Table 3.SM.3: 3.4.4 Ocean Systems

| Risk | Region | Metric (Unit) | Baseline Time Period against Which Change Measured | Baseline Global T | Climate Scenario | Transient (T) or Equilibrium (E) | Overshoot Scenario? | Dynamic Model? | Projected Impact at 1.5°C above Pre-Industrial | Projected Impact at 2°C above Pre-Industrial | Projected Impact at Delta T(°C) | Level of Risk after Adaptation at 1.5°C | Level of Risk after Adaptation at 2°C | Reference |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SST/distributions of pelagic fish species | Northeast Pacific shelf seas | km/decade migrated | 2000–2050 | 0.5°C | (SRES) A2 | T | N | Y | 30.1 ± 2.34 (SRES A2 is around 1.5°C at 2050, average across 28 species) | Likely to increase further | - | - | - | Cheung et al. (2015) (NW Pacific paper) |
| SST/distributions of pelagic fish species | West coast USA | Local exitinction rate | 2000–2050 | 0.5°C | (SRES) A2 | T | N | Y | Increased | Likely to increase further | - | - | - | Cheung et al. (2015) (NW Pacific paper) |
| SST/distributions of pelagic fish species | Northeast Pacific shelf seas | Species invasion rate | 2000–2050 | 0.5°C | (SRES) A2 | T | N | Y | Increased | Likely to increase further | - | - | - | Cheung et al. (2015) (NW Pacific paper) |
| Increased SST (surface), reduced O2, decreased NPP | Global | Species turnover | 1950–1969 | Pre-industrial | 19 CMIP5 models: RCP8.5 (3.5°C at end of century) | T | N | Y | - | - | 21.6 ± 0.33% | - | - | Cheung et al. (2016) |
| Increased SST (surface), reduced O2, decreased NPP | Global | Species turnover | 1950–1969 | Pre-industrial | 19 CMIP5 models: RCP2.6 | E | N | Y | 8.3 ± 0.05% | Likely to increase further | - | - | - | Cheung et al. (2016) |
| Increased SST (surface), reduced O2, decreased NPP | Indo-Pacific | Species turnover | 1950–2100 | 1950 and 1969 | 19 CMIP5 models: RCP8.5 | E | N | Y | - | - | 36.4 ± 2.1% | - | - | Cheung et al. (2016) |
| Increased SST (surface), reduced O2, decreased NPP (species turnover) | Indo-Pacific | Species turnover | 1950–2100 | 1950 and 1969 | 19 CMIP5 models: RCP2.6 | E | N | Y | 9.2 ± 0.8% | 12.1 ± 0.8% | - | - | - | Cheung et al. (2016) |
| Increased SST (surface), reduced O2, decreased NPP (maximum catch potential) | Indo-Pacific | $10^6$ metric tons | 1950–2100 | Average of the top 10-year global annual catches since 1950 | 19 CMIP5 models: RCP8.5 | E | N | Y | - | Linear with change in increased SST, O2, NPP decrease, etc.) | –46.8 ± 1.2% | - | - | Cheung et al. (2016) |
| Increased SST (surface), reduced O2, decreased NPP (maximum catch potential) | Indo-Pacific | $10^6$ metric tons | 1950–2100 | Average of the top 10-year global annual catches since 1950 | 19 CMIP5 models: RCP8.5 | E | N | Y | - | - | –46.8 ± 1.2% | - | - | Cheung et al. (2016) |
| Increased SST (surface), reduced O2, decreased NPP (maximum catch potential) | Global | $10^6$ metric tons | 1950–2100 | Average of the top 10-year global annual catches since 1950 | 19 CMIP5 models: RCP2.6 | E | N | Y | -11.5 ± 0.6% | -20.2 ± 0.6% | - | - | - | Cheung et al. (2016) |
| Increased SST (surface), reduced O2, decreased NPP (maximum catch potential) | Arctic/temperate regions | % | 1950–2100 | Pre-industrial | 19 CMIP5 models: RCP8.5 | E | N | Y | 50 | Likely to increase further | 400 | - | - | Cheung et al. (2016) |
| Increased SST (surface), reduced O2, decreased NPP (maximum catch potential) | Equator | % | 1950-2100 | Pre-industrial | 19 CMIP5 models: RCP8.5 | E | N | Y | -70 | Likely to increase further | -30 | - | - | Cheung et al. (2016) |
| Increased SST (surface), reduced O2, decreased NPP (species turnover) | Arctic/temperate regions | % | 1950–2100 | Prei-ndustrial | 19 CMIP5 models: RCP8.5 | E | N | Y | 3 | Likely to increase further | 20 | - | - | Cheung et al. (2016) |
| Increased SST (surface), reduced O2, decreased NPP (species turnover) | Equator | % | 1950–2100 | Pre-industrial | 19 CMIP5 models: RCP2.6 | E | N | Y | 5 | Likely to increase further | 35 | - | - | Cheung et al. (2016) |
| Increased SST/coral bleaching and mortality | Tropics/subtropics | % loss of today's corals. | 2000 | 0.5°C | "Commit", A1b, A1F1, B1, A2 (B1 is closest to 1.5°C) | T | N | N | 80 | 95 | 100 | Close to zero if corals can increase their tolerance by +1.5°C (no evidence but discussed) | No change | Donner et al. (2009) |
| Increased SST/coral bleaching and mortality | Tropics/subtropics | % loss of today's corals | 1982–2005 | - | RCP2.6 | E | N | N | 95 | Even in the pathway with most pronounced emission reductions (RCP2.6), where CO2 equivalent concentrations peak at 455 ppm (Supplementary Fig. S1), 95% of reef locations experience annual bleaching conditions by the end of the century | 100 | No change | No change | Hooidonk et al. (2013) |
| Increased SST/coral bleaching and mortality | Tropics/subtropics | Median year at which annual bleaching occurs | 1983–2005 | Pre-industrial | RCP8.5 | T | N | N | 2045 | | 2055 | No change | No change | Hooidonk et al. (2016) |
| Increased SST/coral bleaching and mortality | Australia | Likelihood of extreme events like 2015–2016 occurring, that cause coral bleaching | 1861–2005 under both natural and anthropogenic forcings (historical), 1861–2005 under natural forcings only, and 2006–2100 under 4 RCP scenarios (RCP2.6, RCP4.5, RCP6.0 and RCP8.5) were analysed | 1901–2005 | 16 models CMIP5 | T,E | N | - | 64% (53–76%) | 87% (79–93%) | Even more likely | No change | No change | King et al. (2017) |