

Enhanced susceptibility to predation in corals of compromised condition

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The marine gastropod, *Coralliophila abbreviata*, is an obligate corallivore that causes substantial mortality in Caribbean *Acropora* spp. Considering the imperiled status of *Acropora cervicornis* and *A. palmata*, a better understanding of ecological interactions resulting in tissue loss may enable more effective conservation strategies. We examined differences in susceptibility of *A. cervicornis* to *C. abbreviata* predation based on coral tissue condition. Coral tissue condition was a strong determinant of snail prey choice, with snails preferring *A. cervicornis* fragments that were diseased or mechanically damaged over healthy fragments. Generally, snails showed no preference between a healthy prey fragment and a non-feeding conspecific, despite a limited number of observations suggesting a strong preference for fragments undergoing active predation by a conspecific over an undisturbed fragment. These results indicate that the condition of *A. cervicornis* prey influenced foraging behavior of *C. abbreviata*, creating a potential feedback that may exacerbate damage from predation in coral populations compromised by other types of disturbance.

1 Enhanced susceptibility to predation in corals of compromised condition

2 **Abstract**

3 The marine gastropod, *Coralliophila abbreviata*, is an obligate corallivore that causes substantial
4 mortality in Caribbean *Acropora* spp. Considering the imperiled status of *Acropora cervicornis*
5 and *A. palmata*, a better understanding of ecological interactions resulting in tissue loss may
6 enable more effective conservation strategies. We examined differences in susceptibility of *A.*
7 *cervicornis* to *C. abbreviata* predation based on coral tissue condition. Coral tissue condition was
8 a strong determinant of snail prey choice, with snails preferring *A. cervicornis* fragments that
9 were diseased or mechanically damaged over healthy fragments. Generally, snails showed no
10 preference between a healthy prey fragment and a non-feeding conspecific, despite a limited
11 number of observations suggesting a strong preference for fragments undergoing active
12 predation by a conspecific over an undisturbed fragment. These results indicate that the condition
13 of *A. cervicornis* prey influenced foraging behavior of *C. abbreviata*, creating a potential
14 feedback that may exacerbate damage from predation in coral populations compromised by other
15 types of disturbance.

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24 Introduction

25 Corallivory is widely understood to have significant, if sometimes underestimated, effects on
26 scleractinian coral populations (Rotjan & Lewis, 2008). Depending on the type and intensity of
27 predation, corallivory may result in positive or negative ecological responses (Cole, Pratchett &
28 Jones, 2008). While at the community level, moderate predation pressure has sometimes been
29 positively correlated with an increase in species diversity (Menge & Sutherland, 1976), for an
30 individual coral, predation often equates to partial mortality that may compromise physiological
31 processes such as growth (Meesters, Noordeloos & Bak, 1994) and reproductive success (Van
32 Veghel & Bak, 1994). Predation can also be associated with negative indirect effects; if tissue
33 regeneration is incomplete or too slow following predation, spatial competitors such as algae and
34 sponges can colonize the dead areas, potentially introducing a myriad of negative interactions
35 (Bak & Steward-Van Es, 1980). Additionally, some corallivores are known to vector disease
36 (Sussman et al., 2003; Williams & Miller, 2005), and tissue lesions (likely including those from
37 partial predation) have been cited as a pre-requisite to disease transmission in *Acropora*
38 *cervicornis* (Gignoux-Wolfson, Marks & Vollmer, 2012).

39

40 While predation among healthy coral populations can promote a stable equilibrium, within
41 degraded coral populations, the per capita relative impact of corallivory is likely to increase as
42 coral cover decreases, potentially affecting the fitness and recovery of affected coral populations
43 (Jayewardene, Donahue & Birkeland, 2009). This was observed on surveyed reefs in Jamaica
44 where populations of *A. cervicornis* were reduced by the acute disturbance of Hurricane Allen.
45 As a result, predation by the corallivorous gastropod, *Coralliophila abbreviata*, was concentrated

46 on remaining individuals resulting in further population declines of *A. cervicornis* rather than
47 recovery (Knowlton, Lang & Keller, 1990).

48

49 Abiotic and biotic disturbances such as hurricanes, disease and bleaching not only reduce coral
50 populations, but may affect the ‘condition’ of the remaining colonies yielding broken branches,
51 lesions, compromised immune response (Bak & Criens, 1981), growth (Bak, 1983) and
52 reproduction (Rinkevich & Loya, 1979). Furthermore, studies have shown that stressed corals
53 are more susceptible to ambient predation (Morton, Blackmore & Kwok, 2002; Wolf & Nugues,
54 2013) suggesting that predation pressure on a focal coral may increase as a result of disturbance-
55 related physiological stress in addition to a potential numerical effect (i.e., higher ratio of
56 predators to surviving prey). Field studies on the impact of predation following disturbances such
57 as Knowlton, Lang & Keller (1990) cannot distinguish the relative influence of diminished coral
58 abundance versus coral condition.

59

60 The *Acropora-Coralliophila* relationship provides a good model for evaluating the relative
61 influence of coral condition (i.e., healthy, diseased, damaged, etc.) on predator behavior.
62 Considering the region-wide declines of *Acropora* spp., many populations may exist below a
63 threshold abundance where they are now at heightened vulnerability to predation pressure.
64 *Coralliophila abbreviata* is an obligate corallivore with an asymmetrical preference for
65 *Acropora* spp. prey (Johnston & Miller, 2014) and may thus pose a substantive risk to the
66 recovery of decimated *Acropora* populations. In the Florida Keys, predation by *C. abbreviata*
67 was the most prevalent factor causing tissue loss among remnant populations of *A. palmata*,
68 accounting for approximately 29% of all tissue mortality (Williams & Miller, 2012), and is

69 recognized as one of the top three proximal threats to the recovery of wild (Bruckner, 2002) and
70 restored *Acropora* populations (Johnson et al., 2011) throughout the Caribbean. Currently,
71 management actions are underway throughout the Caribbean to enhance *Acropora* population
72 recovery via conservation and restocking strategies. Understanding the interactions of factors
73 contributing to the loss of Caribbean acroporids may allow for more effective conservation
74 strategies for these species. We took advantage of the experimental system offered by *in situ*
75 nursery propagation of *A. cervicornis* to conduct field choice assays testing the hypothesis that
76 susceptibility to colonization by the corallivore, *C. abbreviata*, would be enhanced for corals
77 with disease or mechanical damage relative to an apparently healthy coral.

78

79 **Materials and Methods**

80 This study was conducted at a coral field nursery operated by the Coral Restoration Foundation
81 (CRF) located off Tavernier, Florida (24° 59'N, 80° 26'W) from June to September 2013 (under
82 permit # FKNMS-2013-065). The nursery is located on sand bottom surrounded by seagrass at a
83 depth of 10 m and provided *Acropora cervicornis* fragments for use in choice experiments.
84 *Coralliophila abbreviata* were collected from Pickles Reef (24° 59'N, 80° 24'W), transported
85 2.2 km to the nursery and kept in holding cages until use in choice experiments. Snails were held
86 separately based on the host species from which they were collected: *A. cervicornis* ($n = 38$) or
87 *A. palmata* ($n = 55$). Snails were starved for at least one week prior to use in choice trials.

88

89 Treatment chambers were made by modifying plastic compartment boxes. Each chamber
90 contained two choice arenas with a removable lid, which was secured with cable ties during trial
91 periods (Fig. 1A). A single choice arena consisted of a Y-maze with the subject snail staged at

92 one end facing two treatment lanes and a treatment coral loosely secured at the end of each lane.
93 Rectangular cutouts covered with window-screen mesh were at each end of the treatment
94 chamber to facilitate flow. Chambers were oriented relative to predominant currents to allow
95 water flow from the treatment coral toward the snail staging area. To minimize water exchange
96 between treatment lanes and arenas, Velcro felt was glued to the top of the walls of each
97 treatment lane allowing the lid to lay flush with no gaps. Each of ten experimental chambers was
98 secured to a cinder block and set on sand bottom approximately 1 m apart (Fig. 1B).

99

100 Two types of prey choice experiments were conducted (Fig. 1C-D): healthy coral versus diseased
101 coral (H v D, $n = 52$) and healthy coral versus coral with mechanical damage (H v M, $n = 58$).
102 Prior to the start of the experiment, healthy fragments were snipped from apparently healthy
103 nursery colonies and the cut surfaces were allowed to heal for at least two weeks in order to yield
104 completely undisturbed, healthy tissue. Disease progression is intermittent in *A. cervicornis*
105 requiring actively diseased samples to be identified immediately at the start of a trial. Thus,
106 diseased branch tips were collected from cultured coral with active tissue loss and snipped
107 immediately prior to trials within an area of already-dead skeleton (i.e. no tissue disturbance),
108 approximately 2 cm from the tissue margin. Fragments with mechanical damage were prepared
109 by snipping branch tips from healthy coral, and, immediately prior to the start of a trial, a 3–5 cm
110 long abrasion was created with a clean, dead *A. cervicornis* branch. This treatment was included
111 to mimic the type of damage inflicted from abrasion during storms or hurricanes. At the end of
112 any trial, if a snail was actively feeding on a healthy coral, the coral and feeding snail were
113 immediately transferred to serve as a choice in a subsequent H v P trial (Fig. 1E).

114

115 *Coralliophila abbreviata* are known to be gregarious (Bruckner, Bruckner & Williams, 1997); so
116 there is an aspect of prey choice that may be purely social. Thus, we also tested snail preference
117 between a healthy coral fragment versus a solitary conspecific with no coral (H v S, $n = 45$). In
118 these trials, a treatment snail was tethered via a small length of twine glued to its shell at the
119 treatment end of one of the Y-maze lanes with a healthy coral at the end of the other lane.

120

121 The position of the healthy coral and treatment coral/snail was alternated between the two lanes
122 in subsequent trials. Following each trial, the chamber was flushed of all sand and debris, and the
123 walls and floors were rigorously wiped down with a brush or a diver's gloved-hand to reduce
124 carryover of mucous or other potential cues. Trials were pooled among those conducted during
125 daytime (8:00 am to approximately 4:00 pm; ~8 h duration) and nighttime (sunset to a few hours
126 after sunrise; ~16 h duration).

127

128 During each trial, subject snails were left alone to choose a treatment lane. If the subject snail did
129 not travel more than 5 cm down a treatment lane or remained in the staging area, the trial was
130 determined as 'no choice' and excluded from analyses (n represents only the trials where a
131 choice was made; Table 1). The proportion of trials in which a choice was made (i.e., response
132 rate) ranged from 41 to 72% across the three treatments (D, M and S), which is well within the
133 range of response rates reported in other published Y-maze choice studies using gastropod
134 subjects (range: 27 to 100%; Nakashima, 1995; Avila, 1998; Rilov, Gasith & Benayahu, 2002).

135

136 For each treatment except H v S, trials among the two host-source subject snails are pooled for
137 analysis as no difference was found between snails sourced from *A. palmata* and *A. cervicornis*.

138 Differences in frequencies of choices made between healthy and treatment corals/snail were
139 assessed using a Pearson's chi-squared test.

140

141 **Results and Discussion**

142 Coral condition significantly affected prey preference of *Coralliophila abbreviata* snails sourced
143 from *Acropora* spp. host colonies. In 70.8% of the trials, snails preferred corals with either
144 disease ($df = 51, p < 0.001$, Fig. 2A) or mechanical damage ($df = 57, p = 0.01$, Fig. 2A) over
145 apparently healthy corals. Other studies have shown similar results for the Pacific corallivorous
146 snail, *Drupella rugosa*, where snails were attracted to corals stressed by either mechanical
147 damage, low salinity or low water temperature suggesting that corals stressed by additional
148 factors beyond the scope of the present study may manifest a similar enhanced susceptibility to
149 corallivores (Morton, Blackmore & Kwok, 2002; Tsang & Ang, 2015).

150

151 It is well known that chemoreception is important in foraging behavior of marine benthic
152 organisms (Kohn, 1961; Hay, 2009). Although the specific mode of attractant to prey has not
153 been studied for *C. abbreviata*, it seems likely that variable chemical cues may underlie their
154 preferences. Abraded coral tissue releases mucous and interstitial content that contains primary
155 metabolites such as proteins and amino acids which may attract consumers (Hay, 2009). The
156 release of mucous and/or secretions by damaged cells were the suggested cause of attractants for
157 increases of the corallivorous snail, *D. rugosa*, to stressed corals in Hong Kong (Morton,
158 Blackmore & Kwok, 2002). Similarly, Kita et al. (2005) showed an increase in 'feeding-
159 attractant activity' by the corallivorous snail, *Drupella cornus*, when offered montiporic acids
160 isolated from the prey coral, *Montipora* sp., which are suggested to be expelled with coral

161 mucous. As this study only examined behavioral responses based on short distance cues, further
162 studies should determine a range of distances that snails are able to detect such cues to better
163 infer snail foraging patterns on a reef scale.

164

165 A similar mechanism may apply to diseased coral tissue as it may result in tissue deterioration
166 and the production of excess mucous. However, although mechanically damaged corals used in
167 this study appeared to produce more mucous and expel more interstitial content than diseased
168 corals, snails had a slightly stronger attraction to diseased coral (75% of choices made) than
169 mechanically damaged coral (65.5% of choices made) suggesting there may be something more
170 complex attracting the snails than simple quantity of these exudates. Additionally, as this study
171 did not induce disease for H v D treatment corals, it is possible that an undescribed physiological
172 difference in corals making them more susceptible to disease may also make them more
173 attractive to snails rather than the diseased condition *per se*.

174

175 Though there was only opportunity to conduct limited trials of the H v P treatment ($n = 3$), 100%
176 elicited a choice and 100% chose the fragment under active predation (P) suggesting a strong
177 bias toward prey fragments with active conspecific feeding. To ensure that the subject snail was
178 not attracted to the mere presence of a conspecific, H v S trials were conducted and showed no
179 significant preference for the conspecific relative to a healthy coral (Fig. 2B). However, the
180 following of conspecific mucous trails has been reported for the marine mud snail, *Ilyanassa*
181 *obsoleta* (Trott & Dimock, 1978) and has been suggested to account for aggregation behavior in
182 the corallivorous snail, *Cyphoma gibbosum* (Gerhart, 1986). Yet, considering that traces of
183 previous mucous trails were removed (see methods), this attraction may be the result of damaged

184 coral tissue releasing interstitial attractants (described above) or feeding mucous produced by the
185 feeding snail.

186

187 Coral disease and physical damage occur regularly on coral reefs, and, as changing climate is
188 predicted to bring increases in intensity and/or frequency of strong storms (McWilliams et al.,
189 2005; Knutson et al., 2010), as well as disease (Harvell et al., 2002), it is crucial to understand
190 how corals may be directly and indirectly affected by these disturbances. This study highlights
191 the enhanced vulnerability of remnant coral populations following acute disturbance events such
192 as storms or disease outbreaks due to corallivore behavioral preferences. The indirect effect of
193 attracting snail predators to these impacted corals implies ongoing tissue loss from predation
194 inhibiting potential recovery. Furthermore, there is likely a complex feedback between disease
195 risk and snail predation as *C. abbreviata* has been shown to vector disease among *A. cervicornis*
196 colonies (Williams & Miller 2005). Although corallivory by invertebrates is relatively well-
197 documented, corallivore behavior and its potential influence on recovery of threatened or
198 endangered coral populations has received little attention. Understanding such behavioral
199 complexities can aid in epidemiological and predictive modelling of disease dynamics and
200 transmission in *Acropora* spp. populations as well as improved species recovery strategies such
201 as targeting snail removal efforts (Williams et al., 2014) following specific types of disturbance.

202

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211 **References**

212

213 Avila C. 1998. Chemotaxis in the nudibranch *Hermisenda crassicornis*: does ingestive
214 condition influence its behaviour in a Y-maze? *Journal of Molluscan Studies* 64:215-222.
215 DOI 10.1093/mollus/64.2.215.

216 Bak RPM, Steward-Van Es Y. 1980. Regeneration of superficial damage in the scleractinian
217 corals *Agaricia agaricites* F. *Purpurea* and *Porites astreoides*. *Bulletin of Marine Science*
218 30:883-887.

219 Bak R, Criens S. 1981. Survival after fragmentation of colonies of *Madracis mirabilis*, *Acropora*
220 *palmata* and *A. cervicornis* (scleractinia) and the subsequent impact of a coral disease.
221 *Proceedings of the 4th International Coral Reef Symposium* 2:221-228.

222 Bak R. 1983. Neoplasia, regeneration and growth in the reef-building coral *Acropora palmata*.
223 *Marine Biology* 77:221-221.

224 Bruckner AW. 2002. Proceedings of the Caribbean *Acropora* Workshop: potential application of
225 the U.S. Endangered Species Act as a conservation strategy. NOAA Technical
226 Memorandum NMFS-OPR-24, Silver Spring, MD, p 199.

227 Bruckner RJ, Bruckner AW, Williams EHJ. 1997. Life history strategies of *Coralliophila*
228 *abbreviata* Lamarck (Gastropoda: Coralliophilidae) on the southeast coast of Puerto
229 Rico. *Proceedings of the 8th International Coral Reef Symposium* 1:627-632.

230 Cole AJ, Pratchett MS, Jones GP. 2008. Diversity and functional importance of coral-feeding
231 fishes on tropical coral reefs. *Fish and Fisheries* 9:286-307. DOI 10.1111/j.1467-
232 2979.2008.00290.x.

233 Gerhart DJ. 1986. Gregariousness in the gorgonian-eating gastropod *Cyphoma gibbosum*: tests of
234 several possible causes. *Marine Ecology Progress Series* 31:255-263.

235 Gignoux-Wolfsohn S, Marks CJ, Vollmer SV. 2012. White Band Disease transmission in the
236 threatened coral, *Acropora cervicornis*. *Scientific Reports* 2:804. DOI
237 10.1038/srep00804.

238 Harvell CD, Mitchell CE, Ward JR, Altizer A, Dobson AP, Ostfeld RS, Samuel MD. 2002.
239 Climate warming and disease risks for terrestrial and marine biota. *Science* 296:2158-
240 2162. DOI 10.1126/science.1063699.

241 Hay ME. 2009. Marine chemical ecology: Chemical signals and cues structure marine
242 populations, communities, and ecosystems. *Annual Review of Marine Science* 1:193-212.
243 DOI 10.1146/annurev.marine.010908.163708.

244 Jayewardene D, Donahue MJ, Birkeland C. 2009. Effects of frequent fish predation on corals in
245 Hawai'i. *Coral Reefs* 28:499-506. DOI 10.1007/s00338-009-0475-y.

246 Johnson ME, Lustic C, Bartels E, Baums IB, Gilliam DS, Larson L, Lirman D, Miller MW,
247 Nedimyer K, Schopmeyer S. 2011. Caribbean *Acropora* restoration guide: best practices
248 for propagation and population enhancement. The Nature Conservancy. Arlington, VA

249 Johnston L, Miller MW. 2014. Negative indirect effects of neighbors on imperiled scleractinian
250 corals. *Coral Reefs* 33:1047-1056. DOI 10.1007/s00338-014-1176-8.

251 Kita M, Kitamura M, Koyama T, Teruya T, Matsumoto H, Nakano Y, Uemura D. 2005. Feeding
252 attractants for the muricid gastropod *Drupella cornus*, a coral predator. *Tetrahedron*
253 *Letters* 46:8583-8585. DOI 10.1016/j.tetlet.2005.09.182.

254 Knowlton N, Lang JC, Keller B. 1990. Case study of natural population collapse: post-hurricane
255 predation on Jamaican staghorn corals. *Smithsonian Contributions to the Marine Sciences*
256 31:1-25.

- 257 Knutson TR, McBride JL, Chan J, Emanuel K, Holland G, Landsea C, Held I, Kossin JP,
258 Srivastava A, Sugi M. 2010. Tropical cyclones and climate change. *Nature Geoscience*
259 3:157-163. DOI 10.1038/ngeo779.
- 260 Kohn AJ. 1961. Chemoreception in gastropod molluscs. *American Zoologist* 1:291-308.
261 Available at <http://www.jstor.org/stable/3881260>.
- 262 McWilliams JP, Cote IM, Gill JA, Sutherland WJ, Watkinson AR. 2005. Accelerating impacts of
263 temperature-induced coral bleaching in the Caribbean. *Ecology* 86:2055-2060. Available
264 at <http://dx.doi.org/10.1890/04-1657>.
- 265 Meesters EH, Noordeloos M, Bak RPM. 1994. Damage and regeneration: links to growth in the
266 reef-building coral *Montastrea annularis*. *Marine Ecology Progress Series* 112:119-128.
- 267 Menge BA, Sutherland JP. 1976. Species diversity gradients: synthesis of the roles of predation,
268 competition, and temporal heterogeneity. *The American Naturalist* 110:351-369.
269 Available at <http://www.jstor.org/stable/2459759>.
- 270 Morton B, Blackmore G, Kwok CT. 2002. Corallivory and prey choice by *Drupella rugosa*
271 (Gastropoda: Muricidae) in Hong Kong. *Journal of Molluscan Studies* 68:217-223.
272 DOI 10.1093/mollus/68.3.217.
- 273 Nakashima Y. 1995. Mucous trail following in 2 intertidal nudibranchs. *Journal of Ethology*
274 13:125-128. DOI 10.1007/BF02352571.
- 275 Rilov G, Gasith A, Benayahu Y. 2002. Effect of an exotic prey on the feeding pattern of a
276 predatory snail. *Marine Environmental Research* 54:85-98. DOI 10.1016/S0141-
277 1136(02)00096-X.
- 278 Rinkevich B, Loya Y. 1979. The reproduction of the Red Sea coral *Stylophora pistillata*. I.
279 gonads and planulae. *Marine Ecology Progress Series* 1:133-144.
- 280 Rotjan RD, Lewis SM. 2008. Impact of coral predators on tropical reefs. *Marine Ecology*
281 *Progress Series* 367:73-91.
- 282 Sussman M, Loya Y, Fine M, Rosenberg E. 2003. The marine fireworm *Hermodice carunculata*
283 is a winter reservoir and spring-summer vector for the coral-bleaching pathogen *Vibrio*
284 *shiloi*. *Environmental Microbiology* 5:250-255. DOI 10.1046/j.1462-2920.2003.00424.x.
- 285 Trott TJ, Dimock RV. 1978. Intraspecific trail following by the mud snail *Ilyanassa obsoleta*.
286 *Marine Behaviour and Physiology* 5:91-101. DOI 10.1080/10236247809378526.
- 287 Tsang RHL, Ang P Jr. 2015. Cold temperature stress and predation effects on corals: their
288 possible roles in structuring a nonreefal coral community. *Coral Reefs* 34:97-108. DOI
289 10.1007/s00338-014-1210-x.
- 290 Van Veghel MLJ, Bak RPM. 1994. Reproductive characteristics of the polymorphic Caribbean
291 reef building coral *Montastrea annularis*. III. Reproduction in damaged and regenerating
292 colonies. *Marine Ecology Progress Series* 109:229-233.
- 293 Williams DE, Miller MW. 2005. Coral disease outbreak: pattern, prevalence and transmission in
294 *Acropora cervicornis*. *Marine Ecology Progress Series* 301:119-128.
- 295 Williams DE, Miller MW. 2012. Attributing mortality among drivers of population decline in
296 *Acropora palmata* in the Florida Keys (USA). *Coral Reefs* 31:369-382. DOI
297 10.1007/s00338-011-0847-y.
- 298 Williams DE, Miller MW, Bright AJ, Cameron CM. 2014. Removal of corallivorous snails as a
299 proactive tool for the conservation of acroporid corals. *PeerJ* 2:e680. DOI
300 10.7717/peerj.680.

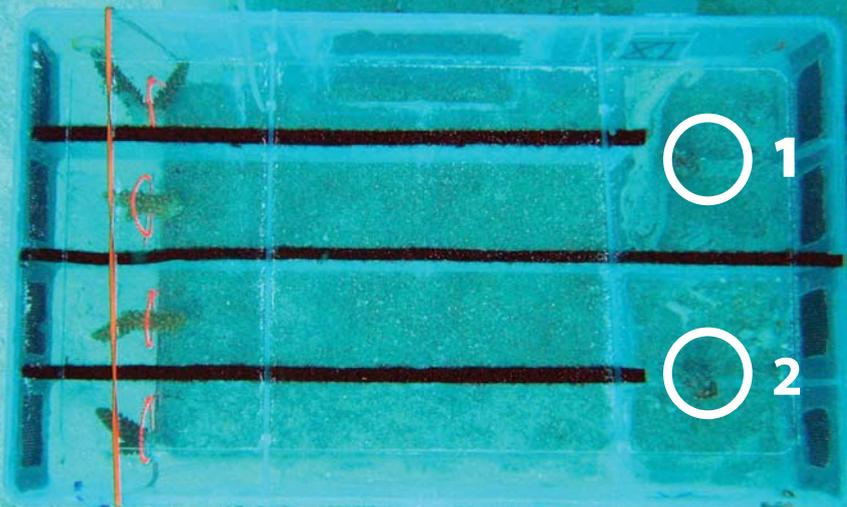
301 Wolf AT, Nugues MM. 2013. Synergistic effects of algal overgrowth and corallivory on
302 Caribbean reef-building corals. *Ecology* 94:1667-1674. Available at
303 <http://dx.doi.org/10.1890/12-0680.1>.

Figure 1(on next page)

Photo examples of experimental Y-maze chamber design and treatment coral fragments.

(A) Experimental chamber design. Each chamber has two separate choice arenas, depicted as '1' and '2.' White circles depict the initial staging area for the subject snail. The treatment corals are attached at the far end of each treatment lane. (B) Cages were aligned in the same direction facing into the current. (C) Photo example of a treatment coral fragment with disease, (D) a fragment with mechanical damage and (E) a fragment with active snail predation.

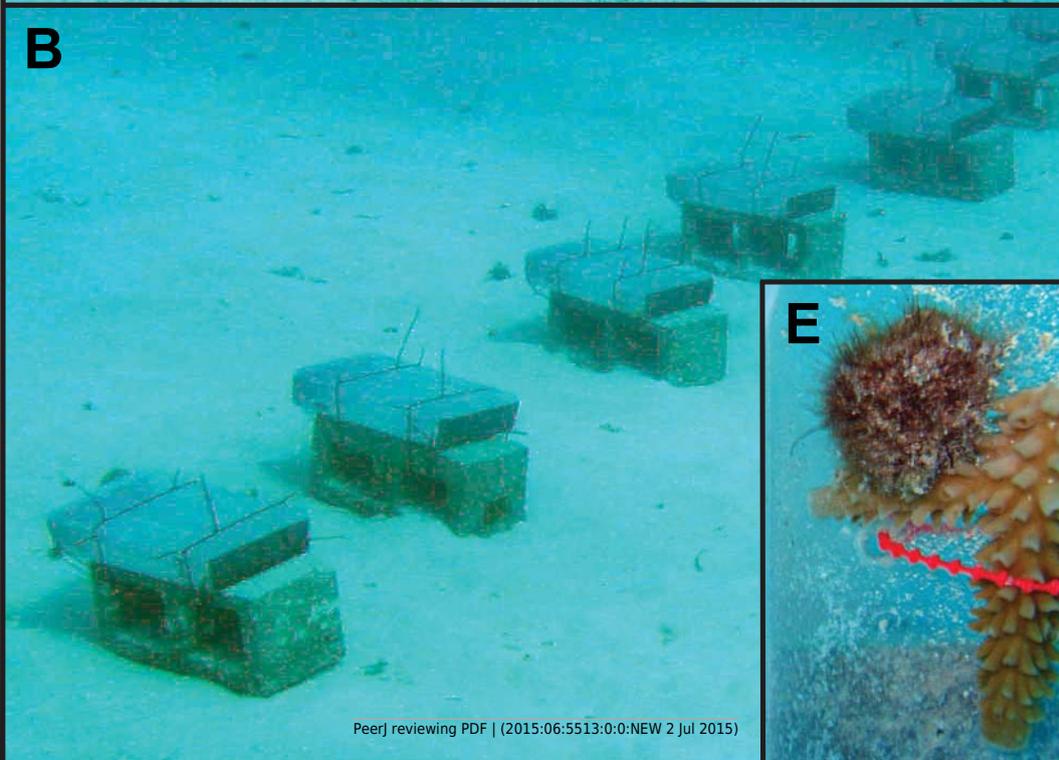
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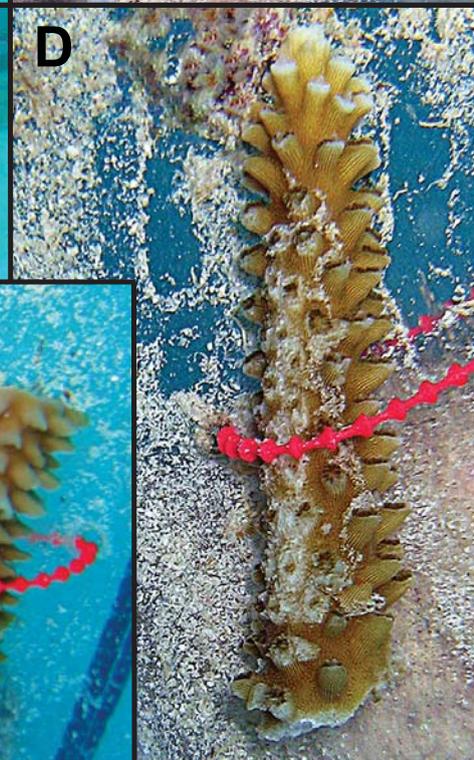
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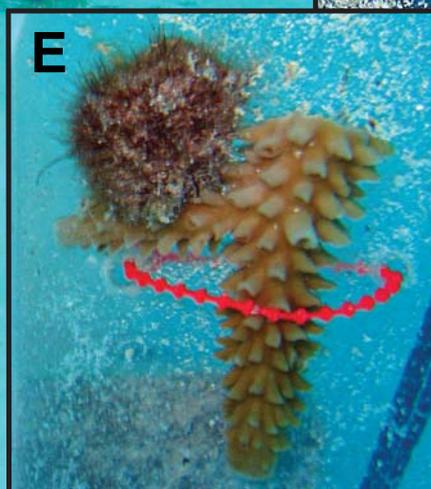
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D



E



2

Results of Y-maze trials.

Percent of successful choice assay trials comparing snail preference of (A) healthy (H; white bars) *A. cervicornis* fragments vs. fragments with compromised condition (black bars; diseased [D] or mechanically damaged [M]) and (B) H vs. a conspecific snail (S; grey bars) presented separately for subject snails sourced from *A. cervicornis* and *A. palmata* hosts. Asterisks indicate significant results (Pearson Chi-squared tests, $p < 0.05$). (The total number of successful trials is given at the base of each bar)

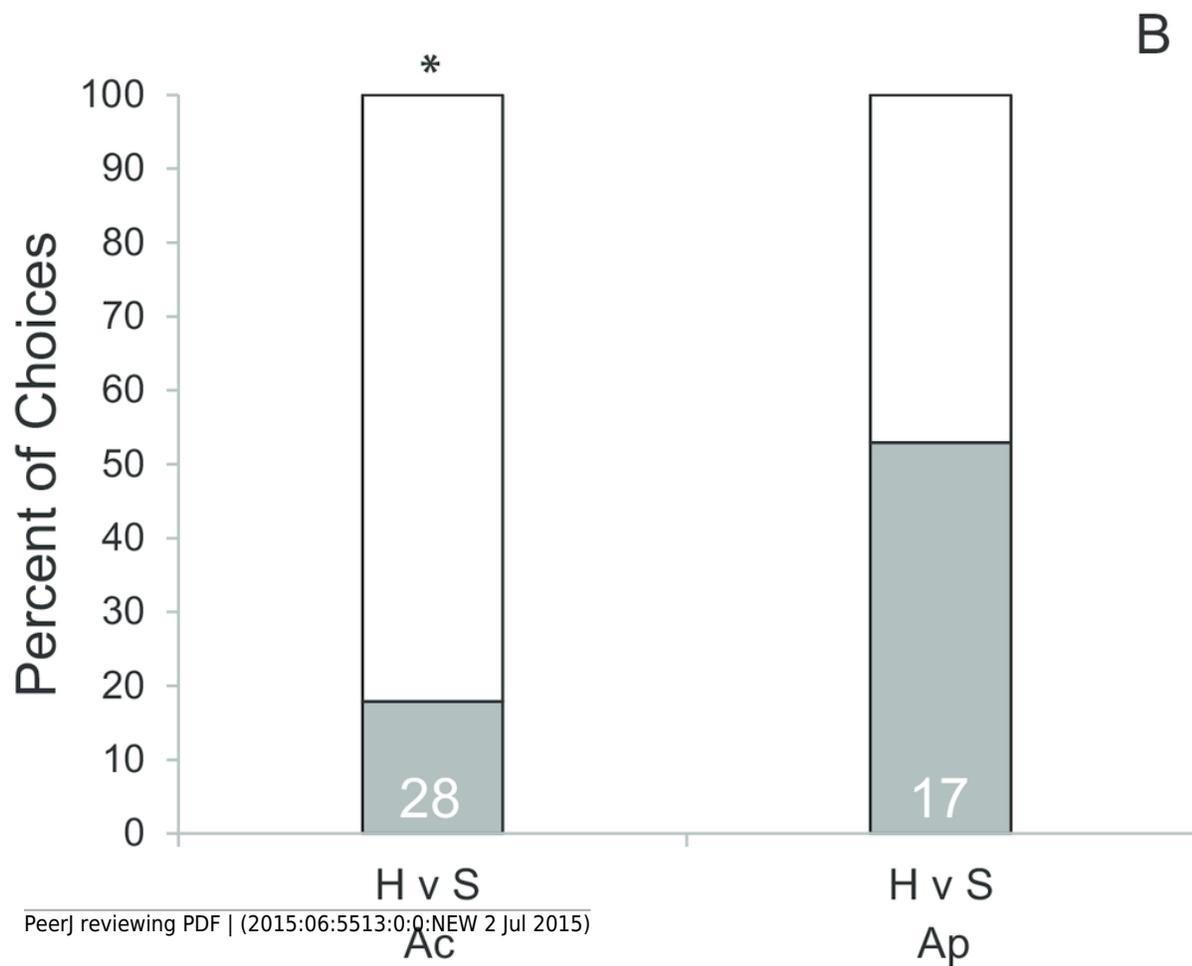
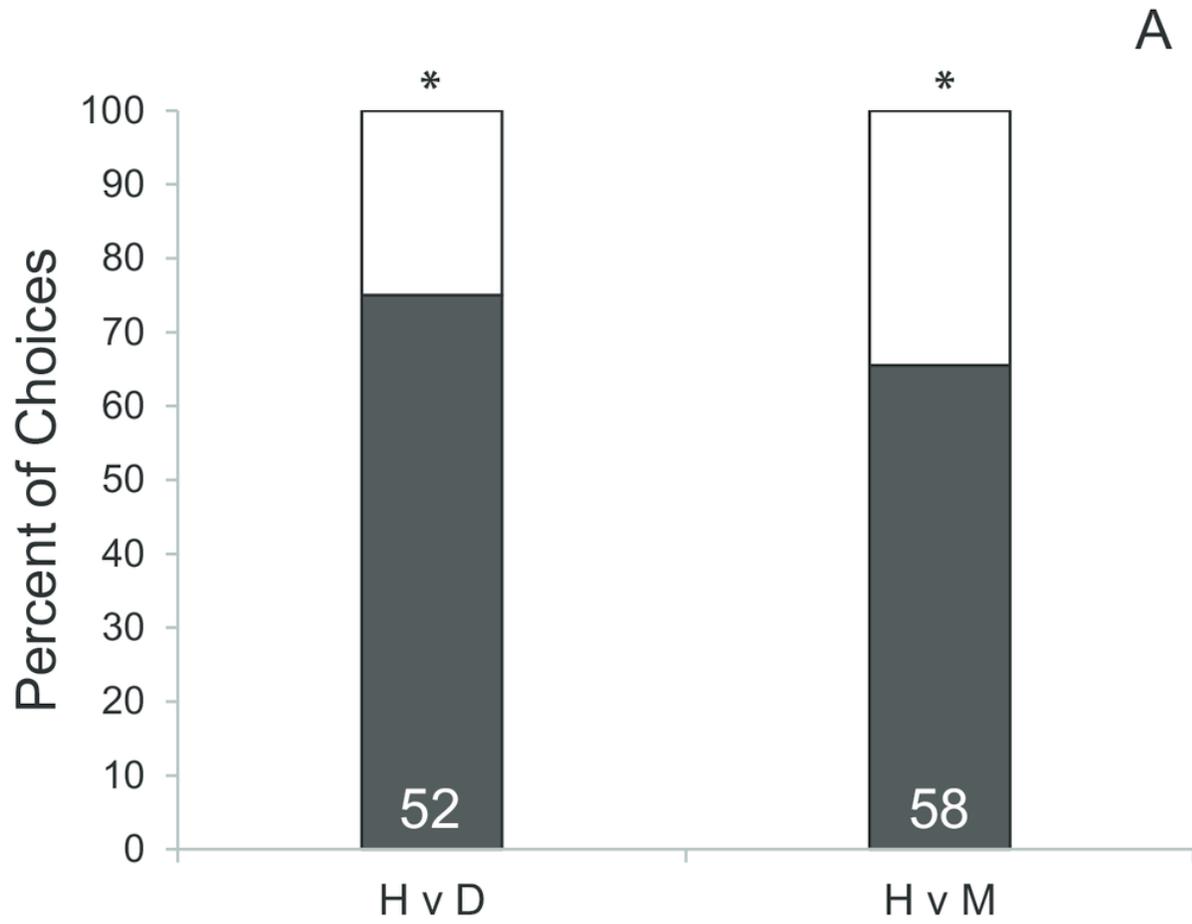


Table 1 (on next page)

Summary of Y-maze trial treatments.

Paired choice experiments testing prey preferences by *Coralliophila abbreviata*. *N* gives the number of successful trials (for the treatment paired with H) with subject snails from each of two host corals, *Acropora cervicornis* (Ac) or *A. palmata* (Ap). The '# of no choice trials' represents additional trials conducted wherein the subject snail did not make a choice.

1

	Treatment	Origin	N			# of No Choice Trials
			Ac	Ap	Sum	
	Healthy Coral (H)	5 cm branch tip snipped from nearby stock colony and allowed to heal for 2 weeks	-	-	-	-
VERSUS	Diseased Coral (D)	4-9 cm branch tip with active disease snipped from nearby stock colony immediately prior to deployment in trial. Breaks were made on dead skeleton approximately 2 cm below active disease margin	29	23	52	32
	Mechanically Damaged Coral (M)	Healthy branch tip with 3-5 cm section actively abraded with a dead <i>A. cervicornis</i> branch immediately prior to deployment in a trial	32	26	58	23
	Solitary Snail (S)	Snail tethered at end of one treatment lane with no coral	28	17	45	65
	Coral with Active Snail Predation (P)	Snail feeding on a healthy fragment from an immediately prior trial	2	1	3	0

2