in a more systematic manner, following the practice already adopted by Golubić (1967). We have then used the conventional binomial which corresponds most closely to the modified size limits. These latter are added after the binomial and the author responsible for the original description. The genera treated in this manner are: *Aphanocapsa*, *Aphanothece*, *Chroococcus*, *Gloeocapsa*, *Gloeothece*.

The computer numbers for each species are those used in a recording system produced by B. M. Diaz, N. T. H. Holmes, M. K. Hughes and the authors. Further details of this system are available on request to the authors.

RESULTS

Taxonomic

The list of photosynthetic organisms found in pools is summarized in the next section. It consists entirely of algae with the exception of one aquatic monocotyledon, *Naias graminea*. A few other angiosperms were however occasionally partially submerged in transient pools, this being true especially of the (?) introduced herbs *Portulaca oleracea* and *Stachytarpheta jamaicensis* on West Island.

Algal species which are more typically terrestrial are included within the lists for some pools. This is because some rocks are alternatively submerged and exposed as the water level rises and falls during the wet season.

For convenience all items in the floristic list are termed species in this account, although in a few cases varieties are included, while in others several different forms have been lumped together.

Floristic list

MYXOPHYTA

010215 *Anabaena variabilis* Kütz. P, A.

- 010216 *A. ambigua* Rao. P. Widespread, and sometimes abundant, especially at the beginning of the wet season; later formed spores which dropped on to the bottom.
- 010531 *Aphanocapsa fusco-lutea* Hansg. $> 1 \leq 2 \mu\text{m}$. P, El, A.
- 010532 *A. montana* Cramer. $> 2 \leq 4 \mu\text{m}$. El, A.
- 010533 *A. grevillei* (Hass.) Rabenh. $> 4 \leq 6 \mu\text{m}$. P, El, A.
- 010534 *A. roeseana* de Bary. $> 6 \leq 8 \mu\text{m}$. P, El, A.
- 010535 *A. testacea* (A. Br.) Næg. $> 8 \mu\text{m}$. P, El, A.
- 010536 *A. delicatissima* W. et G. S. West. $\leq 1 \mu\text{m}$. P, El, A.
- 010602 *Aphanothece pallida* (Kütz.) Rabenh. P, Ep.
- 010631 *Aphanothece saxicola* Næg. $\leq 2 \mu\text{m}$. P, El, A.
- 010632 *A microspora* (Menegh.) Rabenh. $> 2 \leq 4 \mu\text{m}$. P, En, El, A.
- 010902 *Calothrix braunii* Born. et Flah. Ep, A. Widespread, especially among floating flocs of other algae; at least probably just growth stage of *C. parietina*.
- 010905 *C. elenkinii* Kossinskaja. Ep.
- 010910 *C. marchica* Lemm. A.
- 010911 *C. parietina* Thuret. Ep. Main cover of most rocks in pools.
- 011302 *Chlorogloea microcystoides* Geitler. Ep.
- 011534 *Chroococcus turgidus* (Kütz.) Næg. $> 8 \leq 16 \mu\text{m}$, lamellate sheath. Ep, A. Widespread.
- 011538 *C. minutus* (Kütz.) Næg. $> 4 \leq 6 \mu\text{m}$, non-lamellate sheath. P, El, A.
- 011539 *C. membranicus* (Menegh.) Næg. $> 6 \leq 8 \mu\text{m}$, non-lamellate sheath. P, El, Ep, A.
- 011540 *C. turicensis* (Næg.) Hansg. $> 8 \leq 16 \mu\text{m}$, non-lamellate sheath. P, El, Ep, A.
- 011541 *C. spelaeus* Ercegovic. $> 16 \leq 32 \mu\text{m}$, non-lamellate sheath. P, El, Ep, A.
- 011811 *Cylindrospermum muscicola*. El, Ep, A.
- 011903 *Dactylocopsis raphidioides* Hansg. P. Rare; recorded only from West Is.

- 011904 *D. rupestris* Hansg. P. Recorded in only two pools. Abundant in CCl1.
- 012201 *Entophysalis granulosa* Kütz. Ep.
- 013107 *Hapalosiphon welwitschii* W. et West. En, Ep.
- 012631 *Gloeocapsa montana* Kütz. > 2 ≤ 4 μm, sheath colourless. P, El, Ep, A.
- 012640 *G. dermochroa* Näg. > 2 ≤ 4 μm, sheath yellow-brown. P, El, Ep, A.
- 012641 *G. kutzingiana* Näg. > 4 ≤ 6 μm, sheath yellow-brown. P, El, Ep, A.
- 012642 *G. muralis* Kütz. > 6 ≤ 8 μm, sheath yellow-brown. P, El, Ep, A.
- 012647 *G. sanguinea* (Ag.) Kütz. > 4 ≤ 8 μm, sheath red-violet-blue. Ep. Predominantly terrestrial, but found occasionally in pools.
- 012731 *Gloeotheca violacea* Rabenh. ≤ 2 μm. Ep.
- 012732 *G. palea* (Kütz) Rabenh. > 2 ≤ 4 μm. Ep, El, A.
- 012733 *G. repestris* (Lyngb.) Bornet > 4 ≤ 6 μm. Ep, El, A. Mainly restricted to terrestrial habitats, but occasional records for pools, where it can form macroscopic colonies overlying rocks.
- 012801 *Gloeotrichia echinulata* (J. E. Smith) P. Richter. Et.
- 012802 *G. ghosei* R. N. Singh. Et. Forms large brown lobed colonies on *Chara*.
- 012901 *Gomphosphaeria aponina* Kütz. P. Rare.
- 013313 *Homoeothrix varians* Geitler. Et. Frequent epiphyte on *Gongrosira*, and sometimes also on dead wood.
- 013601 *Hyella caespitosa* Born. et Flah. En.
- 013602 *H. fontana* Huber et Jadin. En. Especially abundant in pools W5 and W6.
- 013604 *H. balani* Lehmann. En.
- 013801 *Johannesbaptistia pellucida* (Dickie) Taylor et Drouet. P. Found only in the more brackish pools, where it sometimes formed large floating clumps.

- 014101 *Lithonema adriaticum* Erceg. En. Recorded only from W2.
- 014201 *Lyngbya aestuarii* Liebm. F, P. Very abundant in CC9
- 014202 *L. allorgei* Frémy. El, A.
- 014203 *L. aerugineo-coerulea* (Kütz.) Gom. F, El, A.
- 014204 *L. confervoides* Ag. F, P, A.
- 014205 *L. digueti* Gom. Fl, El, A. Widespread.
- 014206 *L. epiphytica* Hieron. Et. Frequently recorded epiphyte on *Plectonema gloeophilum* and *Oedogonium*.
- 014207 *L. hieronymusii* Lemm. F, P, El. Forms olive-green floating mats in pools in Casuarina Forest; eaten by *Cardisoma*.
- 014208 *L. kutzingii* Schmidle. Et. Occasional epiphyte on *Oedogonium*
- 014209 *L. limnetica* Lemm. F, P. Widespread.
- 014210 *L. majuscula* Harvey. F, Ep, El.
- 014211 *L. martensiana* Menegh. Ep, El, A. Widespread, and often abundant, either among other algae, or forming nearly unigal sheets.
- 014212 *Lyngbya nordgardhii* Wille. Ep. Widespread.
- 014214 *L. pusilla* (Rabh.) Hansg. Et. Frequent epiphyte of *Plectonema gloeophilum*, *Oedogonium* and *Pithophora*.
- 014215 *L. rigidula* (Kütz.) Hansg. Et. Frequent epiphyte of *Plectonema gloeophilum*, *Oedogonium* and *Pithophora*.
- 014231 *Lyngbya* sp., not above, $\leq 1 \mu\text{m}$. El, A. Probably = *L. erebi* W. and G. S. West.
- 014232 *Lyngbya* sp., not above, $> 1 \leq 2 \mu\text{m}$. El, A.
- 014603 *Merismopedia trolleri* Bachmann. El. South Is. only.
- 014631 *M. minima* G. Beck. $\leq 1 \mu\text{m}$. El. South Is. only.
- 014632 *M. tenuissima* Lemm. $> 1 \leq 2 \mu\text{m}$. El. South Is. only.
- 014633 *M. punctata* Meyen. $> 2 \leq 4 \mu\text{m}$. El. A record from pool W2 is only one for any species of this genus away from South Is.
- 014634 *M. glauca* (Ehrenb.) Näg. $> 4 \leq 6 \mu\text{m}$. El. South Is. only.

- 014707 *Microchaetetenera* Thuret. Ep. Generally rare, but large growths developed in the research station reservoirs and in the gutters of the solar stills.
- 014801 *Microcoleus chthonoplastes* Thuret. Ep, El.
- 014802 *M. sociatus* W. et G. S. West. Ep, El. Occasional, and never abundant.
- 014902 *Microcystis flos-aquae* (Wittr.) Kirchn. P. South Is. only, where it sometimes forms dense blooms.
- 015201 *Nostoc carneum* Ag. F, P. For most of the wet season present in only small amounts, but towards the end of wet season produced large floating colonies in some West Is. and Middle Is. pools.
- 015202 *N. commune* Vaucher. F, El. A species characteristic of depressions which receive frequent re-wetting and drying out during the wet season; not a typical component of vegetation of pools holding water for long periods.
- 015207 *N. microscopicum* Carm.
- 015210 *N. punctiforme* (Kütz.) Hariot. P, Ep, El, A. Occurs mostly on rocks in pools but occasionally also planktonic in the vicinity of *Chara* and *Naias*.
- 015213 *N. sphaericum* Vaucher. El. Forms characteristic spherical colonies up to 20 mm diameter in the Cinq Cases region; shallow depressions which have collected water may have their bottom almost covered with these colonies.
- 015218 *N. piscinale* Kütz. F, P, El, A.
- 015504 *Oscillatoria amphibia* Ag. El, A.
- 015505 *O. angusta* Koppe. El, A.
- 015506 *O. animalis* Ag. F, El, A. Often the first alga to appear when a pool is wetted, when it forms green sheets over the mud, which eventually rise as the pool deepens; eaten by *Cardisoma*.
- 015508 *O. brevis* (Kütz) Gom. F, El, A.
- 015509 *O. chalybea* (Mertens) Gom.
- 015510 *O. chlorina* Kütz. El, A.
- 015511 *O. claricentrosa* Gardner. El, A.
- 015514 *O. geminata* Menegh. El, A.

- 015517 *O. limosa* Ag. El, A.
- 015518 *O. mougeoti* Kütz. El, A.
- 015521 *O. proboscoidea* Gom. El, A.
- 015523 *O. pseudogeminata* Schmidle. El, A. Widespread, and recorded frequently throughout the wet season.
- 015538 *Oscillatoria* sp., > 32 μ m. F, P, El. An exceptionally large form for *Oscillatoria*; although it was suspected of being a growth stage of *Lyngbya majuscula*, it was not possible to establish this. Restricted to South Island, and most abundant in the more brackish pools, where it forms sheets which lift of the bottom mud, and are eaten by *Cardisoma* and tortoises.
- 015585 *Oscillatoria tenuis* Ag. El, A.
- 015586 *O. acuta* Bruhl et Biswas. El, A.
- 015587 *O. acuminata* Gom. El, A.
- 015588 *O. acutissima* Kuff. El, A.
- 015589 *O. amphigranulata* Woronich. El, A.
- 015590 *O. guttulata* van Goor. El, A.
- 015591 *O. jasorvensis* Vouk. El, A.
- 015592 *O. koetlitzii* Fritsch. El, A.
- 015593 *O. lacustris* (Kleb.) Geitler. El, A.
- 015594 *O. limnetica* Lemm. F, El, A.
- 015595 *O. nigra* Vaucher. El, A.
- 015596 *O. obscura* Bruhl et Biswas. El, A.
- 015597 *O. okeni* Ag. El, A.
- 015598 *O. tambi* van Goor. El, A.
- 015701 *Phormidium africanum* Gom. Ep, A.
- 015704 *P. foveolarum* Gom. Ep, A.
- 015705 *P. hendersonii* Lemm. Ep, A.
- 015707 *P. jenkelianum* Schmidle. Ep, A.

- 015708 *P. mucicola* Huber-Pestalozzi et Naumann. Ep, A. Frequently present in the mucilage of other species.
- 015769 *P. bohneri* Schmidle. Ep, A.
- 015770 *P. corium* Gom. Ep, A.
- 015771 *P. molle* Gom. Ep, A.
- 015772 *P. usterii* Schmidle. Ep, A.
- 015773 *P. fragile* Ep, A.
- 015802 *Plectonema boryanum* Gom. F, Ep, A. Frequent both as epilith and forming a network of filaments among floating algae.
- 015806 *P. gloeophilum* Borzi. F, Ep, El, A. Abundant, especially in West Is. pools where it often formed pink globular floating lumps which sometimes became the dominant alga.
- 015807 *P. gracillimum* (Zopf.) Hansg. F, Ep, El, A.
- 015815 *P. tomasinianum* Bornet. F, El.
- 015817 *P. notatum* Schmidle. Ep, El, A.
- 015818 *P. puteale* (Kirchn.) Hansg. Ep, El, A.
- 015901 *Pleurocapsa aurantiaca* Geitler. Ep, El, A.
- 015903 *P. amethystea* Kold. Ep, El, A. Recorded only from pool W1.
- 015931 *P. minor* Hansg. Ep, El, A. Widespread and often abundant.
- 016101 *Pseudanabaena catenata* Lauterb. El, A.
- 016103 *P. schmidlei* Jaag. El, A.
- 016104 *P. schmidlei* Jaag var. *gracilis* Skuja. El, A.
- 016301 *Radaisia cornua* Sauv. Ep.
- 016602 *Schizothrix arenaria* (Berk.) Gom. Ep. Occasional in pools on West Is., rare elsewhere.
- 016604 *S. calcicola* (Ag.) Gom. Ep.
- 016801 *Siphononema polonicum* Geitler. Ep. Only one record, from W2.
- 016901 *Spirulina subsalsa* Oerstd. El, A. Most abundant in South Is. pools, especially the more brackish ones where it sometimes became the dominant species.

- 016933 *Spirulina gigantea* Schmidle > 2 ≤ 4. μm.
- 017432 *Synechococcus cedrorum* Sauv. > 2 ≤ 4 μm. El, A.
- 017435 *S. aeruginosus* Näg. > 8 ≤ 16 μm. Ep, El, A.
- 017436 *S. maior* Schroeter. > 16 ≤ 32 μm. El, A.
- 017437 *S. maior* Schroeter var. *maximum* Elenkin et Hollerbach. > 32 μm.
- 017451 *Synechococcus* ≤ 2 μm. El, A.
- 017602 *Tolypothrix byssoidea* (Berk.) Kirchn. Ep. One of the main terrestrial algae of Aldabra: pool records probably in large part due to inwash of terrestrial material.
- 017606 *T. distorta* Kütz. Ep, El, A. Occasional. Truly aquatic species.
- 017801 *Westiellopsis prolifica* Janet. Ep. Restricted to moist rock just above maximum water level of pools.
- 018033 *Xenococcus keneri* Hansg. Et. Rare. Epiphyte of *Oedogonium* sp. and *Portulaca* sp.
- 018101 *Chroococcopsis gigantea* Geitler. Ep, A. Especially abundant in pool W2.

EUGLENOPHYTA

- 030201 *Euglena acus* Ehrb. P, El, A. A common species, especially on West Is.; dominant in W2 in the wet season.
- 030202 *E. gracilis* Klebs. P, El, A. One of the most widespread species on Aldabra.
- 030205 *E. spirogyra* Ehrb. P, El. Only 2 records, both from W2.
- 030206 *E. minuta* Presc. P, El, A. Widespread, but most abundant in West Is. pools.
- 030207 *Euglena oxyuris* Schmarda. P, El, A.
- 030249 *Euglena* spp., not above. P, El, A.
- 030401 *Lepocinclis ovum* (Ehrenb.) Lemm. P. Abundant in West Is. pools, rare elsewhere.
- 030501 *Phacus caudatus* Hüb
- 030502 *Phacus orbicularis* Hüb. P, El, A. One of the most widespread species, usually present throughout the wet season.

- 030601 *Trachelonomas hispida* (Perty) Stein emend. Deflandre var.
coronata Lemm. P.
- 030602 *Trachelomonas volvocina* Ehrb. P. Formed nearly unialgal
blooms in W5 and W6 for a short period, occasional records
elsewhere.

CRYPTOPHYTA

- 049931 cryptomonad ≤ 8 μm long blue-green. P.
- 049932 cryptomonad, $> 8 \leq 16$. μm long, blue-green. P.
- 049956 cryptomonad, $> 16 \leq 32$ μm long, brown. P.
- 049959 cryptomonad, > 16 μm long, green. P.

PYRROPHYTA

- 059969 dinoflagellate A. P, Et. Occurs both as epiphyte on
Oedogonium and free-living. Recorded only on West Is.
- 059970 dinoflagellate B. P. Recorded only towards end of wet
season. Widespread, but never abundant.

XANTHOPHYTA

- 061150 *Goniochloris* sp. P.
- 062050 *Akanthochloris* sp. P, A.

CHRYSOPHYTA

- 081450 *Synura* sp. P. Rare.

BACILLARIOPHYTA

Centrales. Records for centric diatoms on South Is. only

- 090750 *Chaetoceros* sp.
- 099151 centric diatom ≤ 8 μm diameter. P, A.
- 099152 centric diatom $> 8 \leq 16$ μm diameter. P, A.

Pennales

- 100250 *Amphora* spp. El, A. At least two distinct species.
- 101901 *Nitzschia acicularis* W. Smith. P, A. Only records from
South Is.

- 101904 *N. palea* (Kütz.) W. Smith. P, El, A. By far the most widespread freshwater diatom.
- 109950 pennate diatom, other spp. P, El, A.

CONJUGATOPHYTA

- 120269 *Closterium* sp. A, F, El, A. Very abundant on West Is., where it forms conspicuous growths - less abundant on other islands.
- 120270 *Closterium* sp. B. F, El, A.
- 120271 *Closterium cynthia* De. Not. P, A.
- 120272 *Closterium* sp. D. P, A.
- 120369 *Cosmarium blyttii* Wille. P, A. Widespread, but not forming large populations. Present throughout wet season.
- 120370 *Cosmarium polygonum* (Näg.) Arch. P, A.
- 120306 *Cosmarium subcostatum* Nordst. P, A.
- 120372 *Cosmarium tinctum* Ralfs. P, A.
- 120373 *Cosmarium trachydermum* West and G. S. West. P, A.
- 121451 *Mougeotia* sp., c. 7 μ m P. Only record in water-catchment drum, Middle Is.
- 122154 *Spirogyra* sp., > 32 \leq 48 μ m, 1 chloroplast, non replicate. P, El. Found only on South Is.
- 122469 *Staurastrum polymorphum* Bréb. P, A.
- 122470 *Staurastrum* sp. B. P, A.
- 122471 *Staurastrum* sp. C. P, A.
- 122472 *Staurastrum* sp. D. P, A.

CHLOROPHYTA

Volvocales

- 130201 *Carteria globosa* Korshik. P. Recorded only for one pool near Anse Cédres.
- 130402 *Chlamydomonas globosa* Snow. P. Widespread, especially on West Is. and Middle Is.
- 130450 *Chlamydomonas* sp. P.

- 130901 *Eudorina elegans* Ehrb. P, A. Widespread, especially on West Is. and Middle Is.
- 131150 *Gonium* sp.
- 131601 *Phacotus lenticularis* (Ehrb.) Stein. P, A. Widespread and often abundant.
- 132601 *Pleodorina californica* Shaw. P. Only one record, from South Is.

Chlorococcales

- 140201 *Ankistrodesmus acicularis* (A. Br.) Korshik. P.
- 140205 *A. braunii* Brunnth. P.
- 140206 *A. falcatus* (Corda) Ralfs. P.
- 140207 *A. longissimus* Lemm. Wille. P.
- 140208 *A. minutissimus* Korshik. P. Occasionally the dominant species in the plankton. Maximum population recorded = 3.6×10^4 cells/ml on 5 Feb 1973 in pool W4.
- 140209 *A. mucosus* Korshik. P, A.
- 140210 *A. pseudomirabilis* Korshik. P. Often abundant.
- 140402 *Characium ornithocephalum* A. Br. Et. Rare.
- 140403 *Characium strictum* A. Br. Et. Rare, except for one sample from W5/W6.
- 140501 *Chlorella ellipsoidea* Gerneck P, A.
- 140504 *C. vulgaris* Beyer. P, A.
- 140508 *C. mucosa* Korshik. P, A.
- 141003 *Coelastrum cambricum* Arch. var. *rugosum* Rich. P.
- 141009 *Coelastrum microporum* Näg. P.
- 141501 *Dimorphococcus lunatus* A. Br. P. Recorded only on South Is., where it occasionally formed blooms.
- 142102 *Golenkinia radiata* Chod. P, A. Recorded only on South Is., where it is widespread.
- 142401 *Kentrosphaera bristolae* G. M. Smith. E1, A.
- 142650 *Micractinium* sp. P.

- 142750 *Nautococcus* sp. F, P. Forms distinctive yellow-green surface scums on some West Is. pools.
- 142902 *Oocystis crassa* Wittr. P, A.
- 142907 *O. parva* W. et G. S. West. P, A.
- 142910 *O. pusilla* Hansg. P, A.
- 143103 *Pediastrum boryanum* P, A.
- 143501 *Scenedesmus acuminatus* (Lag.) Chodat. P, A.
- 143501 *S. acuminatus* (Lag.) Chodat var. *biseriatus* Reinh. P, A.
- 143513 *S. bijugatus* (Turp.) Lagerheim. P, A. Widespread, and often quite abundant.
- 143513 *S. bijugatus* (Turp.) Lagerheim var. *alternans* (Reinsch) Hansg. P, A.
- 143508 *S. obliquus* (Turp.) Kütz. P, A.
- 143510 *S. quadricauda* (Turp.) Bréb. P, A.
- 143510 *S. quadricauda* (Turp.) Bréb. var. *abundans* Kirchn. P.
- 143510 *S. quadricauda* (Turp.) Bréb. var. *setosus* Kirchn. P, A.
- 144102 *Tetraedron incus* (Teil.) G. M. Smith. P, A.
- 144103 *T. minimum* (A. Br.) Hansg. P, A.
- 144104 *T. muticum* (A. Br.) Hansg. P, A.
- 144403 *Treubaria triappendiculata* Bern. P, A.
- 144605 *Lagerheimia genevensis* Chodat. P. Recorded only in Jan. 1969.
- 144703 *Sorastrum spinulosum* Näg. P.
- Ulotrichales & Chaetophorales
- 150150 *Apatococcus* sp.
- 150250 *Aphanochaete* sp. Et.
- 151202 *Hormidium rivulare* Kütz. El.
- 152301 *Endoderma reineckeii* Schmidle. Et. Almost restricted to being epiphytic on *Pithophora*.

- 152901 *Gongrosira debaryana* Rabh. Ep, El. Widespread, and usually abundant.
- 152949 *Gongrosira* sp. A. Ep, El.
- 154435 *Stichococcus bacillaris* Näg. Ep. Rare.
- 154603 *Trentepohlia iolithus* (L.) Wallr. Ep. Widespread. When pools dry down, this species is visually obvious as a pink or orange covering.
- 154604 *T. odorata* (Wiggers) Wittrock. Ep.
- 154734 *Ulothrix tenerrima* Kütz. Ep. El.
- 15995 Chaetophorales spp. other El.
- 160731 *Oedogonium* sp., < 8 μ m. F, Ep, El, Et.
- 160732 *Oedogonium* sp., > 8 μ m \leq 12 μ m. F, Ep, El, Et.
- 160733 *Oedogonium* sp., > 12 \leq 16 μ m. F, Ep, El, Et.
- 160734 *Oedogonium* sp., > 16 \leq 20 μ m. F, Ep, El, Et.
- 160801 *Pithophora oedogonia* (Mont.) Wittr. F, Et. Widespread, but seldom abundant. Sometimes used by White-eye as almost exclusive nest material.
- 161050 *Rhizoclonium* sp. F, Et.

CHAROPHYTA

- 170106 *Chara zeylanica* Kl. ex Willd. var. *diaphana* (Meyer) R. D. Wood

ANGIOSPERM

- 251602 *Naias graminea* Del.

Distribution within 20 pools also studied for water chemistry

The distribution of species within the 20 pools described by Donaldson and Whitton (1976) is shown in Table 1, while some of the observations on these pools are summarized in Table 2.

GENERAL OBSERVATIONS

Geographical

Some species were found only on West Is., while others only on South Is. The following are some examples:

West Is. (all restricted to only one or a few pools)

Gomphonema aponina (not var. *multiplex*), *Siphononema polonicum*, *Euglena spirogyra*, dinoflagellate A, *Akanthochloris* sp., *Characium ornithocephalum*, *C. strictum*.

South Is.

widespread species:

Microcystis flos-aquae, *Spirogyra* sp., *Staurastrum* spp., *Coelastrum cambricum*, *Dimorphococcus lunatus*, *Golenkinia radiata*, *Tetraedron incus*, *Naias graminea*

locally frequent or abundant species:

Gloeotrichia ghosei, *Nostoc sphaericum*, *Oscillatoria* sp. > 32 μ m, *Chara zeylanica*

restricted to only one or a few pools:

Johannesbaptistia pellucida, cryptomonad (> 16 μ m, long green), *Carteria globosa*.

In a few cases the reasons for the distribution of a species being restricted are fairly clear. For instance *Gloeotrichia ghosei* occurs only as an epiphyte on *Chara*, which latter has itself a restricted distribution. It is worth commenting that the first three species listed as restricted to West Is. were found only in W2, the most eutrophic of any pool studied on Aldabra. The four species listed as locally frequent or abundant all had the focus of their distribution in the region of CC9 (Bassin Flamant).

It is difficult to suggest any obvious factor of pool morphology or chemistry which might inhibit the spread to West Is. of some of the species widespread on South Is. *Microcystis* and *Spirogyra*, which are visually very obvious, were certainly quite absent from West Is. in both 1969 and 1973.

Seasonality

Examples of species which produced by far their largest crops early in the season are: *Oscillatoria animalis*, *Closterium* sp. A, *Eudorina elegans*, *Oedogonium* spp., *Pithophora oedogonia*. The *Pithophora* tended to form spores which dropped into the mud, and which presumably did not germinate until the pool dried out and became re-wetted. Examples of species which were evident only towards the end of the season are: *Gloeotrichia ghosei*, *Trachelomonas volvocina*, dinoflagellate B.

Influence of specific environmental factors on pool flora

(a) Pools which were intermittent rather than permanent through the wet season tended to have a relatively sparse flora, as is shown for W3, W10 and CC11 in Table 2. On the other hand the total surface area of the pool appears to have rather little influence on the richness of its flora, as can be seen by comparing Table 1 of Donaldson and Whitton (1976) with Table 2 of this paper. For example, W4, the pool for which the largest number of species were recorded, has a maximum surface area of only about 3.5 m².

Macroscopic colonies of *Nostoc* were almost always obvious in transient pools. Although these colonies occurred in various morphological forms, it seems probable that these may all be referred to one of the three binomials, *N. commune*, *N. microscopicum* and *N. sphaericum*. The other important algal components of such pools were mostly species of *Lyngbya*, *Phormidium* and *Plectonema*. Transient pools had few flagellates, and never became green with floating algal flocs on the surface.

(b) Although permanent throughout the 1972/73 wet season, two other pools, W102 and W103, both had a very restricted flora (Table 2). Both these pools were dominated throughout most of the period by blooms of *Euglena gracilis*.

(c) Several species were restricted to the more saline of the pools included in this survey e.g. *Johannesbaptistia pellucida*, *Spirulina subsalsa*.

Grazing

Planktonic algae sometimes showed a rapid fall in population density, and in some such cases observations strongly suggested that grazing by planktonic animals was responsible. For instance, the rapid development of a population of ostracods was probably responsible for the destruction of a dense *Ankistrodesmus falcatus* population in W2.

Larger algae were on many occasions observed to be eaten by crabs. For instance grazing by *Cardisoma carniflex* appeared to have a clear impact on the floating mats of *Oscillatoria animalis* which developed early in the season in W2, while this species was frequently observed to eat *Spirogyra* and *Chara* in the Bassin Flamant region. *Nostoc* colonies may possibly be less vulnerable to grazing by crabs than these other species, but *Cardisoma carniflex* was seen to eat *N. commune* in W10. *Geocrapsis stormi* was seen to eat *Oscillatoria animalis* and *Oedogonium* in W1.

As already noted by Grubb (1971) tortoises also often eat some of the larger algae. This occurred for instance, with the flocs of *Oscillatoria* sp. > 32 μ m and *Spirogyra* in CC5 and CC10. During observations made on CC10 throughout one day it became clear that tortoise grazing had an obvious impact on growths of both species. Tortoises were not seen to eat *Nostoc* colonies, though these were often readily available.

Comparison of 1968/69 observations with 1972/73 observations

Although most of the observations reported in this paper were made during the 1972/73 survey floristic notes were also made during the 1968/69 survey. The former survey was much less extensive both in time and in number of pools studied, and only about half the number of species listed for 1972/73 were found in 1968/69. Three species were recorded only in the earlier survey: *Wolleea bharadwajae*, ?*Lobomonas* sp., *Lagerheimia genevensis*. (Of these, the material recorded as *Wolleea*

bharadwajae may possibly have been only a form of *Anabaena ambigua* growing in the Cinq Cases region).

Pools W1, T1 and T2 were studied in both surveys, and the floras recorded in both surveys tended to be rather similar. In T1, five species were recorded in the two samplings made in 1968/69 but not in the three of 1972/73, while 11 species were recorded in 1972/73 but not 1968/69. However almost as many differences were recorded between individual surveys made within either of the two seasons.

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Table 1. Distribution of photosynthetic organisms in the 20 freshwater pools included within water chemistry survey

	W1	W2	W3	W4	W5	W6	W7	W9	W10	W102	W103	T1	T2	CC2	CC5	CC8	CC9	CC10	CC11	CC12	Total
<i>Anabaena variabilis</i>	+											+		+	+	+	+			+	7
<i>A. ambigua</i>	+			+								+		+	+	+	+			+	8
<i>Aphanocapsa fusco-lutea</i>	+	+		+	+	+	+										+				7
<i>A. montana</i>	+	+	+	+	+			+	+				+					+			9
<i>A. grevillei</i>	+		+	+			+	+	+				+	+	+	+				+	12
<i>A. roeseana</i>	+			+		+	+	+					+	+			+			+	9
<i>A. delicatissima</i>			+				+											+			3
<i>Aphanothece saxicola</i>	+																+	+			3
<i>A. microspora</i>	+		+										+	+	+						5
<i>A. microscopica</i>	+		+			+	+	+			+			+	+						8
<i>Calothrix braunii</i>	+		+	+	+		+	+	+				+		+	+				+	11
<i>C. elenkinii</i>														+	+	+					2
<i>C. marchica</i>				+		+	+	+		+			+		+						7
<i>C. parietina</i>	+	+	+	+	+	+	+		+		+	+	+	+	+	+				+	15
<i>Chlorogloea microcystoides</i>	+			+																	2
<i>Chroococcus turgidus</i>	+	+							+				+	+	+					+	7
<i>C. minutus</i>	+			+			+	+									+			+	6
<i>C. membranicus</i>	+			+			+	+						+			+			+	7
<i>C. turicensis</i>			+	+								+	+	+							5
<i>C. spelaeus</i>				+																	1
<i>Dactylococcopsis raphodioides</i>		+			+	+															3
<i>C. rupestris</i>	+																		+		2
<i>Entophysalis granulosa</i>	+						+	+								+		+			5
<i>Hapalosiphon welwitschii</i>	+	+		+			+	+	+												6
<i>Gloeocapsa montana</i>	+			+																	2
<i>G. dermochroa</i>		+		+																	2
<i>G. kutzingiana</i>		+		+																	2
<i>G. muralis</i>				+																	1
<i>G. sanguinea</i>	+	+	+	+	+	+	+	+	+												9
<i>G. rupestris</i>	+						+	+							+						4
<i>Gloeotrichia ghosei</i>																	+				1
<i>Gomphosphaeria aponina</i>		+																			1
<i>Homoeothrix varians</i>		+			+	+	+	+			+	+				+		+		+	10

	W1	W2	W3	W4	W5	W6	W7	W9	W10	W102	W103	T1	T2	CC2	CC5	CC8	CC9	CC10	CC11	CC12	Total
<i>Hyella caespitosa</i>																		+			1
<i>H. fontana</i>	+	+		+	+	+	+	+					+	+	+	+				+	12
<i>Johannesbaptistia pellucida</i>																		+			1
<i>Lithonema adriaticum</i>		+																			1
<i>Lyngbya aestuarii</i>																		+			1
<i>L. allorgei</i>	+	+			+		+						+	+				+			7
<i>L. aerugineo-coerulea</i>					+																1
<i>L. confervoides</i>														+	+			+		+	4
<i>L. digueti</i>	+	+	+	+	+	+	+	+		+			+	+				+			12
<i>L. epiphytica</i>	+		+	+	+																4
<i>L. hieronymusii</i>				+		+	+						+		+						5
<i>L. kutzingii</i>					+																1
<i>L. limnetica</i>			+	+	+	+	+														5
<i>L. martensiana</i>														+	+			+	+		5
<i>L. nordgardhii</i>	+	+		+	+	+	+	+	+			+	+		+	+		+	+		14
<i>L. pusilla</i>	+	+		+			+	+	+			+						+			8
<i>L. rigidula</i>	+			+	+	+	+		+												6
<i>Lyngbya sp., not above, < 1 µm</i>	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	20
<i>Lyngbya sp., not above, > 1 ≤ 2 µm</i>	+			+		+															3
<i>Merismopedia trolleri</i>												+									1
<i>M. tenuissima</i>													+		+						2
<i>M. punctata</i>		+										+		+	+			+		+	6
<i>M. glauca</i>													+		+			+			3
<i>Microcoleus chthonoplastes</i>	+														+						2
<i>M. sociatus</i>							+														1
<i>Microcystis flos-aquae</i>														+	+	+	+			+	5
<i>Nostoc carneum</i>	+					+															2
<i>N. commune</i>			+							+		+			+						4
<i>N. microscopicum</i>	+		+							+		+									4
<i>N. punctiforme</i>	+	+		+		+	+					+					+	+		+	9
<i>N. spaericum</i>																				+	1
<i>N. piscinale</i>						+															1
<i>Oscillatoria amphibia</i>														+							1
<i>O. angusta</i>		+			+	+	+	+		+	+			+	+			+			10

	W1	W2	W3	W4	W5	W6	W7	W9	W10	W102	W103	T1	T2	CC2	CC5	CC8	CC9	CC10	CC11	CC12	Total
<i>O. animalis</i>	+	+		+	+	+	+	+	+				+		+		+	+			12
<i>O. chlorina</i>				+			+	+					+								4
<i>O. claricentrosa</i>															+						1
<i>O. geminata</i>	+											+	+								3
<i>O. limosa</i>				+			+	+									+				4
<i>O. mougeotii</i>			+				+								+						3
<i>O. proboscoidea</i>													+								1
<i>O. pseudogeminata</i>	+	+	+	+	+	+	+	+	+	+		+	+		+					+	14
<i>O. subtilissima</i>												+						+			2
<i>O. tenuis</i>	+			+		+							+		+		+				6
<i>O. amphigranulata</i>		+				+	+							+							4
<i>O. brevis</i>		+		+	+	+	+	+		+				+				+			9
<i>O. gluttulata</i>													+								1
<i>O. koetlitzii</i>												+									1
<i>O. lacustris</i>															+						1
<i>O. limnetica</i>												+									1
<i>O. obscura</i>																		+			1
<i>O. tambi</i>			+																		1
<i>Oscillatoria</i> sp. > 32 µm																	+	+		+	3
<i>Phormidium africanum</i>													+								1
<i>P. foveolarum</i>	+	+		+																	3
<i>P. hendersonii</i>	+					+		+				+			+			+		+	7
<i>P. jenkelianum</i>	+		+	+	+				+											+	6
<i>P. mucicola</i>	+		+	+	+	+	+	+	+				+	+	+	+		+	+	+	15
<i>P. bohneri</i>		+		+	+	+		+	+												6
<i>P. corium</i>				+																	1
<i>P. molle</i>	+	+			+								+								4
<i>P. usterii</i>				+																	1
<i>P. fragile</i>	+	+	+	+	+	+	+		+			+	+	+			+	+		+	14
<i>Plectonema boryanum</i>				+				+				+							+	+	5
<i>P. gloeophilum</i>	+		+	+		+	+	+	+	+											8
<i>P. gracillimum</i>	+			+										+			+	+		+	6
<i>P. notatum</i>									+												1
<i>P. puteale</i>																	+				1

	W1	W2	W3	W4	W5	W6	W7	W9	W10	W102	W103	T1	T2	CC2	CC5	CC8	CC9	CC10	CC11	CC12	Total
<i>Euglena acus</i>	+	+													+						3
<i>E. gracilis</i>	+	+	+	+	+		+	+		+	+	+					+			+	12
<i>E. spirogyra</i>		+																			1
<i>E. minuta</i>		+			+	+	+	+			+	+					+				8
<i>E. oxyuris</i>					+	+					+										3
<i>E. spp. not above</i>					+										+						2
<i>Lepocinclis ovum</i>					+	+	+														3
<i>Phacus orbicularis</i>	+	+		+	+	+	+	+		+	+	+	+	+						+	13
<i>Trachelomonas volvocina</i>				+	+	+															3
cryptomonad > 8 ≤ 16 μm long, blue-green		+					+	+													4
cryptomonad > 16 ≤ 32 μm long, brown															+					+	2
cryptomonad > 16 μm long, green												+									1
dinoflagellate A.	+			+		+															3
dinoflagellate B.	+		+	+	+	+												+			6
<i>Akanthochloris</i> sp.	+				+	+		+													4
centric diatom ≤ 8 μm diameter													+							+	2
<i>Amphora</i> sp. B																				+	2
<i>Nitzschia palea</i>				+	+		+	+		+		+	+	+	+		+	+		+	12
pennate diatom, other spp.										+		+	+	+		+	+				6
<i>Closterium lanceolatum</i>	+	+		+	+	+	+	+		+		+									9
<i>Closterium</i> sp. B.	+			+		+	+														4
<i>Closterium</i> sp. D.																					3
<i>Cosmarium blyttii</i>	+			+		+						+			+		+			+	6
<i>Cosmarium polygonum</i>															+		+		+		4
<i>Cosmarium subcostatum</i>															+		+		+	+	4
<i>Cosmarium tinctum</i>																				+	1
<i>Cosmarium trachydermum</i>																				+	1
<i>Spirogyra</i> > 32 ≤ 48 μm, 1 chloroplast, non-replicate												+			+			+			3
<i>Staurostrum polymorphum</i>															+					+	2
<i>Staurostrum</i> sp. B.															+						1
<i>Chlamydomonas globosa</i>		+	+		+	+	+	+		+											7
<i>Chlamydomonas</i> spp., other		+	+		+	+	+		+												6
<i>Eudorina elegans</i>	+			+		+	+	+				+			+						7

	W1	W2	W3	W4	W5	W6	W7	W9	W10	W102	W103	T1	T2	CC2	CC5	CC8	CC9	CC10	CC11	CC12	Total
<i>Phacotus lenticularis</i>				+	+		+	+				+			+				+	+	8
<i>Ankistrodesmus acicularis</i>		+		+			+					+	+				+				6
<i>A. braunii</i>	+	+		+	+		+	+		+	+										9
<i>A. falcatus</i>		+		+		+	+						+				+				7
<i>A. longissimus</i>		+																			1
<i>A. minutissimus</i>	+	+		+		+	+					+	+								7
<i>A. pseudomirabilis</i>				+			+								+		+			+	5
<i>Characium ornithocephalum</i>				+																	1
<i>C. strictum</i>			+		+																2
<i>Chlorella ellipsoidea</i>	+	+																			2
<i>C. vulgaris</i>	+		+		+	+	+	+													6
<i>C. mucosa</i>		+																			1
<i>Coelastrum cambricum</i> var. <i>rugosum</i>														+	+						2
<i>C. microporum</i>		+										+	+	+	+					+	6
<i>Dimorphococcus lunatus</i>												+				+					2
<i>Golenkinia radiata</i>												+		+	+	+	+			+	6
<i>Kentrosphaera bristolae</i>	+				+	+	+	+													5
<i>Nautococcus</i> sp.	+			+	+	+	+													+	6
<i>Oocystis crassa</i>					+													+			2
<i>O. parva</i>	+			+			+								+					+	5
<i>O. pusilla</i>	+			+																	2
<i>Scenedesmus acuminatus</i>														+	+					+	3
<i>S. acuminatus</i> var. <i>biseriatus</i>															+						1
<i>S. bijugatus</i>	+			+			+	+			+			+	+						7
<i>S. bijugatus</i> var. <i>alternans</i>															+					+	1
<i>S. obliquus</i>															+						1
<i>S. quadricauda</i>		+		+			+					+	+	+	+	+	+			+	10
<i>S. quadricauda</i> var. <i>abundans</i>															+						1
<i>S. quadricauda</i> var. <i>setosus</i>		+		+			+	+			+	+	+								7
<i>Tetraedron incus</i>												+	+		+		+		+		5
<i>T. minimum</i>												+			+					+	3
<i>T. muticum</i>				+			+					+					+			+	4

	W1	W2	W3	W4	W5	W6	W7	W9	W10	W102	W103	T1	T2	CC2	CC5	CC8	CC9	CC10	CC11	CC12	Total
<i>Treubaria triappendiculata</i>														+	+						2
<i>Endoderma reineckeii</i>				+			+	+			+			+		+					6
<i>Gongrosira debaryana</i>	+	+	+	+	+	+	+	+		+	+					+					11
<i>Gongrosira</i> sp. A.											+			+			+	+	+	+	6
<i>Trentepohlia iolithus</i>	+			+												+					3
<i>Oedogonium</i> sp. $\leq 8 \mu\text{m}$	+			+			+								+			+	+		6
<i>Oedogonium</i> sp. $> 8 \leq 12 \mu\text{m}$	+			+			+					+		+	+	+				+	8
<i>Oedogonium</i> sp. $> 12 \leq 16 \mu\text{m}$	+			+			+					+									4
<i>Oedogonium</i> sp. $> 16 \leq 20 \mu\text{m}$	+			+										+		+					2
<i>Pithophora oedogonia</i>				+			+	+			+			+		+					6
<i>Chara zeylanica</i>															+		+			+	3
<i>Naias graminea</i>												+			+		+			+	4

Table 2. Summary of data concerning distribution of algae within the 20 pools chosen for most detailed study.

pool	total species	total Myxophyta	total eukaryotes	% Myxophyta	in only this pool out of the 20	in only this pool on island	spp. in plankton only	spp. epiliths only	total heterocystous spp.	heterocystous plankton spp.
W1	79	54	25	69	2	2	5	8	10	5
W2	55	35	20	64	6	3	11	7	3	1
W3	31	24	7	78	1	0	3	3	3	0
W4	86	56	30	65	7	1	7	7	7	4
W5	53	31	22	59	3	0	7	7	4	1
W6	53	32	21	61	1	0	7	2	4	4
W7	70	39	31	56	0	0	9	7	6	3
W9	52	34	18	68	1	0	3	5	4	3
W10	24	23	1	96	0	0	1	4	5	1
W102	17	9	8	53	0	0	2	0	3	1
W103	16	5	11	31	0	0	1	1	1	0
T1	44	22	22	50	4	1	6	2	6	3
T2	43	32	11	74	3	0	3	3	4	0
CC2	43	27	16	63	2	0	5	2	4	2
CC5	67	37	30	56	9	1	6	3	10	5
CC8	22	14	8	64	0	0	1	2	6	4
CC9	56	35	21	62	6	1	4	1	4	4
CC10	21	17	4	81	0	0	0	1	0	0
CC11	13	7	6	54	1	0	0	0	2	1
CC12	51	28	23	55	0	0	5	2	3	3