

The following supplement accompanies the article

## Reef fish functional composition and metrics reveal spatial differences in three protected islands in the Eastern Pacific

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**Table S1** General descriptive characteristics of the three protected islands in the Eastern Pacific

Island	Protection status	Total area (km <sup>2</sup> )	Offshore (km <sup>2</sup> )	Live coral cover (%)	Anthropogenic pressure	
					Fishing	Tourism
Cleofas ( <b>CI</b> )	Biosphere Reserve	6.40	54.47	39	Illegal extraction	Restricted: Surveyed by Mexican navy
Isabel ( <b>Is</b> )	National Park	8.21	17.87	12	Regulated extraction	Occasional: Mostly SCUBA divers
Marietas ( <b>Ma</b> )	National Park	1.94	4	13	Illegal extraction	Constant: Local and Nacional tourism. Main attraction "Playa del Amor"

<sup>a</sup>Island characteristics were obtained from monitoring data and from the Conservation and Management Program by the Comisión Nacional de Áreas Naturales Protegidas (CONANP)

**Table S2** Description of functional traits of reef fish used to build a functional entities matrix. Fish traits for fish present the three islands of the central Mexican Pacific

Trait	Functions <sup>a</sup>	Classes	Description	Source of information <sup>b</sup>
<i>Length</i>	Defense against predation, nutrient budget	Six: 0.1-7cm, 7.1-15cm, 15.1-30cm, 30.1-50cm, 50.1-80cm, >80cm	Categorical ordered. Interval of fish length that comprises the most common lengths	1-own data; 2-web search; 3-field experience of scientific expert; and 4- scientific literature
<i>Schooling</i>	Defense against predation	Five: Solitary (SOL), in pairs (InP), small group (SMA), large group (LAR)	Categorical ordered. The mode from local data from reef fish, in combination with field observations of fish expert and literature	1-own data; 2-web search; 3-field experience of scientific expert; and 4- scientific literature
<i>Diet</i>	Food acquisition, nutrient budget	Six: Planktivorous, invertivores (In), herbivores (HER), piscivorous (PIS), omnivorous (OMN)	Categorical. Selected by the most common results from multiple information sources. Only adults' diet	2-web search; and 4- scientific literature
<i>Mobility</i>	Mobility, Defense against predation, nutrient budget	Three: Sedentary (SED), within reef (WIT), between reef (BET)	Categorical ordered. Selected according to fish characteristics and available information.	2-web search; 3-field experience of scientific expert; and 4- scientific literature
<i>Position</i>	Mobility	Three: Bottom (BOT), above bottom (AbB), pelagic (PEL)	Categorical ordered. Based on information results and expert advice	2-web search; 3-field experience of scientific expert; and 4- scientific literature
<i>Activity Period</i>	Defense against predation	Three: Diurnal (DIU), nocturnal (NOC), both (BOT)	Categorical ordered. the most common activity found in information results and expert advice	2-web search; 3-field experience of scientific expert; and 4- scientific literature

<sup>a</sup>Function representation according to descriptions in Villéger et al 2017.

<sup>b</sup>The source of information is a selection of the best suited description of the species from multiple sources of information: 1-own data: data from monitoring surveys in the islands since 2011; 2-web search: FishBase (Froese & Pauly 2018); Shorefishes of the Tropical Eastern Pacific (Robertson & Allen 2015); 3-field experience of scientific expert; and 4-scientific literature: Allen & Robertson 1997, Böhlke & Randall 2000, Castro 2000, Disalvo et al 2007, Durville et al 2003, Flores-Ortega et al 2014, Glynn 2011, Hobson 1965, Hobson 1973, Hobson et al 1965, Hobson et al 1981, Humman & Deloach, Liedke 2013, López-Peralta & Arcila 2002, Montgomery 1980, Moreno et al. 2009, Ontiveros-Granillo 2011, Palacios-Delgado et al 2014, Richardson et al 2018, Richardson et al 2018, Robertson & Allen 1996, Rodríguez-Uceda 2009, Sazima 1989, Tripp-Valdez et al 2015.

**Table S3** Functional entities (FEs) details: Unique combination of traits, number of species, species name and abundance species per island: Cleofas (Cl), Isabel (Is) and Marietas (Ma)

Leng	Functional traits <sup>a</sup>					FE/FR	Family	Species in FE	Abundance		
	Group	Diet	Mobi	Posi	Acti				Cl	Is	Ma
15-30	SMA	PIS	BET	AbB	NOC	<b>FE1/5</b>	Haemulidae	<i>Haemulon sexfasciatum</i> Gill 1862.	1	235	14
							Lutjanidae	<i>Lutjanus argentiventris</i> (Peters 1869)	3	0	4
							Lutjanidae	<i>Lutjanus guttatus</i> (Steindachner 1869)	72	20	0
							Lutjanidae	<i>Lutjanus inermis</i> (Peters 1869)	0	3	0
							Lutjanidae	<i>Lutjanus viridis</i> (Valenciennes 1846)	671	0	0
7-15	SOL	INV	WIT	AbB	DIU	<b>FE2/4</b>	Labridae	<i>Halichoeres notospilus</i> (Günther 1864)	5	22	30
							Labridae	<i>Novaculichthys taeniourus</i> (Lacepède 1801)	0	1	0
							Sciaenidae	<i>Pareques fuscovittatus</i> (Kendall & Radcliffe 1912)	1	0	0
							Labridae	<i>Thalassoma grammaticum</i> Gilbert 1890	4	18	0
15-30	SOL	INV	WIT	AbB	DIU	<b>FE3/4</b>	Tetraodontidae	<i>Arothron meleagris</i> (Anonymous 1798)	14	12	7
							Bodianidae	<i>Bodianus diplotaenia</i> (Gill 1862)	16	19	17
							Labridae	<i>Halichoeres nicholsi</i> (Jordan & Gilbert 1882)	9	15	69
							Balistidae	<i>Sufflamen verres</i> (Gilbert & Starks 1904)	36	253	18
15-30	SMA	INV	BET	AbB	NOC	<b>FE4/3</b>	Haemulidae	<i>Haemulon flaviguttatum</i> Gill 1862	44	31	0
							Haemulidae	<i>Haemulon scudderii</i> Gill 1862	46	1	1
							Haemulidae	<i>Haemulon steindachneri</i> (Jordan & Gilbert 1882)	10	0	9
15-30	SOL	OMN	WIT	AbB	DIU	<b>FE5/3</b>	Pomacanthidae	<i>Holacanthus passer</i> Valenciennes 1846	20	29	42
							Pomacanthidae	<i>Pomacanthus zonipectus</i> (Gill 1862)	0	0	1
							Zanclidae	<i>Zanclus cornutus</i> (Linnaeus 1758)	13	32	3
30-50	SOL	HER	WIT	AbB	DIU	<b>FE6/3</b>	Scaridae	<i>Scarus compressus</i> (Osburn & Nichols 1916)	1	0	0
							Scaridae	<i>Scarus perrico</i> Jordan & Gilbert 1882	2	20	3
							Scaridae	<i>Scarus rubroviolaceus</i> Bleeker 1847	88	22	5
0-7	SOL	INV	SED	BOT	DIU	<b>FE7/2</b>	Labrisomidae	<i>Malacoctenus ebisui</i> Springer 1959.	0	0	5
							Labrisomidae	<i>Malacoctenus hubbsi</i> Springer 1959	1	16	28
0-7	SOL	PIS	SED	BOT	DIU	<b>FE8/2</b>	Blenniidae	<i>Plagiotremus azaleus</i> (Jordan & Bollman 1890)	0	16	55
							Chaenopsidae	<i>Acanthemblemaria macrospilus</i> Brock 1940	2	9	23
7-15	SMA	HER	WIT	AbB	DIU	<b>FE9/2</b>	Acanthuridae	<i>Acanthurus nigricans</i> (Linnaeus 1758)	63	2	0

Leng	Group	Functional traits <sup>a</sup>				Acti	FE/FR	Family	Species in FE	Abundance		
		Diet	Mobi	Posi						Cl	Is	Ma
							Acanthuridae	<i>Acanthurus triostegus</i> (Linnaeus 1758)	69	46	80	
7-15	SMA	INV	WIT	AbB	DIU	<b>FE10/2</b>	Labridae	<i>Halichoeres chierchiae</i> Di Caporiacco 1948	133	139	139	
							Labridae	<i>Halichoeres dispilus</i> (Günther 1864)	262	163	149	
7-15	SOL	OMN	SED	AbB	DIU	<b>FE11/2</b>	Pomacanthidae	<i>Stegastes acapulcoensis</i> (Fowler 1944)	260	465	867	
							Pomacentridae	<i>Stegastes flavilatus</i> (Gill 1862)	78	793	0	
7-15	SOL	OMN	WIT	AbB	DIU	<b>FE12/2</b>	Chaetodontidae	<i>Johnrandallia nigrirostris</i> (Gill 1862)	10	30	64	
							Ostraciidae	<i>Ostracion meleagris</i> Shaw 1796	2	0	0	
15-30	SOL	HER	BET	AbB	DIU	<b>FE13/2</b>	Kyphosidae	<i>Kyphosus elegans</i> (Peters 1869)	27	6	59	
							Kyphosidae	<i>Kyphosus vaigiensis</i> (Quoy & Gaimard 1825)	5	11	1	
15-30	SOL	HER	WIT	AbB	DIU	<b>FE14/2</b>	Scaridae	<i>Nicholsina denticulata</i> (Evermann & Radcliffe 1917)	4	0	1	
							Scaridae	<i>Scarus ghobban</i> Forsskål 1775	11	63	0	
15-30	SOL	INV	SED	AbB	NOC	<b>FE15/2</b>	Priacanthidae	<i>Heteropriacanthus cruentatus</i> (Laacepède 1801)	2	0	6	
							Holocentridae	<i>Sargocentron suborbitale</i> (Gill 1863)	49	29	50	
15-30	SOL	INV	WIT	BOT	NOC	<b>FE16/2</b>	Diodontidae	<i>Diodon holocanthus</i> Linnaeus 1758	0	5	11	
							Diodontidae	<i>Diodon hystrix</i> Linnaeus 1758	0	7	0	
15-30	SOL	PIS	SED	BOT	DIU	<b>FE17/2</b>	Serranidae	<i>Cephalopholis panamensis</i> (Steindachner 1876)	44	14	45	
							Cirrhitidae	<i>Cirrhitus rivulatus</i> Valenciennes 1846	18	4	19	
30-50	SOL	PIS	BET	AbB	NOC	<b>FE18/2</b>	Lutjanidae	<i>Hoplopagrus guentherii</i> Gill 1862	128	16	30	
							Lutjanidae	<i>Lutjanus novemfasciatus</i> Gill 1862	0	4	0	
0-7	LAR	PLA	WIT	AbB	DIU	<b>FE19/1</b>	Pomacentridae	<i>Chromis atrilobata</i> Gill 1862	680	1375	2470	
0-7	LAR	PLA	WIT	AbB	NOC	<b>FE20/1</b>	Apogonidae	<i>Apogon pacificus</i> (Herre 1935)	0	0	190	
0-7	SMA	INV	WIT	AbB	NOC	<b>FE21/1</b>	Apogonidae	<i>Apogon retrosella</i> (Gill 1862)	0	4	12	
0-7	SMA	OMN	WIT	AbB	DIU	<b>FE22/1</b>	Labridae	<i>Thalassoma lucasanum</i> (Gill 1862)	1057	1466	1779	
0-7	SMA	PIS	SED	AbB	NOC	<b>FE23/1</b>	Cirrhitidae	<i>Cirrhitichthys oxycephalus</i> (Bleeker 1855)	56	25	33	
0-7	SOL	OMN	WIT	AbB	DIU	<b>FE24/1</b>	Tetraodontidae	<i>Canthigaster punctatissima</i> (Günther 1870)	32	68	87	
7-15	InP	INV	WIT	AbB	DIU	<b>FE25/1</b>	Chaetodontidae	<i>Chaetodon humeralis</i> Günther 1860	6	18	0	
7-15	LAR	PLA	BET	PEL	NOC	<b>FE26/1</b>	Clupeidae	<i>Harengula thrissina</i> (Jordan & Gilbert 1882)	0	300	0	
7-15	LAR	PLA	WIT	AbB	DIU	<b>FE27/1</b>	Serranidae	<i>Paranthias colonus</i> (Valenciennes 1846)	0	11	47	
		Functional traits <sup>a</sup>					FE/FR	Family	Species in FE	Abundance		

Leng	Group	Diet	Mobi	Posi	Acti			Cl	Is	Ma
7-15	SMA	OMN	WIT	AbB	DIU	<b>FE28/1</b>	Pomacentridae <i>Abudefduf troschelii</i> (Gill 1862)	167	12	204
7-15	SMA	PLA	WIT	AbB	NOC	<b>FE29/1</b>	Holocentridae <i>Myripristis leiognathus</i> Valenciennes 1846	49	7	44
7-15	SOL	INV	SED	AbB	DIU	<b>FE30/1</b>	Tetraodontidae <i>Sphoeroides lobatus</i> (Steindachner 1870)	0	0	1
7-15	SOL	INV	SED	BOT	NOC	<b>FE31/1</b>	Serranidae <i>Alphestes immaculatus</i> Breder 1936	0	0	1
7-15	SOL	OMN	SED	BOT	DIU	<b>FE32/1</b>	Blenniidae <i>Ophioblennius steindachneri</i> Jordan & Evermann 1898	0	54	246
7-15	SOL	PIS	SED	BOT	NOC	<b>FE33/1</b>	Serranidae <i>Rypticus bicolor</i> Valenciennes 1846	0	0	1
7-15	SOL	PIS	WIT	BOT	DIU	<b>FE34/1</b>	Serranidae <i>Serranus psittacinus</i> Valenciennes 1846	1	2	7
15-30	LAR	HER	WIT	AbB	DIU	<b>FE35/1</b>	Acanthuridae <i>Prionurus punctatus</i> Gill 1862.	138	1016	318
15-30	LAR	INV	BET	AbB	NOC	<b>FE36/1</b>	Haemulidae <i>Haemulon maculicauda</i> (Gill 1862)	564	63	1
15-30	SMA	HER	BET	AbB	DIU	<b>FE37/1</b>	Acanthuridae <i>Acanthurus xanthopterus</i> Valenciennes 1835	285	77	19
15-30	SMA	INV	WIT	AbB	DIU	<b>FE38/1</b>	Mullidae <i>Mulloidichthys dentatus</i> (Gill 1862)	173	369	0
15-30	SOL	HER	SED	BOT	DIU	<b>FE39/1</b>	Pomacanthidae <i>Microspathodon dorsalis</i> (Gill 1862)	44	124	166
15-30	SOL	INV	WIT	AbB	NOC	<b>FE40/1</b>	Haemulidae <i>Anisotremus interruptus</i> (Gill 1862)	0	5	0
15-30	SOL	PIS	WIT	AbB	NOC	<b>FE41/1</b>	Scorpaenidae <i>Pontinus vaughani</i> Barnhart & Hubbs 1946	0	83	0
15-30	SOL	PIS	WIT	BOT	BOT	<b>FE42/1</b>	Serranidae <i>Epinephelus labriformis</i> (Jenyns 1840)	31	42	83
30-50	SMA	PIS	WIT	PEL	BOT	<b>FE43/1</b>	Carangidae <i>Caranx caballus</i> Günther 1868	58	4	32
30-50	SOL	INV	BET	AbB	DIU	<b>FE44/1</b>	Balistidae <i>Pseudobalistes naufragium</i> (Jordan & Starks 1895)	4	11	11
30-50	SOL	INV	WIT	BOT	DIU	<b>FE45/1</b>	Muraenidae <i>Gymnomuraena zebra</i> (Shaw 1797)	0	1	1
30-50	SOL	OMN	BET	PEL	DIU	<b>FE46/1</b>	Monacanthidae <i>Cantherhines dumerilii</i> (Hollard 1854)	2	1	17
30-50	SOL	OMN	WIT	AbB	DIU	<b>FE47/1</b>	Balistidae <i>Balistes polylepis</i> Steindachner 1876	0	3	1
30-50	SOL	PIS	BET	PEL	BOT	<b>FE48/1</b>	Carangidae <i>Caranx melampygus</i> Cuvier 1833	1	0	0
30-50	SOL	PIS	SED	BOT	NOC	<b>FE49/1</b>	Scorpaenidae <i>Scorpaena mystes</i> Jordan & Starks 1895	2	0	0
50-70	SOL	PIS	BET	PEL	DIU	<b>FE50/1</b>	Fistulariidae <i>Fistularia commersonii</i> Rüppell 1838	0	6	7
>70	SOL	PIS	BET	BOT	NOC	<b>FE51/1</b>	Ginglymostomatidae <i>Ginglymostoma unami</i> (Del Moral-Flores, Ramíz-Antonio, Angulo & Pérez-Ponce de León 2015)	3	2	0
>70	SOL	PIS	WIT	BOT	NOC	<b>FE52/1</b>	Muraenidae <i>Gymnothorax castaneus</i> (Jordan & Gilbert 1883)	4	0	9

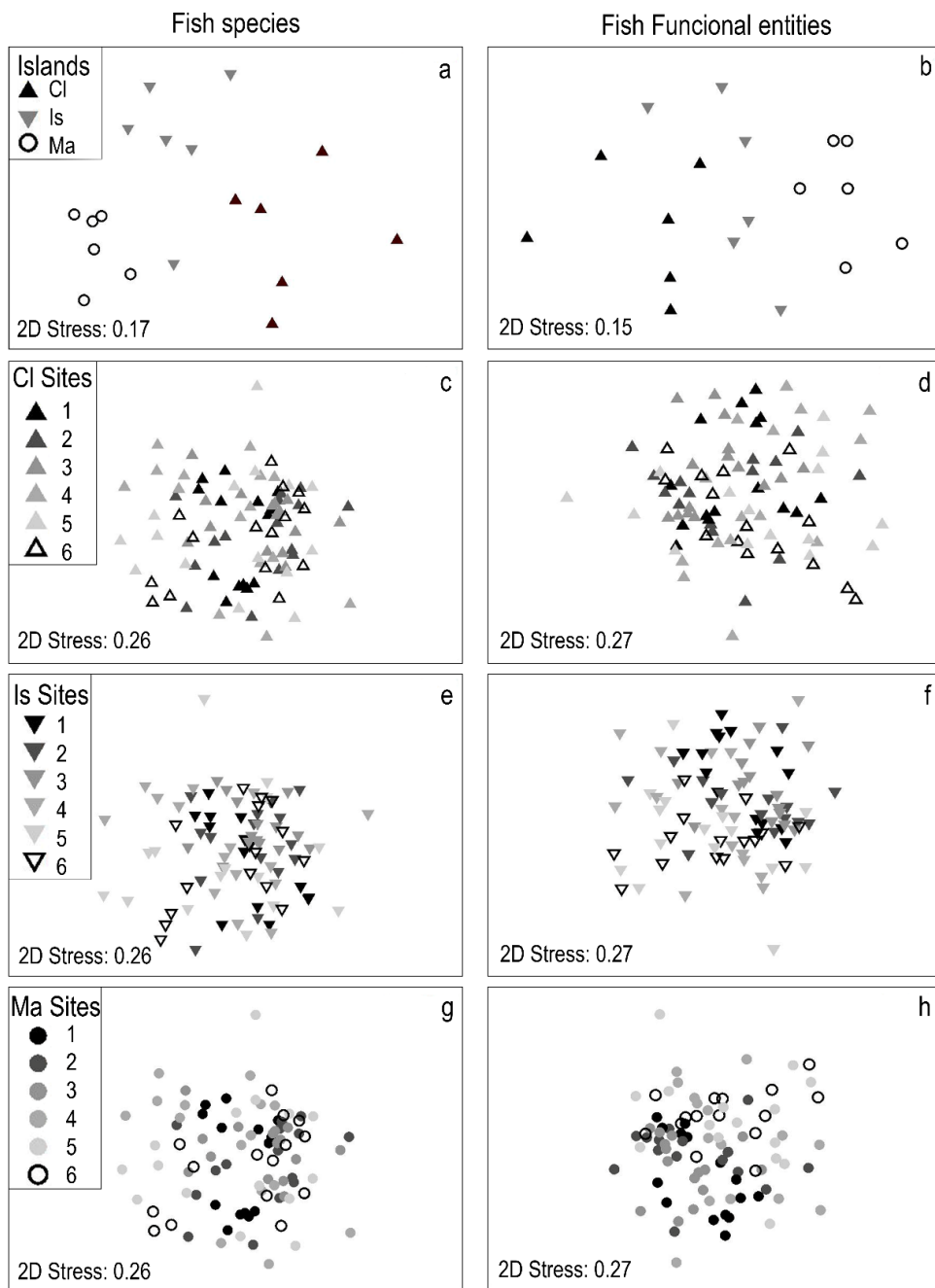
<sup>a</sup>Leng=Fish average length, Group=Type of schooling, Diet=Major food consumption, Mobi=Mobility between areas, Posi=Position in water column, Acti=Period of major activity. Trait code in Trait description (S2).

**Table S4.** SIMPER analysis summary. Reef fish species and functional entities (FEs) average percentage and average total contribution<sup>a</sup> to the dissimilarity between sites of the three islands: Cleofas (Cl), Isabel (Is) and Marietas (Ma)

<b>Cl Av. Diss 60.43</b>			<b>Av. Diss 53.40</b>		
<b>Species<sup>b</sup></b>	Av. Cont	Av. total Cont.	<b>FEs<sup>b</sup></b>	Av. Cont.	Av. total Cont.
<i>C.atrilobata</i>	4.65	69.82	FE12	6.08	91.26
<i>L.viridis</i>	4.41	66.15	FE28	6.26	87.62
<i>H.maculicauda</i>	5.43	65.20	FE36	5.77	86.60
<i>H.dispilus</i>	5.32	63.86	FE26	5.68	85.13
<i>C.punctatissima</i>	2.15	62.29	FE53	5.22	78.28
<i>T.lucasanum</i>	4.03	60.49	FE48	5.81	75.57
<i>S.acapulcoensis</i>	4.48	58.27	FE45	4.51	63.09
<i>H.chierchiae</i>	3.32	49.76	FE45	3.75	52.55
<i>M.dentatus</i>	4.10	49.15	FE2	4.32	51.78
<i>P.punctatus</i>	3.47	48.62	FE5	4.30	51.58
<b>Is Av. Diss 53.95</b>			<b>Av. Diss 47.60</b>		
<b>Species</b>	Av. Cont.	Av. Total Cont.	<b>FEs</b>	Av. Cont.	Av. Total Cont.
<i>C.atrilobata</i>	5.59	83.88	FE12	7.17	107.51
<i>A.troschelii</i>	5.09	76.35	FE9	6.48	97.13
<i>T.lucasanum</i>	4.00	64.01	FE45	5.32	79.86
<i>P.punctatus</i>	4.20	63.06	FE53	5.15	77.25
<i>A.xanthopterus</i>	4.04	60.58	FE48	5.12	71.65
<i>S.acapulcoensis</i>	3.86	57.94	FE2	4.66	69.93
<i>L.argentiventris</i>	3.58	53.63	FE10	4.22	63.34
<i>H.dispilus</i>	3.48	48.68	FE26	3.95	55.29
<i>O.steindachneri</i>	2.61	36.53	FE41	3.33	46.68
<i>M.dorsalis</i>	2.39	35.79	FE37	3.03	45.51
<b>Ma Av. Diss 43.61</b>			<b>Av. Diss 39.34</b>		
<b>Species</b>	Av. Cont.	Av. Total Cont.	<b>FEs</b>	Av. Cont.	Av. Total Cont.
<i>C.atrilobata</i>	7.70	115.48	FE12	9.11	136.61
<i>H.dispilus</i>	3.74	107.90	FE45	4.82	72.34
<i>P.punctatus</i>	4.10	61.47	FE41	4.17	62.59
<i>H.dispilus</i>	3.70	59.25	FE52	3.49	52.34
<i>O.steindachneri</i>	3.55	53.31	FE10	3.66	51.18
<i>S.suborbitalis</i>	2.96	44.39	FE42	3.25	48.70
<i>P.azaleus</i>	2.75	41.19	FE17	3.19	47.85
<i>S.acapulcoensis</i>	3.13	40.71	FE18	3.06	45.91
<i>C.oxycephalus</i>	2.69	40.41	FE8	3.82	45.82
<i>H.passer</i>	2.67	39.98	FE48	4.14	45.56

<sup>a</sup>Values represent the average of the total and average contribution of first 10 reef fish species and FEs of the dissimilarity between the sites within the islands.

<sup>b</sup>Extended species names and FEs information in Table S3



**Fig. S1** nMDS plots of species and functional entities (FEs) reef fish composition a, b) at island level, c, d) sites within Cleofas (Cl), e, f) sites within Isabel (Is) and g, h) sites within Marietas (Ma)

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