D. RUSSELL ALAE DDS
GH BALAZS FILES
1970s - 1990s PART 1 OF 4

Major pub on Codium? Ask Russell

G. BALAZS TO DENNIS Russell

— Movie 7/7/78 ask Russell to check for epiphytes — Hypnea · Ahnfeltia and Caulerpa secretato

The Algae Present in Turtle Gut Samples Collected in the Hawaiian Islands

Samples collected by George H. Balazs and Alan Kam.

Algae identified by Dennis J. Russell

GB-1 May 1975 upper stomach waikiki TAME

	Percent of sample
Codium edule	50
Halimeda discoidea	20
Ulva fasciata	20
Chondrococcus hornemanni	tr
Corallina sandvicensis	tr
Enteromorpha sp.	tr
Gracilaria coronopifolia	tr
Hypnea nidifica	tr
Siphonocladus tropicus	tr
Spyridia filamentosa	tr
Brachidontes crebristriatus (?) (Pelecypod)	approx. 100 as per Cooke
Worm tubes	10
Sand	

Simocaecinus simplex (1)

WAIKIKI MORTALITY MAY 1975 upper Stomach = CROP

GB-2 May 1975 Lower stomach contents WAIKIKI TAME TURTLE

TRUE STOMACH (SAME TURTLE AS ABOVE)

Codium edule	90
Ulva fasciata	8
Acanthophora spicifera	tr
Pelecypods (B. crebristriatus)	tr
Strap-like fibrous material	2

GB-3 (reef-flat) East Is, FFS 6/77 Reef

Bryopsis pennata

Caulerpa racemosa var. macrophysa

Halimeda discoidea

~~Soft Corals~~ anemone (anthozoa)

Additions made of Cooke invertebrate analysis of 11 Dec 78

GB-4 6/24/77 Tiger shark mortality, FFS - stomach of turtle eaten by Tiger shark

Rosenvingea orientalis	FFS	35
Lobophora variegata		25
Porolithon gardineri stoney alga		25
Chlorodesmis hildebrandtii		10
Polysiphonia sp. Biting self?		Tr
Animal Cerithiidae (micromolluscs, 2)		5 pteropod shells, empty

GB-5 6/24/77 Tiger shark mortality, FFS - Strained intestinal

Lobophora variegata	FFS	50 same Turtle as above
Microdictyon setchellianum		25
Porolithon gardineri stoney alga		15
Ceramium sp. } Liagora sp. } Animal		10

GB-6 7/12/77 Midway Mortality - upper stomach contents MIDWAY

Caulerpa serrulata		80
Dictyosphaeria versluysii		10
Halophila ovalis (a sea grass)		3
Animal Cooke "no invertebrates"		3
Terrestrial grass } Blue cloth } Man-made fibers } White string } Pink string }		1

GB-7 7/12/77 Midway mortality - stained stomach and intestinal

Caulerpa serrulata } Caulerpa sertularioides }		95 same Turtle as above
Dictyosphaeria versluysii		5
Amansia glomerata		Tr
Terrestrial vegetation		Tr

KBAY

GB-8 7/14/77 Kaneohe Bay 2326 — Stomach Flush

Codium arabicum	99
Acanthophora spicifera	1

GB-9 7/28/77 Bellows 2329 — 〃

Codium arabicum	80
Ulva fasciata	20

GB-10 8/1/77 Bellows 2335 — 〃

Codium phasmaticum	70
Codium edule	20
Codium arabicum	10

GB-11 8/2/77 Bellows 2338 — 〃

Codium arabicum	60
Amansia glomerata	40

GB-12 8/2/77 Bellows 2339 — 〃

Ulva fasciata	99
Acanthophora spicifera	1
Codium phasmaticum	
Enteromorpha sp.	
Hypnea chordacea	
Laurencia sp.	

GB-13 8/3/77 Bellows 2340 — 〃

Gracilaria coronopifolia	50
Ulva fasciata	50
Pterocladia sp.	Tr

GB-14 8/8/77 Bellows 2343 — 〃

Codium phasmaticum	20
Grateloupia filicina	20
Ulva fasciata	20
Dictyota acuteloba	20
Padina japonica	20

GB-15 8/9/77 BELLOWS 2349

Codium phasmaticum	90
Codium arabicum	10

GB-16 8/12/77 KAIWAILOA 2354 North Shore Oahu kawailoa

Stomach Flush

Codium edule	95
Pterocladia sp. ? big stocky ?	4
Acanthophora spicifera	1

GB-17 8/12/77 KAIWAILOA 2359

Acanthophora spicifera " "	100

" "

GB-18 8/12/77 KAIWAILOA 2361

Ulva reticulata " "	50
Codium arabicum	20
Acanthophora spicifera	5
Ahnfeltia concinna	20
Amansia glomerata	5

" "

GB-19 8/23/77 NECKER 2384 Necker Flush Stomach

Caulerpa racemosa	100

GB-20 8/24/77 NECKER 2389 " "

Caulerpa racemosa	99
Halimeda discoidea	1

GB-21 11/13/77 2412 NECKER " "

Amansia glomerata	100

GB-22 11/14/77 2414 NECKER " "

Amansia glomerata	50
Hypnea sp.	50

Whale-Skate FFS

GB-23 9/26/77 W-S, FFS 1737, FF 2402

Codium phasmaticum	90
Ulva fasciata	10

Stomach Flush

GB-24 11/5/77 Honu Harbor 2365

Ulva reticulata	90
Animal material unidentified tissue	10

Stomach Flush Honolulu Harbor

GB-25 8/77 Bellow's collection (w/SCUBA-drift)

Codium phasmaticum	80
Codium edule	10
Ulva fasciata	10

Bottom Drifting algae Bellows

GB-26 (reef collection) NECKER BANK 11/77

Amansia glomerata
Codium edule
Halimeda discoidea
Sargassum polyphyllum

GB-27 (reef collection) 8/77 NECKER BANK 25F

Codium mamillosum ~~tagged~~ Dennis put TAG on this specimen
Codium sp.
Halimeda discoidea
Laurencia sp.
Padina sp.
Sargassum polyphyllum

GB-28 11/22/77 Wong Dock recovery - Kailua Bay

Codium edule	99
Pterocladia sp.	1

KAILUA BAY MORTALITY

GB-29 10/28/77 CI KINZI GREEN mortality

Hypnea musciformis	80
Codium edule	10
Gracilaria bursapastoris	10
Acanthophora spicifera	Tr
Ulva reticulata	Tr

KBAY MORTALITY

GB-30 11/25/77 KANEOHE TMR juvenile

Gracilaria bursapastoris	80

KBAY MORTALITY

(CONTINUED KBay Mortality)

Ulva fasciata	15
Hypnea cervicornis	5
Pterocladia sp.	Tr
Rosenvingea orientalis	Tr

GB-31 1/11/76 FG conf.(B) sample 1 (Reef Runway)

Pterocladia capillacea	50
Ulva reticulata	50

GB-32 1/11/76 FG conf.(B) sample 2 (Reef Runway)

Pterocladia capillacea	75
Ulva reticulata	25

Reef Runway S. Oahu Mortality

GB-33 9/11/77 FG conf. (A) upper stomach sample 1 (Kawailoa)

Codium edule	75
Codium arabicum	5
Gelidiella acerosa	5
Gelidium pusillum	5
Amansia glomerata	Tr
Animal (Chondrosia chucalla)	10

N. Shore OAHU MORTALITY :: necropsy

GB-34 9/11/77 FG conf.(A) Lower stomach sample 2 (kawailoa)

Codium arabicum } Codium edule	50
Gelidiella acerosa } Gelidium pusillum	40
Amansia glomerata	Tr
Animal	10

" "

GB-35 9/11/77 FG conf.(A) Intestines sample 3 (Kawailoa)

Codium edule	45
Gelidiella acerosa	40
Codium arabicum	5
Pterocladia sp.	Tr
Animal	10

" "

ALL The Same Turtle

SAME TURTLE continued from previous page

GB-36 9/11/76 FG CONF.(A) Intestines sample 4 (kawailoa)

Codium edule	50
Gelidiella acerosa	45
Pterocladia sp.	1
Animal	4

GB-37 9/11/77 FG CONFISC.(A) sample 5 (kawailoa)

Caulerpa serrulata	
Caulerpa sertularioides	95
Dictyosphaeria versluysii	5
Amansia glomerata	Tr
Terrestrial vegetation	Tr

Diet stuff

GB-38 7/28/77 BELLOWS BEACH RECOVERY (feces)

Codium edule	90
Pterocladia sp.	Tr
Terrestrial grass	3
Animal (Chondrosia chucalla)	1
Strap-like fibrous material	1

Bellows fecal

GB-39 7/26/77 Bellows mortality (intestine cut)

Bellow mortality

Codium edule	80
Codium arabicum	15
Cladophora fascicularis	
Enteromorpha sp.	
Hypnea cervicornis	5
Ulva fasciata	

GB-40 Kailua collection Reef - Oahu north shore

Codium edule	75
Codium arabicum	25
Laurencia sp.	Tr
Porolithon gardineri Stoney alga	Tr

MOKAPU CAT KBAY

GB-41 Y/S kaneohe recovery 11/30/77

Ahnfeltia concinna	95
Codium edule	1
Ulva reticulata	1
Animal (black colonial tunicate) (Chondrosia chucalla)	3

Comments:

The alga identified as Pterocladia sp. could just as likely be a Gelidium sp. since fertile material is needed in most cases to tell the two apart. I called it Pterocladia sp. since that genus occurs more often in large patches than does Gelidium sp. In GB-2 and GB-38 I found a tough cellular strap-like fibrous material which I could not identify as an alga. In GB-6 there was a great deal of man-made debris which may indicate the turtle was eating drift. There is an interesting alga in sample GB-29; Hypnea musciformis is known from only two patch reefs in Hawaii, Checker Reef and the small patch reef due south of the western end of Checker Reef. It is an introduced alga, from Florida, and flourishes on those two reefs. Furthermore, Acanthophora spicifera was found in several samples and it too is an introduced species, from Guam. The 100% occurrence of A. spicifera in GB-17 was based on a few scraps and may not represent the true stomach contents of the turtle. Therefore, one should look at the jars contents for a true picture of what the percent means.

Codium arabicum and C. phasmaticum are both cushion-like and fasten to the rock in a prostrate manner, while C. edule is more erect although creeping and highly branched. It may be that the turtles are mistaking the black colonial tunicate in GB-41 for a cushion-like Codium. Students will even bring me this tunicate thinking it is an alga. Both grow in the same environment on the reef.

Chondrosia chucalla (sponge)

Dick Phillips toxic

It was surprising to find Ahnfeltia concinna in such amount in GB-41 since this alga grows in strong surf, usually on igneous rock at mid-tide level. Amansia glomerata, which was found in several samples is almost always found underneath rocks or in dark places. Porolithon gardineri is a stoney alga, a reef builder and very rock-like.

---Dennis J. Russell (18-II-1978)

This is a listing of the algae identified in samples GB-1 through GB-41

CHLOROPHYTA

Bryopsis pennata Lamx.
Caulerpa racemosa (Forsskal) J. Ag.
Caulerpa racemosa var. macrophysa (Kützing) Taylor — Reef flat, East Is.
Caulerpa serrulata (Forsskal) J. Ag.
Caulerpa sertularioides (Gmelin) Howe
Chlorodesmis hildebrandtii A. & E. S. Gepp
Cladophora fascicularis (Mertens) Kützing
Codium arabicum Kützing
Codium edule Silva
Codium mamillosum Harvey
Codium phasmaticum Setchell
Dictyosphaeria versluysii Weber van Bosse
Enteromorpha sp.
Halimeda discoidea Decaisne
Microdictyon setchellianum Howe
Siphonocladus tropicus (Crouan) J. Ag.
Ulva fasciata Delile
Ulva reticulata Forsskal

PHAEOPHYTA

Dictyota acuteloba J. Ag.
Lobophora variegata (Lamx.) Womersley
Padina japonica Yamada
Rosenvingea orientalis (J. Ag.) Boerg.
Sargassum polyphyllum J. Ag.

RHODOPHYTA

Acanthophora spicifera (Vahl) Boerg.
Ahnfeltia concinna J. Ag.
Amansia glomerata C. Ag.
Ceramium sp.
Chondrococcus hornemanni

(continued)

A list of the algae identified (continued):

Corallina sandvicensis Lemm.
Gelidiella acerosa
Gelidium pusillum (Stackhouse) LaJolis
Gracilaria bursapastoris
Gracilaria coronopifolia J. Ag.
Grateloupia filicina (Wulfen) C. Ag.
Hypnea cervicornis J. Ag.
Hypnea chordacea J. Ag.
Hypnea musciformis
Liagora sp.
Polysiphonia sp.
Porolithon gardineri (Foslie) Foslie
Pterocladia capillacea (Gmelin) Bornet
Spyridia filamentosa (Wulfen) Harvey

Hanauma Bay mortality recovery

University of Hawaii at Manoa

Department of Botany
St. John Plant Science Laboratory
Room 101 • 3190 Maile Way • Honolulu, Hawaii 96822
Telephone (808) 948-8369 • Cable Address: UNIHAW

February 15, 1977

MEMORANDUM TO: Mr. George Balaz
HIMB

FROM: M. S. Doty
Professor of Botany

SUBJECT: Green turtle stomach contents from off Oahu, ca 10-II-1977

Hanauma Bay mortality

The stuff is about 50/50 the following two red algae. Each is given with the accession number to which I have assigned it for my herbarium and other record purposes.

#26642 Amansia glomerata C. Agardh. This had softened somewhat from what it would be in nature and in some specimens, the softer, it was off-color and somewhat yellowed. Some looked fresh and rather as when alive.

#26643 Pterocladia capillacea (Gmelin) Bornet & Thuret. No discoloration and looked quite as when alive.

George, this turtle must have been feeding in a shady place that had considerable water motion....

MSD/jk

Deterioration of cell wall mentioned by Russell ?

George BALAZS to Dennis Russell

The Algae Present in Sea Turtle Related Samples Collected by G. H. Balazs

Algae identified by Dennis J. Russell 28 June 1978.

	Percent of Sample
GB-101 Bellows 3/15/78	
Codium edule Silva	95
Animal (Chondrosia chucalla)	5
GB-102 "	
Codium edule	90
Indescript matter	10
GB-103 "	
Codium edule	90
Codium arabicum Kütz.	10
GB-104 "	
Codium edule	100
GB-105 "	
Codium edule	90
Leathery mass	10
GB-106 "	
Codium edule	100
GB-107 "	
Codium edule	100
GB-108 "	
Codium edule	100
GB-109 "	
Codium edule	100
GB-110 "	
Codium edule	95
Amansia glomerata C. Ag.	5

GB-111 Bellows 3/15/78

Codium edule	90
Codium arabicum	10

GB-112 »

Codium edule	80
Terrestrial grass	10
Animal ? (chondrosia chucalla)	8
Polysiphonia sp. (4 pericentral cells)	2

GB-113 »

Codium edule	50
Amansia glomerata	50

GB-114 »

Codium edule	40
Codium phasmaticum Setchell	10
Animal material ? (Spongia oceania)	50

GB-115 »

Codium edule	60
Amansia glomerata	30
Codium phasmaticum	5
Animal no invertebrates as per Cooke	5

GB-116 »

Codium edule	90
Animal "Unidentified tissue"	10

GB-117 »

Codium edule	100

GB-118 »

Codium edule	60
Codium arabicum	40

GB-119 Bellows 3/15/78

Codium edule	100

GB-120 〃

Amansia glomerata	75
Codium edule	20
Lyngbya majuscula Gomont	3
Ulva fasciata Delile	2

GB-121 〃

Amansia glomerata
Codium edule

GB-122 〃

Codium edule	99
Ulva fasciata	1

GB-123 〃

Codium edule	99
Terrestrial grass	1

GB-124 〃

Codium edule	100

GB-125 〃

Codium edule	99
Amansia glomerata	1

GB-126 〃

Codium edule	90
Terrestrial grass	3
Blue plastic	3
Clear plastic sheet	4

GB-127 Bellows 3/15/78

Codium edule	95
Codium arabicum	5

GB-128 »

Codium edule	99
Terrestrial grass	1

GB-129 »

Codium edule	99
Codium arabicum	1

GB-130 »

Amansia glomerata	95
Codium edule	5

GB-132* »

Codium edule	85
Codium arabicum	10
Animal (black) (Chondrosia chucalla)	5

GB-133 »

Codium edule	100

GB-134 »

Codium edule	100

GB-135 »

Amansia glomerata	95
Codium edule	5

GB-136 »

Codium edule	100

GB-137 »

Codium edule	100

GB-138 Bellows 3/15/78

Codium edule	100

GB-139 »

Man-made and cotton fibers	25
Terrestrial plant material	10
Animal (black) "Unidentified tissue"	25
Codium edule	20
Amansia glomerata	15

GB-140 »

Codium edule	80
Codium arabicum	10
Animal (black) (Chondresia chucalla)	10

GB-141 »

Codium edule	100

↑ BELLOWS

GB-142 Gold Cr. captive carapace scraped 3/17/78

Ectocarpus indicus
Enteromorpha clathrata (Roth) Grev. — not found on wild
Polysiphonia sp.
Sphacelaria furcigera Kütz.
" "
Ulva fasciata

Shell scraping of g.t. in pen at HIMB

GB-143 Kailua Boy TMR turtle — not feeding?

Strap-like fiberous material (animal?)

GB-144 Canton Is. reef collection CANTON ISLAND Reef

Cladophora socialis Kütz.
Gelidium crinale (Turner) Lamour.
Polysiphonia sp.

GB-145 2451 - 2/18/78 - Eastern Is., Midway (skin scraping)

Polysiphonia tsudana Hollenberg
Lyngbya cinerescens Kütz.

GB-146 2458 2/21/78 - Eastern Is., Midway (Skin Scraping)

Polysiphonia tsudana

Sphacelaria novae-hollandiae G. Sonder

Acrochaetium sp. 1 and sp. 2

GB-147 2458 2/21/78 - (Stomach) Reef Hotel, Midway

Codium caneatum Setchell and Gardner

GB-148 2460 2/23/78 - (Skin) Eastern Is., Midway

Polysiphonia tsudana

GB-149 2460 2/23/78 - Stomach - Eastern Is., Midway

Ceramium sp.

Oscillatoria sp.

Hard spines (?) present (seen 12/6/78) (set aside w/ GB329 for Cooke)

GB-150 2462 2/24/78 - Green, Kure (Skin Scraping)

P. tsudana

GB-151 2465 2/25/78 - (Skin) Green Is., Kure

P. tsudana

GB-152 2467 2/25/78 - Green Is., Kure (Skin Scraping)

P. tsudana

GB-153 2467 - 2/25/78 - Stomach - Green Is, Kure Atoll

P. tsudana ? seen in vial 12/6/78

Codium edule

GB-154 2469 2/26/78 - Skin - Green Is., Kure Atoll

P. tsudana

GB-155 2473 3/1/78 Skin - plastron Green Is., Kure Atoll

P. tsudana

GB-156 2493 coralline from plastron

Melobesia ?

KBM GB-157 2493 - stomach - 27 April 1978 Kaneohe net-resuscitated

Codium arabicum

KBM GB-158 2491 - stomach 4/27/78 - Kaneohe Bay

Codium arabicum

GB-159 2370 Punaluu - skin KAN

P. tsudana (tetrasporophytes)

GB-160 2374 punaluu KAN skin

Falkenbergia rufolanosa Harvey

KBM GB-161 2493, 2494 2 May 1978 (Kaneohe Bay) by kayaker found dead - floating

Codium edule	80
Codium arabicum	20

*GB-131 is missing

Island of Hawaii, Ka'u, sample contains:

Amansia glomerata (curled thallus)
Halymenia formosa (broad, bumpy thallus)
Pterocladia capillacea (pennate thallus)

collected from Turtle Bay KAN Big Is. in 1976 - mistakenly sent to Russell

(Methods of Collection)

Russell & BALAZS

completed Sept 1978

Number
GB

201 Dried Pterocladia ? 1/78 " Turtle Bay " (dried) stomach KAU Big Island

202 Pterocladia capillacea (Gmelin) Bornet 1/78 Turtle Bay (dried) " stomach "

203 ? Lisianski 7/21/78 dead adult male

204 Padina crassa Yamada 7/8/78 - dead adult female - Laysan
G Pseudobryopsis oahuensis Gilbert (collected fresh my Johnsons)
G Microdictyon japonicum Setchell
R Spyridia filamentosa (Wulf.) Harv.

205 G Microdictyon japonicum 7/8/78 dead adult female - Laysan
R Amansia glomerata C. Ag. (collected by me)
G Halimeda discoidea Decaisne
B Zonaria variegata (Lamx.) C. Ag.
Coralline piece

206 Acrochaetium sp. Kauai male - scrapings for neck - exposed head (collected by Kam)

207 Pterocladia capillacea Kauai male - from esophagus of above

208 Codium arabicum Kuetz. 7/15/78 2835 Tern Is. Seawall FFS stomach

209 Caulerpa racemosa (Forsskal) J. Ag. 7/19/78 2837 LISIANSKI

210 Caulerpa racemosa 7/20/78 2841 LISIANSKI
Halimeda discoidea

211 Gelidiopsis sp. 7/20/78 2839 LISIANSKI

212 Jania capillacea Harvey 7/20/78 2851 LISIANSKI
Polysiphonia sp.
Pterocladia capillacea predominant

213 Gelidiopsis sp. 7/21/78 2859 LISIANSKI

214 Caulerpa racemosa 7/21/78 2864 LISIANSKI

215 " 7/22/78 2867 LISIANSKI
216 " 7/22/78 2869 LISIANSKI
217 " 7/22/78 2871 LISIANSKI

218 Gelidium sp. 8/23/78 Kahoolawe - Reef Rock scraping - site of turtle feeding (collection)

219 Laurencia sp. 8/23/78 Kahoolawe Beach 6 - Turtle
Lobophora variegata seen feeding in area (collection)
Jania capillacea c
Microdictyon japonium

220 Laurencia sp. 8/23/78 Kahoolawe - ledge before lighthouse
Sargassum echinocarpum J. Ag. (collection)
Gelidiopsis sp.
Jania capillacea

221 Lobophora xxxxxxxxx variegata Kahoolawe reef collection 8/23/78 [NW COAST]
Ectocarpus breviarticulatus J. Ag.
Laurencia sp.
Dictyopteris plagiogramma (Mont.) Vickers
Amansia glomerata
Actinotrichia rigida (Lamx.) Decaisne
Chondrococcus hornemanni Lyng.
Jania capillacea Harv.
Corallina sp.

222 Codium edule Silva 95% 7/11/78 Kaneohe Bay - tag 2423 (Kawelo Site)
C. arabicum Kuetzing 5%

223 Amansia glomerata 8/14/78 2476 Kaneohe Bay - from Dick Brock
Laurencia ?

224 ? red speck+ 9/1/78 2478 Kaneohe Bay - from Paul Jokiel

MORTALITIES

225 ? 8/31/78 2146 - kau Big Island

226 Amansia glomerata 8/31/78 2877 - kau Big Island
227 " 8/31/78 2886 - kau " "
228 " 8/31/78 2891 - kau " "

229 Pterocladia ? 8/31/78 2932 - kau " "

230 Galaxaura sp. Kaalualu Reef collection 8/31/78 So. Point Big Island
Martensia flabelliformis
Ahnfeltia xxxxxx concinna Ag.
Codium edule
Amansia glomerata
Caulerpa taxifolia (Fahl) C. Ag.
Gelidium pusillum (Stackhouse) LaJolis
Pterocladia capillacea
Cladymenia pacifica Setchell
Cladophora sp.

231 Pterocladia capillacea 1/78 kau mortality #1 (upper intestine) Big Is.

232 Pterocladia capillacea 1/78 kau mortality #1 (stomach) " "

233 Upper stomach
Enteromorpha sp. 2% Bellows mortality 1977 WAIMANALO BAY
Dictyosphaeria versluysii Van Bosse 2%
Codium edule 90%
C. arabicum 5%
Colonia 1 black animal 1 %

233 Lower stomach 95% Bellows mortality 1977 WAIMANALO BAY
Codium edule
C. arabicum 4%
Ulva fasciata
Cladophora fascicularis (Mertens) Kuetzing 1%

SCHOOL OF NATURAL & MATHEMATICAL SCIENCES

SEATTLE PACIFIC UNIVERSITY

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Dennis J. Russell

26 Mar 1979

George H. Balazs
Hawaii Institute of Marine Biology
P. O. Box 1346
Coconut Island
Kaneohe, Hawaii 96744

Dear George,

Here are the fruits of my labors. I just wish I could make out what more of the fragments may be. For instance GB-303 has a mass of cells in it which is indescript. On the other side of the coin the GB-323 Liagora sp. and the GB-324 Laurencia sp. and the GB-324 red will be worked out as soon as I get another free period of time. There were several large round worms in the shell scraping sample GB-328 and animal-like objects (worms?) in GB-301. Polysiphonia dotyi seems to have joined P. tsudana on your turtle's shells (GB-328), what next?

I am still working on my dissertation (can you believe it?) and have not gotten to the Codium paper like I should. It will come as soon as the *#@*#! dissertation is wrapped up.

Thank you for sending the GB-143 to me again, I've found its name. If there are others like that send them too. Thank you, again, for the calendar. Aloha,

Dennis J. Russell

Dennis J. Russell

The Algae Present in Turtle Gut Samples Collected in Hawaii

Samples collected by George H. Balazs

Algae identified by Dennis J. Russell, March 1979

GB-301 MCOMB-1 5/78 N. Lanai LANAI

	Estimate of % in sample (Tr= trace)
Codium phasmaticum	3
Acanthophora spicifera	80
Padina japonica	2
Dictyota acuteloba	5
Hypnea cervicornis	5
Amansia glomerata	5
Champia parvula	Tr

A 20-30 cm long .2 - .3 cm wide probably synthetic tough animal? worm-like protein thread.
Several tough, tubular, protein? objects.

GB-302 MCOMB-2 5/78 N. Lanai LANAI

Acanthophora spicifera	90+
Amansia glomerata	1
Gracilaria sp.	Tr
Hypnea cervicornis	Tr
Leveillea jungermannioides	Tr
Padina japonica	Tr

GB-303 TAG 2661 13 JUNE 1978 East, FFS SL 18 5/8" EAST FFS

Gracilaria (tip of thallus?)	Tr
Asterionella notata (a diatom, few cells)	Tr

Cellular mass of ?

Same Turtle

GB-304 TAG 2266 14 JUNE 1978 EAST, FFS SL 15 1/4 (STOMACH)

Codium edule	All

GB-305 TAG (IN BOTTLE) 2267 14 JUNE 1978 East, FFS TAG SCRAPING

Acrochaetium sp.	Tr
Ceramium sp.	Tr
Polysiphonia sp.	5
Spacelaria furcigeria	90+

+ Codium ?? INSIDE TAG?

X GB-306 TAG 516 / 16 JUNE 1978 East, FFS (mouth)

Valonia aegagropila? (small piece) All
(looked like Caulerpa to me when sampled)

X GB-307 TAG 2215A 14 June 1978 East, FFS SL 16 3/8
(mouth)

Codium edule All
+ Halimeda ?

X GB-308 TAG 2215B (scrapings from underside of margins)

Ectocarpus indicus 10

Polysiphonia tsudana (tetrasporophyte) 40

Spacelaria furcigeria 50

X GB-309 2630 10/3/78 Lisianski

Unknown cellular plant material (mouth sample)

X GB-310 2841 10/3/78 Lisianski (STOMACH)

Lyngbya majuscula filaments on animal material All

X GB-311 2854A 10/4/78 Lisianski (STOMACH)

Oscillatoria sp. All

X GB-312 2854B (Skin/shell) 10/4/78 Lisianki

Acrochaetium gracile Tr

Ectocarpus indicus 70

Lyngbya sp. Tr

Oscillatoria sp. 10

Polysiphonia sp. 20

X GB-313 2849 10/3/78 LISIANSKI (STOMACH)

Jania capillacea 1

Turbinaria ornata 99

X GB-314 2857 10/4/78 Lisianski (STOMACH)

Red alga (Rhodomelaceae) very small scraps All
George: I'll have to work on this one awhile more to identify it.

Membrane of animal material

X GB-315 2939 10/2/78 Lisianski (STOMACH) SA BASKER 25 3/8" SL

Chlorella sp. (sample contains detritis and scores of these unicellular algae)
All

X GB-316 2944 10/3/78 LISIANSKI (STOMACH)

Melosira sp. DIATOM All

X GB-317 2946 10/3/78 LISIANSKI (STOMACH)

Turbinaria ornata	30
Blue-green algae	20
Detritis	50

X GB-318 2952 10/3/78 LISIANSKI (STOMACH)

Valonia sp. (Two small spheres)	All

+(calcareous from carapace) melobesia ?

X GB-319 2954 10/3/78 LISIANSKI (STOMACH)

Terrestrial plant material ? (there are pits in the cell walls)

X GB-320 SITE 2 10/4/78 LISIANSKI

Ceramium sp.	Tr
Gelidium pusillum	99
Polysiphonia sp.	1

X GB-321 (From the reef flat) 10/3/78 - EAST SHORE LISIANSKI

FFS

Caulerpa webbiana
Bryopsis pennata
Jania capillacea

X GB-322 (From the reef flat) 10/5/78 + July 1978
Pearl & Hermes Reef

Dictyosphaeria cavernosa
Halimeda discoidea
Jania capillacea
Lisgora sp. (I will find the species for this later)

X GB-323 (From the reef flat) 9/28/78 - west end Collection
MARO REEF

Caulerpa taxifolia
Caulerpa racemosa var. peltata
Caulerpa webbiana var. disticha
Chondrococcus hornemanni
Halimeda sp.
Haloplegma duperryi
Laurencia sp.

X GB-324 (From the reef) 10/4/78 SITE I LISIANSKI

Amphiroa fragilissima
Caulerpa webbiana
Spiridia filamentosa
Laurencia sp. (I'll work on species)

(continued on next page)

GB-324 (continued)

Halimeda discoidea

Cartilagenous red (I.D. to come later)

GB-325 (From the reef flat) 10/4/78 SITE 2 LISIANSKI

Caulerpa racemosa var. peltata

Ceramium sp.

Ceramium fimbriatum

Halimeda discoidea

Polysiphonia sp.

Turbinaria ornata

GB-326 10/6/78 TAG 2973 Midway (STOMACH)

Ceramium sp.	SPIT IS.	Tr
Falkenbergia sp.		Tr
Lyngbya majuscula		Tr
Sphacelaria tribuloides		Tr

GB-327 TAG 2974A 10/6/78 midway (mouth)

Padina sp. (small scrap)	SPIT IS.	10
Spyridia filamentosa		90

Horn-like fibers

GB-328 TAG 2974B (skin & shell) 10/6/78 Midway, spit IS.

Lyngbya majuscula	40
Polysiphonia sp.	20
Polysiphonia dotyi	20
Sphacelaria furcigeria	20

There were many large (5 mm long) round worms in this sample

GB-329 TAG 2976 10/6/78 Midway (STOMACH)

Spyridia filamentosa	spit IS.	All

GB-330 10/6/78 INNER HARBOR - Dense mat growth

Caulerpa sertularioides	MIDWAY	All

GB-331 OCT 78 WAIMANALO

Codium edule	TOWER HEAD - From BOURKE	MORTALITY All

* I've saved a sub-sample

12 DEC 1978

GB-332 LANAI Turtle – 1st stomach AMARAL MORTALITY

Amansia glomerata	50
Halophila ovalis	Tr
Sargassum polyphyllum	50

12 DEC

GB-333 1978 Lanai Turtle – 2nd stomach AMARAL MORTALITY

Halophyla ovalis	20
Sargassum polyphyllum	80

12 DEC 78

GB-334 LANAI Turtle – STRAINED INTESTINE AMARAL MORTALITY

Sargassum polyphyllum	All
Slime	

GB-335 (GB-157)

Codium arabicum	25
Codium edule	75

ATTENTION!

GB-143 Ledo

Ulva rigida C. Ag.

Distribution Alaska to Baja California, Chile and Cape of Good Hope, Africa. I've not seen fresh material of this species before, but the pieces you have fit the description given by Abbott and Hollenberg (1978) for the cell size and shape, holdfast portion of the thallus and the blade margin. Thank you, George, for sending it back to me. --Dennis P.S. it is recorded for Hawaii.

This is a listing of the algae found in GB-301 through GB-335 plus GB-143

CHLOROPHYTA (GREEN)

Caulerpa racemosa var. peltata
Caulerpa sertularioides (Gmelin) Howe
Caulerpa taxifolia (Fahl) C. Ag.
Caulerpa webbiana Mont.
Caulerpa webbiana var. disticha Weber Van Bosse
Chlorella sp.
Codium arabicum Kützing
Codium edule Silva
Codium phasmaticum Setchell
Halimeda sp.
Halimeda discoidea Decaisne
Ulva rigida C. Ag.
Valonia sp.
Valonia aegagropila C. Ag.

PHAEOPHYTA (BROWN)

Dictyota acuteloba J. Ag.
Ectocarpus indicus Sonder
Padina japonica Yamada
Sphacelaria furcigeria Kütz.
Sphacelaria tribuloides Meneghini
Sargassum polyphyllum J. Ag.
Turbinaria ornata (Turn.) J. Ag.

RHODOPHYTA (RED)

Acrochaetium sp.
Acrochaetium gracile Boerg.
Acanthophora spicifera (Vahl) Boerg.
Amansia glomerata C. Ag.
Amphiroa fragilissima (L.) Lamx.
Ceramium sp.
Ceramium fimbriatum Setchell and Gardner
(continued)

Champia parvula (C. Ag.) Harvey
Chondrococcus hornemanni (Mert.) Schmitz
Falkenbergia rufalanosa Harvey
Gelidium pusillum (Stackhouse) LaJolis
Gracilaria sp.
Haloplegma duperryi Mont.
Hypnea cervicornis J. Ag.
Jania capillacea Harvey
Laurencia sp.
Leveillea jungermannioides Harvey
Liagora sp.
Polysiphonia sp.
Polysiphonia dotyi Hollenberg
Polysiphonia tsudana Hollenberg
Spyridia filamentosa (Wulfen) Harvey

CYANOPHYTA (BLUE-GREEN)
Lyngbya sp.
Lyngbya majuscula Gomont
Oscillatoria sp.
(many other blue-green algae were seen as ephiphytes on the other algae)

SEAGRASS
Halophila ovalis (R. Br.) Hook

BACILLARIOPHYTA (Diatoms)
Asterionella notata (Grun.) Van Heurck (this is a planktonic species)
Many other diatoms were found as epiphytes or singly in the samples.

* I've saved subsamples of these

GB 400- Series

TO Dennis Russell from George BACAZS

GB 405 KBAY - Miranda, 2 March 1979 upper stomach
GB 406 KBAY - Miranda, 2 March 1979 lower stomach
} same Turtle

GB 407 - Waimanalo mortality, adult ♂ via SCP
10 March 1979 1ST Stomach

GB 408 - Waimanalo mortality, ♂ (SCP) 10 march 1979
upper intestines

GB 411 - Necker, Basking Ledge Bag April 1979

GB 411 - Necker, Shark Bag (Basking Ledge Bag)
April 1979 note: gastropods from ledge

GB 411 - Necker, Basking Ledge Bag, April 1979

GB 412 - Necker, West Coastline & Pools
28 April 1979

GB 413 - "red" a) Sample of abundant algae observed
Gin & L. Gin 3 May 1979 FFS
b) Codium from glass float 5 May 1979
East Is. FFS

GB 414 FFS - Tag 2391 recovery 20 mon 3 days 27 May 197?
Skin scrapings (leeches removed)

GB 415 - Tag 3010 1 May 1979 Tern, FFS stomach sampling

GB 417 - Tag 3012 1 May 1979 Tern, FFS skin scrapings

GB 418 - Tag 3012 1 May 1979 Turn, FFS mouth sample

GB 434 Kailua Beach headless mortality
23 May 1979 First Stomach

GB 435 Kailua Beach headless mortality
23 May 1979 Second Stomach

GB 437 Tag 3090 30 May 1979 FFS

The Marine Algae Present in Turtle Gut Samples Collected in the Hawaiian Islands by George H. Balazs, Hawaii Institute of Marine Biology

Algae identified by Dennis J. Russell, January 1980.

GB-401 Tag 2936 9/15/78 Percent of Sample

Oscillatoria subtilissima	50%
Microcystis sp.	50

STOMACH FLUSH

GB-402 Tag 2340 9/15/78

Oscillatoria subtilissima	99
Acrochaetium sp.	1
Oil droplets	
Detritus	

Location unsure If important, please email me. GB 9/5/06

GB-403 Tag 2988 30 JAN 1979 KURE - STOMACH FLUSH

Spyridia filamentosa	99
Centroceros clavulatum	1

GB-404 EAST REEF FLAT - GREEN ISLAND, KURE

Laurencia majuscula 31 JAN 1979	50
Codium arabicum	50
Jania capillacea	trace

KBay

GB-405 (Miranda - upper stomach - 2 March 1979)

Codium arabicum	90 %
Codium edule	5 %
Codium phasmaticum	2 %
Gelidium crinale	3 %

GB-406 (Miranda - lower stomach - 2 March 1979)

Codium arabicum	70
Codium edule	29
Gelidium crinale	1

GB-407 (Waimanalo adult male mortality - 1st stomach) month 1979

Codium arabicum	3
Amansia glomerata	97

GB-408 (" " upper intestines)

Amansia glomerata	55
Codium phasmaticum	25
Codium arabicum	20

GB-409 Tag 2992 4 April 1979

Ulva sp. stomach contents	Trace (There were a few scraps of each
Hypnea pannosa	Trace of these species)
Laurencia sp.	Trace
Hypnea cervicornis	Trace
Hypneocolax stellaris	Trace
Oscillatoria subtilissima	TRace

GB-410 tag 2995 4 April 1979 Stomach contents

Oscillatoria subtilissima	50
Microcystis sp.	50

GB-411 (Reef Collection) Necker Island - Shark Bay reef collection

Chlorophyta (Phylum)
Caulerpa racemosa
Chlorodesmis hildebrantii
Cladophoropsis luxurians
Halimeda discoidea

Phaeophyta (Phylum)
Dictyota sp.
Dictyota friabilis
Rosenvingea intricata
Sargassum polyphyllum
Turbinaria ornata

Rhodophyta (Phylum)
Asparagopsis taxiformis
Coelothrix irregularis
Corallina sp.
Dasya pedicellata
Galaxaura cylindrica
Laurencia obtusa
Martensia fragilis
Plocamium sandvicense
Plocamium sp.

Cyanophyta (Phylum)
Lyngbya majuscula

GB-412 (Reef Collection) Necker Island - Coastline collection
Turbinaria ornata
Centroceros clavulatum
Rhizoclonium hookeri
Chnoospora implexa
Sargassum echinocarpum
Ectocarpus breviarticulatus
Sphacelaria tribuloides
Laurencia tenera

GB-413
Hydroclathrus clathratus (Gin - LGin 3 May 1979 - abundant) FFS

GB-414
Sphacelaria furcigera (Tag 2391 - skin scaping - leeches removed Necker 27 May 1979)

GB-415 (Tag 3010 - stomach - Tern 1 May 1979)

Codium arabicum	90
Oscillatoria subtilissima	

GB-416 Tag 3010 Tern Is, FFS skin scraping 1 May 1979

Ectocarpus indicus	50
Polysiphonia tsudana	40
Lyngbya semiplena	10
Lyngbya porphyrosiphonis	Trace

GB-417 (Tag 3012 Skin scraping - Tern - 1 May 1979) FFS

Lyngbya semiplena	80
Ectocarpus indicus	20
Polysiphonia tsudana	Trace

GB-418 (Tag 3012 Skin scraping - Tern - 1 May 1979) FFS

Lyngbya semiplena	65
Codium arabicum	30
Ectocarpus indicus	5

GB-419 Tag 3014 Trig, FFS stomach sample FFS 2 may 1979

Microcoleus sp.	95
Laurencia majuscula	Trace
Ceramium tenuissimum	Trace
Oscillatoria subtilissima	Trace
Foraminifera (protozoan)	
Oil droplets	

GB-420 Tag 3033 Trig, FFS stomach sample FFS 3 may 1979 Meter B

Microcoleus sp.	95
Ceramium sp.	Trace
Laurencia sp.	Trace

GB-421 Tag 2614, 3032 Trig, FFS adult male stomach sample FFS 3 May 1979

Microcoleus sp.	90
Jania capillacea	Trace
Laurencia majuscula	10

GB-422 Tag 3050 East, FFS stomach sample 5 May 1979

Microcoleus sp.	90
Polysiphonia sp.	Trace
Ceramium leutzelburgii	Trace
Terrestrial plant fibers	
Ovoid brown pellets	

GB-423 Tag 2661 East, FFS stomach sample 5 May 1979

Turbinaria ornata	Trace
Codium arabicum	Trace
Griffithsia sp.	Trace
Oscillatoria subtilissima	Trace
Terrestrial plant fibers	
Ovoid pellets	

GB-424 Tag 2661 East, FFS skin scraping 5 May 1979

Ectocarpus breviarticulatus	50
Polysiphonia tsudana	45
Sphacelaria furcigera	5
Oscillatoria subtilissima	Trace

GB-425 Tag 3071 W-S, FFS stomach sample 6 may 1979

Laurencia majuscula	80
Ceramium tenuissimum	10
Polysiphonia tsudana	10
Pseudobryopsis oahuensis	Trace
Oscillatoria subtilissima	Trace

GB-426 Tag 3071 W-S, FFS skin R ventral marginals scraping 6 may 1979

Ectocarpus breviarticulatus	90
Porolithon sp. (crustose red alga)	
Sphacelaria tribuloides	Trace

GB-427 Tag 3036 W-S, FFS stomach sample 6 May 1979

Codium arabicum	80
Polysiphonia tsudana	10
Polysiphonia sparsa	10
Ceramium sp.	Trace
Oscillatoria subtilissima	Trace
Laurencia majuscula	Trace
Ovoid pellets	

GB-428 Tag 3073 W-S, FFS stomach sample 6 May 1979

Codium edule	90
Oscillatoria subtilissima	10
Male round worm in Codium	

Bill cooke

GB-429 Tag 3079 W-S, FFS stomach sample 6 May 1979

Codium edule	90
Oscillatoria subtilissima	10

GB-430 Tags 941, 3083 Trig, FFS stomach sample 6 May 1979 Mate D

Laurencia majuscula	90
Sargassum sp.	5
Microcoleus sp.	5
Foraminifera (protozoans)	
Micromollusks (three individuals)	

GB-431 Tag 3085 Tern, FFS stomach sample 7 May 1979

Codium arabicum	60
Oscillatoria subtilissima	30
Microcoleus sp.	10

GB-432 Tag 3088 East, FFS mouth sample 7 May 1979

Caulerpa racemosa	

GB-433 Tag 3012 Tern Is. FFS mouth sample 6 May 1979

Codium arabicum	90
Sphacelaria tribuloides	5
Zonaria variegata	Trace
Ceramium sp.	Trace
Polysiphonia sp.	Trace

KAILUA BAY

GB-434 (Kailua Beach headless - 23 May 1979 - 1st stomach)

Codium arabicum	50
Codium edule	50
Lyngbya majuscula	Trace
Martensia fragilis	Trace
Hypnea sp.	Trace
Dictyopteris plagiogramma	Trace
Black mass of substance	

GB-435 (Kailua Beach headless - 23 May 1979 - 2nd Stomach)

Codium edule	40
Codium arabicum	40
Dictyosphaeria versluysii	10
Amansia glomerata	10

GB-436 Tag 2333 30 May 1979 FFS Stomach Flush
Scrap of brown algae (Turbinaria ornata ?)
Terrestrial plant fibers

GB-437 (Tag 3090 - 30 May 1979
Codium phasmaticum Trace
Hypnea sp. Trace
Oscillatoria subtilissima Trace
Terrestrial plant fibers
Phaeophyte (?)

GB-438 Tag 3105 6 June 1979
Oscillatoria subtilissima 90
Lyngbya majuscula 10
Ulva sp. Trace
Oil droplets

GB-439 Tag 3102 6 June 1979 FFS " "
Squamous epithellial cells 95 (these appeared in some of the earlier samples also)
Oscillatoria sp. Trace
Codium edule Trace
Codium phasmaticum Trace

GB-440 6 June 1979 Tag 3094 FFS " "
Ulva rigida Trace

GB-441 Tag 3113 14 June 1979
Codium arabicum 99 FFS " "
Ceramium codii Trace
Microcoleus sp. Trace
Rivularia sp. Trace

GB-442 Tag 3116 14 June 1979 FFS " "
Codium sp. Trace
Phaeophyte (?) Trace

GB-443 Tag 1201 17 June 1979 FFS " "
Laurencia carolinensis 99
Polysiphonia sparsa 1
Oscillatoria subtilissima Trace

GB-444 Tag 1201 17 June 1979 - skin scraping FFS
Ectocarpus breviarticulatus 99
Lyngbya majuscula 1
Many round worms up to 2 mm long

GB-445 Tag 2828 17 June 1979
Laurencia carolinensis 99
Oscillatoria subtilissima Trace
Cladhymenia pacifica 1
Squamous epithelial cells
FFS stomach flush

GB-446 Tag 3131 17 June 1979 FFS stomach flush
Turbinaria ornata 50
Laurencia carolinensis 30
Cladhymenia pacifica 20
Champia parvula Trace
Oscillatoria subtilissima Trace

GB-447 Tog 1214 17 June 1979 Stomach flush FFS

Laurencia carolinensis	99
Oscillatoria subtilissima	1

GB-448 Tog 3088 17 June 1979 " "
Caulerpa racemosa
FFS

GB-449 Tog 3125 June 1979 " "
Caulerpa racemosa

GB-450 Tog 3082 June 1979 " "

Polysiphonia sparsa	Trace
Laurencia carolinensis	90
Oscillatoria subtilissima	10

GB-451 Tog 3156 June 1979 " "
Caulerpa racemosa
Lyngbya majuscula Trace

GB-452 (Sample for D. Russell)— 3 May 1979 - Glass float - East Is.
Codium sp.
This is a different species than the others you have sent.
It needs more research.

List of the algae in samples GB-401 to GB-451

CHLOROPHYTA

Genus	Species	Author
Caulerpa	racemosa	(Forsskal) J. Ag.
Chlorodesmis	hildebrandtii	A. and E. S. Gepp
Cladophoropsis	luxurians	Gilbert
Codium	arabicum	Kützing
Codium	edule	Silva
Codium	phasmaticum	Setchell
Dictyosphaeria	versluysii	Weber van Bosse
Halimeda	discoidea	Decaisne
Pseudobryopsis	oahuensis	Egerod
Rhizoclonium	hookeri	Kützing
Ulva	sp.	
Ulva	rigida	C. Ag.

PHAEOPHYTA

Genus	Species	Author
Chnoospora	implexa	J. Ag.
Dictyopteris	plagiogramma	(Mont.) Vickers
Dictyota	sp.	
Dictyota	friabilis	Setchell
Ectocarpus	breviarticulatus	J. Ag.
Ectocarpus	indicus	Sonder
Hydroclathrus	clathratus	(C. Ag.) Howe
Rosenvingea	intricata	(J.Ag.) Boerg.
Sargassum	echinocarpum	J. Ag.
Sargassum	polyphyllum	J. Ag.
Sphacelaria	furcigera	Kütz
Turbinaria	ornata	(Turn.) J. Ag.
Zonaria	variegata	(Lamoureux) C. Ag.

RHODOPHYTA

Genus	Species	Author
Acrochaetium	sp.	
Amansia	glomerata	C. Ag.
Asparagopsis	taxiformis	(Delile) Coll. and Harvey
Centroceros	clavulatum	(C.Ag.) Montagne
Ceramium	sp.	
Ceramium	leutzelburgii	Schmidt
Ceramium	tenuissimum	(Lyngbye) J. Ag.
Champia	parvula	(C. Ag.) Harvey
Cladhymenia	pacifica	Setchell
Coelothrix	irregularis	(Harv.) Boerg.
Corallina	sp.	
Dasya	pedicellata	(C. Ag.) C. Ag.
Galaxaura	cylindrica	(Ellis and Solander) Lam.
Gelidium	crinale	(Turn.) Lamour.
Griffithsia	sp.	
Hypnea	cervicornis	J. Ag.
Hypnea	pannosa	J. Ag.
Hypneocolax	stellaris	J. Ag,
Jania	capillacea	Harvey
Laurencia	sp.	
Laurencia	carolinensis	Saito
Laurencia	majuscula	(Harv.) Lucas
Laurencia	obtusa	(Huds.) Lam.
Laurencia	tenera	Tseng
Martensia	fragilis	
Plocamium	sp.	
Plocamium	sandvicense	J. Ag.
Polysiphonia	sp.	
Polysiphonia	sparsa	(Setchell) Hollenberg
Polysiphonia	tsudana	Hollenberg
Porolithon	sp.	
Spyridia	filamentosa	(Wulf.) Harv.

CYANOPHYTA

Genus	Species	Author
Lyngbya	majuscula	Gomont
Lyngbya	semiplena	(C. Ag.) J. Ag.
Lyngbya	porphyrosiphonis	Frémy
Microcoleus	sp.	
Microcystis	sp.	
Oscillatoria	subtilissima	Kütz
Rivularia	sp.	

sent to Dennis 9 October 1979 by George Balazs

GB-501 13 June 1979 Connally Lanai LANAI 1st stomach
SL - 43.8 cm

GB-502 " " " 2nd stomach

GB-503 June 1979 Ruth's 1st stomach
SL - 46.7 cm

GB-504 " " " 2nd stomach

GB-505 June 1979 " Small intestine

GB-506 19 July 1979 Bellows Torso 1st stomach
SL - 78.1 cm

GB-507 " 2nd stomach

GB-508 FG Oct 1979 Mortality 1st stomach
SL - 74.8 cm

GB-509 FG " " 2nd stomach

GB-510 - 532 Fecal Pellets Bellow fecal recoveries
5 Sept 1979 WAIMANALO BAY = Bellows

Stranded Turtle

Maunalua Bay Hawaii Portlock area

GB 510 through GB 537

Bellows Fecal Samples

BALAZS

GB-510 begins GB-510

GB-510 ① 31.8 x 20.0
511 ② 28.1 x 25.3
512 ③ 39.5 x 20.5
513 ④ 35.8 x 16.5
514 ⑤ 35.8 x 14.8
515 ⑥ 58.4 x 25.5
516 ⑦ 34.3 x 21.8
517 ⑧ 32.4 x 21.7
518 ⑨ 24.6 x 18.9
519 ⑩ 41.3 x 14.4
520 ⑪ 53.8 x 22.6
521 ⑫ 40.4 x 20.6
522 ⑬ 38.6 x 29.3
523 ⑭ 53.5 x 26.8
524 ⑮ 43.6 x 17.7
525 ⑯ 43.1 x 27.0
526 ⑰ 42.3 x 14.6
527 ⑱ 29.3 x 20.8
528 ⑲ 34.9 x 15.4
529 ⑳ 35.2 x 16.2
530 ㉑ 33.3 x 16.5
531 ㉒ 46.7 x 25.5
532 ㉓ 38.6 x 21.2

23
+37
60 Sample series

23/60

Ramel
58.4 ↓ 24.6
14.4 ↓ 29.3

473.5

~~41.7~~ 20.6

FECAL SAMPLES collected BAFS 9/5/79

895.3

38.9

38.9 x 20.6 MEAN

GRATELOUPIA

Sent to Dennis Russell
~ 3/16/80 by George Balazs

GB- 600 stomach log 3280 Stomach 10/12/79
GB- 601 tangled on lead line - Bellows 1/4/80
GB- 602 Bellows #1 feces 1/3/80
GB- 603 Bellows #2 " "
GB- 604 Bellows #3 feces 1/3/80
GB- 605 Bellows #4 feces 1/3/80
(GB- 606 IAT'd dermal turtle Fiji Confisc. Stomach #1 - anterior 2/80
GB- 607 " " " " - posterior 2/80
GB- 608) " " Stomach #2 2/80
GB- 609 Kahala Beach mortality Stomach #1 2/20/80
GB-610 " " " " #2 2/20/80
GB-611 Midway/Eastern Is. 3/12/80
GB-612 Kure 3/11/80

GB-613 to GB-640 Dried April-May Necker Reef Collections

GB 641 to GB 644 Dried Necker-ER Lobster traps

GB 645 to GB 648 Dried Kure - Midway collections

GB 649 to GB658 Dried Cahuita Costa Rica
Caribbean coast beach drift collection

GB-600S

The Marine Algae Present in Turtle Gut Samples Collected in the Hawaiian Islands and Fiji by George H. Balazs, Hawaii Insititute of Marine Biology; Algae Identified by Dennis J. Russell, Seattle Pacific University, May 1980.

	Percent of Sample
GB-600	
Climacosphenia sp. (diatom)	Trace
Synedra sp. (diatom)	Trace
Cocconeis sp. (diatom)	Trace
Oscillatoria sp.	Mostly
Hair	
Unidentifiable objects	

GB-601	
Hypnea musciformis (introduced red alga)	All
GB-602	
Codium edule (badly digested)	90
Amansia glomerata	10
GB-603	
Codium edule	99
Amansia glomerata	1
GB-604	
Amansia glomerata	5
Codium edule	95
Codium arabicum	Trace
GB-605	
Codium edule	90
Codium arabicum	10
GB-606	
Laurencia paniculata	80
Dicranema rosaliae	20
Polysiphonia sp.	Trace
Ceramium sp.	Trace
Sponge	
Animal spines (1.2 x 0.5 cm)	
GB-607	
Halophila beccarii (seagrass)	40
Valonia aegagropila	20
Gelidiella acerosa	20
Hypnea esperi	10
Laurencia sp.	10

GB-608

Valonia aegagropila	75
Actinotrichia fragilis	10
Gelidiella acerosa	5
Hypnea esperi	5
Halophila beccarii (seagrass)	5

GB-609

Acanthophora spicifera	40
Amansia glomerata	40
Codium edule	10
Gelidiopsis sp.	10
Cladophoropsis luxurians	Trace
Dictyopteris plagiogramma	Trace
Sargassum echinocarpum	Trace
Sargassum polyphyllum	Trace

GB-610

Acanthophora spicifera	30
Amansia glomerata	30
Codium edule	30
Sargassum echinocarpum	Trace
Gelidiella acerosa	Trace
Chondria (?)	Trace
Gelidium sp.	Trace
Bryopsis pennata	Trace

GB-611

Porolithon sp.	Trace
Spyridia filamentosa	Mostly

GB-612

Helminthocladia rhizoidea (very loose thallus)
Rhodymenia anastomosans (cartilagenous red alga)

List of the algae in samples GB-600 to GB-612

CHLOROPHYTA

Bryopsis pennata Lamx.
Cladophoropsis luxurians Gilbert
Codium arabicum Kützing
Codium edule Silva
Valonia aegagropila C. Ag.

SEAGRASS

Halophila beccarii Ascherson

PHAEOPHYTA

Dictyopteris plagiogramma
Sargassum echinocarpum J. Ag.
Sargassum polyphyllum J. Ag.

CHRYSOPHYTA (diatoms)

Climacosphenia sp.
Cocconeis sp.
Synedra sp.

RHODOPHYTA

Acanthophora spicifera (Vahl) Boerg.
Actinotrichia fragilis (Forsk.) Boerg.
Amansia glomerata C. Ag.
Ceramium sp.
Chondria sp.
Dicranema rosaliae Setchell and Gardner
Gelidiella acerosa (Forsk.) Feldmann and Hamel
Helminthocladia rhizoidea Doty & Abbott
Hypnea esperi Bory
Hypnea musciformis (Wulfen) C. Ag.
Laurencia sp.
Polysiphonia sp.
Porolithon sp.
Rhodymenia anastomosans Weber van Bosse
Spyridia filamentosa (Wulfen) Harvey

MATHEMATICAL SCIENCES

SEATTLE PACIFIC UNIVERSITY

(206) 281-2140 • SEATTLE WASHINGTON 98119

2 June 1980

George Balazs
Hawaii Institute of Marine Biology
P.O. Box 1346
Coconut Island
Kaneohe, Hawaii 96744

Dear George,

I have inclosed the letter that I sent to the Postmaster General. If the sending of this letter will help in your efforts to study the sea turtles and to concerve them I am happy for the opportunity. Good Luck with your campaign!

I will have finished all of the identifications and they will be in the mail by the end of this week. School is finally out for the year and there is a full "free" week before summer school begins. My classes this summer include Marine Biology at Blakely Island in the Puget Sound and Marine Botany of Sitka Sound at Sitka, Alaska. I will also be giving a two hour workshop for high school teachers on Marine Agronomy and will take a couple of trips to professional meetings. My free month is July, when I hope to polish my dissertation. I am also planning a trip to Hawaii sometime this year. Maybe I will be able to meet with you at that time (I will let you know when later) to discuss and wrap-up algae ID loose ends. Keep up the good work,

Sincerely yours,

Dennis

GB-700 series

Recorded 8/9/80

sent ~7/20/80 2 packages

GB-700	Kihole	3/18/80	tag 3318 + 3322 PL scraping
GB-701	"	"	tag 3303 stomach
GB-702	"	"	tag 3311 "
GB-703	"	"	tag 3299 "
GB-706	Bellows	tag 2543	2542 - 5/7/80 stomach
GB-705	" 5/7/80	tag	2544, 2545 stomach
GB-704	Ki Holo	3/18/80	tag 3305 stomach
GB-707	Kure	3/25/80	tag 2538 stomach
GB-708	Kure	tag 2482, 2483, 2484, 2485	stomachs
GB-709	2/78	algae growing on loggerhead barnacle	
GB-710	Kure	3/25/80	tag 2471 (growth on tag)
GB-711	Bellows	4/11/80	tags 2538, 2539 chin scrapings
GB-712	"	4/11/80	tags 2540, 2541 stomach
GB-713	Bellows	5/14/80	tag 2335 stomach
GB-714	"	5/14/80	tag 3461, 3462 skin algae
GB-715	"	"	tag 3455, 3456 stomach
GB-716	"	"	tag 3461, 3462 stomach
GB-717	"	"	tag 3090 stomach
GB-718	"	"	tag 3465, 3466 stomach
GB-719	"	"	tag 2335 stomach
GB-720	"	"	tag 3457 stomach
GB-721	"	"	tag unknown - stomach
GB-722	"	"	tag 3459, 3460 stomach

GB-700 (continued)
recorded 8/9/80

GB-723	Bellows	5/14/80	tag 3454 3453 stomach
GB-724	"	"	tag 3325 large piece from mouth
GB-725	"	"	tag 3090 scraping from tag
[redacted]			
GB726 - 740			(see attached sheet)
GB 741	Kihole	3/18 - 3/24/80	tidepool/sluicegate
GB 742	"	"	"
GB 743	"	"	"
GB 744	"	"	"
GB 745	"	"	"
GB 746	KiHoLo	3/18 - 3/24/80	
GB 747	"		
GB 748	"		
GB 749	"		
GB 750	"		
GB 751	"		
GB 752	"		
GB 753	"		
GB 754	BAFS	5/13 - 5/15 1980	From net - left side of jetty
GB 755	Bellows ie Waimanalo		
GB 756	"		ALAE
GB 757	"		ENTANGLED
GB 758	"		IN TURTLE
GB 759			NET

note 9/13/06
ALL Presumably fecal pellets washed ashore

BATS 17, 18, 19 APRIL 1980

				IN MM SIZE
1	49.3	x	23.7	GB726
2	50.8	x	21.1	GB727
3	34.6	x	19.9	GB 728
4	44.4	x	20.1	GB 729
5	31.9	x	19.7	GB 730
6	35.9	x	20.9	GB 731
7	39.9	x	15.1	GB 732
8	40.4	x	16.6	GB 733
9	21.2	x	25.4	GB 734
10	36.9	x	19.4	GB 735
11	32.8	x	20.1	GB 736
12	31.6	x	21.3	GB 737
13	32.8	x	16.7	GB 738
14	60.0	x	20.0	GB 739
15	42.6	x	19.9	GB 740

GB 760
GB 761 Bellow enlarged algae in net
GB 762

3/24-3/26/80 KURE Atoll - East Reef Collection

GB 763 "
GB 764 "
GB 765 "
GB 766 "
GB 767 "
GB 768 "

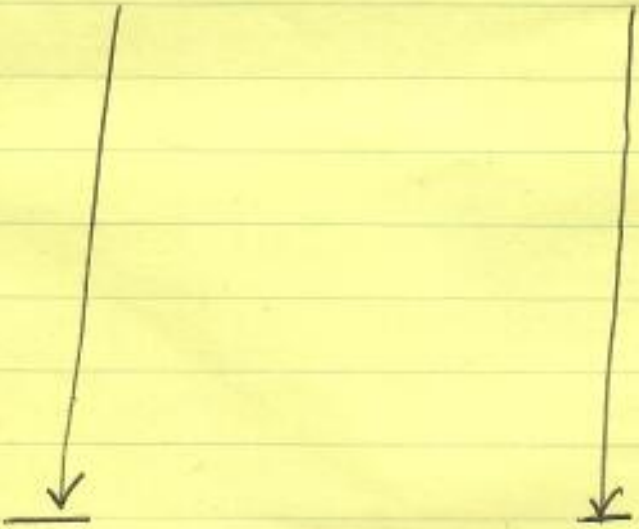
George Balazs Algae
Key to samples Dr. Dennis Russell

GB	SOURCE	DATE	TAGS
GB-800	Kailua, Toplis	8/17/80	Primary Stomach
GB-801	" "	"	Secondary Stomach
GB-802	" "	"	Intestine
GB-803	" "	8/17/80	Skin & Plastron scrapings
GB-804	EASTERN IS. Midway	8/26-8/28/80	tag 3472
GB-805	EASTERN IS. Midway	8/26-8/28/80	tag 2552
GB-806	" "	"	" 3468
GB-807	" "	"	Reef Flat
GB-808	" "		
GB-809	" "		
GB-810	" "		
GB-811	" "		
GB-812	" "		
GB-813	" "		
GB-814	" "		
GB-815	" "		
GB-816	" "		
GB-817	" "		
GB-818			
GB-819	KI HoLo	Oct 1980	tag 3478
GB-820	"	"	" 3487
GB-821	"	"	Stomach 3485, 86
GB-822	"	10/19/80	" 3297, 98

	SOURCE	DATE	TAGS
GB-823	KIHOLO	Oct 1980 10/18 stomach	3499, 3500
GB-824	"	"	3313, 3314
GB-825	"	" 10/17 stomach	3317, 3318
GB-826	"	" Recap 10/17	3311, 3312, 3998
GB-827	" Ledyl	" 10/16	3489
GB-828	"	10/15	3481
GB-829	"	10/17	3492-4
GB-830	"	10/17	3497
GB-831	"	stomach 10/14	3476, 3477
GB-832	"		3320
GB-833	"	stomach 10/15	3315, 3316
GB-834	"	" 10/17	3494, 95
GB-835	"		3483

↑ mailed by air to Dennis Russell January 30, 1981

GB-836	Bellows	stomach	TAG 3516
GB-837	WAIKANE MOLOKAI	12/2/80	reef collection
GB-838	"	"	"
GB-839			
GB-840			
GB-841			
GB-842			
GB-843			
GB-844			
GB-845			



GB	SOURCE	DATE	TAGS
GB-846	KAMALO, MOLOKAI	12/4/80	Reef collection
GB-847	"	"	
GB-848	"	"	
GB-849	"	"	
GB-850	Turned in to SLP Bellows	1/6/81	Feces from tank - 3728, 5109
GB-851	FFS of EAST Is. MORTALITY	JUNE 1980	Esophagus & Primary (1st) stomach
GB-852	" "	"	2nd stomach
GB-853	" "	"	upper intestines
GB-854	Juvenile from Tiger MIDWAY	primary stomach	(Total algae sent) D802
GB-855	"	INTESTINES	(Subsample of what may be algae - (mostly animal retains)
GB-856	"	LOWER INTESTINES	↓ " "
GB-857	Bob Ross KANEOHE	1st STOMACH	1/81
GB-858	Bob Ross KANEOHE BAY MORTALITY - 2nd stomach	1/81	Same TURTLE

GB no.	Source	Date
GB-900	Rose Atoll	November 1980
GB-901		
GB-902		stony
GB-903		stony
GB-904		
GB-905		
GB-906		
GB-907		
GB-908		
GB-909		
GB-910		
GB-911		
GB-912		stony w/ fleshy attached-DARK red growths (?)
GB-913		stony w/ dark red growths
GB-914	stony	

received 4/21/76

Algae from Chelonia mydas stomach
Collected at French Frigate Shoals, III-1976,
by George Balazs

Det. by M. S. Doty, IV-1976, whose herbarium numbers appear at the left below.

31561. Turbinaria ornata (Turner) J. Agardh.

Sterile and free of epiphytes. Composimg about 45 per cent of the contents.

31562. Spyridia filamentosa (Wulfen) Harvey.

Sterile. Composing about 45 per cent of the contents.

31563. ?Gracilaria n. sp.

Cystocarpic. Forming about 9 per cent of the contents.

31564. Ceramium sp.

31565. Microcoleus lyngbyaceus (Kuetzing) Thuret.

31567. Polysiphonia sp.

Tetrasporic.

31568. Sphacelaria tribuloides Meneghini.

31569. Roschera sp.

Moili Growth Study

CARBON_NITROGEN ANALYSIS

Date : 4/15/16

Sample No	Repl.	Sample wt. µg	C Pk. Ht (mm)	Atten.	Total C Ht. (mm)	N Pk. ht. (mm)	Atten.	Total N Ht. (mm)	C µg	N µg	C/N	x̄	% C	x̄	% N	x̄ %
Blank	1	0	29	1	29	2	1	2								
	2	0	31	1	31	2	1	2								
Standard	1	587	154	16	2464	96	4	384								
	2	660	172	"	2752	109	4	436								
Kai (12)	1	748	161	"	2576	61	4	244	315.9	74.5	4.28		42.63		9.96	10.01
	2	706	155	"	2480	60	"	240	306.9	73.2	4.19	4.23	43.47		9.23	
	3	793	173	"	2768	67	"	268	343.0	81.9	4.19		43.25	43.76	10.33	% Protein
	4	796	173	"	2768	67	"	268	343.0	81.9	4.19		43.01		10.29	62.56
	5	680	151	"	2416	57	"	228	295.9	69.6	4.30		43.96		10.24	
Balaz	1	691	99	"	1584	9	"	36	194.7	10.5	18.54		28.18		1.52	1.44
Turtle stomach contents from FFS	2	669	94	"	1504	8	"	32	182.6	9.3	19.72	19.32	27.51	21.81	1.39	Protein
	3	827	116	"	1856	10	"	40	228.7	11.7	19.50		27.65		1.41	9.0
		11.77 DM														
		88.3% H_2O														

FR

Scientists to Squeeze Oil from Algae

By Harry Whitten
Star-Bulletin Wrier

The sun is big and algae are small.

But algae figure in another attempt to use solar energy to help solve the nation's energy problems, a project just getting under way using the talents of Island scientists.

The project is that of getting oil from the single-cell microscopic marine algae known as diatoms.

A conservative estimate of oil yield from algae is 150 barrels per acre per year, at prices competitive with present crude oil acquisition costs, according to a recent news release from Gov. George R. Ariyoshi.

Up to 60 percent of the dry weight of the algae is oil, or liquid hydrocarbon, says John Caperon, the project's principal investigator. He is director of the Hawaii Institute of Marine Biology and professor of oceanography at the University of Hawaii.

"We know that we can grow and harvest the algae," he says. "But we don't know if the project is economically feasible."

THIS IS THE research project's primary objective, to establish an efficient, economical prototype of an oil-from-algae factory.

It's a two-year project, with funding the first year consisting of $120,000 from the state and $213,000 from the U.S. Department of Energy. If things look promising, the necessary additional funding is expected for the second year, Caperon said.

A decision on the site will be made in the next week or so, but the university's Snug Harbor, near the Sand Island bridge, is the probable site, he said.

The site has two essential ingredients for the project, sunshine and sea water, and it has technical backup at the university's machine shop.

For growth, the algae also need a mineral nutrient and carbon dioxide.

The marine diatoms to be used in the project are characterized by unusually vigorous growth, which can be a problem in certain circumstances, Caperon said.

The oil is different chemically from that obtained from petroleum, but it is of very high grade, he said.

"IT'S POSSIBLE we will find the industrial and chemical uses of the oil more valuable than for energy," he said.

The remaining part of the algae, after oil is extracted, is mostly protein, which is also valuable, he said.

The algae will be grown in very dense culture, which keeps the volume down; the concentration will facilitate harvesting. The cost of harvesting is one of the difficulties the researchers will face, but there are many technical problems, Caperon said.

Stack gas from a conventional plant is a rich source of carbon dioxide, and algae have been grown with this stack gas enrichment.

This opens up the possibility, but it's quite speculative, that carbon dioxide could be used from a fossil fuel power generation system, thus reducing the amount being emitted into the atmosphere.

MANY SCIENTISTS have expressed concern about the atmospheric changes that may result from an increase in carbon dioxide caused by increased use of coal.

But reduction of carbon dioxide by algae projects is an "iffy" matter, Caperon says; the project's primary purpose is finding an economical way of producing oil.

Working with him on the project are six other scientists: Nancy Y. Withers, Edward A. Laws, Hugo Kortschak, Peter M. Kroopnick, Theodore Jordan and Kenneth Terry. In addition, two technicians will be hired.

George Balazs
NOAA National Marine Fisheries Service
SWFC Honolulu Laboratory F/SWC2
2570 Dole Street
Honolulu, HI 96822-2396

14 June 1993

MATERIALS AND METHODS FOR DETERMINING THE PERCENT CONTENT OF ALGAL SPECIES AND OTHER ITEMS IN SEA TURTLE STOMACH SAMPLES, STOMACH FLUSHES AND FECAL PELLETS SAMPLES

I begin with samples that have been taken from sea turtles and preserved in formalin. The samples range from 20-200 ml in size and consist mostly of algae that has been mascerated by the turtle to pieces, chunks, 10 mm long or less, most are less than 5 mm long, and are often partly digested.

1. The sample is divided equally into two or four parts (sub-samples) and poured into two or four Petri plates, depending on sample size and density. The result is a single layer of algae spread uniformly over the bottom of the dish.

2. Each sub-sample is viewed over a grid (10 equal squares) and the main bulk of the species sorted into separate squares and a percent of their mass is estimated.

3. Each sub-sample is then scanned under the low power of a dissecting scope (2X) and the percent of each species in the field of view is adjusted (re-estimated) until the entire sample has been researched.

4. Those pieces that need to be dissected (i.e. Codium) or viewed under higher power (i.e. Sphacelaria, Polysiphonia) are placed onto a microscope slide, with coverslip and viewed under 100x or 400x as necessary to find the specific diagnostic features. Sometimes methylene blue is used.

5. The entire sample is investigated (searched) until no more trace species (less than 1% of the mass) are found.

6. Notes are also taken on the presence and abundance of marine animal species (such as sponges), parasites (worms, mites) terrestrial plant material (tree leaves, grass, moss), terrestrial animals (flies, cockroaches, ants), plastics of various types, fabric and rope threads, paint chips, flesh from fish, fish bones or scales, sand particles and anything else that is found. Pictures are drawn of some of these items for future reference.

7. All of the sample material is returned to the original vials and new or cleaned Petri plates, forceps and pipettes are used for the next sample. To avoid cross contamination between samples.

8. Diatoms and other microscopic algae are usually not identified because they occur in such minute quantities. They are identified, however, if they reach trace levels of abundance (i.e. tufts of the blue-green "alga" Lyngbya majuscula).

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Algal life-history strategies and resistance to digestion

B. Santelices & R. Ugarte

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ABSTRACT: The capacity to resist digestion is emerging as a widespread adaptation of benthic algae, especially among some opportunistic forms. This study examines differences in digestion resistance among macroalgae having different degrees of tissue differentiation and different life strategies. Opportunistic Chlorophyta and Bangiophycidae are able either to release protoplasts or to regenerate new tissues from undigested algal remains, suggesting 100 % grazing mortality to be a rare event among these species. In species with differentiated reproductive structures, swarmer and protoplast release does not occur in algal fragments; survival depends on the capacity of meristematic cells to pass through the digestive tract undamaged. Survival after digestion is higher among densely branched, filamentous forms with apical cell or diffuse growth, and lower in late successionals where meristematic tissues are restricted to particular regions of the thallus. Reproductive cells in all species with differentiated reproductive organs show greater sensitivity to digestion than vegetative, meristematic cells. Since resistance to digestion is closely related to morphological organization, life-history phases in heteromorphic species (e.g. leafy 8pl filamentous phases of *Porphyra*) may have completely different sensitivity to digestion. Overall, these results suggest that algae presently recognized as opportunistic forms include species with very different morphological and reproductive responses to grazing. Likewise algal mortality induced by grazing varies significantly among species of grazers. Some grazers induce high algal mortality while others stimulate swarmer and protoplast release, allowing survival of apical and intercalary meristems. Some of these grazers may have important ecological roles in dispersing, redistributing and even increasing the number of macroalgal propagules being dispersed.

INTRODUCTION

The ability to survive digestion by grazers seems to be a general adaptation of benthic algal propagules. The phenomenon is frequent for the algal species found in the guts of common intertidal and shallow subtidal sea urchins (Santelices et al. 1983), and intertidal grazing molluscs (Santelices & Correa 1985). Ongoing research indicates it is also evident among species grazed by amphipods and spores ingested by filter feeders.

A common, yet unexplained, observation in these studies is a greater ability of opportunistic algal species to survive passage through the digestive tract of grazers, as compared to late successional forms. Several as yet untested hypotheses have been advanced. Since opportunistic species usually have little division of labour and reproductive organs develop over much of the thallus, grazers consuming these species would, on average, have a much higher chance of eating propagules than those consuming late successional forms (Santelices et al. 1983). Germination and growth of propagules from opportunistic forms may perhaps be stimulated by nutrient released in the feces more than propagules from late successional forms. Alternatively, since the examination of algal cultures has often revealed growth from undigested algal remains, perhaps opportunistic species intrinsically have increased regeneration capacities compared to late successional forms (Santelices & Correa 1985).

A second general pattern emerging from these studies is conspicuous differences in digestion resistance among opportunistic algal species. This was especially clear in the Rhodophyta where Bangiophycidae are frequent survivors in fecal cultures while Ceramiales rarely survive. Differential sensitivity to digestive enzymes due to differences in cell wall structure was suggested as an explanation (Santelices & Correa 1985).

In this study we look for the causes of these patterns

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and test the above hypotheses through feeding experiments using intertidal grazing molluscs and selected algal species with varying morphologies and degrees of tissue differentiation, and different life strategies.

MATERIALS AND METHODS

A total of 10 algal species (Table 1) and 4 herbivorous molluscs were employed. Taxonomic authorities for the invertebrate and algal species identified in this study are to be found in Marinkovich (1973) and Santelices et al. (1981). *Littorina peruviana* (Littorinidae), *Collisella zebrina* (Acmaeidae), *Siphonaria lessoni* (Siphonariidae) and *Fissurella crassa* (Fissurellidae) are common intertidal grazers which modify in different degrees the survival capacities of common intertidal macroalgae in exposed habitats of Central Chile (Santelices & Correa 1985). The algal species used are common food items of these 4 grazers and they represent different morpho-functional groups (sensu Littler & Littler 1980). *Enteromorpha compressa*, *Ulva rigida* and *Porphyra columbina* are considered foliose opportunists; *Ectocarpus* sp., the filamentous (*Conchocelis*) phase of *Porphyra columbina*, *Chaetomorpha firma* and *Centroceras clavulatum* constitute filamentous opportunists; while the corticated, structurally more complex *Gelidium lingulatum* and *Iridaea laminarioides* and the calcareous crust *Leptophytum* sp. were all used as representatives of late successional forms. Leathery macrophytes (sensu Steneck & Watling 1982) and articulated corallines are infrequent food items among these grazers and therefore were excluded from the study.

Table 1. Collection data and reproductive stages for algal species used in this study

Species	Collection date	Reproductive state
Enteromorpha compressa	12 Jan 1985	Vegetative
Ulva rigida	13 Feb 1985	Vegetative
Porphyra columbina	15 Mar 1985	Reproductive
Ectocarpus sp.	2 Apr 1985	Polysporangial
Conchocelis phase of *Porphyra columbina*	28 Apr 1985	Vegetative
Chaetomorpha firma	15 May 1985	Vegetative
Centroceras clavulatum	3 Jun 1985	Vegetative
Gelidium lingulatum	5 Jul 1985	Tetrasporangial
Iridaea laminarioides	7 Aug 1985	Cystocarpic
Leptophytum sp.	21 May 1986	Tetrasporangial

Algae and invertebrates were collected at various dates from intertidal rocky habitats at Peñascura, near San Antonio Bay (33° 35' S, 71° 38' W) in Central Chile. For each experiment 30 haphazardly collected individuals of each invertebrate species were carefully rinsed up to 7 times in sterile seawater to remove algal remains from the invertebrate surface. Then they were transported to the laboratory in a temperature-controlled container and maintained with no macroscopic food in a circulating seawater aquarium for 10 d. Then, and for the next 3 d, a given algal species attached to the walls and bottom of plastic trays and maintained with circulating seawater was offered as food to each of the 4 species of grazer. The invertebrates were then removed, rinsed in sterile seawater and maintained in plastic containers with sterile seawater and bubbling air.

Fecal pellets from these grazers were collected with sterile forceps each morning for the next 3 d and examined under a microscope. A total of 60 fragments of algal thalli of each species were removed from the fecal pellets and transferred to 3 replicate sterile Petri dishes filled with 25 ml of SWM-3 culture medium (McLachlan 1973) and incubated 20 to 25 d under constant temperature (14 °C), photon flux-density (50 $\mu E\ m^{-2}\ s^{-1}$) and photoperiod (12:12). Ungrazed thalli of each algal species tested (non-exposed to grazers) were sectioned with razor blades and 60 thallus fragments of approximately similar size to those recovered from fecal remains were used as controls.

Resistance to digestion was defined as the ability either to grow and regenerate new cells or to produce propagules by the cells surviving in each of 60 thallus fragments recovered from the invertebrate fecal pellets. It was quantified as the number of living fragments out of the total number of thallus fragments (60) recovered from the pellets of each species of grazer. Comparisons of digestion resistance between vegetative and reproductive cells was made by simultaneously offering both types of tissues to grazers. Reproductive cells (tetraspores or carpospores) were always offered as part of a reproductive branch or tissue normally protected by the cortical cells.

Spontaneous swarmer release often occurred in some of our experiments both in the cultures started from fecal remains and in those started from non-ingested, control fragments. These swarmers eventually developed into sporelings. Frequently the resulting densities of sporelings in both types of treatments were different, but the sporeling density in the control culture was always ½ to ⅓ that in other experimental treatments. After 8 d of incubation, a total of 50 sporelings per treatment were transferred to a larger container (1000 ml) to compare elongation rates between sporelings arising from ingested and non-ingested thallus fragments. One-way ANOVA followed by a *priori* comparisons (Sokal & Rohlf 1969, p. 238) were used to evaluate the significance of differences in growth between these treatments. Similar methods were used to test for growth differences between ingested and non-ingested algal fragments of filamentous opportunists, as well as meristematic and reproductive cells of late successionists. In these experiments, however, the number of replicates used in each treatment often was less than 50 due to scarcity of surviving tissues.

RESULTS

Foliose opportunists

The ability of blade tissues of the 3 foliose opportunists to resist digestion varied according to grazer type (Fig. 1). Almost 90 % of the thallus fragments from *Enteromorpha compressa* and *Ulva rigida* recovered from fecal pellets of *Siphonaria lessoni* and *Fissurella*

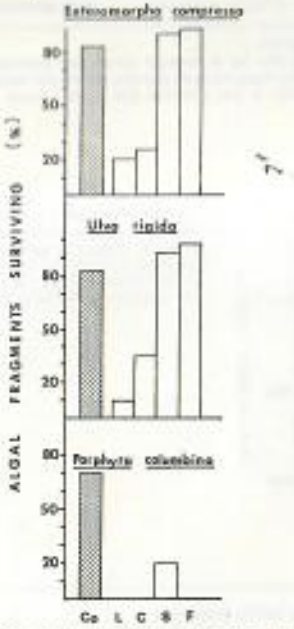

Fig. 1. Enteromorpha compressa, Ulva rigida and Porphyra columbina. Percent survival of 3 foliose opportunists consumed by 4 species of grazing molluscs (L: *Littorina peruviana*, C: *Collisella zebrina*, S: *Siphonaria lessoni*, F: *Fissurella crassa*); Co: control, non-ingested thalli

crassa remained healthy. Survival of tissue from both algal species was much lower with *Collisella zebrina* and *Littorina peruviana*. *Porphyra columbina* resisted digestion only when consumed by *S. lessoni*. Survival of control fragments ranged from 80 to 85 % in *E. compressa* and *U. rigida* and 70 % in *P. columbina*.

Two types of responses were common in the 3 foliose species over the 8 d period following their recovery from the fecal pellets. In some algal fragments the cytoplasm of the surviving cells was condensed toward one side of the cell, then the wall disintegrated, the tissue lost integrity and protoplasts were set free in the culture medium. In *Enteromorpha compressa* and *Ulva rigida* the protoplasts developed flagella, behaved like swarmers and settled down on the bottom of the culture vessels to form new thalli. In *Porphyra columbina*, protoplasts arising from vegetative cells developed into thin and short filaments which then formed a callus on the bottom of the culture dishes; protoplasts arising from reproductive cells normally originated *Conchocelis* filaments, although in one culture dish they developed directly into a thin *Porphyra* blade.

A second type of response, tissue regeneration from cells surviving in the algal fragments, was shown by *Ulva rigida* and *Enteromorpha compressa*.

The grazer strongly influenced the type of response shown by the algae (Fig. 2). Probably stimulated by the sectioning of the algal tissue, swarmer release occurred even in the non-ingested algal fragments used as control (12 to 25 %). However, the number of fragments of both Chlorophyta species releasing swarmers was much higher than the control when consumed by *Siphonaria lessoni* or *Fissurella crassa* or when *Enteromorpha compressa* was recovered from fecal pellets of *Collisella zebrina*. The number of algal fragments of the 2 Chlorophyta able to release swarmers after passing through *Littorina peruviana* and of *Ulva rigida* passing through *C. zebrina* was approximately similar to that shown by the control thalli.

Regeneration of new tissues was a response normally shown by the non-ingested, control fragments and, in smaller quantity, by some of the experimental fragments, especially of *Enteromorpha compressa* when passing through *Collisella zebrina* or *Fissurella crassa*. With the exception of a few fragments surviving through *C. zebrina*, ingested *Ulva rigida* was unable to regenerate.

In *Porphyra columbina*, protoplast release was the only response shown by ingested tissues and this was restricted to fragments recovered from *Siphonaria lessoni*. Non-ingested fragments of this species used as control either regenerated new tissues (72 %) or bleached and died. Not a single control fragment showed protoplast release.

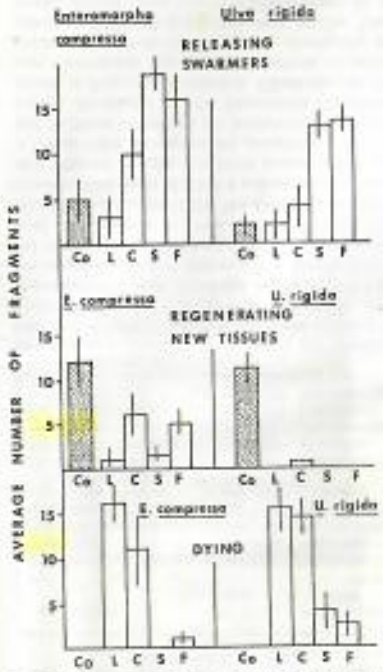

Fig. 2. *Enteromorpha compressa* and *Ulva rigida*. Average number of fragments (sample size = 20, n = 3) releasing swarmers, regenerating new tissues or dying after passing through the digestive tract of 4 species of grazing molluscs (L, C, S, F and Co as in Fig. 1). Bars correspond to range

Sporelings of both Chlorophyta species arising from swarmers released by ingested tissues grew significantly faster (Fig. 3, Table 2) than sporelings originating from non-ingested, control thalli. The effect was most pronounced in sporelings arising from swarmers passing through *Fissurella crassa*. As previously explained (see 'Materials and Methods'), during the 8 d following recovery of algal fragments from fecal pellets, sporeling density was much reduced in the control thalli than in the 2 other treatments, therefore growth stimulation cannot be explained as a density-related phenomenon. Probably growth stimulation was produced by unknown factors in the fecal remains of both grazers.

The reduced number of ingested algal fragments of the 2 Chlorophyta showing regeneration capacity did not allow a comparison of growth rates with regenerating, non-ingested, control fragments.

Filamentous opportunists

Survival of filamentous opportunists also varied with the algal and the grazer species tested (Fig. 4). *Chaetomorpha firma*, the filamentous phase of *Porphyra columbina*, and *Ectocarpus* sp. survived best when consumed by *Siphonaria lessoni* or *Fissurella crassa* and least well when ingested by *Littorina peruviana*. Only a few fragments of *Centroceras clavulatum* survived and only when consumed by *S. lessoni*.

Microscopic examination revealed that these filamentous species could either produce new swarmers or regenerate new tissues. Swarmer formation (8 to 12 per cell) occurred in the remains of *Chaetomorpha firma* recovered from the fecal pellets of all 4 grazers. In contrast, control filaments regenerated by growth of the apical cell without swarmer formation. Ingested as well as non-ingested fragments of *Ectocarpus* sp., the filamentous (Conchocelis) phase of *Porphyra columbina*, and *Centroceras clavulatum* regenerated from terminal branch cells. No evidence of protoplasts formation and release was ever found in these species. Upon recovery from the fecal pellets, the apical and intercalary cells of these 3 species, the cortical cells of *C. clavulatum* and the pluriangia of *Ectocarpus* sp. revealed structural damage and pigment destruction. Recovery and growth occurred later from undamaged apical cells. The increased abundance of lateral branches, each with terminal branch cell in *Ectocarpus* sp. and in the Conchocelis filaments corresponded with increased survival capacity of these species relative to the lower values shown by the sparingly branched *C. clavulatum*.

Sporelings of *Chaetomorpha firma* which arose from swarmers passing through *Siphonaria lessoni* and the Conchocelis filaments which survived consumption by *S. lessoni* and *Fissurella crassa* grew significantly faster than the non-ingested control thalli under laboratory conditions (Fig. 5).

Late successionists

Survival capacity in culture of *Gelidium lingulatum* and *Iridaea laminarioides* fragments recovered from fecal pellets varied according to the cell type (vegetative or reproductive) and to the type of grazer tested (Fig. 6, Table 2).

Vegetative tissues of *Gelidium lingulatum* generally resisted digestion (80 to 82 %) when consumed by

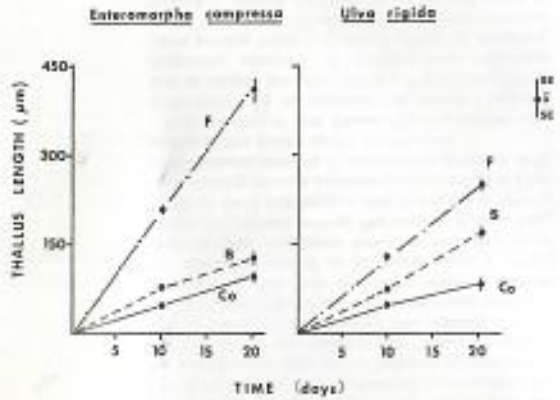

Fig. 3. *Enteromorpha compressa* and *Ulva rigida*. Growth (measured as thallus length increments) of 10 sporelings recovered from fecal pellets of *Siphonaria lessoni* and *Fissurella crassa* (indicated S and F respectively)

Table 2. ANOVA tables with treatment sum of squares decomposed into planned comparisons for the results of growth of opportunistic and late successional forms surviving digestion through *Siphonaria lessoni* and *Fissurella crassa*. Comparisons have been performed with growth achieved at the end of each experimental period (20 d). * Significant differences at $p<0.05$; ** significant differences at $p<0.01$

Opportunistic forms	Sporelings of *Enteromorpha compressa*			Sporelings of *Ulva rigida*			Filaments of *Chaetomorpha firma*			Filaments of *Porphyra columbina*		
Source of variation	df	MS	F_s	df	MS	F_s	df	MS	F_s	df	MS	F_s
Treatments	2	184 149.0	226.0**	2	87 945.0	143.0**	2	270 105.0	549.1**	2	12 224.0	17.5**
Ingested vs uningested	1	123 384.0	265.3**	1	134 786.0	219.1**	1	1 820.0	3.0	1	24 338.0	34.9**
Siphonaria vs *Fissurella*	1	84 954.0	183.0**	1	41 103.0	66.8**	1	538 390.0	293.0**	1	110.0	0.2
Within	147	464.9		147	615.0		132	1 812.0		28	697.4	
Total	149			149			134			40		

Late successionists	Meristematic cells of *Gelidium lingulatum*			Meristematic cells of *Iridaea laminarioides*			Tetraspores of *Gelidium lingulatum*			Carposporos of *Iridaea laminarioides*		
Source of variation	df	MS	F_s	df	MS	F_s	df	MS	F_s	df	MS	F_s
Treatments	2	7 561.0	14.3**	1	4 454.0	103.0**	2	6 716.0	98.5**	2	18 088.0	53.5**
Ingested vs uningested	1	13 408.0	25.4**				1	10 773.0	158.0**	1	34 612.0	102.4**
Siphonaria vs *Fissurella*	1	1 714.0	3.3				1	2 658.0	39.0**	1	1 563.0	4.6*
Within	147	528.0		39	42.9		58	68.2		57	338.0	
Total	149			40			60			59		

Siphonaria lessoni and *Fissurella crassa* but not when consumed by *Collisella zebrina* or *Littorina peruviana*. Apical initials and cortical cells of *G. lingulatum* exhibited pigment destruction and structural damage after recovery from the feces. However, a number of apical initials remained alive in most fragments recovered from *S. lessoni* and *F. crassa* and were able to grow in culture. In a few fragments where all apical cells showed pigment destruction, regeneration occurred by differentiation of cortical cells into apical initials. This did not occur in fragments recovered from *L. peruviana* or *C. zebrina*.

Few tetraspores of *Gelidium lingulatum* resisted digestion by any grazer (Fig. 6). Often the cortical cells around the tetraspores showed pigment destruction and may have protected the few surviving spores from digestion. Although the survival rates of reproductive cells were slightly higher when consumed by

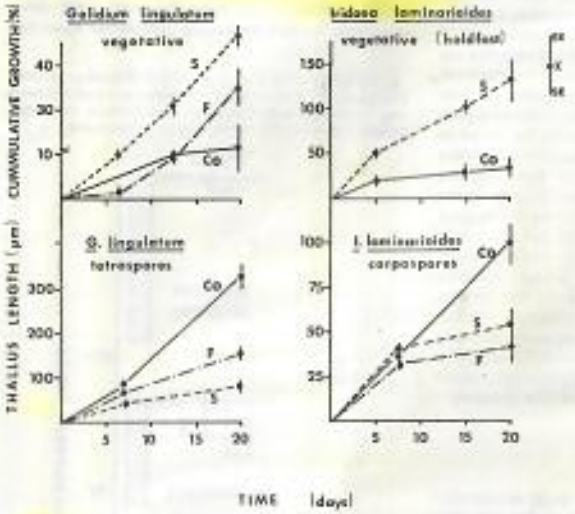

Fig. 7. *Gelidium lingulatum* and *Iridaea laminarioides*. Growth (measured as length or surface area increments) of sporelings and regenerated tissues recovered from fecal pellets of *Siphonaria lessoni* and *Fissurella crassa* (indicated as S and F respectively)

the viewpoint of trophic relations arising from these partially digested though living materials.

Our results also indicate that the variety of algae currently recognized as opportunistic forms include species with qualitatively different responses to grazing digestion. From this viewpoint the opportunistic algae are a highly heterogeneous group. The capacity to release swarmers and protoplasts by tissues that resist digestion clearly segregates the opportunistic Chlorophyta and Bangiophycidae from all other opportunists. Further, the capacity to regrow or regenerate new individuals from branch tips in single, highly branched filaments as in the Ectocarpaceae contrasts with the reduced capacity shown by morphologically different filaments as in the Ceramiaceae. These results are consistent with recent reports indicating that some Ceramiaceae had a more restricted space-time spore production than other filamentous opportunists (Hoffmann & Ugarte 1985). Future comparative studies will probably show additional life strategy differences among the variety of algal species now pooled together as filamentous opportunists.

The different response shown by the leafy (haploid) and the filamentous (diploid, *Conchocelis*) phase of *Porphyra columbina* is noteworthy. While the leafy form released protoplasts and only when consumed by *Siphonaria lessoni*, the filamentous phase had only diffuse growth and survived grazing by 2 of the 4 grazers. These differences are consistent with the well-known differences in morphological organization and physiological and ecological responses of these 2 phases and suggest that the type of response shown by digestion-resistant tissues is closely related to morphological organization and degree of differentiation.

Differences in algal mortality induced by different grazers in our experiments are in good agreement with previous results (Santelices & Correa 1985) where we reported conspicuous differences in ability to survive in relation to the grazer. Differences were explained on the basis of damage produced to the algal thallus by the feeding apparatus of the corresponding grazer. Present results, however, suggest that the phenomenon might be more complex, perhaps involving selective digestive enzymes as algal survival capacity is not restricted to tissue regeneration but also to swarmer production. For example, digestion by *Siphonaria lessoni* stimulated swarmer or protoplast release in several species and resulted in high survival rates of vegetative and reproductive tissues of several filamentous opportunists and late successionists. It is possible that this and similar grazers have important ecological roles dispersing and redistributing propagules and, in some cases, even increasing the number of macroalgal propagules being dispersed.

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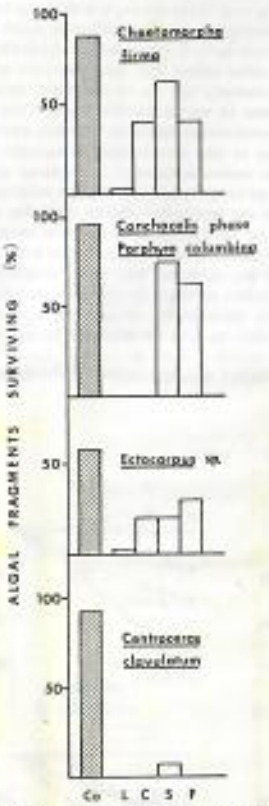

Fig. 4. Chaetomorpha linum, Conchocelis phase of *Porphyra columbina*, *Ectocarpus* sp. and *Centroceras clavulatum*. Percentage survival of 4 filamentous opportunists consumed by 4 species of grazing molluscs (L, C, S, F and Co as in Fig. 3)

Fissurella crassa and *Siphonaria lessoni*, they were much lower than vegetative cells, indicating higher sensitivity of reproductive cells to digestive enzymes.

Holdfast fragments were the only tissue of the *Iridaea laminarioides* thallus with regeneration capacity. Other frond fragments were unable to regenerate under ingested or non-ingested conditions. Holdfast fragments of *I. laminarioides* had very low digestion resistance and survived only when consumed by *Siphonaria lessoni* or *Colisella zebrina* (Fig. 6). Carposporos of *I. laminarioides* survived only when eaten by *Siphonaria lessoni* or *Fissurella crassa* and in higher percentage than vegetative fragments (Fig. 6).

Thallus fragments of *Gelidium lingulatum* and *Iridaea laminarioides* surviving in the fecal pellets of *Siphonaria lessoni* or *Fissurella crassa* grew significantly faster in cultures than non-ingested thallus fragments used as control (Fig. 7, Table 2). However, these algal fragments did not attach themselves to the culture dishes during the experiments. In contrast, the reproductive cells of *G. lingulatum* and *I. laminarioides* resisting digestion could attach themselves but their growth rates were significantly smaller than the non-ingested control spores.

Vegetative tissues of *Leptophytum* sp. failed to grow under any experimental condition. Growth of calcareous crusts normally requires longer experimental periods to detect significant differences. Tetraspores ingested by any of the 4 grazers did not have any growth capacity after recovery from the fecal pellets. Control spores showed 60 % germination capacity and kept growing in our cultures up to the end of the experiments (20 d).

DISCUSSION

Swarmer and protoplast release shown by opportunistic Chlorophyta and Bangiophycidae that survive digestion is perhaps the most significant result of this research. These protoplasts and swarmers in generating new individuals act as accessory means of reproduction. This result is not completely unexpected since swarmer release is a common response among Chlorophyta when exposed to stressful situations (Vidaver 1972) and protoplast release after application of abalone gut enzymes to *Porphyra perforata* has been reported (Polne-Fuller & Gibor 1984). Our findings, however, add an evolutionary perspective to this response suggesting it could be analogous to some dispersal mechanisms observed in land plants, where seed germination is sometimes stimulated by digestion tract passage. In these algae, swarmer and protoplast production is often stimulated by the passage through the digestive tract of these grazers.

The combination of results allows us to establish digestion resistance patterns among algae with different life strategies, and to evaluate some of the hypotheses previously proposed to explain survival differences. Opportunistic Chlorophyta and Bangiophycidae are able either to release protoplasts or to regenerate new tissues from undigested algal remains, suggesting that 100 % grazing mortality might be a rare event among these species when consumed by these grazers. High grazing mortality is expected only

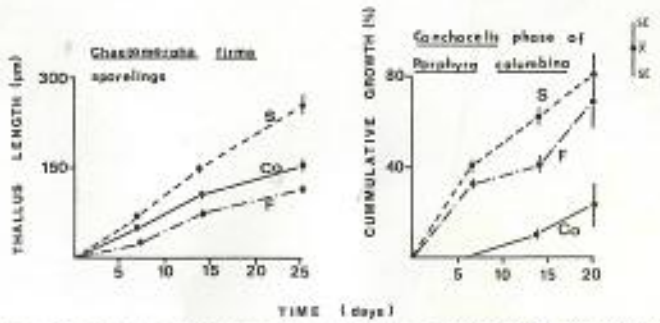

Fig. 5. *Chaetomorpha linum* sporelings and filaments of *Conchocelis* phase of *Porphyra columbina*. Growth (measured as thallus length increments) after recovery from the fecal pellets of *Siphonaria lessoni* and *Fissurella crassa* (indicated as S and F respectively)

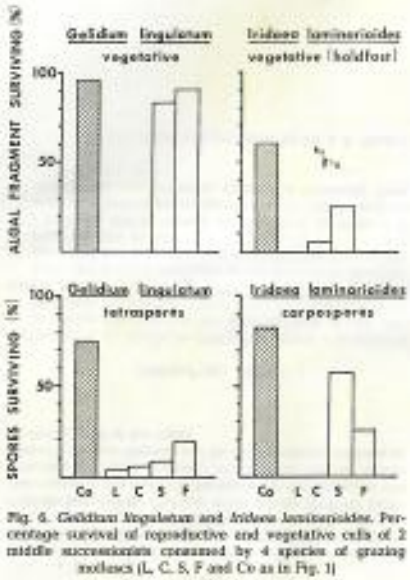

Fig. 6. *Gelidium lingulatum* and *Iridaea laminarioides*. Percentage survival of reproductive and vegetative cells of 2 middle successionists consumed by 4 species of grazing molluscs (L, C, S, F and Co as in Fig. 3)

for *Porphyra columbina* when consumed by grazers other than *Siphonaria lessoni*. This also explains the increased ability to survive digestion shown by these opportunists as compared to other algal forms in previous experiments (Santelices et al. 1983, Santelices & Correa 1985). Furthermore, the differences in survival capacity among opportunistic Rhodophyta (Bangiales vs Ceramiales) could also be explained by the above results rather than by differences in cell wall constituents as previously thought (Santelices & Correa 1985).

Swarmer and protoplast release from undigested algal remains does not occur in species with differentiated reproductive structures. Survival in these cases is wholly dependent upon the capacity of meristematic cells to pass alive through the digestive tract of grazers. In many filamentous opportunists, the probability of survival is higher in densely branched morphologies (e.g. *Ectocarpus* sp. vs *Centroceras clavulatum*). These results also suggest that filamentous opportunists with intercalary meristems may perhaps be of greater advantage than apical meristems for survival.

Meristematic cells of late algal successional forms can also resist digestion. However, since the meristematic tissues in these species are localized in the thallus, the probability of their consumption by grazers is reduced as compared to the meristems of opportunistic filamentous taxa.

Reproductive cells in all species with differentiated reproductive organs showed greater sensitivity to digestion than meristematic cells. Since surviving spores were able to attach themselves to the culture containers, in nature they are expected to be able to generate new individuals upon settlement. In contrast, vegetative cells and tissues were unable to produce new attachment structures in culture, even though growth was often stimulated by unknown substances in the fecal remains. Therefore they could be considered dead from the point of view of generating new individuals although they are probably important from

Land Panel Okays Seaweed Research

A research project involving the seaweed eucheuma, subject of a scientific controversy three years ago, was approved yesterday by the state Board of Land and Natural Resources.

The conservation district use application by Brewer Chemical Corp. proposed utilization of a tidal pond, not now in use, near the reef runway.

The approval is for a one-year period, after which the company would have to apply again if it decides the project is feasible.

Roger C. Evans, staff planner, told the board the staff was of the opinion that the project, if successful, could result in a new enterprise contributing to the state's economy.

The seaweed, a native of Southeast Asia, has many uses when processed, mainly as a food additive.

Brewer Chemical had submitted a request to proceed with the project that was denied in January 1977 because of unanswered questions about effective controls to prevent the escape or eradication of the seaweed if the research proved unsuccessful.

EVANS TOLD the board that it now appears measures are available to control and, if necessary, to eliminate the eucheuma seaweed strains and to mitigate adverse effects to the marine environment.

One condition of the approval is that the importation of the seaweed shall be done only with the approval of the state Department of Agriculture.

Moses Kealoha, Oahu board member, said there were still too many unanswered questions and voted against approval.

The board also approved a request by R.W. Power, Oceanic Institute president, to conduct aquaculture research at Kanohuluiwi Fishpond, on Kaneohe Bay opposite Coconut Island.

The project calls for enclosing the landward side of the fishpond with a chain-link fence for security reasons, widening the north landward side of the pond's wall to 10 feet, and using the restored pond to raise breeding stock of harvestable aquatic species.

The project will also evaluate the potential of using Hawaiian fishponds for small-scale aquaculture.

One condition of the approval is that the wall's repair will be under supervision of the historic sites section, state Parks Division.

IN OTHER ACTION, the board:

—Recommended that the governor issue an executive order for a lease of 30,390 square feet to the city for the Ala Moana sewage pump station expansion project.

Wallace Miyahira, director of the city Public Works Department, told the board that the federal government would pay 75 percent of the $8 million project planned since 1972.

—Approved a cooperative agreement between Haleakala National Park and the land department for interagency cooperation in the Hawaiian goose (nene) restoration project.

—Approved, subject to a staff report, an extension of a revocable permit for CBS Television to use 4.8 acres at Fort Ruger for TV studio productions.

United States Department of the Interior

FISH AND WILDLIFE SERVICE

National Museum of Natural History
Washington, D.C. 20560
(202) 357-1930

16 November 1993

Dr. George H. Balazs
Southwest Fisheries Science Center
Honolulu Lab, NMFS
NOAA, Honolulu, HI 96822

Dear George:

Been a bit of time since you heard from me, eh? Getting old and fat and not having much of any chance to travel so am doing some work as senior editor of the Virginia breeding bird atlas and once again, am becoming a local bird expert. Needless to say, I am after something.

I am currently doing some bibliographic work on Hawaii, especially Laysan and Midway, and knowing how prolific you are (having seen your name with great regularity in Wildlife Review, which I read like some people do Time) I wonder if you could send me a care package of your publications. The more obvious sources (Elepaio, etc) I have no trouble getting a look at but the Smithsonian Library has fallen on hard times and their efficiency and willingness are a lot less than they used to be. [Too bad Ripley left -- my few colleagues who have been here thirty years like me - feel that the beauracracy had finally won with bull taking precedence over academics].

So, as anything out of the NOAA Tech Mem NMFS, especially the SWFC ones, would be highly helpful -- and if you wanted to send me some of the stuff by other authors there I would also appreciate it and acknowledge your help in whatever I might assemble. [The Smithsonian being the way it now is, I have a better chance of hearing from you in relatively short order than I do on library request.

The last time I was in Hawaii was in 1988 and I somehow doubt I am going to live long enough to get out there again -- although my officially being part of the marvelous "National Biological Survey" as of yesterday -- you would think would improve my chances. I know you are productive and hope other things also go well.

Regards,

Roger

Roger B. Clapp
Museum Specialist

(1)

CIRCA 1991

Visiting diver suspects algae conspiracy

COMMENTARY

By URSULA KEUPER-BENNETT

I am writing this letter for some friends of mine who can't take pen to flipper and fin.

For me this no longer matters. After spending 15 summers in Hawaii averaging five weeks a stay and two dives daily, this is my last time on Maui. Next summers will be spent in the Caribbean as Maui can no longer provide decent ocean for me anymore.

But I'm not leaving until I've had my say — my aquatic friends can't up and leave as easily as I can.

This summer, like two summers before (1989), there is alleged algae choking the waters off Honokowai. I say "alleged" because no one admits to it being here.

Each morning the topic of conversation at the condo we rent is where to snorkel. Certainly there are suggestions. "Try Honolua . . . heard it's pretty clear," "Been to Olowalu? You might try there." Advice spews forth, but does anyone stop to ponder how sad things get when you have to search for decent ocean?

Here in Honokowai there is algae everywhere, fouling the beach, in thick green mats trapped between reefs, floating free like gruesome green Brillo pads, lodged in and around coral heads; in fact, it is more Green Hawaii than Blue Hawaii.

I find it interesting that not only is nothing being done about it, few here even acknowledge a problem.

"Algae? It wasn't here a week ago . . . must have been the eclipse what brought it."

"Algae? Must be all the sun we've had lately."

My husband and I went to the Lahaina library. We rifled through the July, June and May back issues of The Maui News, expecting to find this algae of daily concern. Instead, not a peep from one day to the next.

Oh, we did find one article on stinky seaweed at Kahului and one about a diver holding up a strand of the green slime. (I can show you plenty places where a diver can be covered completely in the stuff). And one article was the crown jewel in all this — an article by Jill Engledow proclaiming we should welcome the stuff for use in our gardens, kind of like being joyous you got roaches because they can be dipped in chocolate and sold as a protein supplement!

There is so little being written or said about the algae that one wonders if there isn't some conspiracy of silence.

Algae can affect tourism, so let's pretend we don't notice.

Algae are plants. Anyone who knows anything about plants knows what makes them grow. Nitrogen; no mystery, nitrogen is a fertilizer.

To get this explosion of algae means somehow, somewhere nitrogen is getting into the waters off Honokowai. I can hazard a guess to possible sources — fertilizer from pineapple/sugar fields or inadequate treatment of sewage from the increased development here.

I have been videotaping the mess here. Between the reefs are algae carpets up to two feet thick. In the sand flats around 40 feet deep are acres of algae — acres — as green as far as visibility will allow.

Unless there is acknowledgement by your government that there is an algae problem, the Kaanapali/Honokowai/Kapalua area will have water more like Lake Erie sludge than Hawaiian pristine.

If you head makai straight from this condo, there is a turtle house with eight to 10 individuals all expecting to see me each morning. They have been there forever, and their ancestors were here before the first humans.

They are ancient but they have no pockets to carry any money, they aren't registered to vote, they can't lobby Congress, they can't even voice their concern. But I can!

The water here is disgusting; OK, allegedly disgusting from all this alleged algae.

Oh, and as for your island motto "Maui No Ka Oi" . . . Not if you're here to enjoy the water.

Ursula Keuper-Bennett is a resident of Toronto, Ontario, Canada.

George Balazs
NOAA National Marine Fisheries Service
SWFC Honolulu Laboratory F/SWC2
2570 Dole Street
Honolulu, HI 96822-2396

23 July 1993

Dear George,

I just received your 16 July letter and agree 100% Sorry if the enthusiasm began to get away with itself. I sent Ron Phillips a letter and have talked with him and he knows that the sample is yours and is sending it back to you soon. He is the World expert on sea grasses along with Den Hartog and since he has worked with Kent Bridges (UH) for 25 years on sea grasses it was a natural to contact him to get an identification. Nothing else will be done without your approval.

NOAA wants me to write up the NEMO paper* I gave here in Seattle this past winter. Would you want to be co-author of that paper? I will send you the draft copy as soon as I finish it, before I mail it to NOAA. It will be a short version of the one we sent to Aquatic Botany.

Aloha,

Dennis

*a Tech Report

Dennis J. Russell
P.O. Box 655
Mountlake Terrace, WA 98043

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Fisheries Science Center Honolulu Laboratory
2570 Dole St. • Honolulu, Hawaii 96822-2396

FLORIDA

Date: AUGUST 19, 1993

4 **Algae samples submitted to Dr. Dennis Russell, 4408 237th Place, S.W. Mount Lake Terrace, WA 98043.**

by George Balazs
NMFS, Honolulu Laboratory
2570 Dole Street
Honolulu, Hawaii 96822-2396

SAMPLE ID.	LOCATION	DESCRIPTION
8 / 93	Indian River	Bottom Drift (Lg plastic vial)
8/13/93	Indian River	N-2399 (Red ID label)
8 / 93	Indian River	N-2396 (Sm. tall/thin vial)
8 / 93	Select Indian River	Glass vial (White label)

BALA25

HONOLULU LABORATORY
Southwest Fisheries Center
2570 Dole Street
Honolulu, HI 96822-2396

51 ALGAE SAMPLES COLLECTED FROM NECROPSIED GREEN TURTLES
MARINE TURTLE RESEARCH PROGRAM, N M F S

Submitted 4/23/93

(- Identification on Samples -)

NAME	DATE	LOCATION	SAMPLE SITE
Frank Viterise	7-1-92	K-Bay/Kahaluu	Forestomach
Don Williamson	7-14-92	Midway Atoll	Forestomach
Blanche McCabe	9-15-92	Kaneohe Bay	Stomach
Skippy Hau	9-25-92	Kahana Beach/Maui	Forestomach #1
Skippy Hau	9-25-92	Kahana Beach/Maui	Forestomach #2
Michael Moore	9-26-92	Kailua Beach	Forestomach
Belluche & Ellis	9-26-92	Kailua Beach	Forestomach
Kiholo	9-29-92	Kiholo	Fecal Pellet
Shannon Kawakami	10-1-92	Hukilau Beach/Laie	Stomach
Bill Taylor	10-5-92	Haleiwa; Alii B.P.	Forestomach
Brooks Tamaye	10-6-92	Kapalua Bay/Maui	Forestomach
Albert Morita	10-6-92	Hauola/Lanai	Forestomach
Kualoa #1	10-6-92	Kualoa	Fecal Pellet
Kualoa #2	10-6-92	Kualoa	Fecal Pellet
Mark Wilkerson	10-9-92	Kualoa Ranch	Forestomach
Lee File	10-16-92	Kailua	Forestomach
Water Safety Div.	10-18-92	Ft. DeRussy	Forestomach
Skippy Hau	10-19-92	Maliko Bay/Maui	Stomach
Norman Chun	10-28-92	K-Bay; KMCAS	Stomach
Norman Chun	10-28-92	K-Bay; KMCAS	Intestine
Earl Omoto	10-29-92	Heeia Kea B.Ramp	Stomach
Larry Valdez	11-8-92	Kailua	Forestomach
Bradley Hara	11-11-92	Waialua	Forestomach
Richard White	11-17-92	Spencer B.Park/BigI	Forestomach

Please return all samples.

SUBMITTED 4/23/93

Richard White	11-17-92	Spencer B.Park/BigI	Second stomach
Bradley Hara	11-24-92	Waialua	Forestomach
Tag # F16	11-25-92	Hanauma Bay	Mouth
Mark Thomas	11-30-92	Kualoa/White Sands	Forestomach
James Kaulukukui	11-30-92	AnaehoomaluBay/BigI	Forestomach
Craig Nakamura	12-5-92	K-Bay/Kahaluu	Forestomach
Steve Struckman	12-6-92	Waialua	Forestomach
Albert Morita	1-18-93	Kahua Point/Lanai	Forestomach
Skippy Hau	1-21-93	Kahului Harb/Maui	Hksbill feces
Earl Omoto	1-21-93	K-Bay	Stomach
Floyd Hustace	1-26-93	Hickam A.F.B.	Stomach
David Frenz	2-2-93	Hilo Bay/Big Island	Forestomach
Darcy Kerrigan	2-17-93	Mokuleia Beach	Forestomach
Greta	2-21-93	Camp Mokuleia	Forestomach
Terri Lambert	2-24-93	Barberts Point NAS	Forestomach
Andy J. Brown	2-26-93	Makaha	Forestomach
Sam Morales	2-27-93	K-Bay/Kahaluu	Forestomach
Kim Slagel	3-8-93	K-Bay/Kauhale Bch	Forestomach
Liz Hawkins	3-10-93	Maunalua Bay	Forestomach
Brooks Tamaye	3-24-93	Maalaea Bay/Maui	Forestomach
Skip Tracy	3-25-93	Hawaii Kai Marina	Stomach
Brooks Tamaye	3-29-93	Lahaina/Maui	Forestomach
Larry Lopez	3-31-93	K-Bay/Kahaluu	Forestomach
J. Robello (SSG)	4-3-93	Kahana Bay	Forestomach
Dan Akaka	4-13-93	Mauna Lani/Big Is	Forestomach
Richard Taylor	4-15-93	Kailua Bay	Forestomach
Debbie Ancheta	4-16-93	Barbers Pt. NAS	Forestomach

Please return all samples

George Balazs
NOAA National Marine Fisheries Service
SWFC Honolulu Laboratory F/SWC2
2570 Dole Street
Honolulu, HI 96822-2396

6 April 1993

Dear George,

The agenda for the workshop on Nonindigenous Estuarine and Marine Organisms (NEMO) just arrived and since I am giving a paper on the utilization of alien algae by sea turtles, I thought it best to send you the program so your agency can be fully informed. Thank you for letting me present this information. It may be the exposure I need to get a decent job. I am really tired of doing everything else under the sun to earn a living, when I would really like to put a research project together to study the effects of alien algae in Hawaii. If you have any suggestions about how to get a job with NOAA, etc. please let me know. I would like to put my full-time into research of this kind.

Also, I found a little article in Reason magazine about sea turtles and shark attacks on surfers. I think the article is probably stretching "logic" a bit too far to assume the endangered species laws are responsible for these deaths. However, if sea turtles are becoming more abundant because of Hypnea musciformis, then whoever introduced Hypnea is responsible for the deaths of swimmers and surfers attacked by the sharks that are attracted to the turtles. Amusing isn't it?

Aloha,

Dennis J. Russell
Science Division, Biology
Everett Community College
801 Wetmore Avenue
Everett, WA 98201-1327

addressing the problem of unwanted aquatic organisms and pathogens discharged by ships. This paper will discuss the evolution of the Guidelines and international developments since their adoption.

Utilization of Alien Algal Species by Sea Turtles - ***Dennis J. Russell***

Eighteen species of marine macro-algae have been introduced to Oahu, Hawaii, since 1950. Although one came by ship, most of the introductions were in conjunction with marine agronomy projects and were transported to Hawaii by air from California, Florida, the Philippines, etc. The alien species Acanthophora spicifera (Vahl) Boerg, and Hypnea musciformis (Wulfen) J. Ag. have become wide spread and have displaced two native algal species, while adding to the total biomass of the reef. In addition, these aliens are now being prominently used as food sources by the green turtle (Chelonia mydas L.), a species considered endangered worldwide. A total of seven alien algal species are presently being used by sea turtles for food. This is the first known documentation of introduced algae being incorporated into the diet of the green turtle and represents only one of many changes the introduction of fast growing alien primary producers may cause in the food web.

A workshop on Nonindigenous Estuarine and Marine Organisms. Seattle, Washington, NOAA. April 20-22, 1993. NEMO Workshop Abstracts p. 1-17.

George Balazs
NOAA National Marine Fisheries Service
SWFC Honolulu Laboratory F/SWC2
2570 Dole Street
Honolulu, HI 96822-2396

22 May 1993

Dear George,

Thank you for the latest PO, which I will process in a month or so. I also received the box of samples, which I have started working on. There is still no word from Aquatic Botany about our article! It seems I begin to worry and then begin to panic, when finally they write. Maybe I should send them a letter asking what is going on now.

I wrote to REASON magazine about their little article on "sea turtles" and they sent me their source of information. They certainly took the information and stretched it beyond reason to infer the protection of sea turtles leads to shark attacks on people. I sent them a copy of the article you sent to me. These "smart alec" reporters need to be challenged once in awhile and it appears they were responsive in a positive way.

I have also included a copy of the NEMO abstract from the paper I presented, because I don't remember if I sent it to you yet or not. Also, Richard Harbison, Woods Hole Ocean. Inst. sent me an article on "A study on the gut contents of six leathery turtles Dermochelys coriacea (Linnaeus) (Reptilia: Testudines: Dermochelyidae) from British waters and from the Netherlands", by J. C. Den Hartog and M. M. Van Nierop, Zool. Verhand. 204: 1-36 (1984). It is about the diet of these turtles and the extremely watery diet of jellyfish they eat. They identify the jellyfish (Scyphozoa) in the gut contents from the nematocysts, which survive initial digestion (photos included). Harbison, who studies jellys, wants me to look specifically for such evidence of Scyphozoa in Green Turle gut samples. I would have recognized them thus far if they were in our samples, but will look more specifically for them now that I have photos of them.

I will work-up a materials and methods for you, George, so you will know the way I come up with the percentages of algal materials. I have no summer school courses to teach this year and plan to catch up on a back log of reading and writing (during the 3 summer months).

Lu Aldrich sent me "Proceedings of the regional workshop on seaweed culture and marketing", by T. Adams and R. Foscarini (1990), which has several articles that relate to alien algal introductions in Hawaii and the South Pacific. The conference was held in Suva, Fiji, November 1989. I applied for a job at the University of the South Pacific, but have heard nothing from them yet. That's all for now,

Aloha,

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Fisheries Science Center Honolulu Laboratory
2570 Dole St. • Honolulu, Hawaii 96822-2396

MTRP - COPY

Date: 10/6/92

45 Algae samples submitted to Dr. Dennis Russell, 4408 237th Place, S.W. Mount Lake Terrace, WA 98043.

by George Balazs
NMFS, Honolulu Laboratory
2570 Dole Street
Honolulu, Hawaii 96822-2396

SAMPLE ID.	LOCATION	DESCRIPTION (Necropsy samples
09-09-91	Heeia Kea fishpond; Kathleen Brooks From:	Stomach *
03-23-92	Kaneohe Bay; Lcpl Ron Casares	Intestine
03-23-92	Heeia Kea Pier; Slip 309; Tommy Friel	Forestomach
03-26-92	Ewa Beach; Newkirk	Forestomach
03-29-92	Kaneohe Bay; Lcpl Ron Casares	Forestomach
04-09-92	Kaneohe Bay; Dave Woltz	Large intestine
04-09-92	Kaneohe Bay; Dave Woltz	Forestomach/Stomach
04-09-92	Lanikai; Vic Honda	Stomach
04-13-92	Waianae; Alan Oshiro	Stomach
04-20-92	Waialua; Francis Allen	Stomach *
04-24-92	Kaneohe Bay; Turtle track #10; Tag Y80	Fecal pellet (Alive) *
04-27-92	Kaneohe Bay; " " " " "	Stomach flush (alive) *
04-29-92	Kualoa Beach Park; Pat McGovern	Stomach *
05-01-92	Haleiwa; Mike Silbernagle	Stomach
05-06-92	Diamond Head lighthouse; Jerry Crow	Stomach
05-13-92	Wailua Beach Road; Stevie Heatherby	Stomach
05-14-92	Campbells Industrial Park; Diane	Forestomach
05-18-92	Kaneohe Bay; Tony Medley	Stomach *
05-28-92	Hawaii Kai boat ramp; Capt. Harada	Forestomach *
05-31-92	Waianae; Carol Cox	Stomach
06-07-92	Bellows AFB; Terry Corpus	Stomach
06-07-92	Bellows AFB; Walter Carvalho	Stomach

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
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Southwest Fisheries Science Center Honolulu Laboratory
2570 Dole St. • Honolulu, Hawaii 96822-2396

Date:

____ Algae samples submitted to Dr. Dennis Russell, 4408 237th Place, S.W. Mount Lake Terrace, WA 98043.

by George Balazs
NMFS, Honolulu Laboratory
2570 Dole Street
Honolulu, Hawaii 96822-2396

SAMPLE ID.	LOCATION	DESCRIPTION (Necropsy samples)
06-09-92	Kaneohe Bay; Mr. Yoshioka	From: Stomach
06-10-92	Makena, Maui; Dr. Kehler	Stomach
06-25-92	Lae Hi, Lanai; Sample A	Fecal pellet (beached)
06-25-92	" " ; Sample C	" " "
06-25-92	" " ; Sample D	" " "
06-25-92	" " ; Sample 3	" " "
06-26-92	Waianae; Trent Cypriano	Stomach
06-29-92	Turtle Bay Hilton; Roy Nacapuy	Stomach
07-06-92	Waimanalo State Park; Paul Chong via Steve Kaiser	Intestine
07-08-92	Kaneohe Bay; Craig Nakamura	Stomach
07-19-92	Laniakea (North Shore); Bob Rath	Stomach
07-14 92	Kona; Big Island w/o Tumors Pete Hendricks	Forestomach
05 - 92	Palaau, Molokai w/Tumors #H707	Stomach
08-18-92	S. Kona, Big Is. w/o Tumors; Gordon Joyce	Forestomach
08-21-92	Kapalua Bay Hotel, Maui w/o Tumors	Forestomach
08-24-92	Waialae Bch Pk. w/Tumors Jerry Crow/Mike	Stomach
08-24-92	Waialae Bch Pk. w/o Tumors Jery Crow	Forestomach
09-22-92	K-Bay #Y80 w/Tumors AA HI92-47	Stomach
09-22-92	K-Bay W/Tumors AA HI92-46	Stomach
09-23-92	K-Bay AOL W/Tumors AA HI92-49	2nd Stomach
09-23-92	K-Bay AOL w/Tumors AA HI92-49	Forestomach
08-01-92	East Is. FFS moto U-166	CROP
08-01-92	East Is. FFS moto U-166	Intestine

George Balazs
NOAA National Marine Fisheries Service
SWFC Honolulu Laboratory F/SWC2
2570 Dole Street
Honolulu, HI 96822-2396

10 May 1991

Dear George,

I am trying to follow the new scheme of doing the samples in the order from your lists (attached). One check came already and another should arrive soon, therefore, there will soon be 51 samples to your credit after these (10 may) identifications. This is the last of the work you have given me, I'm all caught up for now.

Algae Identifications

12-10-90 Kawela Bay, selected particles from feces

Amansia glomerata	Trace
Cladophoropsis sp.	Trace
Codium arabicum	Trace
Animal material (insect leg)	Trace
Terrestrial plant material	Trace

12-25-90 Horoshak, stomach sample (list #1)

Codum edule	75%
Codium arabicum	10
Gelidium pusillum	10
Acanthophora spicifera	5
Dictyota divaricata	Trace
Polysiphonia sp.	Trace
Colonial black ascidian	Trace

12-20-90 Heeia Kea Pier

Codium edule	95%
Dictyosphaeria versluysii	3
Geldium sp.	1
Sphacelaria tribuloides	1
Achrochaetium sp.	Trace
Lyngbya majuscula	Trace
Valonia aegagropila	Trace

12-21-90 Ray, stomach sample (list #6)

Halophila ovalis	100%
Dictyosphaeria versluysii	Trace
Lyngbya majuscula	Trace

12-9-90 Eisner, stomach sample (list #4)

Pterocladia capillacea	88%
Codium arabicum	10
Amansia glomerata	1
Sponge	1
Microdictyon sp.	Trace
Turbinaria ornata	Trace
Valonia aegagropila	Trace
Terrestrial grass	Trace

1-2-90 fecal med., Mark Reef (list #5)

Sargassum polyphyllum	90%
Codium edule	10
Enteromorpha sp.	Trace
Halimeda discoidea	Trace
Sponge	Trace

1-3-91 Hau, stomach sample (list #8)

Pterocladia capillacea	100%

1-12-91 Preble, stomach sample (list #9)

Hypnea musciformis	90%
Ulva reticulata	5
Acanthophora spicifera	1
Champia parvula	1
Dictyota divaricata	1
Halimeda discoidea	1
Sargassum echinocarpum	1
Gelidium sp.	Trace

1-13-91 Witham, stomach sample (list #7)

Chondrococcus hornemanni	74%
Laurencia nidifica	10
Turbinaria ornata	10
Dictyosphaeria versluysii	2
Amansia glomerata	1
Dictyota acuteloba	1
Hypnea nidifica	1
Terrestrial plant material	1
Halimeda sp.	Trace
Lyngbya majuscula	Trace
Polysiphonia sp.	Trace
Rivularia sp.	Trace
Tolypiocladia calodictyon	Trace

1-16-91 Puako, stomach flush

Gelidium sp.	95%
Dictyosphaeria sp.	5
Centroceros clavulatum	Trace
Dictyota friabilis	Trace
Amphipods	16 each
Bryozoans	Trace

— 2-6-91 Puako, Big Is., N649, stomach flush of live turtle

Gelidiella adnata	90%
Unknown red alga	10
Ceramium sp.	Trace
Jania capillacea	Trace
Terrestrial plant material	Trace
Amphipod	1 each

— 2-6-91 Puako, N655, stomach

Turbinaria ornata	90%
Jania capillacea	10
Centroceros clavulatum	1
Polysiphonia exilis Harvey	Trace

— 2-6-91 Puako, N672, stomach

Gelidium sp.	99%
Sphacelaria tribuloides	1
Amphipod	1 each
sand grain	

— 2-28-91 Mark Reef (broken jar), Kaneohe Bay, Z76, stomach flush of live turtle

Acanthophora spicifera	99%
Spyridia filamentosa	1
Gracilaria coronocopifolia	Trace

— 2-28-91 Mark Reef, Kaneohe Bay, N679, stomach flush of live turtle

Gracilaria coronopifolia	99%
Acanthophora spicifera	1
Codium arabicum	Trace

— 11-14-90 Sheree Lipton, Kailua Bay, stomach sample from necropsy

Hypnea musciformis	80%
Halimeda discoidea	10
Hypnea cervicornis	10
Dictyota acuteloba	5
Cladophoropsis luxuriens	Trace
Corallina sandvicensis Lemm.	Trace
Sargassum sp.	Trace

— 12-17-90 Waikiki, Z227 (A), 1st stomach from necropsy

Hypnea musciformis	30%
Pterocladia capillacea	30
Ulva reticulata	25
Codium edule	15
Acanthophora spicifera	Trace

— 12-17-90 Waikiki, Z227(B), 2nd stomach from necropsy

Pterocladia capillacea	70%
Codium arabicum	10
Hypnea musciformis	10
Codium edule	5
Ulva reticulata	5
Amansia glomerata	Trace
Gracilaria coronocopifolia	Trace
Sargassum echinocarpum	Trace

~ 3-1-91 Sheraton Waikiki, N691, stomach flush of live turtle

Spyridia filamentosa	30%
Gelidium pusillum	30
Laurencia nidifica	20
Dictyota friabilis	10
Ulva fasciata	10
Lyngbya sp.	Trace
Ceramium sp.	Trace
Amphipods	5 each

— 3-15-91 Waikiki, N742 Scraped from plastron

Sphacelaria furcigera	90%
Achrochaetium sp.	10
Chaetomorpha gracilis	Trace
Lyngbya sp.	Trace
Round worm	

— 3-15-91 Waikiki, N741 stomach flush

Pterocladia capillacea	80%
Hypnea musciformis	15
Acanthophora spicifera	5
Ectocarpus indicus	Trace
Sargassum sp.	Trace
sand grains	

— 3-28-91 Waikiki, N776 stomach

Ulva fasciata	100%
Terrestrial plant material	Trace
Amphipods	7 each
Spine	1 each

— 4-491 Grace's Ledge Waikiki, Y47, food from mouth

Amansia glomerata	100%

3-5-91 Kiholo, N. Kona, Y4(A) scraped from tag

Gelidium pusillum	45%
Peysonellia sp.	30
Sphacelaria sp.	20
Polysiphonia pseudovillum	5
Achrochaetium sp.	Trace
Bangia sp.	Trace
Chaetomorpha sp.	Trace
Schizothrix calcicola	Trace
Diatoms	Trace
Black Mite	1 each

3-5-91 Kiholo, N. Kona, Y4(B) stomach flush

Gelidium pusillum	90%
Dictyota crenulata	10
Cladophoropsis luxurians	Trace
Derbesia marina	Trace
Hypnea sp.	Trace
Polysiphonia sp.	Trace
Diatoms	Trace
Sand	Trace
Micromolluscs	2 each

3-4-91 Kiholo, N. Kona, stomach flush

Turbinaria ornata	90%
Gelidium pusillum	10
Jania capillacea	Trace
Sand	Trace

3-21-91 Puako (scuba), S. Kohala, N755 stomach flush

Gelidium pusillum	50%
Turbinaria ornata	50
Dictyota crenulata	Trace
Laurencia sp.	Trace
Amphipods	2 each

10-9-90 Waikiki, Kaimana Hotel, 1st stomach contents

Ulva reticulata	90%
Acanthophora spicifera	5
Amansia glomerata	5
Ceramium sp.	Trace
Champia parvula	Trace
Gelidiella acerosa	Trace
Gracilaria coronopifolia (?)	Trace
Lyngbya majuscula	Trace

SUMMARY (10 MAY 1991)

RHODOPHYTA

Achrochaetium sp.
Acanthophora spicifera (Vahl) Boerg.
Amansia glomerata C. Ag.
Bangia sp.
Centroceros clavulatum (C. Ag.) Harvey
Ceramium sp.
Champia parvula (C. Ag.) Harvey
Chondrococcus hornemanni (Mert.) Schmitz
Corallina sandvicensis Lemm.
Gelidiella acerosa (Forsskal) Feldmann and Hamel
Gelidiella adnata Dawson
Gelidium pusillum (Stackhouse) LaJolis
Gelidium sp.
Gracilaria coronopifolia J. Ag.
Hypnea cervicornis J. Ag.
Hypnea musciformis (Wulfen) C. Ag.
Hypnea nidifica J. Ag.
Jania capillacea Harvey
Laurencia nidifica J. Ag.
Peysonellia sp.
Polysiphonia exilis Harvey
Polysiphonia pseudovillum Hollenberg
Pterocladia capillacea (Gmelin) Bornet
Spyridia filamentosa (Wulfen) Harvey
Tolypiocladia calodictyon (Harv.) Silva

PHAEOPHYTA

Dictyota acuteloba J. Ag.
Dictyota crenulata J. Ag.
Dictyota divaricata Lamouroux
Dictyota friabilis Setchell
Ectocarpus indicus Sonder
Sargassum echinocarpum J. Ag.
Sargassum sp.
Sphacelaria furcigera Kuetzing
Sphacelaria sp.
Spacelaria tribuloides Meneghini
Turbinaria ornata (Turn.) J. Ag.

CHLOROPHYTA

Chaetomorpha gracilis Kuetzing
Chaetomorpha sp.
Cladophoropsis luxurians Gilbert
Cladophoropsis sp.
Codium arabicum Kutzing
Codium edule Silva
Derbesia marina (Lyngb.) Sol.
Dictyosphaeria cavernosa (Forsskal) Boerg.
Dictyosphaeria sp.
Dictyosphaeria versluysii Weber Van Bosse
Halimeda discoidea Decaisne
Halimeda sp.
Microdictyon sp.
Ulva fasciata Delile

Ulva reticulata Forsskal
Valonia aegagropila C. Ag.

SEAGRASS

Halophila ovalis (R. Br.) Hook

CYANOPHYTA

Lyngbya majuscula Gomont
Lyngbya sp.
Oscillatoria sp.
Rivularia sp.
Schizothrix calcicola (Ag.) Gomont

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Fisheries Science Center Honolulu Laboratory
2570 Dole St. • Honolulu, Hawaii 96822-2396

Algae samples submitted to Dennis Russell on January 7, 1991 **by George Balazs.**

NMFS, Honolulu
2570 Dole Street
Honolulu, Hawaii 96822-2396

SAMPLE ID.	LOCATION	DESCRIPTION
① 12/25/90 Horoschak	Sand Island	stomach samp.
② 12/20/90 Peta	Hecia Kea Pier	stomach Samp.
③ 11/12/90 Mary Alice Evans	WAIMANALO BEACH	stomach samp.
④ 12-9-90 Eisner	Kewala bay	stomach Samp.
⑤ 1-2-91	Kaneohe Bay "MARK REEF"	fecal samp. - Medium size -

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Fisheries Science Center Honolulu Laboratory
2570 Dole St. • Honolulu, Hawaii 96822-2396

Algae samples submitted to Dennis Russell on
January 22, 1991 **by George Balazs.**

NMFS, Honolulu
2570 Dole Street
Honolulu, Hawaii 96822-2396

SAMPLE ID.	LOCATION	DESCRIPTION
~~D~~ 6 12-21-90 JERRY RAY	NEAR Coconut Island	Stomach Sample
~~D~~ 7 1-13-91 Gene Witham	Kailua	Stomach Sample
~~B~~ 8 1-3-91 Skippy Hau	Maui	Stomach Samp.
~~H~~ 9 1-12-91 Jeff Preble	Kaneohe Bay	Stomach Samp.

Dennis - Please return this copy with your findings.

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Fisheries Science Center Honolulu Laboratory
2570 Dole St. • Honolulu, Hawaii 96822-2396

9 Algae samples submitted to Dennis Russell on MARCH 4, 1991 by George Balazs.

NMFS, Honolulu
2570 Dole Street
Honolulu, Hawaii 96822-2396

SAMPLE ID.	LOCATION	DESCRIPTION
2-6-91 N649	PUAKO, BIG IS.	STOMACH FLUSH OF LIVE TURTLE.
2-6-91 N655	PUAKO, BIG IS.	STOMACH FLUSH OF LIVE TURTLE.
2-6-91 N672	PUAKO, BIG IS.	STOMACH FLUSH OF LIVE TURTLE.
2-28-91 Z76	KANEOHE BAY (MARK REEF)	STOMACH FLUSH OF LIVE TURTLE.
2-28-91 N679	KANEOHE BAY (MARK REEF)	STOMACH FLUSH OF LIVE TURTLE.
11-14-90	KAILUA BAY (SHEREE LIPTON)	STOMACH SAMPLE FROM NECROPSY.
12-17-90 Z227(A)	WAIKIKI BEACH	1ST STOMACH FROM NECROPSY.
12-17-90 Z227 (B)	WAIKIKI BEACH	2ND STOMACH FROM NECROPSY.
3-1-91 N691	WAIKIKI SHERATON	STOMACH FLUSH OF LIVE TURTLE.

DENNIS -
PLEASE
RETURN THIS
COPY W/YOUR RESULTS

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Fisheries Science Center Honolulu Laboratory
2570 Dole St. • Honolulu, Hawaii 96822-2396

Date: 4-5-91

PLEASE RETURN THESE SAMPLES TO ME. SASE LABELS ENCLOSED

9 Algae samples submitted to Dr. Dennis Russell, 4408 237th Place, S.W. Mount Lake Terrace, WA 98043.

by George Balazs
NMFS, Honolulu Laboratory
2570 Dole Street
Honolulu, Hawaii 96822-2396

SAMPLE ID.	LOCATION	DESCRIPTION
N742 3-15-91 ✓	WAIKIKI	SCRAPED FROM PLASTRON
N741 3-15-91 ✓	WAIKIKI	STOMACH FLUSH
N776 ✓ 3-28-91	WAIKIKI	STOMACH FLUSH
Y47 4-4-91 ✓	WAIKIKI	MOUTH CONTENTS (3 SMALL PIECES)
Y4(A) 3-5-91 ✓	KIHOLO N. KONA	SCRAPED FROM TAG
Y4(B) 3-5-91 ✓	KIHOLO N. KONA	STOMACH FLUSH
Y710 ✓ 3-4-91	KIHOLO N. KONA	STOMACH FLUSH
N755 ✓	PUAKO S. KOHALA	STOMACH FLUSH
10-9-90 ✓	KAIMANA HOTEL, WAIKIKI	SAMPLE FROM 1ST STOMACH - NECROPSY

George Balazs
NOAA National Marine Fisheries Service
SWFC Honolulu Laboratory F/SWC2
2570 Dole Street
Honolulu, HI 96822-2396

28 June 1992

Dear George,

I just finished your latest 31 samples so you now have 46 samples to your credit. I did receive your letters, article and corrections by the reviewer and will incorporate everything into the article. I wanted to finish these samples first just in case there were more Hypnea musciformis records of importance. None of the reviewers that I sent the paper to have added anything of significance at all, so I am going to finalize the thing in the style of The Journal of Cryptogamic Botany, they accept ecology and descriptive papers. Do you have a better suggestion?

I just finished teaching two summer courses and monday I will begin teaching Marine Biology in the San Juan Islands for two weeks, then it is back to Seattle to teach a three week course in Microbiology, whew! The paper will get done, however, and I will send you a copy soon.

8-9-91 Officer J. Kaulukukui, Kiholo Bay, Big Island, ~~intestine~~ stomach, necropsy

Coelothrix irregularis	90%
Bryopsis pennata	10
Turbinaria ornata	Trace

8-9-91 Officer J. Kaulukukui, Kiholo Bay, small intestine (necropsy)

Cladophoropsis gracillum	30%
Gelidiopsis variabile	30
Gelidium adnata	25
Turbinaria ornata	10
Acanthophora spicifera	5
Worm tubes	Trace

9-9-91 Kahana Bay; Cindy Lipshutz, stomach (necropsy)

Pterocladia capillacea	95%
Codium edule	5
Dictyota friabilis	Trace

10-8-91 Holoholo Kai (glass bottom boat) Waikiki, stomach sample (necropsy)

Codium arabicum	35%
Acanthophora spicifera	30
Pterocladia capillacea	25
Amansia glomerata	10

11-8-91 Paul Swanson, Haleiwa, stomach sample (necropsy)

Ulva rigida	90%
Amansia glomerata	5
Unidentifiable algae scraps	5
Terrestrial grass	Trace
Small egg cases (< 1mm long)	Trace

~~3-11-92~~ (11-4-91 ?) ~~check dates~~, Skippy Hau, Maui, stomach sample (necropsy)

Pterocladia capillacea	90%
Amansia glomerata	10
Sponge	Bulk of sample

11-20-91 Don Heacock, Kauai, stomach (necropsy)

Pterocladia capillacea	95%
Cladophoropsis gracillum	5
Microdictyon japonicum	Trace

12-22-91 Gary Gill, Ala Moana Beach Park, stomach sample (necropsy)

Pterocladia capillacea	70%
Amansia glomerata	20
Acanthophora spicifera	10
Gracilaria coronopifolia	Trace
Lyngbya majuscula	Trace

12-26-91 Larry Lopez, Kahaluu, Kaneohe Bay, stomach sample (necropsy)

Acanthophora spicifera	80%
Gracilaria salicornia	10
Spyridia filamentosa	10
Pterocladia capillacea	Trace

12-29-91 Waianae #1, DOCARE (?), stomach (necropsy)

Pterocladia capillacea	All

12-29-91 Waianae #2, DOCARE (?), stomach sample (necropsy)

Pterocladia capillacea	All

1-2-92 Mike Klein, Kahaluu, stomach (necropsy)

Acanthophora spicifera	95%
Sargassum polyphyllum	4
Gracilaria sp.	1
Dictyota friabilis	Trace
Pterocladia capillacea	Trace

1-11-92 Feather Stone, Hickam Air Force Base, stomach sample (necropsy)

Pterocladia capillacea	All

Sponge masses

1-22-92 Lt. Napuelua, Iraquois Point, stomach sample (necropsy)

Codium sp. (utricles with crystals)*	50%
Pterocladia capillacea	30
Acanthophora spicifera	20

1-24-92 Vic Honda, Lanikai, DOCARE, stomach (necropsy)

Codium arabicum	50%
Codium edule	50

1-30-92 Craig Harimoto, Hickam Air Force Base, stomach sample (necropsy)

Pterocladia capillacea	85%
Codium edule	10
Acanthophora spicifera	5
Cladophoropsis gracillum	Trace
Sphacelaria sp.	Trace

1-31-92 Lanai (Died 2-7-92) small intestine (necropsy)

Masses of white/green lumps with no identifiable algae present

1-31-92 Lanai, died 2-7-92, small intestine (necropsy)

Dictyosphaeria versluysii	50%
Codium arabicum	40
Acanthophora spicifera	10
Gelidiosis variabile	Trace
Lobophora variegata	Trace

2-3-92 Pete Hendricks, Big Island, Kawaihae Harbor, stomach necropsy

Gelidium adnata (?)*	90%
Amansia glomerata	10

2-5-92 Pete Hendricks, Big Island, fore stomach (necropsy)

Gelium adnata (?)*	90%
Amansia glomerata	10

2-5-92 Pete Hendricks, Big Island, stomach sample (necropsy)

Gelidium adnata (?)*	80%
Amansia glomerata	20

2-6-92 Puako, carapace H10b, smear scrapping

Microcystis sp.	80%
Filamentous green species A*	10
Filamentous green species B*	10
Oscillatoria sp.	Trace

*tentative identification, part of the sample was saved for further research

2-12-92 Francis Peleo, P/U Sealife Park, DOCARE, 2-9-92, stomach sample (necropsy)

Hypnea musciformis	40%
Sargassum polyphyllum	30
Codium edule	20
Ulva fasciata	10
Human hair	Trace

2-18-92 Kaneohe Marine Corps Air Station (KMCAS); Lcpl Casarez, stomach sample (necropsy)

Codium edule	70%
Hypnea musciformis	30
Halimeda discoidea	Trace
Lobophora variegata	Trace

2-22-92 Dr. Morris, 1/2 mile N. of Kualoa Beach, stomach sample (necropsy)

Codium arabicum	40%
Codium edule	40
Hypnea musciformis	10
Amansia glomerata	5
Dictyosphaeria versluysii	5
Pterocladia sp.	Trace

3-1-92 Sal Alvorez, stomach sample (necropsy)

Pterocladia capillacea	60%
Amansia glomerata	40
Codium edule	Trace
Rhodymenia sp.	Trace
Valonia aegagropila	Trace

3-9-92 Linda Fujihara, Kualoa Beach Park Camp ground A, stomach sample (necropsy)

Hypnea musciformis	99%
Halophila hawaiiana (with leaves, stems and flowers)	1
Dictyota acuteloba	Trace

3-11-92 Skippy Hau, Maui, (invertebrate ?), stomach sample (necropsy)

Amansia glomerata	90%
Pterocladia capillacea	10
Sponge	Bulk of sample

3-11-92 Skippy Hau, Maui, (invertebrate ?) stomach sample (necropsy)

Amansia glomerata	90%
Pterocladia capillacea	10
Sponge	Bulk of sample

3-16-92 Don Heacock, Kauai, stomach sample (necropsy)

Codium arabicum	50%
Amansia glomerata	40
Dictyosphaeria versluysii	10
Sponge	Half the bulk of sample

Dictyosphaeria versluysii Weber Van Bosse
Halimeda discoidea Decaisne
Microdictyon japonicum Setchell
Ulva fasciata Delile
Ulva rigida C. Ag.
Valonia aegagropila C. Ag.

SEAGRASS

Halophila hawaiiana

CYANOPHYTA

Lyngbya majuscula Gomont
Microcystis sp.
Oscillatoria sp.

LIST OF SPECIES IN THESE SAMPLES

RHODOPHYTA

Acanthophora spicifera (Vahl) Boerg.
Amansia glomerata C. Ag.
Coelothrix irregularis (Harv.) Boerg.
Gelidium adnata Dawson
Gelidium sp.
Gelidiopsis variabile J. Ag.
Gracilaria salicornia C. Ag.
Hypnea musciformis (Wulfen) C. Ag.
Pterocladia capillacea (Gmelin) Bornet
Pterocladia sp.
Rhodomenia leptophylloides Dawson
Spyridia filamentosa (Wulfen) Harvey

PHAEOPHYTA

Lobophora variegata (Lamx.) Womersley
Dictyota acuteloba J. Ag.
Dictyota friabilis Setchell
Sargassum polyphyllum J. Ag.
Sphacelaria sp.
Turbinaria ornata (Turn.) J. Ag.

CHLOROPHYTA

Bryopsis pennata Lamx.
Cladophoropsis gracillum Dawson
Codium arabicum Kutzing
Codium edule Silva
Codium sp.

George Balazs
NOAA National Marine Fisheries Service
SWFC Honolulu Laboratory F/SWC2
2570 Dole Street
Honolulu, HI 96822-2396

17 February 1992

Dear George,

Here are the results of the last set of samples (16) including the Scilly Atoll sample and the N. Kona tag sample (which turned out to be Ahnfeltia concinna rather than G. salicornia). This leaves you with 37 samples to your credit and I am all caught up at the moment. I will send you the samples soon, after I double check a couple of the species. There were no Hypnea musciformis in these samples, so I will finalize our manuscript now and send you a copy for your reviewers.

aloha,

Algae Identifications from Turtle Samples

10-16-91, Scilly Atoll, French Polynesia

Microdictyon japonicum	50%
Caulerpa serrulata	25
Turbinaria ornata	25

8-27-91 Mark Reef, Kaneohe Bay, stomach sample, V96

Acanthophora spicifera	95%
Dictyosphaeria cavernosa	2
Codium arabicum	2
Lobophora variegata	1
Sphacelaria sp.	Trace
Spyridia filamentosa	Trace

8-91 Hyatt Waikoloa (Gondola Raceway), collected from rocks

Hypnea nidifica	60%
Ulva fasciata	30
Acanthophora spicifera	10
Boodlea composita	Trace
One amphipod	

11-20-91 Puako, mouth, V542

Not algae or plant material. Maybe it is animal tissue.

12-2-91 Kaneohe Bay, mouth, V545

Gracilaria salicornia	All

11-91 Punaluu, Kau - Hawaii, coraline stone with red algae

Porolithon onkodes	the stone
Gelidium adnatum	growing on the stone

I will double check this identification. Gelidium is a difficult genus to deal with.

11-22-91 Kailua Beach, Oahu, washed up fecal pellet, rinsed

Amansia glomerata	90%
Codium edule	10
Scinaia furcellata	Trace

11-22-91 Kailua Beach, Oahu, washed up fecal pellet, rinsed

Natural animal sponge	50%
Halimeda discoidea	20
Codium edule	18
Halophila hawaiiana	10
Dictyosphaeria versluysii	2
Amansia glomerata	Trace
Sargassum sp.	Trace

12-6-91 Palaau, Molokai, floating feces, rinsed

Amansia glomerata	90%
Halophila hawaiiana	10
Lyngbya majuscula	Trace
Rhodomenia leptophylloides (?)	Trace
Sphacelaria sp.	Trace

most likely

12-6-91 Palaau, Molokai, floating feces, rinsed

Amansia glomerata	99%
Bryopsis pennata	Trace
Lyngbya majuscula	Trace
Rhodomenia leptophylloides (?)	Trace
Sphacelaria sp.	Trace

12-6-91 Palaau, Molokai, floating feces, rinsed

Amansia glomerata	99%
Bryopsis pennata	1
Lyngbya majuscula	Trace

12-6-91 Palaau, Molokai, floating feces, rinsed

Amansia glomerata	99%
Rhodomenia leptophylloides (?)	1
Sphacelaria sp.	Trace

12-6-91 Palaau, Molokai, floating feces, rinsed

Amansia glomerata	99%
Rhodomenia leptophylloides (?)	1
Sphacelaria sp.	Trace
Halimeda discoidea	Trace

Tag scrape, 7789

Chaetomorpha sp.
Lobophora variegata
Sphacelaria tribuloides
Gelidium sp. 1
Gelidium sp. 2

All of these algae have strange growth habits, elongated thalli that are curled and tufted.

Kaneohe Bay, mouth, V520

Ahnfeltia concinna	one piece

1-13-92 North Kona, Kiholo Bay, tag scrape

Ahnfeltia concinna	mostly
Ulva fasciata	small tuft (grazed)
Gelidium adnata	small red thalli (grazed)

LIST OF SPECIES IN THESE SAMPLES

RHODOPHYTA

Acanthophora spicifera (Vahl) Boerg.
Ahnfeltia concinna J. Ag.
Amansia glomerata C. Ag.
Gelidium adnata Dawson
Gelidium sp.
Gracilaria salicornia C. Ag.
Hypnea nidifica J. Ag.
Porolithon onkodes Heydrich
Rhodomenia leptophylloides Dawson
Scinaia furcellata (Turner) Biv.
Spyridia filamentosa (Wulfen) Harvey

PHAEOPHYTA

Lobophora variegata (Lamx.) Womersley
Sargassum sp.
Sphacelaria sp.
Sphacelaria tribuloides Meneghini
Turbinaria ornata (Turn.) J. Ag.

CHLOROPHYTA

Boodlea composita (Harvey) Brand
Bryopsis pennata Lamx.
Chaetomorpha sp.
Caulerpa serrulata (Forsskal) J. Ag.
Codium arabicum Kutzing
Codium edule Silva
Dictyosphaeria cavernosa (Forsskal) Boerg.
Dictyosphaeria versluysii Weber Van Bosse
Halimeda discoidea Decaisne
Microdictyon japonicum Setchell
Ulva fasciata Delile

SEAGRASS

Halophila hawaiiana

CYANOPHYTA

Lyngbya majuscula Gomont

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Fisheries Science Center Honolulu Laboratory
2570 Dole St. • Honolulu, Hawaii 96822-2396

Please return this copy with Results

Date:

~~14~~ 15 (16) Algae samples submitted to Dr. Dennis Russell, 4408 237th Place, S.W. Mount Lake Terrace, WA 98043.

by George Balazs
NMFS, Honolulu Laboratory
2570 Dole Street
Honolulu, Hawaii 96822-2396

10-16-91 Scilly atoll, French Polynesia

SAMPLE ID.	LOCATION	DESCRIPTION
8-27-91 ✓	MARK REEF, K-BAY	V96 STOMACH
8-91 ✓	Hyatt Waikoloa (Gondola Raceway)	Collected from rocks
11-20-91 ✓	Puako	V542 Mouth
12-2-91 ✓	K-BAY	V545 Mouth
11-91 ✓	Punaluu, Kau-Hawaii	Collected from Bay (Punaluu)
11-22-91 ✓	Kailua Beach	Washed up fecal pellet (rinsed)
11-22-91 ✓	Kailua Beach	Washed up fecal pellet (rinsed)
12-6-91 ✓	Palaau (Molokai)	Floating feces (rinsed)
12-6-91 ✓	Palaau (Molokai)	Floating feces (rinsed)
12-6-91 ✓	Palaau (Molokai)	Floating feces (rinsed)
12-6-91 ✓	Palaau (Molokai)	Floating feces (rinsed)
12-6-91 ✓	Palaau (Molokai)	Floating feces (rinsed)
V520 ✓		V520 Mouth
7789 ✓		7789 Tag Scrap

1-13-92 Y250, N. Kona, Kiholo Bay, Tag Scrape

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Fisheries Science Center Honolulu Laboratory
2570 Dole St. • Honolulu, Hawaii 96822-2396

Date: 12-9-91

14 Algae samples submitted to Dr. Dennis Russell, 4408 237th Place, S.W. Mount Lake Terrace, WA 98043.

by George Balazs
NMFS, Honolulu Laboratory
2570 Dole Street
Honolulu, Hawaii 96822-2396

SAMPLE ID.	LOCATION	DESCRIPTION
8-27-91	MARK REEF, K-BAY	V96 STOMACH
8-91	Hyatt Waikoloa (Gondola Raceway)	Collected from rocks
11-20-91	Puako	V542 Mouth
12-2-91	K-BAY	V545 Mouth
11-91	Punaluu, Kau-Hawaii	Collected from Bay (Punaluu)
11-22-91	Kailua Beach	Washed up fecal pellet (rinsed)
11-22-91	Kailua Beach	Washed up fecal pellet (rinsed)
12-6-91	Palaau (Molokai)	Floating feces (rinsed)
12-6-91	Palaau (Molokai)	Floating feces (rinsed)
12-6-91	Palaau (Molokai)	Floating feces (rinsed)
12-6-91	Palaau (Molokai)	Floating feces (rinsed)
12-6-91	Palaau (Molokai)	Floating feces (rinsed)
V520	—	V520 Mouth
7789	—	7789 Tag Scrap

George Balazs
NOAA National Marine Fisheries Service
SWFC Honolulu Laboratory F/SWC2
2570 Dole Street
Honolulu, HI 96822-2396

25 November 1991

George,

Please note the samples that have plastic trash in them, especially the last one taken by Skippy Hau from Maui. The Maui landfill dump between Olowalu and Lahaina is the primary source of plastic trash that is blown into the sea. During moderate to strong tradewind days plastic trash is blowing out across the road and onto the reef all day and night long. I wish someone would put a stop to this huge littering and pollution problem. Where on Maui did Skippy find this turtle?

Presently, you have 53 samples to your credit and now I have only one sample left to process. The one from the South Pacific. By the way, how do you like our manuscript?

aloha, Peter

Algae Identifications from Turtle Samples

1-23-91 Portlock, Oahu, stomach sample, necropsy, Kawamoto

Codium edule	90%
Codium arabicum	5
Amansia glomerata	3
Gelidium pucillum	1
Avrainvillea amadelpha	Trace
Bryopsis hydnoides	Trace

1-22-91 Nukolii, Kauai, stomach sample, Necropsy, Heacock

Pterocladia capillacea	65%
Amansia glomerata	30
Actinotrichia rigida	5
Ceramium sp.	Trace
Dictyosphaeria versluysii	Trace
Dictyota friabilis	Trace
Galaxaura sp.	Trace
One copepod	
Black colonial ascidians	
Animal sponge	

1-28-91 Maui, stomach sample, necropsy, Skippy Hau

Amansia glomerata	25%
Cladophora sp.	25
Hypnea musciformis	25
Ulva reticulata	20
Acanthophora spicifera	5
Sand grains	

2-5-91 Koko Isle, Koko Marine, Oahu, stomach sample, necropsy, Paine

Hypnea musciformis	99%
Acanthophora spicifera	1
Dictyota acuteloba	Trace
Sargassum echinocarpum	Trace

2-21-91 Punaluu, Oahu, stomach sample, necropsy

Codium edule	80%
Codium arabicum	20
Amansia glomerata	Trace
Dictyosphaeria cavernosa	Trace
Gelidium pucillum	Trace

2-22-91 Kawela, Turtle Bay Hilton, Oahu, stomach sample, necropsy, Richard Sullivan

Codium edule	50%
Codium arabicum	20
Pterocladia capillacea	20
Amansia glomerata	10
Codium phasmaticum	Trace
Dictyota acuteloba	Trace
Valonia aegagropila	Trace

A few grains of sand

3-13-91 Kawela Bay, Oahu, stomach sample, necropsy, Eisner

Turbinaria ornata	
Amansia glomerata	
Pterocladia capillacea	
Codium arabicum	Trace
Valonia aegagropila	Trace

3-22-91 Heeia (Kaneohe Bay), stomach sample, necropsy, Stanley Chun

Codium arabicum	40%
Codium edule	40
Pterocladia sp.	20
Amansia glomerata	Trace
Bornetella sphaerica	Trace
Dictyosphaeria cavernosa	Trace
Dictyota sp.	Trace
Halimeda discoidea	Trace

4-3-91 Waikiki, Oahu, stomach sample, necropsy, Ivan

Ulva fasciata	50%
Pterocladia capillacea	40
Amansia glomerata	10
Bryopsis pennata	Trace
Polysiphonia howei	Trace

4-5-91 Lanikai, Oahu, stomach sample, necropsy, Dave Smith

Hypnea musciformis	99%
Lyngbya majuscula	1

4-7-91 Lanai, stomach sample, necropsy, Mike Colilo

Amansia glomerata	80%
Codium arabicum	10
Pterocladia capillacea	10

Animal flesh (muscle, white like fish meat, or squid)

4-16-91 Pahoa, Hawaii Island, stomach sample, necropsy, Alice Solywoda

Turbinaria ornata	80%
Amansia glomerata	15
Halymenia formosa	5
Bryopsis pennata	Trace
Ceramium sp.	Trace
Champia parvula	Trace
Dictyota divaricata	Trace
Ectocarpus indicus	Trace
Halophila hawaiiana	Trace
Laurencia dotii	Trace
Polysiphonia sp.	Trace
Pterocladia caerulescens	Trace
Sphacelaria tribuloides	Trace
Tolypiocladia calodictyon	Trace

Monofilament fishing netting and line (two 2 inch pieces)

7-29-91 Nanakuli, Oahu, stomach contents, necropsy, Russ

Amansia glomerata	98%
Galaxaura apiculata	1
Turbinaria ornata	1
Acanthophora spicifera	Trace
Ceramium sp.	Trace
Cladophoropsis sp.	Trace
Ectocarpus sp.	Trace
Galaxaura apiculata	Trace
Gelidium pusillum	Trace
Polysiphonia howei	Trace

Some bryozoans in trace amounts

8-4-91 Nanakuli, Oahu, stomach sample, necropsy, Docare, Balazs

Hypnea musciformis	50%
Ulva fasciata	25
Acanthophora spicifera	20
Ulva reticulata	5
Diatoms	Trace
Ectocarpus indicus	Trace
Laurencia nidifica	Trace

8-5-91 Kahaluu, Kaneohe Bay, Oahu, stomach sample, necropsy, Newalu

Hypnea musciformis	90%
Acanthophora spicifera	10
Centroceros clavulatum	Trace
Halophila hawaiiana	Trace
Lyngbya majuscula	Trace

Animal sponge spicules (?)

8-13-91 Ulumau Beach Park, Heeia, Kaneohe Bay, Oahu, stomach sample, necropsy, Richard Gorloff

Codium edule	35%
Codium arabicum	25
Hypnea musciformis	15
Acanthophora spicifera	10
Dictyosphaeria versluysii	10
Ulva reticulata	5
Amansia glomerata	Trace
Dictyota divaricata	Trace
Lobophora variegata	Trace
Sargassum polyphyllum	Trace
Sphacelaria tribuloides	Trace
Ulva reticulata	Trace

Encrusting type bryozoan

8-16-91 Bellows AFS, Oahu, sponge, stomach sample, necropsy, Sgt. Yeo

Acanthophora spicifera	40%
Hypnea musciformis	20
Ulva fasciata	20
Grateloupia filicina	10
Ulva rigida	10
Enteromorpha clathrata	Trace
Laurencia nidifica	Trace

One large lump of animal sponge
Traces of bryozoans

9-5-91 Kauai, stomach sample, necropsy, Heacock

Pterocladia capillacea	99%
Amansia glomerata	1
Ceramium sp.	Trace
Cladophora sp.	Trace
Cladophoropsis sp.	Trace

2-28-91 Aina Haina, Oahu, stomach sample, necropsy, Don Maxey

Hypnea musciformis	95%
Acanthophora spicifera	5
Laurencia nidifica	Trace

Pieces of terrestrial grass

1-28-91 Maui, stomach sample, necropsy, Skippy Hau

Amansia glomerata	Trace
Avrainvillea amadelpha	Trace

The majority of bulk in this sample was plastic trash, terrestrial plant material, shells and rock. I have listed them here as percents.

Clear plastic "bubble" foam	80%
(I put some of this in a vial inside the sample jar)	
Cotton wads (diaper material?)	10
Polyproplene twine	4
Clam shells	2
Claer sheet plastic	1
(plastic bag material)	
Hard blue plastic chips	1
Hard white plastic chips	1
White "milk jug" plastic chips	1
Bark, wood, branch material	1
(terrestrial plant matter)	
Black pebbles (rock)	1

LIST OF SPECIES IN THESE SAMPLES

RHODOPHYTA

Acanthophora spicifera (Vahl) Boerg.
Actinotrichia rigida (Lamx.) Decaisne
Amansia glomerata C. Ag.
Avrainvillea amadelpha (Mont.) Gepp and Gepp
Centroceros clavulatum (C. Ag.) Harvey
Ceramium sp.
Champia parvula (C. Ag.) Harvey
Galaxaura apiculata Kjellm.
Galaxaura sp.
Gelidium pusillum (Stackhouse) LaJolis
Grateloupia filicina (Wulfen) C. Ag.
Halymenia formosa Harvey
Hypnea musciformis (Wulfen) C. Ag.
Laurencia dotii Saito
Laurencia nidifica J. Ag.
Polysiphonia howei Hollenberg
Polysiphonia sp.
Pterocladia caerulescens (Kutz.) Santelices
Pterocladia capillacea (Gmelin) Bornet
Pterocladia sp.
Tolypiocladia calodictyon (Harv.) Silva

PHAEOPHYTA

Dictyota acuteloba J. Ag.
Dictyota divaricata Lamouroux
Dictyota friabilis Setchell
Dictyota sp.
Ectocarpus indicus Sonder

Ectocarpus sp.
Lobophora variegata (Lamx.) Womersley
Sargassum echinocarpum J. Ag.
Sargassum polyphyllum J. Ag.
Spacelaria tribuloides Meneghini
Turbinaria ornata (Turn.) J. Ag.

CHLOROPHYTA

Avrainvillea amadelpha (Mont.) Gepp and Gepp
Bornetella sphaerica (Zand.) Solms-Laubach
Bryopsis hydnoides Lamx.
Bryopsis pennata Lamx.
Cladophora sp.
Cladophoropsis sp.
Codium arabicum Kutzing
Codium edule Silva
Codium phasmaticum Setchell
Dictyosphaeria cavernosa (Forsskal) Boerg.
Dictyosphaeria versluysii Weber Van Bosse
Enteromorpha clathrata (Roth) Grev.
Halimeda discoidea Decaisne
Ulva fasciata Delile
Ulva reticulata Forsskal
Ulva rigida C. Ag.
Valonia aegagropila C. Ag.

SEAGRASS

Halophila hawaiiana

CYANOPHYTA

Lyngbya majuscula Gomont

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Fisheries Science Center Honolulu Laboratory
2570 Dole St. • Honolulu, Hawaii 96822-2396

Date: 9-11-91

20 Algae samples submitted to Dr. Dennis Russell, 4408 237th Place, S.W. Mount Lake Terrace, WA 98043.

by George Balazs
NMFS, Honolulu Laboratory
2570 Dole Street
Honolulu, Hawaii 96822-2396

SAMPLE ID.	LOCATION	DESCRIPTION
1-23-91	(Kawamoto) - Portlock, Oahu	Stomach Sample from necropsied turtle
1-22-91	(Heacock) - Nukolii, Kauai	"
1-28-91	(Skippy Hau) - Maui	"
2-5-91	(Paine) - Koko Marina, Oahu	"
2-21-91	Punaluu - Oahu	"
2-22-91	Kawela - Turtle Bay (Richard Sullivan) Oahu	"
3-13-91	Kawela Bay (Eisner), Oahu	"
3-22-91	(Stanley Chun) - Heeia (Kaneohe Bay)	"
4-3-91	(Ivan) Waikiki, Oahu	"
4-5-91	Lanikai (Dave Smith), Oahu	"
4-7-91	Lanai (Mike Cohelo)	"
4-16-91	Pahoa (Alice Solywoda), Hawaii (Big Is.)	"

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 Date: 9-11-91

20 Algae samples submitted to Dr. Dennis Russell, 4408 237th Place, S.W. Mount Lake Terrace, WA 98043.

by George Balazs
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2570 Dole Street
Honolulu, Hawaii 96822-2396

SAMPLE ID.	LOCATION	DESCRIPTION
7-29-91	Nanakuli, Oahu	Stomach Sample from necropsied turtle
8-4-91	(Docare)-Nanakuli, Oahu	"
8-5-91	(Nevala) Kahaluu, KBay, Oahu	"
8-13-91	Ulumau Beach Park (Richard Gorloff) HEEIA, KBay, Oahu	"
8-16-91	Bellows (Sgt. Yeo), Oahu	"
9-5-91	Kauai (Heacock)	"
2-28-91	Aina Haina (Don Maxey), Oahu	"
1-28-91	Maui (Skippy Hau)	"

D-10 Honolulu Star-Bulletin Wednesday, April 8, 1981

Bishop Museum Gets Big Algae Collection

What is probably the largest private collection of marine algae in existence has been given to Bishop Museum by Maxwell S. Doty and his wife, Meng Sung Doty, the museum has announced.

Doty, well known for his work in seaweed farming and classification of many groups of large algae during his 26 years as phycologist in the University of Hawaii's botany department.

The collection of about 30,000 dried and mounted specimens and about 3,000 specimens preserved in alcohol will be housed in the Herbarium Pacificum of the museum's department of botany.

The museum reports that the addition of this collection will allow it to become the Pacific region's major center for the systematic study of certain marine algal groups.

There are only a few institutions in the world that give specialized attention to the study of cryptograms, or plants that reproduce by spores, such as ferns, mosses, algae and fungi.

Doty said the study of cryptograms has not received the scientific attention it deserves, barring a few exceptions. Algae play an important role in supporting human and animal life in the Pacific by providing food for other marine organisms which in turn feed man, and by stabilizing the movement of sand and reef formation.

Doty is also donating to the museum his botanical library, considered to be one of the largest and most complete phycological libraries in the world.

George Balazs
NOAA National Marine Fisheries Service
SWFC Honolulu Laboratory F/SWC2
2570 Dole Street
Honolulu, HI 96822-2396

20 August 1991

Dear George,

Thank you for the articles on the green algal bloom on Maui and the turtle tagging. I've been taken away from the Hypnea musciformis article this month, because of two summer school classes, consulting, family re-unions etc. Now that that flurry of activity is over the MS is next. The fecal pellet cultures have not grown anything yet and probably won't. It would be worth a try again, without using formalin to surface sterilize, if a pellet can be obtained somehow from a turtle without it contacting the seawater environment.

Presently you have 33 sample IDs to your credit paid in full, but I just received a service order (40-JJNF-1-0217) for more sample IDs, when that check arrives you will have 73 samples to your credit. Also, the samples, if taken properly, need not be bigger than 100 ml volume.

Algae Identifications (13 samples)

6-7-91 Y875 Stomach flush, Kaneohe Bay, w/ D. J. Russell

Halophila ovalis	30%
Acanthophora spicifera	20
Hypnea musciformis	20
Spyridia filamentosa	20
Amansia glomerata	5
Gracilaria salicornia	5

6-7-91 Y875, fecal pellet, Kaneohe Bay, w/ D. J. Russell

Acanthophora spicifera	80%
Halophila ovalis	10
Sargassum echinocarpum	10

2 dark brown egg case clusters (look like insect egg cases)

6-7-91 V28, Stomach flush, Kaneohe Bay, Mark Reef

Acanthophora spicifera	90%
Hypnea musciformis	5
Gracilaria sp.	3
Dictyota acuteloba	1
Sargassum echinocarpum	1
Lyngbya majuscula	Trace

6-10-91 N875, Puako, S. Kohala, stomach flush

Gelidium pusillum	95%
Acanthophora spicifera	3
Laurencia nidifica	2
Polysiphonia sp.	Trace

One amphipod

6-9-91 Makapuu, across from Sea Life Park, GHB DEAD STRAND

Codium edule	25%
Codium arabicum	20
Codium phasmaticum	15
Spyridia filamentosa	10
Turbinaria ornata	10
Halimeda discoidea	5
Hypnea sp.	5
Laurencia nidifica	5
Laurencia obtusa	5
Ceramium sp.	Trace
Lyngbya sp.	Trace
Polysiphonia howei	Trace
Siphonocladus tropicus	Trace

5-2-91 Kualoa Ranch, Kaneohe, Troy Murakami, dead turtle

Hypnea musciformis	40
Acanthophora spicifera	30
Laurencia nidifica	10
Codium arabicum	5
Codium edule	5
Gracilaria coronopifolia	5
Dictyosphaeria versluysii	1
Sargassum echinocarpum	1
Sargassum polyphyllum	1
Ulva reticulata	1
Cladophoropsis sp.	Trace
Lyngbya majuscula	Trace
Sphacelaria sp.	Trace
Muscle fibers (meat)	1

6-6-91 Lyman Blank, Kahala, stomach sample, dead turtle

Acanthophora spicifera	80%
Pterocladia capillacea	10
Hypnea musciformis	5
Laurencia nidifica	5
Cladophoropsis luxurians	Trace
Dictyota sp.	Trace
Halimeda discoidea	Trace

5-8-91 49-705 Kam Hwy, Jack Randall, Kaneohe Bay, Coral House, dead turtle

Hypnea musciformis	35%
Ulva reticulata	30
Acanthophora spicifera	25
Gelidium sp.	5
Laurencia nidifica	5

5-11-91 off reef runway, officer Scott Chun, head prop slash, dead turtle

Amansia glomerata	50%
Halophila ovalis	50
Chondrococcus hornemanni	Trace
Ceramium sp.	Trace
worm tubes	Trace

5-1-91 Kailua near Castle Point, Shannon, dead turtle

Hypnea musciformis	85%
Dictyota plagiogramme	4
Laurencia nidifica	2
Codium edule	1
Halimeda gracilis	1
Sargassum echinocarpum	1
Spyridia filamentosa	1
Amansia glomerata	Trace
Caulerpa taxifolia	Trace
Gracilaria sp.	Trace
Lyngbya majuscula	Trace
Polysiphonia howei	Trace
Polysiphonia tepida	Trace
Sphacelaria tribuloides	Trace

"A" 5-7-91 Kailua Beach Park, rinsed feces

Halimeda gracilis	60%
Dictyosphaeria versluysii	20
Sphacelaria sp.	20

Plant material (Casurina equisetifolia)
Sand
Digested matter (most of the sample was unrecognisable)

"B" 5-7-91 Kailua Beach Park, rinsed feces

Codium edule	70%
Amansia glomerata	20
Dictyosphaeria versluysii	5
Sargassum sp.	5
Microdictyon japonicum	Trace
Polysiphonia howei	Trace
Schizothrix calcicola	Trace
Sphacelaria sp.	Trace

Sand grains

"C" 5-7-91 Kailua Beach Park, rinsed feces

Amansia glomerata	95%
Codium edule	5

One clear plastic sheet (3 X 5mm)

SUMMARY OF SPECIES (20 August 1991)

RHODOPHYTA

Acanthophora spicifera (Vahl) Boerg.
Amansia glomerata C. Ag.
Ceramium sp.
Chondrococcus hornemanni (Mert.) Schmitz
Gelidium pusillum (Stackhouse) LaJolis
Gelidium sp.
Gracilaria coronopifolia J. Ag.
Gracilaria salicornia C. Ag.
Gracilaria sp.
Hypnea musciformis (Wulfen) C. Ag.
Hypnea sp.
Laurencia nidifica J. Ag.
Laurencia obtusa (Huds.) Lam.
Polysiphonia howei Hollenberg
Polysiphonia sp.
Polysiphonia tepida Hollenberg
Pterocladia capillacea (Gmelin) Bornet
Spyridia filamentosa (Wulfen) Harvey

PHAEOPHYTA

Dictyota acuteloba J. Ag.
Dictyota plagiogramme (Mont.) Vickers
Dictyota sp.
Sargassum echinocarpum J. Ag.
Sphacelaria sp.
Spacelaria tribuloides Meneghini
Turbinaria ornata (Turn.) J. Ag.

CHLOROPHYTA

Caulerpa taxifolia (Vahl) C. Ag.
Cladophoropsis luxurians Gilbert
Cladophoropsis sp.
Codium arabicum Kutzing
Codium edule Silva
Codium phasmaticum Setchell
Dictyosphaeria versluysii Weber Van Bosse
Halimeda discoidea Decaisne
Halimeda gracilis Harvey
Microdictyon japonicum Setchell
Siphonocladus tropicus (Crouan) J. Ag.
Ulva reticulata Forsskal

SEAGRASS

Halophila ovalis (R. Br.) Hook

CYANOPHYTA

Lyngbya majuscula Gomont
Lyngbya sp.
Schizothrix calcicola (Ag.) Gomont

TERRESTRIAL PLANTS

Casurina equisetifolia L.

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Fisheries Science Center Honolulu Laboratory
2570 Dole St. • Honolulu, Hawaii 96822-2396

Please Return This copy with ID's

Date: July 19, 1991

12 Algae samples submitted to Dr. Dennis Russell, 4408 237th Place, S.W. Mount Lake Terrace, WA 98043.

by George Balazs
NMFS, Honolulu Laboratory
2570 Dole Street
Honolulu, Hawaii 96822-2396

SAMPLE ID.	LOCATION	DESCRIPTION
Y875 6/7/91	KANEOHE BAY	STOMACH FLUSH WITH DENNIS RUSSELL
V28 6/7/91	" " (MARK REEF)	" "
N875 6/10/91	PUAKO, S. KOHALA	STOMACH FLUSH
6/9/91	MAHAIUU (NEAR SLP)	STOMACH CONTENTS OF DEAD TURTLE
5/2/91 (Murakami)	KANEOHE BAY (KUALOA RANCH)	" "
6/6/91 (L. BLANK)	KAHALA	" "
5/8/91 (J. Randall)	KANEOHE BAY (CORAL HOUSE)	" "
5/11/91 (S. Chun)	REEF RUNWAY	" "
5/1/91 (Shannon)	kailua Bay	" "
5/7/91 "A"	KAILUA BEACH	RINSED FECES
5/7/91 "B"	" "	" "
5/7/91 "C"	" "	" "

George Balazs
NOAA National Marine Fisheries Service
SWFC Honolulu Laboratory F/SWC2
2570 Dole Street
Honolulu, HI 96822-2396

20 May 1991

Dear George,

I got your letter and need to change one ID from the last series. There were only a few "hook-shaped" pieces of a Hypnea in the Kiholo sample (Y4 B) 3-5-91, so I double checked the cellular structure more and it does not match to H. musciformis (please change that ID). Both checks came in now, so there are 46 samples to your credit as of this letter.

Algae Identifications

12-14-90 Y47 - Waikiki, Turtle "B" (Grace Ledge) mouth contents

Sargassum sp.	only

4-26-91 N844 - Waikiki Sheraton, stomach flush

Hypnea musciformis	40%
Sargassum sp.	30
Ulva reticulata	15
paper	10
sand	5
Ectocarpus indicus	Trace

4-24-91 7540, Punaluu Bay, Big Island, fresh fecal pellet in formalin

Pterocladia sp.	90%
Black sand	10
Terrestrial grass	Trace

4-29-91 N846, Kaneohe Bay, Mark Reef, stomach flush

Codium arabicum	40%
Codium phasmaticum	30
Eucheuma denticulatum	20
Hypnea musciformis	10
Dictyosphaeria cavernosa	5
Laurencia nidifica	Trace
Padina japonica	Trace
Sphacelaria sp.	Trace
Spyridia filamentosa	Trace
Round worms	Trace ---->

3-14-91 Kawela Bay, Eisner, stomach sample

Codium arabicum	40%
Codium edule	25
Amansia glomerata	20
Gymnogongrus sp.	15
Dictyosphaeria cavernosa	Trace
Gelidium sp.	Trace
Laurencia obtusa	Trace
Ulva sp.	Trace

SUMMARY OF SPECIES (20 May 1991)

RHODOPHYTA

Amansia glomerata C. Ag.
Eucheuma denticulatum (Berman) Collins et Hervey
Gelidium sp.
Hypnea musciformis (Wulfen) C. Ag.
Laurencia nidifica J. Ag.
Laurencia obtusa (Huds.) Lam.
Pterocladia sp.
Spyridia filamentosa (Wulfen) Harvey

PHAEOPHYTA

Ectocarpus indicus Sonder
Padina japonica Yamada
Sargassum sp.
Sphacelaria sp.

CHLOROPHYTA

Codium arabicum Kutzing
Codium edule Silva
Codium phasmaticum Setchell
Dictyosphaeria cavernosa (Forsskal) Boerg.
Ulva reticulata Forsskal
Ulva sp.

George,

Yes, I did use University stationery, but did indicate the check be sent to my home address. Oh well, next time I'll use plain paper to avoid confusion. I see you will be in Seattle again 19 & 20 June. Sue and I would like to invite you to our house for a barbeque with Lew and his family. Would that work out ok for you? or will you be too rushed? Please let me know.

June 6 or 7th would be a good time for me to go with you to Kaneohe Bay to capture sea turtles. My phone number for Kailua will be 261-1238 (my friends names are Dick and Linda Bogert, 1015 Aoloa Pl. #230, Kailua, HI 96734).

Dennis

3-5-91 Kiholo, N. Kona, Y4(A) scraped from tag

Gelidium pusillum	45%
Peysonellia sp.	30
Sphacelaria sp.	20
Polysiphonia pseudovillum	5
Achrochaetium sp.	Trace
Bangia sp.	Trace
Chaetomorpha sp.	Trace
Schizothrix calcicola	Trace
Diatoms	Trace
Black Mite	1 each

3-5-91 Kiholo, N. Kona, Y4(B) stomach flush

Gelidium pusillum	90%
Dictyota crenulata	10
Cladophoropsis luxurians	Trace
Derbesia marina	Trace
Hypnea sp.	Trace
Polysiphonia sp.	Trace
Diatoms	Trace
Sand	Trace
Micromolluscs	2 each

3-4-91 Kiholo, N. Kona, stomach flush

Turbinaria ornata	90%
Gelidium pusillum	10
Jania capillacea	Trace
Sand	Trace

3-21-91 Puako (scuba), S. Kohala, N755 stomach flush

Gelidium pusillum	50%
Turbinaria ornata	50
Dictyota crenulata	Trace
Laurencia sp.	Trace
Amphipods	2 each

10-9-90 Waikiki, Kaimana Hotel, 1st stomach contents

Ulva reticulata	90%
Acanthophora spicifera	5
Amansia glomerata	5
Ceramium sp.	Trace
Champia parvula	Trace
Gelidiella acerosa	Trace
Gracilaria coronopifolia (?)	Trace
Lyngbya majuscula	Trace

PLEASE RETURN THIS COPY WITH YOUR RESULTS

U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
Southwest Fisheries Science Center Honolulu Laboratory
2570 Dole St. • Honolulu, Hawaii 96822-2396

Date: 5-13-91

5 Algae samples submitted to Dr. Dennis Russell, 4408 237th Place, S.W. Mount Lake Terrace, WA 98043.

— PLEASE RETURN THESE SAMPLES —

by George Balazs
NMFS, Honolulu Laboratory
2570 Dole Street
Honolulu, Hawaii 96822-2396

SAMPLE ID.	LOCATION	DESCRIPTION
12-1-90 Y47 -TURTLE "B"	WAIKIKI (GRACE LEDGE)	MOUTH CONTENTS
4-26-91 N844	WAIKIKI SHERATON	STOMACH FLUSH
4-24-91 7540	PUNALUU BAY, BIG ISLAND	FRESH FECAL PELLET IN FORMALIN
4-29-91 N846	KANEOHE BAY, MARK REEF	STOMACH FLUSH
3-14-91 EISNER	KAWELA BAY, OAHU	STOMACH SAMPLE FROM NECROPSIED TURTLE

George Balazs
NOAA National Marine Fisheries Service
SWFC Honolulu Laboratory F/SWC2
2570 Dole Street
Honolulu, HI 96822-2396

15 February 1991

Dear George,

This completes all of the 1990 samples I have received, plus one from 1991. This means all of the credit has been used and you are now one sample in debt. I have ten more samples to process and will send the results to you soon. It really doesn't take a lot of extra time to do trace species and I would like to continue because it assures I have looked carefully at the entire sample and gives a good idea of the variety the turtles are sampling. I have, however, stopped identifying really little things like diatoms, blue-green algae when in tiny amounts and some of the tiny epiphytic filamentous reds. You may, someday, figure out some type of species diversity related to diet or what was taken into the animals. Thank you for being concerned about my over-doing it.

Algae Identifications

1-3-91 Leatherback, Midway Island.

Connective tissue
Squamous epithelial cells (loose)
Sand grains
No plant material in sample
No fish scales or recognizable animal organs (bones, skin, etc.)

HIMB Freezer stomach sample, Kaneohe Bay RFL Mono entangle
No date

Spyridia filamentosa	90%
Casurina equisetifolia (terrestrial foliage)	10%

Part of a bird feather
Shell fragment

8-89 Dave GWKO CF, Kaneohe Bay, Stomach sample

Gelidium sp.	50%
Gracilaria coronocopifolia	40
Acanthophora spicifera	10
Hypnea spinella	Trace

Small fecal pellet #1, Kawela Bay.

Codium arabicum	50%
Amansia glomerata	30
Codium edule	20
Padina sp.	Trace
Ulva sp.	Trace

Small fecal pellet #2, Kawela Bay.

Codium edule	95%
Amansia glomerata	5
Casurina equisetifolia	Trace
Ectocarpus sp.	Trace

Medium fecal pellet #1, Kawela Bay

Codium edule	90%
Amansia glomerata	10
Dictyosphaeria sp.	Trace
Griffithsia sp.	Trace
Sphacelaria sp.	Trace
Casurina equisetifolia	Trace

Medium fecal pellet #2, Kawela Bay

Codium edule	90%
Amansia glomerata	10
Sphacelaria sp.	Trace

Large fecal pellet #1, Kawela Bay

Codium edule	90%
Amansia glomerata	10
Gelidium sp.	Trace

Large fecal pellet #2, Kawela Bay

Codium edule	70%
Amansia glomerata	30
Cladophoropsis sp.	Trace

6-29-90 Club Lanai, Halepalaoa

Spyridia filamentosa	70%
Laurencia nidifica	30
Sand	

7-6-90 Kewala Bay (Sullivan) Stomach sample

Pterocladia capillacea	50%
Codium edule	20
Codium arabicum	10
Laurencia sp.	10
Acanthophora spicifera	5
Amansia glomerata	5
Dictyosphaeria versluysii	Trace
Valonia aegagropila	Trace

12 July 1990 Fenny Cox, stomach sample, SPEBE Student, HIMB?

Black colonial ascidian	50%
Codium arabicum	20
Codium edule	20
Dictyosphaeria cavernosa	5
Gelidium pusillum	5

7-16-90 Wailua, Bradley Hara, stomach sample

Codium arabicum	40%
Codium edule	40
Amansia glomerata	20
Cladophoropsis luxuriens	Trace
Microdictyon japonicum	Trace
Turbinaria ornata	Trace
Ceramium sp.	Trace
Gelidium sp. (?)	Trace

One hollow cone-shaped spine

7-23-90 Lanikai, stomach sample

Codium phasmaticum	40
Dictyosphaeria cavernosa	20
Codium edule	10
Turbinaria ornata	10
Actinotrichia rigida	Trace
Jania capillacea	Trace
Lyngbya majuscula	Trace
Sphacelaria sp.	Trace
Spyridia filamentosa	Trace
Tolypiocladia calodictyon	Trace

8-3-90 N490

Hypnea musciformis	90%
Codium sp.	10
Acanthophora spicifera	Trace
Ceramium sp.	Trace
Champia parvula	Trace
Dictyosphaeria cavernosa	Trace
Laurencia nidifica	Trace
Sargassum sp.	Trace
Sphacelaria sp.	Trace

1 foraminifera shell
1 amphipod
Sand

8-3-90 N491

Codium sp.	50%
Hypnea musciformis	50

8-4-90 Kailua Beach Park, Midnight - 6am, stomach sample, fisherman's net

Hypnea musciformis	80%
Codium sp.	10
Dictyota acuteloba	10
Acanthophora spicifera	Trace
Cladophora fascicularis	Trace
Corallina sandvicensis	Trace
Halimeda discoidea	Trace
Padina japonica	Trace

Bryozoans (small)

8-18-90 N. Kaneohe Bay Y269 Y270, stomach sample

Halophila ovalis	90%
Black colonial ascidians	10

8-20-90 Kailua Beach near Castle Point, stomach sample

Acanthophora spicifera	75%
Dictyosphaeria cavernosa	10
Dictyota acuteloba	10
Sargassum echinocarpum	5
Halimeda discoidea	Trace
Hypnea cervicornis	Trace
Hypnea musciformis	Trace
Laurencia nidifica	Trace
Lyngbya majuscula	Trace
Padina japonica	Trace
Sphacelaria sp.	Trace

8-24-90 Mark's Reef #1

Sargassum obtussifolium	70%
Codium edule	20
Amansia glomerata	10
Dictyosphaeria versluysii	Trace
Sphacelaria sp.	Trace

8-24-90 Mark's Reef #2

Sargassum obtussifolium	70%
Amansia glomerata	10
Dictyosphaeria versluysii	Trace
Lyngbya majuscula	Trace
Sphacelaria sp.	Trace

8-29-90 Laie, entangled on shore, stomach sample

Codium arabicum	40%
Codium edule	20
Halymenia formosa	15
Chondrococcus hornemanni	10
Codium phasmaticum	10
Alsidium sp.	4
Halophila ovalis	1
Amansia glomerata	Trace
Ceramium sp.	Trace
Corallina sp.	Trace
Dictyosphaeria versluysii	Trace
Halimeda discoidea	Trace
Laurencia sp.	Trace
Lyngbya majuscula	Trace
Microdictyon japonicum	Trace
Polysiphonia howei	Trace
Sphacelaria tribuloides	Trace
Spyridia filamentosa	Trace

11-12-90 Mary Alice, stomach sample

Amansia glomerata	90%
Turbinaria ornata	5
Cladophoropsis luxurians	3
Sargassum obtussifolium	2
Jania sp.	Trace
Valonia aegagropila	Trace

11-13-90 Buckmaster, stomach

Hypnea musciformis	85%
Acanthophora spicifera	5
Laurencia nidifica	5
Halophila ovalis	1
Laurencia sp.	Trace

One lump of yellow sponge

SUMMARY
(15 February 1991)

RHODOPHYTA

Acanthophora spicifera (Vahl) Boerg.
Actinotrichia rigida (Lamx.) Decaisne
Alsidium sp.
Amansia glomerata C. Ag.
Ceramium sp.
Champia parvula (C. Ag.) Harvey
Chondrococcus hornemanni (Mert.) Schmitz
Corallina sandvicensis Lemm.
Gelidium pusillum (Stackhouse) LaJolis
Gelidium sp.
Gracilaria coronopifolia J. Ag.
Griffithsia sp.
Halymenia formosa Harvey

Hypnea cervicornis J. Ag.
Hypnea musciformis (Wulfen) C. Ag.
Hypnea spinella (J. Ag.) Kutzing
Jania capillacea Harvey
Jania sp.
Laurencia nidifica J. Ag.
Laurencia sp.
Polysiphonia howei Hollenberg
Pterocladia capillacea (Gmelin) Bornet
Spyridia filamentosa (Wulfen) Harvey
Tolypiocladia calodictyon (Harv.) Silva

PHAEOPHYTA

Dictyota acuteloba J. Ag.
Ectocarpus sp.
Padina japonica Yamada
Padina sp.
Sargassum echinocarpum J. Ag.
Sargassum obtussifolium J. Ag.
Sargassum sp.
Sphacelaria sp.
Spacelaria tribuloides Meneghini
Turbinaria ornata (Turn.) J. Ag.

CHLOROPHYTA

Cladophora fascicularis (Mertens) Kutzing
Cladophoropsis luxurians Gilbert
Cladophoropsis sp.
Codium arabicum Kutzing
Codium edule Silva
Codium phasmaticum Setchell
Codium sp.
Dictyosphaeria cavernosa (Forsskal) Boerg.
Dictyosphaeria sp.
Dictyosphaeria versluysii Weber Van Bosse
Halimeda discoidea Decaisne
Microdictyon japonicum Setchell
Ulva sp.
Valonia aegagropila C. Ag.

SEAGRASS

Halophila ovalis (R. Br.) Hook

CYANOPHYTA

Lyngbya majuscula Gomont

TERRESTRIAL PLANTS

Casurina equisetifolia L.

"TMR" = Tumors
"SL" and "CL" are carapace length of turtle in centimeters.

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11 May 1990

Dear George,

I will be presenting a paper at a Mariculture 90 meeting in Nova Scotia this June, which is based on alien sea weed introductions to Hawaii and I need some information about the samples you have collected that contained H. musciformis. If you have the time, would you please send me the missing locations and dates for the following samples? This is a complete list for H. musciformis as far as I can gather from my records of your samples and publications.

GB-29 Location: Kaneohe Bay, Oahu (Turtle dead) SL = 60 cm Date: 10/28/77 1977

GB-533 Location: Bellows, Oahu (Rocky Groin NOT FROM TURTLE) Date: 9/5/79 1979

GB-601 Location: Bellows, Oahu (NOT FROM TURTLE) Date: 4 Jan 80 algae TANGLED ON LENDLINE OF NET

GB-755 Location: Bellows, Oahu (algae TANGLED IN NET) Date: 5/13/80 (NOT FROM TURTLE) 1980

GB-757 Location: Bellows, Oahu " Date: 5/14/80 "

GB-758 Location: Bellows, Oahu " Date: 5/15/80 "

(FROM SAME TURTLE) GB-1041 Location: Lilipuna Kaneohe Bay Date: 7/16/80 (Stomach) 1980

(Dead Turtle w/TMRs) GB-1042 Location: Lilipuna Kaneohe Bay Date: 7/16/80 (intestines) 1980

Location: Kawela Bay, Oahu (Dead Turtle) Date: 28 Mar 85 (SL = 55.5) Stomach contents

Location: Punaluu, Oahu and Kawailoa Oahu Date: 19 Mar 85 Shoreline wash-ups - NOT FROM TURTLE

Location: Kuliouou, (Niu Valley) Oahu Date: 4 Apr 85 Shoreline washup - NOT FROM TURTLE

Location: Kahului Harbor, Maui Date: 5 May 85 Rocky shoreline - NOT FROM TURTLE

Location: Kahaluu, Oahu (KBay) Date: 3 Jun 85 (SL = 53.0) Dead turtle w/TMR (Stomach contents)

GB-8464 Location: Kahului, Maui Date: 17 Jun 85 (SL-86.2) Live turtle stomach flush

Location: Kaneohe, Oahu (NOSC KBay) Date: 14 Aug 85 (SL 69.5) Dead Turtle w/TMRs (STOMACH SAMPLE)

Location: Airport Lagoon Drive Oahu Date: 13 Jul 85 (SL 89.8) Dead turtle w/TMRs (Stomach sample)

→ Can be cited as: Balazs, G.H, R.G. Forsyth and A.K.H. Kam. 1987. Preliminary Assessment of Habitat Utilization By Hawaiian Green Turtles on their Resident Foraging Pastures. US Dept. Commerc. NOAA Tech. Memo. NMFS, NOAA-TM-NMFS-SWFC-71, 107p.

SAME FOR SAMPLES GB 8514 and

Location: Just off Haleiwa Harbor, Oahu Date: 26 mar 86 Dead Turtle w/TMR (Stomach sample)
CL-73.5

GB-8514 Location: KUAHUA, (Shipwreck Beach), Lanai Date: 7/14/85 TURTLE MOUTH Sample 1985
GB-8516 " KUAHUA, Lanai Date: 7/16/85 " "
Location: Sand Island, Oahu Date: Mar 86 DEAD TURTLE (38.6cm) (STOMACH SAMPLE)
Location: Kahaluu, Oahu (K Bay) Date: 27 Jun 86 SL-85.0 Dead Turtle (Stomach Sample)
Location: Kaneohe Bay, Oahu Date: 19 Jun 86 SL: 65.4 DEAD TURTLE w/TMR (STOMACH SAMPLE)
Location: Kahaluu, Oahu (K Bay) Date: 22 Jun 86 SL=58.9 TMR DEAD TURTLE STOMACH SAMPLE
Location: Kaneohe, Oahu (K Bay) Date: 13 Sep 86 SL 68 cm Dead turtle w/TMR (STOMACH SAMPLE)
Location: Kailua Bay, Oahu Date: 12 Jan 87 SL 67.2 Dead turtle (Stomach Sample) TMR
Location: Kahaluu, Oahu (K Bay) Date: 27 Jan 87 SL=37.8cm Dead turtle (Stomach Sample)
Tag 3448 Location: Kaneohe Bay, Oahu Drowned from entanglement Date: 11 Mar 87 SL 89.2 Dead Turtle (Stomach Sample)
Location: Mokuleia, Oahu Date: 5 Sep 87 SL-37.6 Dead Turtle (Stomach contents)
Location: Kualoa Beach, Oahu Date: 17 Aug 87 SL-61.2 DEAD TURTLE TMR (STOMACH CONTENTS)
Location: Mauanalua Bay (Hawaii Kai) Oahu 2 MAY 87 SL-72.6 Dead Turtle TMR (STOMACH CONTENTS)
#9874 Location: Palaau, Molokai Date: Dead turtle (Stomach Sample) 1988.
SL: 56.0 13 JULY 88
Location: Kahala Beach, Oahu Date: 21 Feb 88 SL 87.4 Dead Turtle TMR (STOMACH CONTENTS)
Location: Kahuku, Oahu Date: 18 Sep 88 C=91.5 Dead Turtle TMR (Stomach Sample)
Location: Kailua Bay, Oahu Date: 27 Apr 89 SL-41.0cm Dead turtle (Stomach Sample)

There isn't much about H. musciformis from Kauai, Molokai or Hawaii. Do you have any samples from there? I have Abbott's Bishop Museum article, which you sent me and will visit the UH and Bishop Museum for herbarium records in December 1990 after I finish teaching the Hawaiian Marine Biology class I'm bringing a class to Camp Pecusa, Olowalu, Maui, 13-23 Dec 90. I hope to present similar papers in three meetings this year and then submit a manuscript to an appropriate journal in early 1991 (after plenty of input by reviewers).

Several years ago (Dec 1984) I found Hypnea musciformis at Launiupoko Park, Maui, and wrote to you about it. In that letter I said that I was writing a manuscript that included its establishment in Hawaii and might need some more information later on. Now I have almost completed the manuscript, which is concentrating more on Acanthophora and its competition with native algae, but which also includes Hypnea musciformis as an additional alien introduction. It is difficult to find time to write while teaching a full load, but this paper seems to be coming together quite well.

The NOAA check for $700 came in the mail yesterday, so you now have paid credit for 57 samples.

aloha,