

Table S1. Frameworks on Essential Variables for ocean biology and ecosystems organized by focal ecosystem component

Focal ecosystem component	PICO plan (UNESCO, 2012)	GEO BON EBVs (Pereira et al., 2012)	GEO-WOW (2012)	IOC proposed eEOV (UNESCO, 2013)	IMOS EOVS (IMOS, 2015)	IOOS EOVS (NOC, 2016)	SOOS eEOVs (Constable et al., 2016)	GCOS ECVs (related to Ocean Biology and Ecosystems) (WMO, 2016)	GOOS BioEco identified EOVS (this paper)
BACTERIA									
			Bacterial communities				Microbial loop		Microbe diversity and biomass(*)
	Distribution and abundance of waterborne pathogens		Abundance of waterborne pathogens						
PHYTOPLANKTON									
	Phytoplankton biomass	Primary productivity	Phytoplankton pigments Primary productivity and biomass (chl-a)	Chlorophyll	Chlorophyll a concentration Primary Productivity Phytoplankton biomass	Ocean color Phytoplankton Abundance	Color spectrum	Phytoplankton (biomass)	Phytoplankton biomass
	Distribution and abundance of toxic phytoplankton		Toxic phytoplankton abundance	Harmful Algal Blooms (HABs)				Harmful Algal Blooms (HABs)	
		Genetic composition Species populations Species traits Community composition			Phytoplankton species	Phytoplankton Species	Phytoplankton species		Phytoplankton diversity
			Phytoplankton (size)				Phytoplankton (size spectrum)		
			Diatoms/non-diatom ratio						
			Calcareous phytoplankton abundance						
ZOOPLANKTON									
	Copepod indicator species Fish eggs and larvae	Genetic composition Species populations Species traits Community composition	Abundance of copepod indicator species Abundance of eggs, larvae and size classes of exploited fish stocks		Zooplankton Species	Zooplankton Species	Zooplankton Species Zooplankton size spectrum	Zooplankton diversity, abundance and size spectrum	Zooplankton biomass and diversity
		Secondary productivity	Zooplankton (abundance, size structure, composition and timing)	Zooplankton (biomass/abundance) Zooplankton (krill)	Zooplankton Biomass	Zooplankton Abundance	Zooplankton abundance/density Krill abundance and size spectrum		
	Distribution and condition of calcareous plankton								
							Diet of zooplankton and krill		
									Catch reports of zooplankton and krill
BENTHOS									
	Extent of living benthic habitats	Secondary productivity Habitat structure Ecosystem extent and fragmentation	Extent of living benthic habitats	Mangrove Area Coral cover Salt Marsh Area Seagrass area	Benthos (% coverage of species)		Diversity, abundance, and size spectrum of benthic sessile and mobile invertebrates and fish	Coral cover Seagrass cover Mangrove cover Macroalgal cover	Live coral Seagrass cover Macroalgal canopy Mangrove cover
	Species diversity		Species diversity of communities associated with living benthic habitats			Submerged Aquatic Vegetation Species/Abundance Invertebrate species/abundance Coral Species/Abundance			Benthic invertebrate abundance and distribution (*)
	Coral skeletal density		Coral skeletal density						
							Diet of benthic fish		
									Catch reports of benthic species
NEKTON (FISH)									
		Genetic composition Species populations Species traits Community composition			Nekton Species Top Predators species Top predators – population	Fish Species	Diversity, abundance and size spectrum of mesopelagic fish		
	Abundance and size of apex predators		Abundance and size of apex predators	Abundance and distribution of large marine vertebrates	Nekton biomass	Fish abundance			Fish abundance and distribution
			Food webs and trophic changes			Nekton Diet	Diet of mesopelagic fish		
NEKTON (FISHERIES)									
	Abundance and diet of exploitable fish stocks	Secondary productivity	Diet of exploitable fish species						
			Fish stocks				Fish catch reports Fisheries magnitude/effort Fisheries range/location		
	Bycatch		Bycatch						
LARGE MARINE VERTEBRATES: TURTLES, BIRDS, AND MAMMALS									
		Genetic composition Species populations Species traits Community composition	Geographic distribution of taxa (biodiversity)	Tags and Tracking of species of value/large marine vertebrates		Marine Mammal Species/Abundance Sea Bird Species/Abundance Sea Turtle Species/Abundance	Diversity, abundance and size spectrum of Pygoscelis penguins Diversity and abundance of Aptenodytes penguins and humpback whales Abundance of crabeater, Antarctic fur and southern elephant seals Abundance of flying birds		Marine turtles, birds and mammals abundance and distribution
							Diet and foraging range of penguins, humpback whales, seals and flying birds Phenology of penguins and seals Reproductive rate of penguins, seals and flying birds		
						Sound			
OTHERS									
						Biological Vital rates			

Variables in blue: proposed by the IOOC Bio Task Team (NOC, 2016)

(*) Identified as emerging EOVS in this paper

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