

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

Biodiversity survey for Archipiélago de Revillagigedo

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 Archipiélago de Revillagigedo in April 2023. A total of 20 samples were collected at 4 locations in the park: "San Benedicto""Las Cuevitas""", Isla Clarion, Punta Tosca, and Roca Partida (Figure 1). Up to 1800 mL of seawater was filtered through filter cartridges with a 0.8 μ m 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.

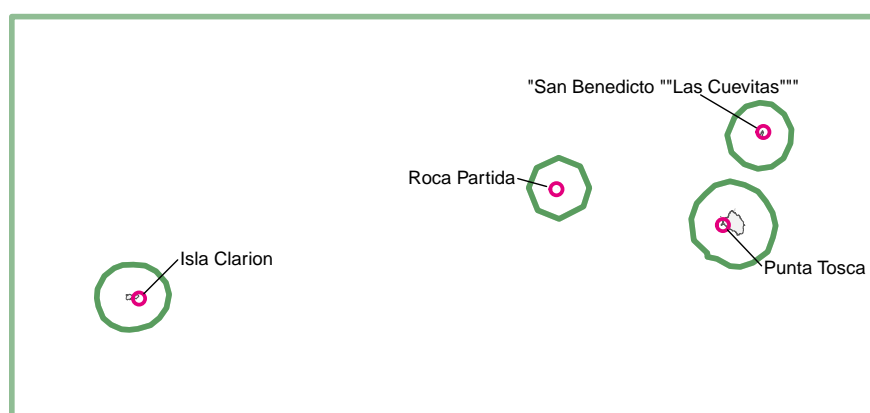


Figure 1: Map of the sampling locations.

DNA sequencing

Sequencing of the DNA from 10 samples resulted in over 10 million sequence reads (Table 2), from which we collected 16950 unique sequences or ASVs. By matching those sequences with reference sequences in public databases, we were able to detect 286 species. Most of these species are vertebrates, but also species from other groups were detected, including algae, jellyfish, starfish, copepods, and molluscs (Figure 2). Of the 286 species detected, 145 are not among the 1592 species previously reported from Archipiélago de Revillagigedo to the UNESCO OBIS database.

reads	asvs
10687541	16950

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

locality	materialSampleID	sampleSize	reads	asvs	species
"San Benedicto "Las Cuevitas" "	EE0065	1740	876866	7798	159
Isla Clarion	EE0098	1260	971563	7719	102
Isla Clarion	EE0100	1620	975021	9099	92
Isla Clarion	EE0106	1800	1597412	9739	157
Isla Clarion	EE0129	1800	1130165	9468	147
Punta Tosca	EE0060	1800	958908	8662	95

Punta Tosca	EE0064	1500	855753	6252	95
Punta Tosca	EE0111	1800	1745149	9559	107
Roca Partida	EE0101	1800	965406	7634	46
Roca Partida	EE0128	1800	611298	6672	54

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 286 species, of which 137 fish species, 3 mammalian species, and 3 turtle species (Table 3). This represents about 27% of the species known from Archipiélago de Revillagigedo in the OBIS database. 13 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.

group	eDNA species	total species	fraction
fish	137	510	0.27
mammals	3	16	0.19
turtles	1	4	0.25

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	1	6	0.17
EN	5	15	0.33
VU	7	55	0.13

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

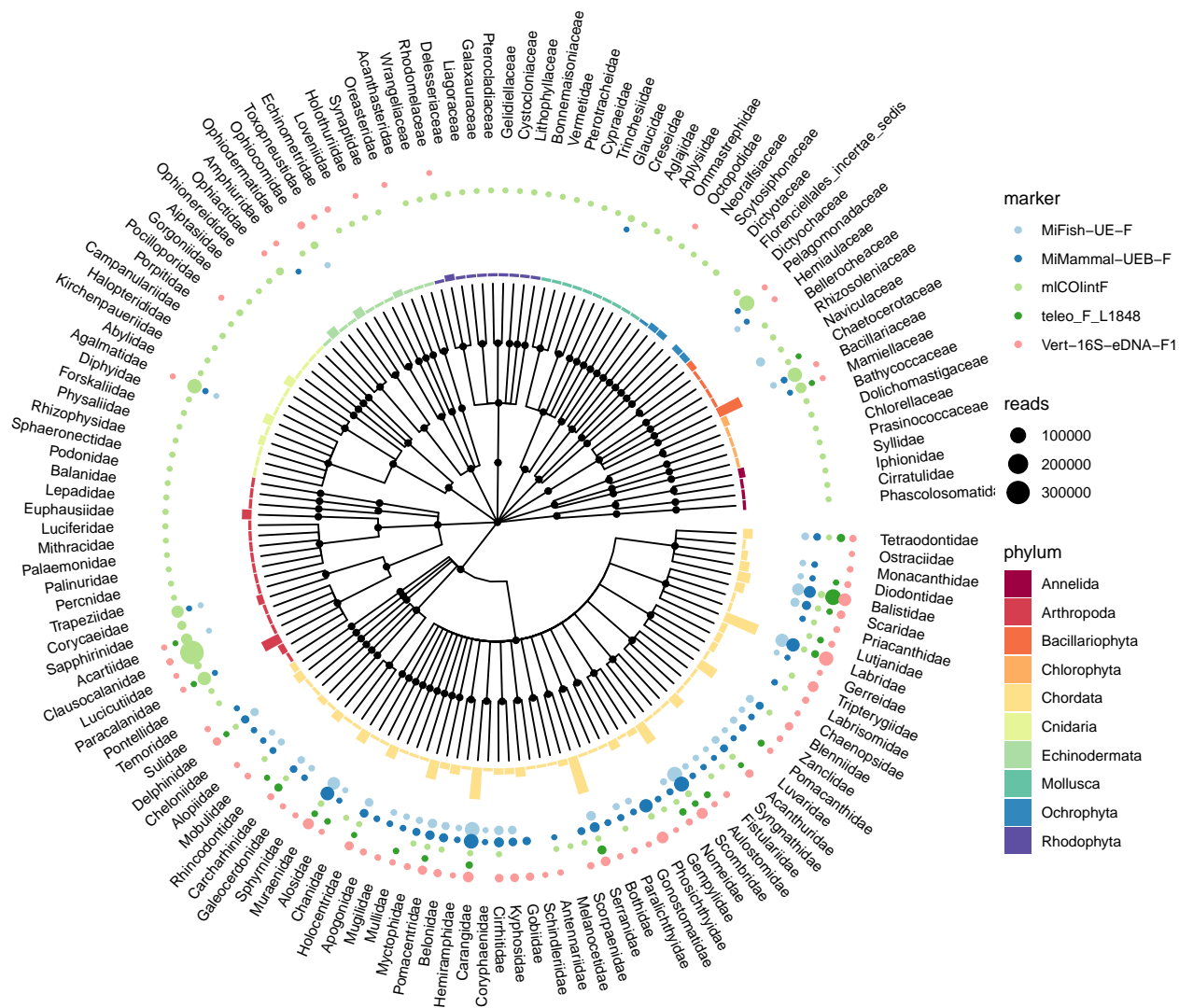


Figure 2: Number of DNA reads (bubbles) and species detected (bars) by family.

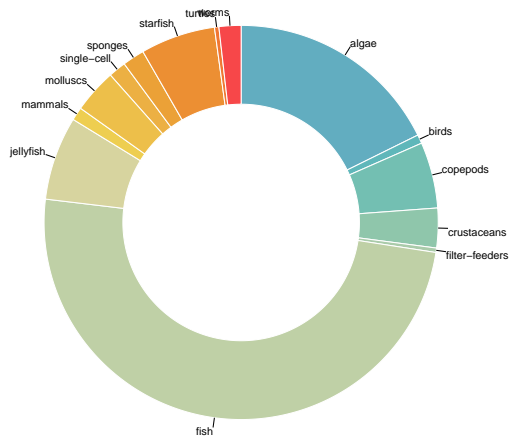


Figure 3: Distribution of detected species across groups.

phylum	class	species	group	category	new	vernacular
Amoebozoa	Discosea	Neoparamoeba aestuarina	single-cell		yes	
Annelida	Polychaeta	Eusyllis kupfferi	worms		yes	
Annelida	Polychaeta	Lphione henshawi	worms		yes	
Annelida	Polychaeta	Odontosyllis phosphorea	worms		yes	
Annelida	Polychaeta	Timarete punctata	worms		yes	
Annelida		Phascolosoma (Phascolosoma) perlucens	worms		yes	
Arthropoda	Branchiopoda	Pseudevadne tergestina			yes	
Arthropoda	Copepoda	Acartia (Acartia) negligens	copepods		yes	
Arthropoda	Copepoda	Acrocalanus gracilis	copepods		yes	
Arthropoda	Copepoda	Calocalanus pavo	copepods		yes	
Arthropoda	Copepoda	Calocalanus plumulosus	copepods		yes	
Arthropoda	Copepoda	Calocalanus styliremis	copepods		yes	
Arthropoda	Copepoda	Clausocalanus furcatus	copepods		yes	
Arthropoda	Copepoda	Copilia mirabilis	copepods		yes	
Arthropoda	Copepoda	Farranula gibbula	copepods		yes	
Arthropoda	Copepoda	Labidocera detruncata	copepods		yes	
Arthropoda	Copepoda	Lucicutia flavicornis	copepods		yes	
Arthropoda	Copepoda	Mecynocera clausi	copepods		yes	
Arthropoda	Copepoda	Paracalanus indicus	copepods		yes	
Arthropoda	Copepoda	Pontellina plumata	copepods		yes	
Arthropoda	Copepoda	Sapphirina stellata	copepods		yes	
Arthropoda	Copepoda	Temora discaudata	copepods		yes	
Arthropoda	Malacostraca	Brachycarpus biunguiculatus	crustaceans			twoclaw shrimp
Arthropoda	Malacostraca	Euphausia distinguenda	crustaceans		yes	
Arthropoda	Malacostraca	Euphausia tenera	crustaceans		yes	
Arthropoda	Malacostraca	Hansarsia gracilis	crustaceans		yes	
Arthropoda	Malacostraca	Lucifer typus	crustaceans		yes	standard lucifer prawn, gamba des monts sous-marins
Arthropoda	Malacostraca	Microphrys platysoma	crustaceans			
Arthropoda	Malacostraca	Panulirus penicillatus	crustaceans	LC		pronghorn spiny lobster, grosses têtes
Arthropoda	Malacostraca	Percnon abbreviatum	crustaceans			
Arthropoda	Malacostraca	Trapezia bidentata	crustaceans			
Arthropoda	Thecostraca	Balanus trigonus			yes	
Arthropoda	Thecostraca	Conchoderma virgatum			yes	
Bacillariophyta	Bacillariophyceae	Bellerochea polymorpha	algae		yes	
Bacillariophyta	Bacillariophyceae	Chaetoceros curvisetus	algae		yes	
Bacillariophyta	Bacillariophyceae	Cylindrotheca closterium	algae			
Bacillariophyta	Bacillariophyceae	Eucampia striata	algae		yes	
Bacillariophyta	Bacillariophyceae	Eucampia zodiacus	algae			
Bacillariophyta	Bacillariophyceae	Navicula minima	algae		yes	
Bacillariophyta	Bacillariophyceae	Pseudo-nitzschia abrensis	algae		yes	
Bacillariophyta	Bacillariophyceae	Pseudo-nitzschia caciantha	algae		yes	
Bacillariophyta	Bacillariophyceae	Pseudo-nitzschia decipiens	algae		yes	
Bacillariophyta	Bacillariophyceae	Pseudo-nitzschia lundholmiae	algae		yes	
Bacillariophyta	Bacillariophyceae	Pseudo-nitzschia pseudodelicatissima	algae		yes	
Bacillariophyta	Bacillariophyceae	Pseudo-nitzschia sabit	algae		yes	
Bacillariophyta	Bacillariophyceae	Pseudo-nitzschia subpifica	algae		yes	
Bacillariophyta	Bacillariophyceae	Sundstroemia setigera	algae		yes	
Bigyra	Bicoecia	Cafeteria roenbergensis			yes	
Bryozoa	Gymnolaemata	Bugula neritina	filter-feeders		yes	Common bugula, Brown bryozoan, bugule brune
Cercozoa	Chlorarachnea	Bigelowiella natans	single-cell		yes	

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phylum	class	species	group	category	new	vernacular
Cercozoa	Chlorarachnea	Chlorarachnion reptans	single-cell		yes	
Chaetognatha	Sagittoidea	Flaccisagitta enflata			yes	
Chaetognatha	Sagittoidea	Krohnitta subtilis			yes	
Chlorophyta	Mamiellophyceae	Bathycoccus prasinus	algae		yes	
Chlorophyta	Mamiellophyceae	Dolichomastix tenuilepis	algae		yes	
Chlorophyta	Mamiellophyceae	Micromonas commoda	algae		yes	
Chlorophyta	Mamiellophyceae	Micromonas pusilla	algae		yes	
Chlorophyta	Pyramimonadophyceae	Prasinoderma coloniale	algae		yes	
Chlorophyta	Trebouxiophyceae	Prototheca ciferrii	algae		yes	
Chlorophyta		Chloroparvula pacifica	algae		yes	
Chlorophyta		Chloropicon laureae	algae		yes	
Chlorophyta		Chloropicon primus	algae		yes	
Chlorophyta		Chloropicon roscoffensis	algae		yes	
Chlorophyta		Chloropicon sieburthii	algae		yes	
Chordata	Aves	Sula dactylatra	birds	LC		blue-faced booby, Fou masqué
Chordata	Aves	Sula sula	birds	LC		red-footed booby, fou à pieds rouges
Chordata	Elasmobranchii	Alopias pelagicus	fish	EN		thresher shark, renard pélagique
Chordata	Elasmobranchii	Carcharhinus albimarginatus	fish	VU		silvertip shark
Chordata	Elasmobranchii	Carcharhinus falciformis	fish	VU		silky shark
Chordata	Elasmobranchii	Galeocerdo cuvier	fish	NT	yes	tiger shark
Chordata	Elasmobranchii	Mobula birostris	fish	EN	yes	
Chordata	Elasmobranchii	Mobula thurstoni	fish	EN	yes	smoohtail mobula
Chordata	Elasmobranchii	Rhincodon typus	fish	EN		whale shark, requin baleine
Chordata	Elasmobranchii	Sphyrna lewini	fish	CR		scalloped hammerhead
Chordata	Elasmobranchii	Triaenodon obesus	fish	VU		whitetip reef shark
Chordata	Mammalia	Pseudorca crassidens	mammals	NT		false killer whale, faux-orque
Chordata	Mammalia	Stenella coeruleoalba	mammals	LC		striped dolphin, dauphin bleu et blanc
Chordata	Mammalia	Tursiops truncatus	mammals	LC		bottlenose dolphin, grand dauphin
Chordata	Teleostei	Abantennarius sanguineus	fish			
Chordata	Teleostei	Ablennes hians	fish	LC		flat needlefish
Chordata	Teleostei	Acanthemblemaria aspera	fish	LC	yes	roughhead blenny
Chordata	Teleostei	Acanthocybium solandri	fish	LC		wahoo
Chordata	Teleostei	Acanthurus nigricans	fish	LC		backsurgeonfish
Chordata	Teleostei	Acanthurus triostegus	fish	LC		convict surgeonfish
Chordata	Teleostei	Alphestes immaculatus	fish	LC		Pacific mutton hamlet
Chordata	Teleostei	Aluterus monoceros	fish	LC		unicorn leatherjacket
Chordata	Teleostei	Aluterus scriptus	fish	LC		scrawled filefish
Chordata	Teleostei	Apogon guadalupensis	fish	LC		Guadalupe cardinalfish
Chordata	Teleostei	Arothron meleagris	fish	LC		Guinea fowl puffer
Chordata	Teleostei	Aulostomus chinensis	fish	LC		Chinese trumpetfish
Chordata	Teleostei	Auxis thazard	fish	LC		frigate tuna, auxide
Chordata	Teleostei	Axoclinus multicinctus	fish	VU		multibarred triplefin
Chordata	Teleostei	Axoclinus storeyae	fish	LC	yes	
Chordata	Teleostei	Bodianus diplotaenia	fish	LC		Mexican hogfish
Chordata	Teleostei	Bolinichthys longipes	fish	LC		
Chordata	Teleostei	Bothus mancus	fish	LC		tropical flounder
Chordata	Teleostei	Calotomus carolinus	fish	LC		Caroline's parrotfish
Chordata	Teleostei	Canthigaster janthinoptera	fish	LC	yes	spotted puffer
Chordata	Teleostei	Caranx caballus	fish	LC		green jack
Chordata	Teleostei	Caranx lugubris	fish	LC		black jack

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phylum	class	species	group	category	new	vernacular
Chordata	Teleostei	Caranx melampygus	fish	LC		bluefin trevally
Chordata	Teleostei	Caranx sexfasciatus	fish	LC		bigeye trevally
Chordata	Teleostei	Cephalopholis cruentata	fish	LC		graysby
Chordata	Teleostei	Cephalopholis microprion	fish	LC	yes	
Chordata	Teleostei	Cephalopholis panamensis	fish	LC		Panama graysby
Chordata	Teleostei	Cephalopholis sexmaculata	fish	LC	yes	sixspot grouper
Chordata	Teleostei	Cephalopholis sonnerati	fish	LC	yes	tomato hind
Chordata	Teleostei	Chaenomugil proboscideus	fish	LC		snouted mullet
Chordata	Teleostei	Chanos chanos	fish	LC	yes	milkfish, chano
Chordata	Teleostei	Chilomycterus reticulatus	fish	LC		spotfin burrfish
Chordata	Teleostei	Chlorurus sordidus	fish	LC	yes	
Chordata	Teleostei	Cirrhitichthys oxycephalus	fish	LC		pixy hawkfish
Chordata	Teleostei	Cirrhitus rivulatus	fish	LC		giant hawkfish
Chordata	Teleostei	Coryphaena equiselis	fish	LC		pompano dolphin
Chordata	Teleostei	Coryphopterus urospilus	fish	LC		redlight goby
Chordata	Teleostei	Cubiceps pauciradiatus	fish	LC		bigeye cigarfish
Chordata	Teleostei	Cubiceps whiteleggii	fish		yes	
Chordata	Teleostei	Decapterus macarellus	fish	LC		mackerel scad
Chordata	Teleostei	Decapterus macrosoma	fish	LC	yes	shortfin scad
Chordata	Teleostei	Diaphus splendidus	fish	LC	yes	
Chordata	Teleostei	Diodon holocanthus	fish	LC		balloonfish
Chordata	Teleostei	Diodon liturosus	fish		yes	black-blotched porcupinefish
Chordata	Teleostei	Diogenichthys laternatus	fish	LC		Diogenes lanternfish
Chordata	Teleostei	Diplophos taenia	fish	LC		Pacific portholefish
Chordata	Teleostei	Doryrhamphus excisus	fish	LC		bluestripe pipefish
Chordata	Teleostei	Elagatis bipinnulata	fish	LC		rainbow runner
Chordata	Teleostei	Entomacrodus caudofasciatus	fish	LC	yes	
Chordata	Teleostei	Entomacrodus chiostictus	fish	LC		notchfin blenny
Chordata	Teleostei	Entomacrodus sealei	fish	LC	yes	
Chordata	Teleostei	Epinephelus clippertonensis	fish	LC		
Chordata	Teleostei	Eucinostomus dowii	fish	LC	yes	Pacific spotfin mojarra
Chordata	Teleostei	Euthynnus affinis	fish	LC		kawakawa, thonine orientale
Chordata	Teleostei	Fistularia commersonii	fish	LC		cornetfish
Chordata	Teleostei	Gempylus serpens	fish	LC		snake mackerel
Chordata	Teleostei	Gerres cinereus	fish	LC	yes	yellowfin mojarra
Chordata	Teleostei	Gymnomuraena zebra	fish	LC		zebra moray
Chordata	Teleostei	Gymnothorax buroensis	fish	LC	yes	vagrant moray
Chordata	Teleostei	Halichoeres insularis	fish	VU		Socorro wrasse
Chordata	Teleostei	Halichoeres melanotis	fish	LC		golden wrasse
Chordata	Teleostei	Halichoeres nicholsi	fish	LC		spinster wrasse
Chordata	Teleostei	Halichoeres notospilus	fish	LC		banded wrasse
Chordata	Teleostei	Heteropriacanthus cruentatus	fish	LC		glasseye snapper
Chordata	Teleostei	Holacanthus passer	fish	LC		king angelfish
Chordata	Teleostei	Hygophum reinhardtii	fish	LC		Reinhardt's lantern fish
Chordata	Teleostei	Hypsoblennius brevipinnis	fish	LC	yes	barnaclebill blenny
Chordata	Teleostei	Iniistius pavo	fish	LC		peacock razorfish
Chordata	Teleostei	Katsuwonus pelamis	fish	LC		skipjack tuna, bonite à ventre rayé
Chordata	Teleostei	Kyphosus pacificus	fish			
Chordata	Teleostei	Kyphosus vaigiensis	fish	LC		brassy chub
Chordata	Teleostei	Labrisomus multiporosus	fish	LC		porehead blenny

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phylum	class	species	group	category	new	vernacular
Chordata	Teleostei	Labrisomus xanti	fish	LC		largemouth blenny
Chordata	Teleostei	Lagocephalus lagocephalus	fish	LC		oceanic puffer
Chordata	Teleostei	Lampanyctus parvicauda	fish	LC		
Chordata	Teleostei	Lutjanus kasmira	fish	LC	yes	common bluestripe snapper
Chordata	Teleostei	Luvarus imperialis	fish	LC		luvar, louvureau
Chordata	Teleostei	Lythrypnus dalli	fish	LC	yes	bluebanded goby
Chordata	Teleostei	Lythrypnus rhizophora	fish	DD		spottedcheek goby
Chordata	Teleostei	Melanocetus johnsonii	fish	LC	yes	Humpback anglerfish
Chordata	Teleostei	Melichthys niger	fish	LC		black durgon
Chordata	Teleostei	Microspathodon dorsalis	fish	LC		giant damselfish
Chordata	Teleostei	Mulloidichthys vanicolensis	fish	LC	yes	yellowfin goatfish
Chordata	Teleostei	Myctophum aurolaternatum	fish	LC		
Chordata	Teleostei	Myripristis berndti	fish	LC		blotcheye soldierfish
Chordata	Teleostei	Myripristis leiognathus	fish	LC		Panamic soldierfish
Chordata	Teleostei	Ophioblennius atlanticus	fish	LC		
Chordata	Teleostei	Ophioblennius steindachneri	fish	LC		Panamic fanged blenny
Chordata	Teleostei	Ostracion meleagris	fish			whitespotted boxfish
Chordata	Teleostei	Oxyporhamphus micropterus	fish			smallwing flyingfish
Chordata	Teleostei	Paralichthys californicus	fish	LC	yes	California halibut
Chordata	Teleostei	Paranthias colonus	fish			Pacific creolefish
Chordata	Teleostei	Plectrypops lima	fish	LC		
Chordata	Teleostei	Prionurus laticlavus	fish	LC		razor surgeonfish
Chordata	Teleostei	Prionurus punctatus	fish	LC		yellowtail surgeonfish
Chordata	Teleostei	Pronotogrammus multifasciatus	fish	LC		threadfin bass
Chordata	Teleostei	Pseudogramma thaumasia	fish			
Chordata	Teleostei	Rypticus saponaceus	fish	LC	yes	greater soapfish
Chordata	Teleostei	Sardinops sagax	fish	LC		California pilchard, pilchard sudaméricain
Chordata	Teleostei	Sargocentron suborbitale	fish			
Chordata	Teleostei	Scarus rubroviolaceus	fish	LC		ember parrotfish
Chordata	Teleostei	Schindleria praematura	fish	LC		
Chordata	Teleostei	Scomber australasicus	fish	LC		spotted chub mackerel
Chordata	Teleostei	Scomber japonicus	fish	LC		Atlantic chub mackerel, maquereaux blanc
Chordata	Teleostei	Scorpaenodes evides	fish	LC	yes	
Chordata	Teleostei	Scorpaenodes xyris	fish	LC		rainbow scorpionfish
Chordata	Teleostei	Scuticaria tigrina	fish	LC		tiger reef eel
Chordata	Teleostei	Selar crumenophthalmus	fish	LC		bigeye scad
Chordata	Teleostei	Seriola lalandi	fish	LC		yellowtail, sérieole chicard
Chordata	Teleostei	Seriola rivoliana	fish	LC		Almaco jack, sérieole limon
Chordata	Teleostei	Serranus aequidens	fish	LC		deepwater serrano
Chordata	Teleostei	Stegastes beebei	fish	VU	yes	
Chordata	Teleostei	Stethojulis bandanensis	fish	LC		
Chordata	Teleostei	Sufflamen verres	fish	LC		orangeside triggerfish
Chordata	Teleostei	Thalassoma lucasanum	fish	LC		Cortez rainbow wrasse
Chordata	Teleostei	Thalassoma lutescens	fish	LC		
Chordata	Teleostei	Thalassoma purpureum	fish	LC	yes	surge wrasse
Chordata	Teleostei	Thalassoma robertsoni	fish	VU	yes	
Chordata	Teleostei	Thunnus alalunga	fish	LC		albacore, thon blanc
Chordata	Teleostei	Tylosurus acus	fish	LC		agujon needlefish
Chordata	Teleostei	Tylosurus crocodilus	fish	LC	yes	houndfish
Chordata	Teleostei	Uropterygius macrocephalus	fish	LC		largehead moray

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phylum	class	species	group	category	new	vernacular
Chordata	Teleostei	Vinciguerria lucetia	fish	LC		
Chordata	Teleostei	Vinciguerria nimbaria	fish	LC	yes	oceanic lightfish
Chordata	Teleostei	Woodsia nonsuchae	fish	LC	yes	bigeye lightfish
Chordata	Teleostei	Xanthichthys mento	fish	LC		redtail triggerfish
Chordata	Teleostei	Xanthichthys ringens	fish	LC		Sargassum triggerfish
Chordata	Teleostei	Zanclus cornutus	fish	LC		Moorish idol
Chordata		Chelonia mydas	turtles	EN		green turtle, tortue verte
Cnidaria	Anthozoa	Exaiptasia diaphana	jellyfish		yes	
Cnidaria	Anthozoa	Pacifigorgia irene	jellyfish		yes	
Cnidaria	Anthozoa	Pocillopora damicornis	jellyfish	LC		cauliflower coral
Cnidaria	Hydrozoa	Abylopsis eschscholtzii	jellyfish		yes	
Cnidaria	Hydrozoa	Agalma elegans	jellyfish		yes	
Cnidaria	Hydrozoa	Athorybia rosacea	jellyfish		yes	
Cnidaria	Hydrozoa	Clytia gracilis	jellyfish			
Cnidaria	Hydrozoa	Clytia linearis	jellyfish		yes	
Cnidaria	Hydrozoa	Diphyes bojani	jellyfish		yes	
Cnidaria	Hydrozoa	Forskalia edwardsii	jellyfish		yes	
Cnidaria	Hydrozoa	Forskalia tholoides	jellyfish		yes	
Cnidaria	Hydrozoa	Halopteris alternata	jellyfish			
Cnidaria	Hydrozoa	Kirchenpaueria halecioides	jellyfish		yes	
Cnidaria	Hydrozoa	Nanomia bijuga	jellyfish		yes	
Cnidaria	Hydrozoa	Obelia dichotoma	jellyfish			sea thread hydroid
Cnidaria	Hydrozoa	Physalia physalis	jellyfish		yes	Portuguese man-of-war, galère portugaise
Cnidaria	Hydrozoa	Porpita porpita	jellyfish		yes	blue button
Cnidaria	Hydrozoa	Rhizophysa filiformis	jellyfish		yes	
Cnidaria	Hydrozoa	Sphaeroneustes koellikeri	jellyfish		yes	
Cryptophyta	Cryptophyceae	Hemiarma marina			yes	
Echinodermata	Asteroidea	Acanthaster planci	starfish			crown-of-thorns
Echinodermata	Asteroidea	Pentaceraster cumingi	starfish			
Echinodermata	Echinoidea	Echinometra oblonga	starfish			
Echinodermata	Echinoidea	Lovenia cordiformis	starfish			
Echinodermata	Echinoidea	Tripneustes gratilla	starfish		yes	collector urchin
Echinodermata	Holothuroidea	Eupta lappa	starfish		yes	
Echinodermata	Holothuroidea	Holothuria (Platyperona) difficilis	starfish			
Echinodermata	Holothuroidea	Holothuria (Stauropora) pervicax	starfish		yes	
Echinodermata	Ophiuroidea	Amphipholis squamata	starfish		yes	dwarf brittle star
Echinodermata	Ophiuroidea	Ophiactis picteti	starfish		yes	
Echinodermata	Ophiuroidea	Ophiactis savignyi	starfish			
Echinodermata	Ophiuroidea	Ophiactis simplex	starfish		yes	
Echinodermata	Ophiuroidea	Ophiocoma erinaceus	starfish		yes	
Echinodermata	Ophiuroidea	Ophiocomella alexandri	starfish			
Echinodermata	Ophiuroidea	Ophiocomella sexradia	starfish			
Echinodermata	Ophiuroidea	Ophioderma panamense	starfish			
Echinodermata	Ophiuroidea	Ophionereis annulata	starfish			
Haptophyta	Coccolithophyceae	Chrysochromulina tobinii	algae		yes	
Haptophyta	Coccolithophyceae	Emiliania huxleyi	algae		yes	
Haptophyta	Coccolithophyceae	Phaeocystis globosa	algae		yes	
Hemichordata	Enteropneusta	Ptychodera flava			yes	Hawaiian acorn worm
Mollusca	Cephalopoda	Octopus hubbsorum	molluscs	LC		
Mollusca	Cephalopoda	Sthenoteuthis oualaniensis	molluscs	LC		purpleback flying squid

Continued on next page

phylum	class	species	group	category	new	vernacular
Mollusca	Gastropoda	Creseis virgula	molluscs		yes	
Mollusca	Gastropoda	Cupolaconcha meroclista	molluscs		yes	
Mollusca	Gastropoda	Firoloida desmarestia	molluscs		yes	
Mollusca	Gastropoda	Glaucus atlanticus	molluscs		yes	sea swallow
Mollusca	Gastropoda	Naria albuginosa	molluscs			aubergine cowry
Mollusca	Gastropoda	Niparaya regiscorona	molluscs		yes	
Mollusca	Gastropoda	Phestilla lugubris	molluscs		yes	
Mollusca	Gastropoda	Stylocheilus rickettsi	molluscs		yes	
Myzozoa	Dinophyceae	Karenia brevis	single-cell		yes	
Ochrophyta	Dictyochophyceae	Octactis octonaria	algae			
Ochrophyta	Dictyochophyceae	Pseudochattonella farcimen	algae		yes	
Ochrophyta	Dictyochophyceae	Vicicitus globosus	algae		yes	
Ochrophyta	Pelagophyceae	Aureococcus anophagefferens	algae		yes	
Ochrophyta	Pelagophyceae	Pelagomonas calceolata	algae		yes	
Ochrophyta	Phaeophyceae	Colpomenia sinuosa	algae		yes	
Ochrophyta	Phaeophyceae	Dictyota flabellata	algae		yes	
Ochrophyta	Phaeophyceae	Diplura simplex	algae		yes	
Ochrophyta	Phaeophyceae	Lobophora obscura	algae		yes	
Ochrophyta	Phaeophyceae	Neoralfsia expansa	algae		yes	
Porifera	Demospongiae	Chondrosia collectrix	sponges		yes	
Porifera	Demospongiae	Cliona vermifera	sponges			orange boring sponge
Porifera	Demospongiae	Halichondria (Halichondria) bowerbanki	sponges		yes	Bowerbank's halichondria
Porifera	Demospongiae	Pione vastifica	sponges		yes	boring sponge, clione rouge
Porifera	Demospongiae	Thoosa purpurea	sponges			
Rhodophyta	Florideophyceae	Amphiroa foliacea	algae		yes	
Rhodophyta	Florideophyceae	Asparagopsis taxiformis	algae			
Rhodophyta	Florideophyceae	Dasya caraibica	algae		yes	
Rhodophyta	Florideophyceae	Galaxaura filamentosa	algae			
Rhodophyta	Florideophyceae	Ganonema farinosum	algae		yes	
Rhodophyta	Florideophyceae	Gelidiella acerosa	algae			
Rhodophyta	Florideophyceae	Hypnea pannosa	algae			
Rhodophyta	Florideophyceae	Janczewskia hawaiiiana	algae		yes	
Rhodophyta	Florideophyceae	Melanothamnus ramireziae	algae		yes	
Rhodophyta	Florideophyceae	Monosporus indicus	algae		yes	
Rhodophyta	Florideophyceae	Pterocladella capillacea	algae			
		Amastigomonas debrynei			yes	