**Supplementary Data:**

Ocean acidification may affect several ecosystems and their organisms that have biological and socio-economic importance.

**Table 1**

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| --- | --- | --- | --- |
| **Ecosystems and organisms likely to be affected by ocean acidification** | **Biological importance** | **Socio-economic importance** | **Impacts of ocean acidification** |
| Coral reefs | * Major marine ecosystem
* Central role in sustaining the biodiversity in the oceans realm (host 1/3 of all marine life)
* Nursery for numerous organisms
* Carbon export to the open sea
* Corals as major habitat builders (ecosystem engineer)
 | * Coastal protection
* Provide various resources, including drugs (antibacterial, antimitotic…)
* Materials for construction
* Food source for about 500 M people
* Tourism industry, recreational and leisure
* Entertainment (e.g. films and documentaries)
* Aquarium market
* Recreational and commercial fisheries
 | Weakens carbonate skeletons and reduces coral growth, narrows distribution range, exacerbates temperature effects, shifts in species composition, |
| Coralligen (gorgonians, red coral, crustose coralline algae…) | * High biological diversity
* Habitat
* Spawning site
* Inducer for larval invertebrate settlement (crustose coralline algae)
 | * Ecosystem maintenance
* Recreational fisheries
* Recreational diving
* Entertainment (e.g. films and documentaries)
* Jewelry (red coral)
* Use for construction and as a soil conditioner (crustose coralline algae)
 | Very few data available, potential effect by reduction of calcification |
| Pelagic ecosystems | * Very large ecosystems (open ocean)
* Key element in ocean productivity and food webs
* Very large reservoir of marine organisms
* Very important carbon reservoir
* Nutrient cycling
* Biogas production and flux to atmosphere
 | * Globally important source of oxygen
* Globally important source of primary production supporting major food webs
* Source of genes and drugs
* Commercial fisheries
* Recreational fisheries
* Carbon sequestration
 | Shifts in species composition, potential effect on plankton growth and productivity |
| Plankton species(foraminifera, coccolithophores, pteropods)  | * Major component of the food web
* Major component of marine ecosystems
* Large primary production
* Major elements in the carbon cycle
* Calcifier species are major elements for long-term landscape builders (sedimentary rocks)
 | * Globally important source of oxygen for some species
* Carbon sequestration
* Food source for fishes
* Biofuels
* Genetic resources, drugs…
 | Likely important, potential effect by change of calcification and productivity |
| Macroalgae and seagrass meadows | * *Seagrass* beds: spawning site, nursering grouds, high biodiversity
* Oxygen production
* Habitat, high biodiversity
* Food supply for large grazers
* High productivity
* Nutrient cycling
 | * Food source
* Biofuels, alginates and land fertilizer
* Oxygen production
* Sediment stabilization
* Commercially harvested species
* Coastal protection (by reducing water currents)
* Water purification
* Recreational and commercial fisheries
* Ecosystem maintenance
* Recreational diving
 | CO2 entichment has fertilizing effect but alteration of species composition and biodiversity could occur.Some species may benefit from OA (increase in productivity) |
| Estuarine environment | * Interface between land and sea leading to an highly variable environment
* Important habitat for birds (particularly migratory birds)
 | * Nursery for commercial fish and invertebrates
* Key transport hubs
* Commercial, industrial, recreational fisheries
* Aquaculture activities
* Bird watching
* Ecotourism
* Most preferred residential locations and harbours
 | Vulnerable to multiple stressors including acidification from freshwater input, ocean acidification will be stronger in low salinity waters |
| Deep-sea | * Largest (but yet least-known) habitat on earth
* Largest store of carbon (apart from rocks) on planet
* High biodiversity
* Important endemic / specific organisms
* Cold-water corals as ecosystem engineer and support of deep-water ecosystems
* Important part of food web
* Important in remineralization of organic matter and nutrient recycling, important carbon sink role
 | * Habits for deep-sea fishes (nursery)
* Source of new genes, enzymes, chemicals and drugs
* Commercial fisheries
* Entertainment (e.g. films and documentaries)
 | Weakens carbonate skeletons and reduces coral growth, shifts in species composition, change in nutrient cycles |
| Polar regions | * Original ecosystems with highly specific (endemic) organisms
* Significant carbon cycling role (Southern Ocean)
 | * Source of new genes and drugs
* Tourism, touristic cruise
* Commercial fisheries
* Entertainment (e.g. films and documentaries)
* Home to charismatic species such as polar bears
 | Ocean acidification will be stronger in cold waters, but only few data on sensitivity of polar organisms |
| Mollusks (oysters, musels, scallops, nudibranchs, sea snails, limpets, squids…) | * Second largest [marine](http://en.wikipedia.org/wiki/Marine_biology) phylum (about 17% of all the known marine [organisms](http://en.wikipedia.org/wiki/Organism))
* Important part of food web
* Landscape builders
 | * Important human food source (sea foods: oysters, mussels, scallops…)
* Aquaculture
* Jewelry (pearls, mother-of-pearl)
* Source of drugs (antibacterial, antifungal, anti-inflammatory, antimitotic…)
* Genetic resources
* Source of textile fibers
* Aquariology
 | Weakens carbonate shells and reducesreproduction, growth, shifts in species composition |
| Echinoderms (Sea urchins, sea cucumbers, starfish…) | * Important part of food web
* Keystone species and ecosystem engineers
 | * Human food source (sea urchins, sea cucumbers
* Genetic resources
* Major animal model for developmental biology and regenerative medicine (sea urchins, starfish)
 | Weakens carbonate skeletons and reduces growth, possible total extinction of some species (brittlestars) |
| Sponges | * Ecosystem engineer, landscape formation, habitat for important fish species
* Water filtration
 | * Sponge culture
* Important source of drugs
* Recreational diving
* Genetic resources, enzymes antibacterial compounds
 | Weakens carbonate skeletons and reduces growth |
| Crustaceans(crabs, prawns, lobsters, crayfish…) | * First largest animal phylum
* Important part of food web
 | * Important human food source
* Use in aquaria
* Source of drugs and chitin
 | Inhibition to stimulation of growth according to species, shifts in species composition |
| Marine mammals (whales, dolphins, seals…) | * Plankton-eaters and source of carbon for deep-sea ecosystems (carcass)
* Top predators and food source
* Role in nutrient cycle (e.g. Southern Ocean
 | * Cultural role (charismatic species)
* Ecotourism such as whale watching
* Fishes by some cultures
* Entertainment (e.g. films and documentaries)
 | Possible indirect effects by change in the food web |
| Fishes(herrings, sardines, anchovies, tunas, cods, flounders, sharks…) | * Important part of food web
* Forage species for top predators
* Some are top predators
 | * Commercial fisheries
* Aquaculture
* Human food (almost 80% of the world catch)
* Oil production
* Fish meal provision
* Recreational fisheries
* Cultural role (charismatic species and cultural heritage)
* Entertainment (e.g. stories, films and documentaries)
 | Effects uncertain, disturbances reported in development, behaviours and predation abilities |
| Bacterial community | * Drivers of major biogeochemical cycles (decomposition of organic matter, nutrient regeneration…)
* Most production is cycled through the microbial loop
* Some are major actor in O2 production and marine productivity
* Food source for small heterotrophic zooplankton and benthic feeders
 | * Ecosystem maintenance
* Nutrient cycling
* Sewage treatment
* Source of new genes and drugs
 | Potential alteration of microbial processes, potential impact on biogeochemical cycles and climate regulation |
| Jellyfish | * Important part of food web
* Biological model for medical research
 | * Commercial fisheries
* Competitors with fishermen
* Obstacle for beach activities, no swimmers
* Genetic resources
* Source of drugs and medical compounds
 | Few contrasting data available, possible indirect effects |