

UNESCO environmental DNA (eDNA) Expeditions in marine World Heritage sites

Biodiversity survey for Belize Barrier Reef Reserve System

Interim Results Based on 50% of Samples Analyzed
Not for public distribution

UNESCO's eDNA Expeditions is a global, citizen science initiative that is conducted with the intention to measure marine biodiversity and predict the impact climate change on marine community composition across UNESCO World Heritage marine sites.

eDNA is a cost effective and minimally invasive method to measure biodiversity in any given area. Marine species continuously shed DNA into the water around them in the form of waste, mucus, or cells. By collecting this DNA from water samples, and subsequently amplifying and sequencing specific regions within these DNA strands, experts can detect a wide variety of species without removing any organisms from their environment. The amplified regions are selected depending on the scope of the study: while some markers are suitable to obtain a broad overview of biodiversity across many groups of species, other markers are particularly suited to get high resolution insight for a more specific taxonomic group. The UNESCO eDNA Expeditions initiative combines a number of markers tailored for marine vertebrates (fish, mammals, and turtles). A general marker was added to allow to detect also species from other groups such as invertebrates which can give a broader insight in the marine species diversity in a given area.

Between September 2022 and May 2023, UNESCO organized eDNA sampling campaigns in 21 marine World Heritage sites across 17 countries around the world. At every World Heritage site, about 20 samples were collected from different habitats. Over 250 young people participated in the local sampling expeditions. They were guided by local experts and park management staff, using protocols and eDNA sampling equipment provided by UNESCO.

Biodiversity inventories generated from the samples are being combined with existing species distribution data from public biodiversity databases such as the Ocean Biodiversity Information System (OBIS) in view of obtaining a comprehensive overview of marine life across marine World Heritage sites. Through the use of climate scenarios and species distribution models, an estimate will be made of the impact of climate change, in particular rising temperatures, on local biodiversity and its potential future distribution patterns.

More information about the initiative is available on the UNESCO website: <https://www.unesco.org/en/edna-expeditions>.

Results

Sampling and sample processing

eDNA sampling was conducted in Belize Barrier Reef Reserve System in April 2023. A total of 20 samples were collected at 5 locations in the park: BCMR, Bacalar Chico Marine Reserve, Glovers Reef Marine Reserve belize, SCMR, and SWCMR (Figure 1). Up to 1800 mL of seawater was filtered through filter cartridges with a 0.8 µm pore size. After sampling, the filter cartridges were flushed with preservation liquid and shipped to UNESCO. From the 20 samples, 10 have now (December 2023) been processed. A second batch of samples will be processed in January 2024. DNA from these samples was extracted and amplified, and then sent to the sequencing facility at KU Leuven in Belgium, a specialized university eDNA lab contracted by UNESCO for this work. PCR amplification was done using five primer pairs selected to capture as much biodiversity as possible in the target groups of the study: fish, mammals, and turtles. The results in this preliminary report are based on a first batch of 10 samples that were analyzed covering all locations that were sampled in the World Heritage site.

DNA sequencing

Sequencing of the DNA from 10 samples resulted in over 17 million sequence reads (Table 2), from which we collected 27725 unique sequences or ASVs. By matching those sequences with reference sequences in public databases, we were able to detect 478 species. Most of these species are vertebrates, but also species from other groups were detected, including algae, jellyfish, sponges, molluscs, and worms (Figure 2). Of the 478 species detected, 168 are not among the 2675 species previously reported from Belize Barrier Reef Reserve System to the UNESCO OBIS database.

reads	asvs
17239291	27725

Table 1: Reads, ASVs, and species across all samples.

locality	materialSampleID	sampleSize	reads	asvs	species
BCMR	EE0324	1500	1416747	10652	226
BCMR	EE0417	1500	450464	302	5
BCMR	EE0419	1500	2154113	12996	235
BCMR	EE0421	1500	1299693	11098	246
Bacalar Chico Marine Reserve	EE0422	1500	2636174	11057	223
Glovers Reef Marine Reserve belize	EE0325	1200	1589663	9034	111
Glovers Reef Marine Reserve belize	EE0326	1200	1263862	5910	62
SCMR	EE0420	1500	2586311	9820	177
SWCMR	EE0323	1800	2122206	12086	155
SWCMR	EE0418	1800	1720058	11016	174

Table 2: Reads, ASVs, and species by sample.

Species identification

The marker sequences obtained from sequencing were matched with sequence reference databases built using public data available from the National Center for Biotechnology Information (NCBI). This resulted in the identification of 478 species, of which 183 fish species, 1 mammalian species, and 1 turtle species (Table 3). This represents about 28% of the species known from Belize Barrier Reef Reserve System in the OBIS database. 19 of the detected species are listed as threatened on the IUCN Red List (Table 4). A full list of species is added at the end of this report.

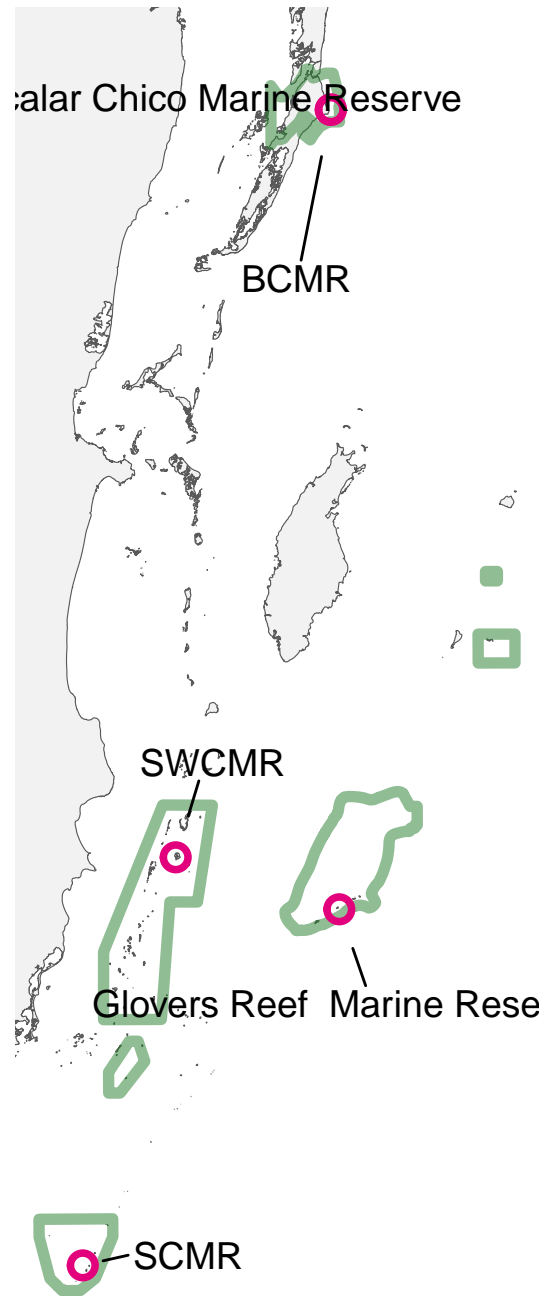


Figure 1: Map of the sampling locations.

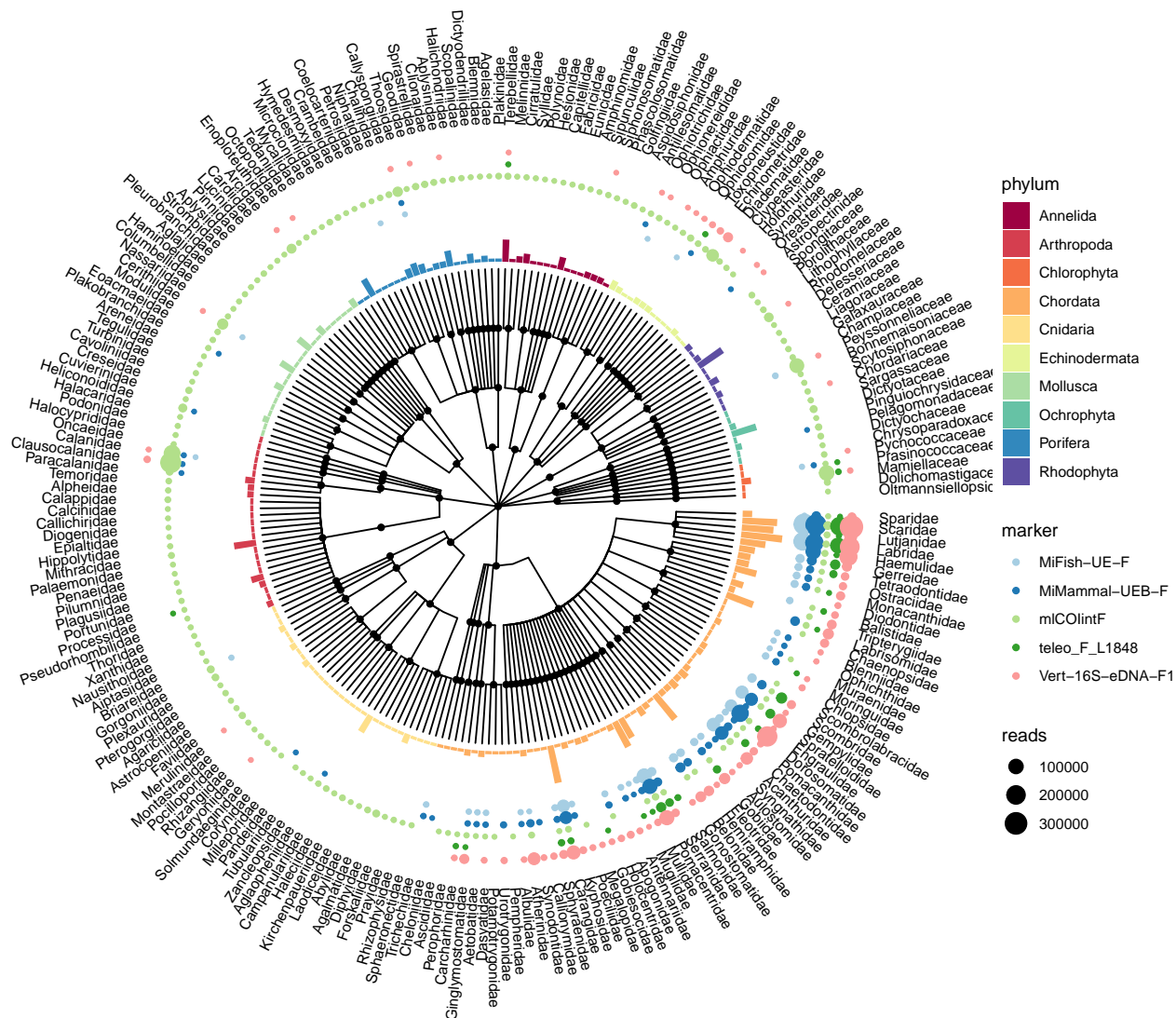


Figure 2: Number of DNA reads (bubbles) and species detected (bars) by family.

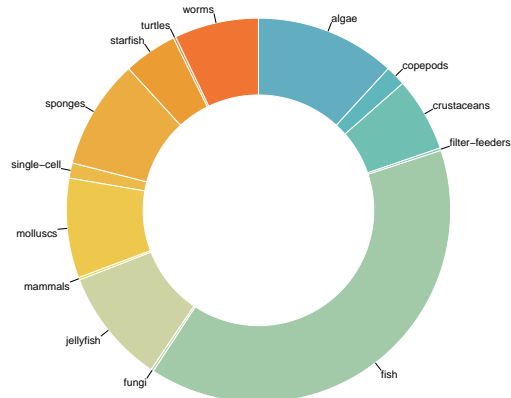


Figure 3: Distribution of detected species across groups.

group	eDNA species	total species	fraction
fish	183	651	0.28
mammals	1	4	0.25
turtles	1	3	0.33

Table 3: Number of species in the three target groups, from the OBIS database and from eDNA sampling.

category	eDNA species	total species	fraction
CR	4	21	0.19
EN	5	12	0.42
VU	10	42	0.24

Table 4: Number of species by IUCN Red List category, from the OBIS database and from eDNA sampling.

phylum	class	species	group	category	new	vernacular
Amoebozoa	Discosea	Neoparamoeba aestuarina	single-cell		yes	
Amoebozoa	Discosea	Neoparamoeba pemaquidensis	single-cell		yes	
Annelida	Polychaeta	Capitella nonatoi	worms		yes	
Annelida	Polychaeta	Echinofabricia goodhartzorum	worms			
Annelida	Polychaeta	Eupolymnia rullieri	worms			
Annelida	Polychaeta	Eurythoe complanata	worms			fireworm
Annelida	Polychaeta	Harmothoe longidentis	worms			
Annelida	Polychaeta	Isolda bipinnata	worms		yes	
Annelida	Polychaeta	Lanicola carus	worms			
Annelida	Polychaeta	Leodice miurai	worms			
Annelida	Polychaeta	Loimia bermudensis	worms			
Annelida	Polychaeta	Loimia medusa	worms		yes	medusa worm
Annelida	Polychaeta	Loimia minuta	worms			
Annelida	Polychaeta	Myrianida gidholmi	worms			
Annelida	Polychaeta	Neogyptis fauchaldi	worms			
Annelida	Polychaeta	Nicidion angeli	worms			
Annelida	Polychaeta	Nicidion mikeli	worms			
Annelida	Polychaeta	Nicidion mutilata	worms			
Annelida	Polychaeta	Odontosyllis enopla	worms			Bermuda fireworm
Annelida	Polychaeta	Spinospaera hutchingsae	worms			
Annelida	Polychaeta	Syllis ypsiloides	worms		yes	
Annelida	Polychaeta	Thelepus verrilli	worms			
Annelida	Polychaeta	Timarete caribous	worms			
Annelida	Polychaeta	Timarete punctata	worms			
Annelida		Antillesoma antillarum	worms			
Annelida		Aspidosiphon (Aspidosiphon) gosnoldi	worms		yes	
Annelida		Aspidosiphon (Paraspidosiphon) laevis	worms			
Annelida		Golfingia (Golfingia) elongata	worms			
Annelida		Nephasoma (Nephasoma) pellucidum	worms			
Annelida		Phascolosoma (Phascolosoma) nigrescens	worms			
Annelida		Phascolosoma (Phascolosoma) perlucens	worms			
Annelida		Siphonosoma cumense	worms			
Annelida		Sipunculus (Sipunculus) nudus	worms			
Arthropoda	Arachnida	Rhombognathus areolatus			yes	
Arthropoda	Branchiopoda	Pseudevadne tergestina			yes	
Arthropoda	Copepoda	Calocalanus styliremis	copepods		yes	
Arthropoda	Copepoda	Clausocalanus furcatus	copepods		yes	
Arthropoda	Copepoda	Delibus nudus	copepods		yes	
Arthropoda	Copepoda	Oncaea waldemari	copepods		yes	
Arthropoda	Copepoda	Paracalanus quasimodo	copepods		yes	
Arthropoda	Copepoda	Temora stylifera	copepods		yes	
Arthropoda	Copepoda	Temora turbinata	copepods		yes	
Arthropoda	Copepoda	Undinula vulgaris	copepods		yes	
Arthropoda	Malacostraca	Achelous depressifrons	crustaceans		yes	flat-browed crab
Arthropoda	Malacostraca	Achelous ordwayi	crustaceans		yes	
Arthropoda	Malacostraca	Actaea acantha	crustaceans		yes	spinose rubble crab
Arthropoda	Malacostraca	Alpheus formosus	crustaceans			striped snapping shrimp
Arthropoda	Malacostraca	Amphithrax aculeatus	crustaceans		yes	
Arthropoda	Malacostraca	Calappa gallus	crustaceans		yes	rough box crab
Arthropoda	Malacostraca	Calcinus tibicen	crustaceans		yes	orange claw hermit crab

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phylum	class	species	group	category	new	vernacular
Arthropoda	Malacostraca	Callinectes ornatus	crustaceans		yes	shelligs
Arthropoda	Malacostraca	Clibanarius tricolor	crustaceans			tricolor hermit
Arthropoda	Malacostraca	Garthiope barbadensis	crustaceans		yes	prickly mud crab
Arthropoda	Malacostraca	Latreutes fucorum	crustaceans		yes	slender Sargassum shrimp, crevette des Sargasses
Arthropoda	Malacostraca	Leander tenuicornis	crustaceans			brown grass shrimp, crevette à rostre étroit
Arthropoda	Malacostraca	Macrocoeloma diplacanthum	crustaceans			
Arthropoda	Malacostraca	Metapenaeopsis gerardoi	crustaceans		yes	
Arthropoda	Malacostraca	Mithraculus coryphe	crustaceans			nodose clinging crab
Arthropoda	Malacostraca	Mithraculus forceps	crustaceans			red-ridged clinging crab
Arthropoda	Malacostraca	Mithraculus sculptus	crustaceans			green clinging crab
Arthropoda	Malacostraca	Neocallichirus grandimana	crustaceans		yes	big-hand ghost shrimp
Arthropoda	Malacostraca	Omalacantha bicornuta	crustaceans			speck-claw decorator crab
Arthropoda	Malacostraca	Pilumnus longleyi	crustaceans		yes	studded hairy crab
Arthropoda	Malacostraca	Pitho lherminieri	crustaceans			broadback urn crab
Arthropoda	Malacostraca	Plagusia depressa	crustaceans			flattened crab
Arthropoda	Malacostraca	Portunus sanguinolentus	crustaceans		yes	blood-spotted swimming crab
Arthropoda	Malacostraca	Processa bermudensis	crustaceans			Bermuda night shrimp
Arthropoda	Malacostraca	Processa fimbriata	crustaceans			grass night shrimp
Arthropoda	Malacostraca	Synalpheus townsendi	crustaceans			Townsend snapping shrimp
Arthropoda	Malacostraca	Teleophrys ruber	crustaceans			
Arthropoda	Malacostraca	Thor manningi	crustaceans			Manning grass shrimp
Arthropoda	Malacostraca	Williamstimpsonia denticulatus	crustaceans		yes	
Arthropoda	Ostracoda	Porroecia spinirostris			yes	
Ascomycota	Dothideomycetes	Cladosporium herbarum	fungi		yes	
Bacillariophyta	Bacillariophyceae	Bellerophila polymorpha	algae		yes	
Bacillariophyta	Bacillariophyceae	Cylindrotheca closterium	algae		yes	
Bacillariophyta	Bacillariophyceae	Navicula minima	algae		yes	
Bryozoa	Gymnolaemata	Amathia evelinae	filter-feeders		yes	
Cercozoa	Chlorarachnea	Bigelowiella natans	single-cell		yes	
Cercozoa	Chlorarachnea	Chlorarachnion reptans	single-cell		yes	
Chaetognatha	Sagittoidea	Flaccisagitta enflata			yes	
Chaetognatha	Sagittoidea	Krohnitta subtilis			yes	
Chaetognatha	Sagittoidea	Sagitta helenae			yes	
Chlorophyta	Mamiellophyceae	Dolichomastix tenuilepis	algae		yes	
Chlorophyta	Mamiellophyceae	Mantoniella squamata	algae		yes	
Chlorophyta	Mamiellophyceae	Micromonas commoda	algae		yes	
Chlorophyta	Mamiellophyceae	Micromonas pusilla	algae		yes	
Chlorophyta	Pyramimonadophyceae	Prasinoderma coloniale	algae		yes	
Chlorophyta	Pyramimonadophyceae	Pycnococcus provasolii	algae		yes	
Chlorophyta	Ulvophyceae	Oltmannsiellopsis viridis	algae		yes	
Chlorophyta		Chloropicon laureae	algae		yes	
Chlorophyta		Chloropicon sieburthii	algae		yes	
Chordata	Asciacea	Ascidia ahodori			yes	
Chordata	Asciacea	Ecteinascidia styeloides				
Chordata	Elasmobranchii	Aetobatus flagellum	fish	EN	yes	
Chordata	Elasmobranchii	Aetobatus narinari	fish	EN	yes	spotted eagle ray
Chordata	Elasmobranchii	Ginglymostoma cirratum	fish	VU		nurse shark, requin nourrice
Chordata	Elasmobranchii	Hypanus americanus	fish	NT		
Chordata	Elasmobranchii	Negaprion brevirostris	fish	VU		lemon shark
Chordata	Elasmobranchii	Rhizoprionodon terraenovae	fish	LC		Atlantic sharpnose shark

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phylum	class	species	group	category	new	vernacular
Chordata	Elasmobranchii	Styracura schmardae	fish	EN		
Chordata	Elasmobranchii	Urobatis jamaicensis	fish	LC		yellow stingray
Chordata	Mammalia	Trichechus manatus	mammals	VU		West Indian manatee
Chordata	Teleostei	Abudefduf saxatilis	fish	LC		sergeant major
Chordata	Teleostei	Abudefduf vaigiensis	fish	LC	yes	Indo-Pacific sergeant
Chordata	Teleostei	Acanthostracion polygonium	fish			
Chordata	Teleostei	Acanthostracion quadricornis	fish	LC		scrawled cowfish
Chordata	Teleostei	Acanthurus bahianus	fish	LC		ocean surgeon
Chordata	Teleostei	Acanthurus chirurgus	fish	LC		doctorfish
Chordata	Teleostei	Acanthurus coeruleus	fish	LC		blue tang surgeonfish
Chordata	Teleostei	Acyrtops beryllinus	fish	LC		emerald clingfish
Chordata	Teleostei	Albula vulpes	fish	NT		bonefish
Chordata	Teleostei	Aluterus schoepfii	fish	LC		orange filefish
Chordata	Teleostei	Aluterus scriptus	fish	LC		scrawled filefish
Chordata	Teleostei	Anchoa cayorum	fish	LC		key anchovy
Chordata	Teleostei	Anisotremus scapularis	fish	LC	yes	
Chordata	Teleostei	Anisotremus surinamensis	fish	DD		black margate
Chordata	Teleostei	Archosargus probatocephalus	fish	LC	yes	sheepshead
Chordata	Teleostei	Atherinomorus stipes	fish	LC		hardhead silverside
Chordata	Teleostei	Aulostomus chinensis	fish	LC	yes	Chinese trumpetfish
Chordata	Teleostei	Aulostomus maculatus	fish	LC		Atlantic trumpetfish
Chordata	Teleostei	Azurina cyanea	fish			
Chordata	Teleostei	Balistes vetula	fish	NT		queen triggerfish
Chordata	Teleostei	Barbulifer ceuthoecus	fish	LC		bearded goby
Chordata	Teleostei	Bathygobius curacao	fish	LC		notchtongue goby
Chordata	Teleostei	Bodianus rufus	fish	LC		Spanish hogfish
Chordata	Teleostei	Bryx dunckeri	fish	LC		pugnose pipefish
Chordata	Teleostei	Calamus calamus	fish	LC		saucereye porgy
Chordata	Teleostei	Calamus penna	fish	LC		sheepshead porgy
Chordata	Teleostei	Callionymus bairdi	fish	LC		lancer dragonet
Chordata	Teleostei	Cantherhines pullus	fish	LC		orangespotted filefish
Chordata	Teleostei	Canthidermis maculata	fish	LC	yes	rough triggerfish
Chordata	Teleostei	Canthidermis sufflamen	fish	LC		ocean triggerfish
Chordata	Teleostei	Canthigaster rostrata	fish	LC		sharpnose puffer
Chordata	Teleostei	Caranx bartholomaei	fish	LC		yellow jack
Chordata	Teleostei	Caranx crysos	fish	LC		blue runner, carangue couballi
Chordata	Teleostei	Caranx hippos	fish	LC		common jack, carangue crevalle
Chordata	Teleostei	Caranx latus	fish	LC		horse-eye jack
Chordata	Teleostei	Caranx ruber	fish	LC		bar jack
Chordata	Teleostei	Caranx sexfasciatus	fish	LC	yes	bigeye trevally
Chordata	Teleostei	Cephalopholis cruentata	fish	LC		graysby
Chordata	Teleostei	Chaetodon capistratus	fish	LC		four-eye butterflyfish
Chordata	Teleostei	Chaetodon striatus	fish	LC		banded butterflyfish
Chordata	Teleostei	Chriolepis roosevelti	fish	LC		
Chordata	Teleostei	Clepticus parrae	fish	LC		creole wrasse
Chordata	Teleostei	Coryphopterus glaucofraenum	fish	LC		bridled goby
Chordata	Teleostei	Cosmocampus elucens	fish	LC		shortfin pipefish
Chordata	Teleostei	Cryptotomus roseus	fish	LC		bluelip parrotfish
Chordata	Teleostei	Ctenogobius boleosoma	fish	LC		darter goby
Chordata	Teleostei	Ctenogobius saepepallens	fish	LC		dash goby

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phylum	class	species	group	category	new	vernacular
Chordata	Teleostei	Cyclothone pseudopallida	fish	LC	yes	slender bristlemouth, cyclothone mince
Chordata	Teleostei	Decapterus macarellus	fish	LC		mackerel scad
Chordata	Teleostei	Decapterus punctatus	fish	LC	yes	round robin
Chordata	Teleostei	Diodon hystrix	fish	LC		spot-fin porcupinefish
Chordata	Teleostei	Doratonotus megalepis	fish	LC		dwarf wrasse
Chordata	Teleostei	Emmelichthyops atlanticus	fish	LC		bonnetmouth
Chordata	Teleostei	Enchelycore carychroa	fish	LC		chestnut moray
Chordata	Teleostei	Enchelycore nigricans	fish	LC		viper moray
Chordata	Teleostei	Enneanectes boehlkei	fish	LC		roughhead triplefin
Chordata	Teleostei	Enneanectes jordani	fish	LC		mimic triplefin
Chordata	Teleostei	Epinephelus morio	fish	VU		red grouper, mérrou rouge
Chordata	Teleostei	Erotelis smaragdus	fish	LC		emerald sleeper
Chordata	Teleostei	Etelis oculatus	fish	DD	yes	queen snapper
Chordata	Teleostei	Eucinostomus argenteus	fish	LC		silver mojarra
Chordata	Teleostei	Eucinostomus gula	fish	LC		Jenny mojarra
Chordata	Teleostei	Eucinostomus jonesii	fish	LC		slender mojarra
Chordata	Teleostei	Eucinostomus melanopterus	fish	LC		flagfin mojarra
Chordata	Teleostei	Gambusia affinis	fish	LC	yes	mosquitofish
Chordata	Teleostei	Gambusia nicaraguensis	fish	LC		
Chordata	Teleostei	Gempylus serpens	fish	LC	yes	snake mackerel
Chordata	Teleostei	Gerres cinereus	fish	LC		yellowfin mojarra
Chordata	Teleostei	Gnatholepis thompsoni	fish	LC		goldspot goby
Chordata	Teleostei	Gobioclinus haitiensis	fish	LC		
Chordata	Teleostei	Haemulon aurolineatum	fish	LC		tomtate grunt
Chordata	Teleostei	Haemulon flavolineatum	fish	LC		French grunt
Chordata	Teleostei	Haemulon macrostomum	fish	LC		Spanish grunt
Chordata	Teleostei	Haemulon plumierii	fish	LC		grunt
Chordata	Teleostei	Haemulon sciurus	fish	LC		bluestriped grunt
Chordata	Teleostei	Halichoeres bivittatus	fish	LC		slippery dick
Chordata	Teleostei	Halichoeres garnoti	fish	LC		yellowhead wrasse
Chordata	Teleostei	Halichoeres maculipinna	fish	LC		clown wrasse
Chordata	Teleostei	Halichoeres pictus	fish	LC		rainbow wrasse
Chordata	Teleostei	Halichoeres poeyi	fish	LC		blackear wrasse
Chordata	Teleostei	Halichoeres radiatus	fish	LC		puddingwife
Chordata	Teleostei	Harengula humeralis	fish	LC		pilchard
Chordata	Teleostei	Harengula jaguana	fish	LC		scaled sardine
Chordata	Teleostei	Hemiramphus balao	fish	LC	yes	balao
Chordata	Teleostei	Hemiramphus brasiliensis	fish	LC		ballyhoo halfbeak
Chordata	Teleostei	Histrio histrio	fish	LC		Sargassumfish
Chordata	Teleostei	Holacanthus tricolor	fish	LC		rock beauty
Chordata	Teleostei	Hypleurochilus geminatus	fish	LC	yes	crested blenny
Chordata	Teleostei	Hypoatherina harringtonensis	fish	LC		reef silverside
Chordata	Teleostei	Hypoplectrus gemma	fish	LC		blue hamlet
Chordata	Teleostei	Hypoplectrus unicolor	fish	LC		butter hamlet
Chordata	Teleostei	Hyporthodus niveatus	fish	VU	yes	
Chordata	Teleostei	Jenkinsia lamprotaenia	fish	LC		dwarf herring
Chordata	Teleostei	Kaupichthys hyoproroides	fish	LC		false moray
Chordata	Teleostei	Kyphosus vaigiensis	fish	LC		brassy chub
Chordata	Teleostei	Labrisomus nuchipinnis	fish	LC		hairy blenny
Chordata	Teleostei	Lachnolaimus maximus	fish	VU		hogfish

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phylum	class	species	group	category	new	vernacular
Chordata	Teleostei	Lactophrys bicaudalis	fish	LC		spotted trunkfish
Chordata	Teleostei	Lactophrys trigonus	fish	LC		trunkfish
Chordata	Teleostei	Lutjanus analis	fish	NT		mutton snapper
Chordata	Teleostei	Lutjanus apodus	fish	LC		schoolmaster snapper
Chordata	Teleostei	Lutjanus campechanus	fish	VU	yes	northern red snapper
Chordata	Teleostei	Lutjanus griseus	fish	LC		grey snapper
Chordata	Teleostei	Lutjanus mahogoni	fish	LC		Mahogany snapper
Chordata	Teleostei	Lutjanus synagris	fish	NT		lane snapper
Chordata	Teleostei	Malacotenus aurolineatus	fish	LC		goldline blenny
Chordata	Teleostei	Malacotenus erdmani	fish	LC		imitator blenny
Chordata	Teleostei	Malacotenus macropus	fish	LC		rosy blenny
Chordata	Teleostei	Malacotenus triangulatus	fish	LC		saddled blenny
Chordata	Teleostei	Megalops atlanticus	fish	VU		tarpon
Chordata	Teleostei	Melichthys niger	fish	LC		black durgon
Chordata	Teleostei	Microgobius microlepis	fish	LC		banner goby
Chordata	Teleostei	Microspathodon chrysurus	fish	LC		yellowtail damselfish
Chordata	Teleostei	Monacanthus ciliatus	fish	LC		fringed filefish
Chordata	Teleostei	Monacanthus tuckeri	fish	LC		slender filefish
Chordata	Teleostei	Moringua edwardsi	fish	LC		spaghetti eel
Chordata	Teleostei	Mugil curema	fish	LC		silverside mullet
Chordata	Teleostei	Mulloidichthys vanicolensis	fish	LC	yes	yellowfin goatfish
Chordata	Teleostei	Mycteroperca bonaci	fish	NT		black grouper
Chordata	Teleostei	Myrophis punctatus	fish	LC		speckled worm eel
Chordata	Teleostei	Neoniphon vexillarium	fish			
Chordata	Teleostei	Nes longus	fish	LC		orangespotted goby
Chordata	Teleostei	Nesiarchus nasutus	fish	LC	yes	black gemfish
Chordata	Teleostei	Ocyurus chrysurus	fish	DD		yellowtail snapper
Chordata	Teleostei	Paraclinus fasciatus	fish	LC		banded blenny
Chordata	Teleostei	Pempheris schomburgkii	fish	LC		glassy sweeper
Chordata	Teleostei	Phaeoptyx xenus	fish	LC		sponge cardinalfish
Chordata	Teleostei	Pomacanthus arcuatus	fish	LC		gray angelfish
Chordata	Teleostei	Pomacanthus paru	fish	LC		French angelfish
Chordata	Teleostei	Pristipomoides argyrogrammicus	fish	LC	yes	ornate jobfish
Chordata	Teleostei	Pristipomoides macrophthalmus	fish	LC	yes	cardinal snapper
Chordata	Teleostei	Pseudupeneus maculatus	fish	LC		spotted goatfish
Chordata	Teleostei	Salmo salar	fish	LR/lc	yes	Atlantic salmon, saumon d'Atlantique
Chordata	Teleostei	Sargocentron punctatissimum	fish	LC	yes	speckled squirrelfish
Chordata	Teleostei	Scarus iseri	fish	LC		striped parrotfish
Chordata	Teleostei	Scarus taeniopterus	fish	LC		princess parrotfish
Chordata	Teleostei	Scarus vetula	fish	LC		queen parrotfish
Chordata	Teleostei	Scomberomorus cavalla	fish	LC		cavalla, thazard barré
Chordata	Teleostei	Scomberomorus maculatus	fish	LC	yes	Spanish mackerel
Chordata	Teleostei	Scombrobrax heterolepis	fish	LC	yes	longfin escolar
Chordata	Teleostei	Selar crumenophthalmus	fish	LC		bigeye scad
Chordata	Teleostei	Seriola rivoliana	fish	LC	yes	Almaco jack, sérieole limon
Chordata	Teleostei	Serranus baldwini	fish	LC		lantern bass
Chordata	Teleostei	Sparisoma atomarium	fish	LC		greenblotch parrotfish
Chordata	Teleostei	Sparisoma aurofrenatum	fish	LC		redband parrotfish
Chordata	Teleostei	Sparisoma axillare	fish	DD	yes	
Chordata	Teleostei	Sparisoma chrysotermum	fish	LC		redtail parrotfish

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phylum	class	species	group	category	new	vernacular
Chordata	Teleostei	Sparisoma radians	fish	LC		bucktooth parrotfish
Chordata	Teleostei	Sparisoma rubripinne	fish	LC		redfin parrotfish
Chordata	Teleostei	Sparisoma viride	fish	LC		stoplight parrotfish
Chordata	Teleostei	Sphoeroides parvus	fish	LC	yes	least puffer
Chordata	Teleostei	Sphoeroides spengleri	fish	LC		bandtail puffer
Chordata	Teleostei	Sphoeroides testudineus	fish	LC		checkered puffer
Chordata	Teleostei	Sphyræna barracuda	fish	LC		great barracuda
Chordata	Teleostei	Starksia lepicoelia	fish	LC		blackcheek blenny
Chordata	Teleostei	Starksia ocellata	fish	LC	yes	checkered blenny
Chordata	Teleostei	Stathmonotus stahli	fish	LC		eelgrass blenny
Chordata	Teleostei	Stegastes adustus	fish	LC		dusky damselfish
Chordata	Teleostei	Stegastes diencaeus	fish	LC		longfin damselfish
Chordata	Teleostei	Stegastes leucostictus	fish	LC		beaugregory
Chordata	Teleostei	Stegastes partitus	fish	LC		bicolor damselfish
Chordata	Teleostei	Stegastes planifrons	fish	LC		threespot damselfish
Chordata	Teleostei	Stephanolepis hispidia	fish			
Chordata	Teleostei	Stephanolepis setifer	fish	LC		pygmy filefish
Chordata	Teleostei	Strongylura notata	fish	LC		redfin needlefish
Chordata	Teleostei	Strongylura timucu	fish	LC		timucu
Chordata	Teleostei	Synodus synodus	fish	LC		red lizardfish
Chordata	Teleostei	Thalassoma bifasciatum	fish	LC		bluehead
Chordata	Teleostei	Tigriobius pallens	fish	LC		
Chordata	Teleostei	Tomicodon reitzae	fish	LC	yes	
Chordata	Teleostei	Trachinotus carolinus	fish	LC	yes	pompano
Chordata	Teleostei	Trachinotus falcatus	fish	LC		permit
Chordata	Teleostei	Tylosurus crocodilus	fish	LC		houndfish
Chordata	Teleostei	Xyrichtys novacula	fish	LC		pearly razorfish
Chordata	Teleostei	Xyrichtys splendens	fish	LC		green razorfish
Chordata		Eretmochelys imbricata	turtles	CR		hawksbill turtle, caret
Cnidaria	Anthozoa	Agaricia agaricites	jellyfish	VU		lettuce coral
Cnidaria	Anthozoa	Antillogorgia bipinnata	jellyfish			
Cnidaria	Anthozoa	Briareum asbestinum	jellyfish			corky sea finger
Cnidaria	Anthozoa	Eunicea flexuosa	jellyfish			
Cnidaria	Anthozoa	Exaiptasia diaphana	jellyfish			
Cnidaria	Anthozoa	Gorgonia mariae	jellyfish			
Cnidaria	Anthozoa	Helioseris cucullata	jellyfish	CR		sunray lettuce-leaf coral
Cnidaria	Anthozoa	Montastraea cavernosa	jellyfish	LC		false knob coral
Cnidaria	Anthozoa	Muriceopsis flava	jellyfish			bottle-brush coral
Cnidaria	Anthozoa	Orbicella annularis	jellyfish	EN		
Cnidaria	Anthozoa	Orbicella faveolata	jellyfish	EN		
Cnidaria	Anthozoa	Pseudodiploria strigosa	jellyfish	CR		brain coral
Cnidaria	Anthozoa	Siderastrea siderea	jellyfish	CR		massive starlet coral
Cnidaria	Anthozoa	Stephanocoenia intersepta	jellyfish	NT		blushing star coral
Cnidaria	Anthozoa	Stylophora pistillata	jellyfish	NT	yes	hood coral
Cnidaria	Hydrozoa	Abylopsis eschscholtzii	jellyfish			
Cnidaria	Hydrozoa	Aglaophenia latecarinata	jellyfish			
Cnidaria	Hydrozoa	Campanularia hincksii	jellyfish		yes	
Cnidaria	Hydrozoa	Clytia gracilis	jellyfish			
Cnidaria	Hydrozoa	Clytia hemisphaerica	jellyfish			
Cnidaria	Hydrozoa	Clytia linearis	jellyfish			

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phylum	class	species	group	category	new	vernacular
Cnidaria	Hydrozoa	Clytia noliiformis	jellyfish			
Cnidaria	Hydrozoa	Diphyes bojani	jellyfish			
Cnidaria	Hydrozoa	Diphyes dispar	jellyfish			
Cnidaria	Hydrozoa	Forskalia edwardsii	jellyfish		yes	
Cnidaria	Hydrozoa	Kirchenpaueria halecioides	jellyfish			
Cnidaria	Hydrozoa	Laodicea undulata	jellyfish		yes	
Cnidaria	Hydrozoa	Larsonia pterophylla	jellyfish			
Cnidaria	Hydrozoa	Lensia campanella	jellyfish		yes	
Cnidaria	Hydrozoa	Lilyopsis fluoracantha	jellyfish		yes	
Cnidaria	Hydrozoa	Liriope tetraphylla	jellyfish			
Cnidaria	Hydrozoa	Millepora alcicornis	jellyfish	VU		fire coral
Cnidaria	Hydrozoa	Nanomia bijuga	jellyfish		yes	
Cnidaria	Hydrozoa	Nemalcium lighti	jellyfish			
Cnidaria	Hydrozoa	Obelia dichotoma	jellyfish			sea thread hydroid
Cnidaria	Hydrozoa	Ralpharia gorgoniae	jellyfish		yes	
Cnidaria	Hydrozoa	Rhizophysa filiformis	jellyfish		yes	
Cnidaria	Hydrozoa	Solmundella bitentaculata	jellyfish		yes	
Cnidaria	Hydrozoa	Sphaeronectes koellikeri	jellyfish		yes	
Cnidaria	Hydrozoa	Stauridiosarsia nipponica	jellyfish		yes	
Cnidaria	Hydrozoa	Zancleopsis dichotoma	jellyfish			
Cnidaria	Scyphozoa	Nausithoe punctata	jellyfish			crown jellyfish
Cryptophyta	Cryptophyceae	Hemiarma marina			yes	
Ctenophora	Tentaculata	Bolinopsis vitrea	jellyfish		yes	
Ctenophora	Tentaculata	Ocyropsis crystallina	jellyfish		yes	ocyroé cristalline
Ctenophora	Tentaculata	Vallicula multiformis	jellyfish		yes	
Echinodermata	Asteroidea	Astropecten articulatus	starfish		yes	
Echinodermata	Asteroidea	Oreaster reticulatus	starfish			
Echinodermata	Echinoidea	Clypeaster rosaceus	starfish			sea biscuit
Echinodermata	Echinoidea	Diadema antillarum	starfish			spiny urchin
Echinodermata	Echinoidea	Echinometra viridis	starfish			reef urchin
Echinodermata	Echinoidea	Lytechinus variegatus	starfish			
Echinodermata	Echinoidea	Lytechinus williamsi	starfish			
Echinodermata	Holothuroidea	Euapta lappa	starfish			
Echinodermata	Holothuroidea	Holothuria (Halodeima) mexicana	starfish			donkey dung sea cucumber
Echinodermata	Holothuroidea	Leptosynapta tenuis	starfish		yes	slender footless sea cucumber, holothurie grêle
Echinodermata	Ophiuroidea	Amphipholis squamata	starfish			dwarf brittle star
Echinodermata	Ophiuroidea	Ophiactis savignyi	starfish			
Echinodermata	Ophiuroidea	Ophiocoma echinata	starfish			
Echinodermata	Ophiuroidea	Ophioderma appressum	starfish			
Echinodermata	Ophiuroidea	Ophioderma cinereum	starfish			
Echinodermata	Ophiuroidea	Ophiomastix wendtii	starfish			
Echinodermata	Ophiuroidea	Ophionereis olivacea	starfish			
Echinodermata	Ophiuroidea	Ophionereis reticulata	starfish			
Echinodermata	Ophiuroidea	Ophiothrix (Acanthophiothrix) suensonii	starfish			
Echinodermata	Ophiuroidea	Ophiothrix (Ophiothrix) angulata	starfish			
Echinodermata	Ophiuroidea	Ophiothrix (Ophiothrix) oerstedii	starfish			
Gastrotricha		Urodasys calicostylis			yes	
Haptophyta	Coccolithophyceae	Chrysochromulina tobinii	algae		yes	
Haptophyta	Coccolithophyceae	Emiliania huxleyi	algae		yes	
Hemichordata	Enteropneusta	Ptychodera flava			yes	Hawaiian acorn worm

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phylum	class	species	group	category	new	vernacular
Mollusca	Bivalvia	Anadara notabilis	molluscs			eared ark
Mollusca	Bivalvia	Codakia orbicularis	molluscs			
Mollusca	Bivalvia	Laevicardium serratum	molluscs		yes	
Mollusca	Bivalvia	Pinna carnea	molluscs			amber penshell
Mollusca	Cephalopoda	Abraia redfieldi	molluscs	LC	yes	
Mollusca	Cephalopoda	Octopus briareus	molluscs	LC		Caribbean reef octopus
Mollusca	Cephalopoda	Octopus hummelincki	molluscs			bumblebee octopus
Mollusca	Cephalopoda	Octopus taganga	molluscs		yes	
Mollusca	Gastropoda	Agathistoma fasciatum	molluscs			
Mollusca	Gastropoda	Aliger gigas	molluscs			
Mollusca	Gastropoda	Aplysia dactylomela	molluscs			large-spotted sea hare
Mollusca	Gastropoda	Aplysia parvula	molluscs		yes	dwarf sea hare, petit lièvre de mer
Mollusca	Gastropoda	Arene cruentata	molluscs			
Mollusca	Gastropoda	Camachoaglaja berolina	molluscs		yes	
Mollusca	Gastropoda	Camachoaglaja mariagordae	molluscs		yes	
Mollusca	Gastropoda	Cerithium atratum	molluscs			dark cerith
Mollusca	Gastropoda	Cerithium eburneum	molluscs			ivory cerith
Mollusca	Gastropoda	Cerithium guinaicum	molluscs			
Mollusca	Gastropoda	Cerithium litteratum	molluscs			stocky cerith
Mollusca	Gastropoda	Cerithium lutosum	molluscs			dwarf Atlantic cerith
Mollusca	Gastropoda	Chelidonura alisonae	molluscs		yes	
Mollusca	Gastropoda	Chelidonura hirundinina	molluscs		yes	
Mollusca	Gastropoda	Columbella mercatoria	molluscs			common dove shell
Mollusca	Gastropoda	Creseis acicula	molluscs			
Mollusca	Gastropoda	Creseis conica	molluscs			
Mollusca	Gastropoda	Cuvierina atlantica	molluscs			
Mollusca	Gastropoda	Diacavolinia longirostris	molluscs		yes	
Mollusca	Gastropoda	Elysia buanoi	molluscs		yes	
Mollusca	Gastropoda	Elysia cornigera	molluscs			
Mollusca	Gastropoda	Elysia velutinus	molluscs		yes	
Mollusca	Gastropoda	Eoacmaea pustulata	molluscs			
Mollusca	Gastropoda	Haminoea antillarum	molluscs		yes	Antilles glassy-bubble
Mollusca	Gastropoda	Heliconoides inflatus	molluscs			
Mollusca	Gastropoda	Lithopoma americanum	molluscs			American starsnail
Mollusca	Gastropoda	Modulus modulus	molluscs			Atlantic modulus
Mollusca	Gastropoda	Philinopsis pusa	molluscs		yes	
Mollusca	Gastropoda	Phrontis alba	molluscs			
Mollusca	Gastropoda	Pleurobranchus areolatus	molluscs		yes	Atlantic sidegill slug
Mollusca	Gastropoda	Stylocheilus polyomma	molluscs		yes	
Myzozoa	Dinophyceae	Amphidinium massartii	single-cell		yes	
Myzozoa	Dinophyceae	Kryptoperidinium triquetrum	single-cell		yes	
Nemertea	Hoploneurtea	Tetrastemma herthae	worms		yes	
Nemertea	Pilidiophora	Micrura chlorapardalis	worms			
Ochrophyta	Chrysoparadoxophyceae	Chrysoparadoxa australica	algae		yes	
Ochrophyta	Dictyochophyceae	Octactis octonaria	algae		yes	
Ochrophyta	Pelagophyceae	Aureococcus anophagefferens	algae		yes	
Ochrophyta	Pelagophyceae	Pelagomonas calceolata	algae		yes	
Ochrophyta	Phaeophyceae	Canistrocarpus cervicornis	algae			
Ochrophyta	Phaeophyceae	Cladosiphon okamuranus	algae		yes	
Ochrophyta	Phaeophyceae	Colpomenia sinuosa	algae			

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phylum	class	species	group	category	new	vernacular
Ochrophyta	Phaeophyceae	Dictyota bartayresiana	algae			
Ochrophyta	Phaeophyceae	Dictyota ceylanica	algae		yes	
Ochrophyta	Phaeophyceae	Dictyota friabilis	algae			
Ochrophyta	Phaeophyceae	Dictyota humifusa	algae			
Ochrophyta	Phaeophyceae	Dictyota mayae	algae		yes	
Ochrophyta	Phaeophyceae	Dictyota pinnatifida	algae			
Ochrophyta	Phaeophyceae	Lobophora littlerorum	algae		yes	
Ochrophyta	Phaeophyceae	Sargassum vulgare	algae		yes	
Ochrophyta	Phaeophyceae	Turbinaria tricostrata	algae			
Ochrophyta	Pinguicoccyceae	Pinguicoccus pyrenoidosus	algae		yes	
Porifera	Demospongiae	Agelas clathrodes	sponges			orange elephant ear sponge
Porifera	Demospongiae	Aiolochoira crassa	sponges			blue bleeder
Porifera	Demospongiae	Biemna caribea	sponges			
Porifera	Demospongiae	Callyspongia (Callyspongia) fallax	sponges			
Porifera	Demospongiae	Callyspongia (Cladochalina) aculeata	sponges		yes	
Porifera	Demospongiae	Callyspongia (Cladochalina) plicifera	sponges			
Porifera	Demospongiae	Chalinula molitba	sponges			
Porifera	Demospongiae	Cladocroce burapha	sponges		yes	
Porifera	Demospongiae	Clathria (Clathria) prolifera	sponges		yes	
Porifera	Demospongiae	Clathria (Clathria) unica	sponges		yes	
Porifera	Demospongiae	Clathria (Thalysias) abietina	sponges		yes	
Porifera	Demospongiae	Clathria (Thalysias) curacaoensis	sponges			
Porifera	Demospongiae	Clathria (Wilsonella) rugosa	sponges		yes	
Porifera	Demospongiae	Cliona celata	sponges		yes	boring sponge, clione jaune
Porifera	Demospongiae	Cliona tenuis	sponges		yes	
Porifera	Demospongiae	Cliona yorkin	sponges		yes	Yorkin Cliona
Porifera	Demospongiae	Cliothisa delitrix	sponges		yes	
Porifera	Demospongiae	Coelocarteria bartschi	sponges			
Porifera	Demospongiae	Desmoxia pelagia	sponges		yes	
Porifera	Demospongiae	Gelliodes wilsoni	sponges		yes	
Porifera	Demospongiae	Geodia gibberosa	sponges			white encrusting sponge
Porifera	Demospongiae	Geodia neptuni	sponges			
Porifera	Demospongiae	Haliclona (Reniera) manglaris	sponges			
Porifera	Demospongiae	Haliclona (Reniera) tubifera	sponges			
Porifera	Demospongiae	Igernella notabilis	sponges		yes	
Porifera	Demospongiae	Monanchora arbuscula	sponges			red-white marbled sponge
Porifera	Demospongiae	Mycale (Carmia) cecilia	sponges		yes	
Porifera	Demospongiae	Neofibularia nolitangere	sponges		yes	do-not-touch-me sponge
Porifera	Demospongiae	Niphates amorpha	sponges			
Porifera	Demospongiae	Niphates erecta	sponges			lavender rope sponge
Porifera	Demospongiae	Pandaros acanthifolium	sponges		yes	
Porifera	Demospongiae	Phorbas plumosus	sponges		yes	
Porifera	Demospongiae	Pione vastifica	sponges		yes	boring sponge, clione rouge
Porifera	Demospongiae	Scopalina ruetzleri	sponges			orange lumpy encrusting sponge
Porifera	Demospongiae	Spirastrella cunctatrix	sponges			encrusting orange sponge, éponge encroûtante orange
Porifera	Demospongiae	Spirastrella hartmani	sponges			
Porifera	Demospongiae	Svenzea cristinae	sponges			
Porifera	Demospongiae	Svenzea zeai	sponges			
Porifera	Demospongiae	Tedania (Tedania) ignis	sponges			
Porifera	Demospongiae	Thoosa purpurea	sponges		yes	

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phylum	class	species	group	category	new	vernacular
Porifera	Demospongiae	Topsentia ophiraphidites	sponges			
Porifera	Demospongiae	Xestospongia muta	sponges			Caribbean barrel sponge
Porifera	Homoscleromorpha	Plakortis halichondrioides	sponges		yes	
Rhodophyta	Florideophyceae	Acanthophora spicifera	algae			
Rhodophyta	Florideophyceae	Amphiroa valonioides	algae		yes	
Rhodophyta	Florideophyceae	Asparagopsis taxiformis	algae			
Rhodophyta	Florideophyceae	Centroceras hyalacanthum	algae		yes	
Rhodophyta	Florideophyceae	Champia hasselbringii	algae		yes	
Rhodophyta	Florideophyceae	Chondria baileyana	algae		yes	
Rhodophyta	Florideophyceae	Coelothrix irregularis	algae			
Rhodophyta	Florideophyceae	Dasya collinsiana	algae		yes	
Rhodophyta	Florideophyceae	Digenea arenahauriens	algae		yes	
Rhodophyta	Florideophyceae	Galaxaura rugosa	algae			
Rhodophyta	Florideophyceae	Ganonema farinosum	algae			
Rhodophyta	Florideophyceae	Harveyolithon munitum	algae		yes	
Rhodophyta	Florideophyceae	Herposiphonia pecten-veneris	algae		yes	
Rhodophyta	Florideophyceae	Herposiphonia secunda	algae		yes	
Rhodophyta	Florideophyceae	Laurencia catarinensis	algae			
Rhodophyta	Florideophyceae	Laurencia obtusa	algae		yes	
Rhodophyta	Florideophyceae	Liagora nesophila	algae		yes	
Rhodophyta	Florideophyceae	Lithophyllum corallinae	algae		yes	
Rhodophyta	Florideophyceae	Melanothamnus ferulaceus	algae			
Rhodophyta	Florideophyceae	Neogoniolithon rhizophorae	algae		yes	
Rhodophyta	Florideophyceae	Neogoniolithon spectabile	algae			
Rhodophyta	Florideophyceae	Palisada perforata	algae			
Rhodophyta	Florideophyceae	Ramicrusta textilis	algae		yes	
Rhodophyta	Florideophyceae	Titanophycus validus	algae			
Xenacoelomorpha		Convolutriloba longifissura			yes	