Fish stable-isotope community structure of a Bahamian coral reef

Zhu, Y.[1*], Newman, S. P.[1, 2], Reid, W. D. K.[1] and Polunin, N. V. C.[1]

[1] School of Natural and Environmental Sciences, Newcastle University, Newcastle upon Tyne, UK, NE1 7RU

[2] Banyan Tree Marine Lab, Vabbinfaru, North Malé Atoll, Republic of the Maldives

Electronic Supplementary Material

Appendices

Appendix A. Table of length to weight conversion factors *a* and *b*. Updated in September 2016 from fishbase.org (Froese and Pauly, 2017).

Scientific name	*a*	*b*
Abudefduf saxatilis	0.01905	3.00
Acanthemblemaria maria	0.00457	3.08
Acanthurus chirurgus	0.02042	2.96
Acanthurus coerules	0.02512	2.96
Acanthurus tractus	0.01862	2.91
Atherinidae spp	0.00537	3.11
Aulostomus maculatus	0.00396	2.87
Bodianus rufus	0.01440	3.05
Calamus calamus	0.02455	2.93
Calamus penna	0.03020	2.86
Canthigaster rostrata	0.02239	2.96
Caranx latus	0.02188	2.95
Caranx lugubris	0.01820	2.94
Caranx ruber	0.01698	2.94
Cephalopholis cruentata	0.01122	3.07
Cephalopholis fulva	0.01000	3.02
Chaetodon capistratus	0.02512	3.09
Chaetodon ocellatus	0.02570	3.02
Chaetodon sedentatius	0.02291	3.03
Chromis cyanea	0.01479	2.99
Chromis multilineata	0.01479	2.99
Clepticus parrae	0.00955	3.05
Coryphopterus personatus/hyalinus	0.00740	3.10
Coryphopterus spp	0.00683	3.10
Echeneis naucrates	0.00275	3.15
Elacatinus evelynae	0.00589	3.13
Epinephelus adscensionis	0.01349	3.09
Epinephelus guttatus	0.01148	3.04
Epinephelus striatus	0.01148	3.04
Ginglymostoma cirratum	0.00417	3.08
Gnatholepis cauerensis	0.00933	3.20
Gramma loreto	0.01122	3.04
Gramma melacara	0.00389	3.12
Gymnothorax miliaris	0.00182	3.07
Haemulon album	0.01259	2.99
Haemulon flavolineatum	0.01318	3.00
Haemulon plumierii	0.01479	2.98
Haemulon sciurus	0.01549	2.98
Halichoeres bivittatus	0.00933	3.06
Halichoeres garnoti	0.01000	3.13
Halichoeres maculipinna	0.01047	3.20
Halichoeres poeyi	0.01000	3.08
Halichoeres radiatus	0.01310	3.04

Hamlet Juvenile	0.01778	3.03
Holacanthus ciliaris	0.03090	2.89
Holacanthus tricolor	0.03388	2.91
Holocentrus rufus	0.01122	2.90
Hypoplectrus puella	0.00900	3.04
Kyphosus sectatrix/biggibus	0.01413	3.00
Lucayablennius zingaro	0.00457	3.08
Lutjanus apodus	0.01413	2.98
Lutjanus griseus	0.01445	2.98
Malacoctenus boehlkei	0.00933	3.03
Malacoctenus triangulatus	0.00891	3.00
Monacanthus tuckeri	0.02754	3.07
Mulloidichthys martinicus	0.00977	3.14
Mycteroperca bonaci	0.01000	3.05
Mycteroperca tigris	0.01122	3.06
Ocyurus chrysurus	0.01479	2.95
Opistognathus aurifrons	0.00389	3.12
Pomacanthus arcuatus	0.03236	2.92
Pseudupeneus maculatus	0.01000	3.12
Pterois volitans	0.01122	3.09
Scarus iserti	0.01096	3.01
Scarus taeniopterus	0.01350	3.00
Scarus vetula	0.01413	3.03
Scorpaena plumieri	0.01514	2.99
Serranus tabacarius	0.01072	3.06
Serranus tigrinus	0.01000	3.05
Sparisoma atomarium	0.01210	3.03
Sparisoma aurofrenatum	0.01047	3.13
Sparisoma chrysopterum	0.01047	3.10
Sparisoma rubripinne	0.00891	3.04
Sparisoma viride	0.01349	3.05
Sphyraena barracuda	0.00851	2.92
Stegastes adustus	0.01995	2.99
Stegastes diencaeus	0.01995	2.99
Stegastes leucostictus	0.01995	2.95
Stegastes partitus	0.01479	3.02
Stegastes planifrons	0.02138	2.96
Stegastes variabilis	0.01820	2.97
Thalassoma bifasciatum	0.00912	3.01

Appendix B Methods to retrieve stable isotope values of uncollected species from the species list.

Using data from similar species

Scarus taeniopterus and *S. iserti* were observed swimming and foraging in mixed groups as juveniles in all surveyed sites. They have similar length to weight conversion factors *a* and *b* (Nagelkerken and Van Der Velde, 2004; Froese *et al.*, 2014): 0.01350 and 3.00 (*S. taeniopterus*), 0.01096 and 3.01 (*S. iserti*). The $\delta^{15}N_{S.\ taeniopterus}$ was reported to be 4.3 ± 0.1‰ (Dromard *et al.*, 2015) with the baseline $\delta^{15}N_{turf\ algae}$ = 1.7‰ between September and November 2010 in Guadeloupe. Taking natural seasonal variations of isotopic signatures of algae into consideration, $\delta^{15}N$ of *S. taeniopterus* was represented by that of local *S. iserti*. Scarinae spp in the Bahamas were all recorded with the same trophic position (2.0) in fishbase.org. Thus the $\delta^{15}N$ of all other missing Scarinae spp were represented by the combined $\delta^{15}N$ of collected Scarinae spp.

Chromis multilineata and *C. cyanea* were also observed feeding plankton in mixed groups, and their length to weight ratio coefficient *a* and *b* are the same. Although Aguilar *et al.* (2008) suggested a much higher $\delta^{15}N_{C.\ multilineata}$ = 7.2‰ with a high combined baseline of $\delta^{15}N$ = 5.5‰, the high input of anthropogenic pollution in northern coast of Cuba, west of Havana City did not resemble the situation in Cape Eleuthera, thus the $\delta^{15}N$ of *C. multilineata* was represented by that of local *C. cyanea*.

Cephalopholis fulva which only appeared in the most degraded site (Ike's Reef) had similar trophic position and length to weight ratio conversation factors to *Cephalopholis cruentata* and *Epinephelus striatus*. However, Keegan and DeNiro (1988) recorded $\delta^{15}N_{C.\ fulva}$ = 2.0‰ at Nassau with same baseline which did not match the reported trophic position (4.1). Thus, the $\delta^{15}N$ of *C. fulva* was replaced by the combined $\delta^{15}N$ of *C. cruentata* and *E. striatus*. *Epinephelus adscensionis* and *Epinephelus guttatus* had similar trophic positions and length to weight conversion factors, thus their $\delta^{15}N$ were treated equivalent. Both *Mycteroperca bonaci* and *Mycteroperaca tigris* have high trophic positions and biomass contribution, but could not be sampled. Their $\delta^{15}N$ values were replaced by combined $\delta^{15}N$ of other groupers.

Holacanthus tricolor was spotted traveling and foraging solely which was different from *P. arcuatus* and *Holacanthus ciliaris*. However, these three species share similar trophic positions, length to weight conversion factors and potentially similar food items (e.g. sponges), thus the $\delta^{15}N$ of *H. tricolor* was replaced by combined $\delta^{15}N$ of *P. arcuatus* and *H. ciliaris*.

Using published data

Abudefduf saxatilis was not sampled due to no available gears, and it does not share similar trophic position, length to weight conversion factors and foraging strategies with other pomacentrids in the surveyed area. We used a constant baseline-adjusted value ($\delta^{15}N$ = 3.6‰) from the Gulf of Mexico (Rooker *et al.*, 2006).

Same method was applied to *Bodianus rufus*, *Canthigaster rostrata*, *Chaetodon capistratus*, *Kyphosus sectatrix*, *Mulloidichthys martinicus*, *Stegastes planifrons* and *Stegastes variabilis*.

Species with no available data

$\delta^{15}N$ of the rest of species were not obtained due to 1) sole species in its family was surveyed thus no alternative species to refer to, 2) morphologically and trophically different from other species surveyed in its genus/family, 3) no research on its stable isotope values, 4) existing data was not applicable for this location, and 5) contributed little biomass to its 5 cm L class.

Appendix C. Statistical terms of linear regression analysis on the relationship between $\delta^{15}N$ and $\log_2$ body mass (M) of collected fish species or family at Cape Eleuthera (the Bahamas): slope and intercept values of linear regression, minimum and maximum of collected body mass ($\log_2$ transformed), p and r^2 values. For codes see Table 1.

Code	Slope	Intercept	$\log_2 M_{min}$	$\log_2 M_{max}$	p	$r^2_{adjusted}$
CARU	0.097	7.045	8.146	9.681	0.58	0.12
THBI	0.140	5.179	-0.245	2.765	0.28	0.17
CHCY	0.170	4.868	1.195	3.253	0.28	0.23
ACCO	0.249	3.441	3.618	6.733	0.87	0.07
CLPA	0.551	3.928	1.915	3.959	0.00	0.88
GRLO	0.150	4.852	-3.020	-0.983	0.45	0.30
HAFL	0.345	5.287	3.544	7.381	0.00	0.90
POAR	-0.561	11.010	7.876	8.776	0.34	0.19
SPBA	0.647	1.806	11.854	12.925	0.62	0.15
CECR	0.373	5.944	3.852	8.512	0.00	0.82
STDI	-0.229	6.966	1.860	3.584	0.82	0.01
LUSY	0.995	-0.408	7.116	8.941	0.16	0.54
HORU	0.251	5.653	4.411	7.388	0.10	0.54
COPE	0.121	4.562	-5.573	-3.760	0.35	0.73
HAAL	0.241	5.251	8.652	9.801	0.66	0.08
EPST	0.549	3.415	9.284	9.979	0.33	0.23
ACTR	0.284	3.209	3.188	8.242	0.02	0.54
CAPE	-3.598	37.205	7.940	8.264	0.04	0.92
Pomacentridae	0.126	5.642	-1.581	3.584	0.09	0.36
HOCI	-0.502	10.062	7.369	9.498	0.10	0.65
BAVE	0.096	6.861	8.253	9.412	0.76	0.06
SPAU	0.105	3.148	2.012	10.080	0.06	0.63
HAPI	-0.165	4.103	-4.555	-1.762	0.07	0.87
EPGU	0.426	4.341	6.950	8.969	0.08	0.69
PTVO	0.081	7.438	5.741	9.967	0.11	0.26
Scarinae	0.032	3.929	1.412	10.635	0.33	0.06
LUAP	0.087	7.940	6.777	7.624	0.90	0.03
SCIS	0.051	4.007	1.412	4.627	0.61	0.03
HAPL	0.487	4.118	7.420	8.543	0.25	0.57
HAGA	0.224	5.487	-0.860	5.109	0.01	0.92
OCCH	0.707	2.157	7.787	9.380	0.76	0.01

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