



A PRELIMINARY GLOBAL ASSESSMENT OF THE STATUS OF EXPLOITED MARINE FISH AND INVERTEBRATE POPULATIONS

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A report prepared by the *Sea Around Us* for OCEANA

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EXECUTIVE SUMMARY

An assessment of the status of 1320 fish and invertebrate populations (or ‘stocks’) of 483 species exploited by fisheries in 232 Marine Ecoregions (MEs) overlapping with the Exclusive Economic Zones (EEZs) of 218 countries and their overseas territories was performed using the CMSY method applied to annual catches (1950-2014) reconstructed by the *Sea Around Us*, with some emphasis on the 64 MEs overlapping with the EEZs of countries where OCEANA operates.

The main finding was that a large majority of the assessed populations (73.4%) had biomass below that associated with Maximum Sustainable Yield (B_{MSY}), 8.2% were collapsed ($B < 0.2 B_{MSY}$), and 18.5% were considered healthy and can produce MSY. Thus, these populations would be expected to generate higher sustainable catches if allowed to rebuild. A preliminary conservative estimate gives the foregone catch for the examined stocks as 20 million tonnes (24%), when catches in 2014 are compared with 90% of MSY level catches. The 90% reduction accounts for the fact that predator-prey interactions make it impossible to achieve MSY for all stocks simultaneously. This study examined only stocks identified to the species level. If the above percentage is scaled up to the total catch, this would amount to a preliminary estimate of about 26 million tonnes of foregone catch.

As expected, cases with unreliable catch statistics generated questionable results and high uncertainties. In particular, the CMSY method, when applied to catch statistics from countries that ‘manufactured’ high catches in recent decades, suggested lower declines in biomass than likely occurred. This implies that the results presented herein are conservative, i.e., do not exaggerate declining trends in biomass.

This study is preliminary in that informative priors could be provided only for fish and invertebrate populations in the waters of countries conducting systematic fisheries research on their major exploited populations. A plan is briefly presented on how this shortcoming will be mitigated in the second year of this project, which will also see the development of new features on the website of the *Sea Around Us*, allowing for the biomass estimates and other data from our stock assessments to be downloaded and/or the assessments to be rerun by users with different prior estimates. In the meantime, this report presents summaries of the status of some of the major stocks in the countries where OCEANA operates, while summaries (in form of PDFs) for all 1320 stocks may be found at www.searoundus.org/under under the respective MEs or EEZs.

INTRODUCTION

Since the 1990s, there is a widespread perception that fisheries, almost everywhere, are in crisis, mainly due to a huge build-up in fishing effort and a declining resource base (Watson *et al.* 2013; Costello *et al.* 2016). However, while detailed stock assessments are available in many economically developed countries (e.g., the EU, Norway, the US, Canada or Australia), confirming large-scale resource depletion and providing a baseline for rebuilding effort (particularly in the US, the EU and Norway), similar stock assessments are generally lacking for developing countries.

There are many reasons for this deficiency, notably: (1) lack of expertise, only slowly alleviated through various training workshops (Venema *et al.* 1988; Palomares and Froese 2017); (2) the frequently cited “lack of data” and (3) a dearth of methods to generate at least preliminary assessments with the limited data that are available. While (1) remains a real problem, (2) and (3) have been mitigated, in the last 2 decades, through the development of computer-intensive methods relying mainly on fisheries catch time series. Moreover, a comprehensive global set of fisheries catch data has recently emerged, i.e., the reconstructed catches of the *Sea Around Us*, which corrects many of the worst problems associated with the database of landings (not catches!) disseminated by the Food and Agriculture Organization of the United Nations (FAO), which is largely based on unmodified submissions by its member countries (see Pauly and Zeller 2016a and www.seaaroundus.org).

Notably, the reconstructed data of the *Sea Around Us* (freely available at www.seaaroundus.org) include discarded catch and distinguish between different fishery sectors (industrial, artisanal, subsistence, and recreational). Perhaps most importantly, these reconstructed catch data are spatialized, i.e., distributed over 180,000 half degree latitude/longitude cells, with this spatialization accounting for the biological distribution of each taxon in the data as well as the access fishing countries may have to waters of other countries (Zeller *et al.* 2016). This allows marine catches to be assigned to spatial entities much smaller than the 19 giant Statistical Areas that FAO uses to assign marine landings. Thus, *Sea Around Us* data have been readily assigned to Exclusive Economic Zones (see the 273 EEZs in Pauly and Zeller 2016b), 64 Large Marine Ecosystems (LMEs; Pauly *et al.* 2008; NOAA 2018), and 232 Marine Ecoregions identified by Spalding *et al.* (2007).

Marine Ecoregions (MEs) are areas roughly corresponding to ecosystems, i.e., communities of plants, animals and other living organisms, which, jointly with the non-living components of their environment, can be found in particular habitats and which interact with each other. Thus, MEs serve as ‘units’ for the stock assessments that are presented in this report. We are aware that MEs do not necessarily overlap with all distinct populations of various exploited species, but the ecology-based geography they provide are more realistic (especially when grouped to account for ‘straddling’ stocks) than using the political boundary-based EEZs for our stock definitions, or even the giant artificial FAO Statistical Areas that were used for some global assessments (Costello *et al.* 2012; Rosenberg *et al.* 2014).

The assessments presented here should give an impression mainly of the state of the resource base of the countries and territories whose EEZs overlap with the MEs where the majority of the stocks we assessed are located. However, we also assessed highly migratory species, which ‘straddle’ EEZ or ME boundaries (and which may also occur in the High Seas) grouped by FAO areas or by combined MEs covering the areas where they migrate.

Reconstructed catches vs official catches

The catch time series data used for the present study are based on FAO data, corrected and complemented through a procedure called ‘catch reconstruction’ documented in Zeller *et al.* (2007), Lam *et al.* (2016), Palomares *et al.* (2016) and Zeller *et al.* (2016). The actual reconstructions were largely performed on a per-country (or overseas territory) basis, with over 200 papers (*Fisheries Centre Working Papers*, chapters in *Fisheries Centre Research Reports*, book chapters and articles in peer-reviewed journals) documenting the time series reconstructions in 273 EEZs or parts thereof (see Pauly and Zeller 2016b). Herein, the catch of industrial, artisanal, subsistence and recreational fisheries of each country or territory was presented, based on catch and related data from FAO or the fisheries agency of the country or territory in question, complemented with data from other sectors as required to obtain a complete time series, from 1950-2010 (now updated to 2014) of catches by the above-mentioned sectors including estimates of illegal and previously unreported catches (see, e.g., Le Manach *et al.* 2011; Belhabib *et al.* 2012; Tesfamichael *et al.* 2013; Abudaya *et al.* 2013; Palomares and Pauly 2014; Piroddi *et al.* 2015; Khalfallah *et al.* 2016; Derrick *et al.* 2017).

The difference between reconstructed vs official catches can be huge, for example, in small island states in the Caribbean, and especially in the Pacific, which emphasize their industrial tuna catches, but neglect to document catches of nearshore reef fishes, which massively contribute to their food security (Zeller *et al.* 2015). Overall, the reconstructed global catches over the last 65 years are 50% higher than reported catches. In addition, reconstructed catches are taxonomically disaggregated to a finer level than official catches; although, in some cases, this yielded species-specific time series of dubious validity, depending on how the disaggregation was performed.

For purposes of stock assessments, only that portion of the *Sea Around Us* reconstructed catches disaggregated to the species level was used. The December 2017 version of the *Sea Around Us* catch database contains 3386 taxa, 1446 of which are species-level taxa, the latter being those used in this analysis. Note that there are 260 taxa assigned to the category “not elsewhere identified”, and 1680 taxa representing genera, families, orders, classes and phyla (altogether representing just over 50% of the global catch). Thus, this study deals with the assessment of approximately half of the global marine catch³.

Marine ecoregions vs EEZs

The EEZs that countries can claim since the UNCLOS was concluded in 1982 extend a maximum of 200 nautical miles from the coast of maritime countries and their territories. Over 90% of the world’s marine fisheries catch originates from EEZs. In some cases, e.g., around isolated islands, the inshore fauna belongs to a distinct ecosystem, and hence their exploited fish populations can be treated as distinct ‘stocks.’ However, in the majority of cases, and especially for large countries (e.g., the USA or Russia), the EEZs along their coasts encompass a range of very different

³ Only the fraction of the catch reported at species level can be assessed by single-species methods. Thus, the results of assessments which purport to refer to the ‘global catch’, if they were based on single-species assessment methods, have been ‘scaled up’ to the global catch, even if this is not stated explicitly, as there is no way to assess the ‘miscellaneous fish’ that comprise the reported catch of numerous countries.

ecosystems. For example, the US east Coast EEZ ranges from high latitude temperate systems in New England (e.g., Gulf of Maine) to tropical coral reef ecosystems in southern Florida. Therefore, in order to better address ecosystem issues in fisheries data and assessments, a more nuanced spatial system of MEs is offered by the *Sea Around Us* in addition to EEZs and LMEs.

The Marine Ecoregions of the World (often referred to as MEOW, but here labelled MEs) are biogeographic entities along the world's shelves and coasts, as defined by Spalding *et al.* (2007). ME data and GIS shapefiles are available from a joint WWF/Nature Conservancy project. MEs have clearly defined boundaries and definitions and are generally smaller than LMEs.

MEs were derived to represent and spatially group ecological patterns of species and communities in the ocean, and to serve as a tool for conservation planning worldwide. The presently available ME system focuses on coast and shelf areas and does not consider open-ocean pelagic or deep benthic environments. The *Sea Around Us* anticipates that parallel but distinct systems for pelagic and deep benthic biotas can be integrated in the future, possibly leaning on the Pelagic Provinces concept of Spalding *et al.* (2012), and/or the biochemical provinces of Longhurst (2010).

Adopting and presenting MEs as part of our spatial data system ensures that the stock assessments we performed for all maritime countries in the world, based on the well-established data-poor CMSY method, originally proposed by Martell and Froese (2013) and operationalized by Froese *et al.* (2016a), are applied at appropriate ecosystem scales. Internal consistency in our global spatial data allocations are ensured in two steps: (1) we slightly modified some ME boundaries to correspond to existing EEZ boundaries; and (2) we assigned the 232 MEs of Spalding *et al.* (2007) to our 273 EEZs (and parts thereof) as a function of the MEs' overlap with the EEZs (see Appendix 1). Thus, the ME boundaries as presented and used on the *Sea Around Us* website may differ slightly from the ME shapefiles available from the WWF.

An example may be provided for MEs' overlap with the EEZs: Mexico has two separate EEZ components, one in the Atlantic, the other in the Pacific. On the Mexico (Atlantic) EEZ page, the *Sea Around Us* website lists the Southern Gulf of Mexico and Western Caribbean MEs as overlapping extensively with the Mexican Atlantic EEZ. However, a third ME (Northern Gulf of Mexico) also overlaps with Mexico's EEZ, though this involves only 14% of Mexico's Atlantic EEZ surface. For such cases, the *Sea Around Us* has set a minimum percentage coverage requirement of 20% of a given EEZ, in order for a partially overlapping ME to be included. Hence, in the present example, the boundary for the Northern Gulf of Mexico ME was slightly modified to exclude Mexican EEZ waters. Note also that some MEs will be accessible from two or more countries. For example, the ME called Chiapas-Nicaragua, which extends from Southern Mexico (Pacific) to the boundary of Nicaragua and Costa Rica, will also be listed in the EEZs of Guatemala (Pacific), El Salvador, and Nicaragua (Pacific).

The CMSY method

The Catch Maximum Sustainable Yield (CMSY) method first proposed in Martell and Froese (2013) and updated in Froese *et al.* (2016a) is based, like the Maximum Sustainable Yield (MSY) concept from which it gets its name, on an approach to fish population dynamics formulated by Schaefer (1954, 1957; see Figure 1). This approach, also known as ‘surplus-production’ modeling, assumes that a given ecosystem has, for any animal population, a specific carrying capacity (k), and that if this population is reduced through an external event (e.g., fishing), the population will tend to grow back toward its carrying capacity.

Such growth (r_B) will be determined by the attributes of the individuals of the population in question (individual growth rate, age at first maturity, natural mortality, fecundity, etc.), and by the current abundance (B) of the population. Thus, the abundance of a very small population cannot grow by a large amount, even if its r_B is relatively high, and neither will a population that is near carrying capacity, because in this case, r_B is close to zero. In other words, while the maximum population growth rate $r_B = r_{max}$ occurs at very low population size and r_B declines to zero as the population approaches its maximum size, high population growth occurs at intermediate abundance levels, and the maximum occurs at $k/2$. Note that the decline in r_B at high levels of abundance is not caused by density dependence of adults, but of recruits (due to a ‘hockey stick’ stock-recruitment curve), such that at carrying capacity, loss of adult biomass is replaced by recruit biomass, and thus recruit biomass and adult natural mortality (M) determines k . We follow the (slightly confusing) convention in the ecological literature to use r for maximum population growth rate instead of the more telling r_{max} .

Thus, a fishery can in principle maintain a given population at any given biomass level, by removing for every year, an amount of biomass equivalent to the natural growth of that population. Also, because production of new biomass is maximized at half carrying capacity ($k/2$), MSY is obtained when the unfished biomass (B_0) is halved, assuming $B_0 \sim k$.

The CMSY method is built on this conceptual framework, and it essentially consists of tracing, for a given exploited stock, random trajectories of its likely biomass and identifying the trajectories that

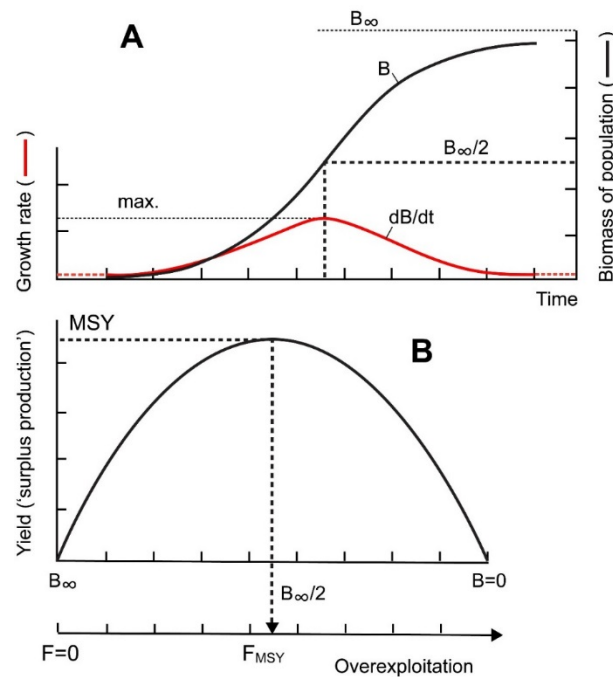


Figure 1. Basic principles behind (Schaefer-type) surplus-production models. A: the population size (i.e., biomass; B) of any living organisms (incl. fish) will, if released into a new ecosystem, increase slowly, then rapidly, then again slowly as the carrying capacity of the ecosystem (B_∞) is approached. B: The growth of that population (dB/dt), when plotted against biomass, generates a parabola, with low values of dB/dt (i.e., ‘surplus production’) near carrying capacity (B_∞) and near $B=0$. Surplus production has a maximum value at $B_\infty/2$, corresponding to Maximum Sustainable Yield. Surplus-yield predictions, and the CMSY method thus rest on a sound theoretical basis, as density-dependent limitation of carrying capacity is known to occur in all ecosystems (see also text and Figure 2).

remain viable while accommodating the catches taken from this population and a few other constraints. Here, ‘remaining viable’ means not going extinct, and the constraints (or ‘priors’) are assumed biomass reductions caused by fishing, a range for the carrying capacity (k) of the ME in question for the species under study, and a range of likely values of r , its maximum intrinsic rate of population growth (see Figure 2). Qualitative measures of r , i.e., resilience (as defined in Musick 1999 and refined in Musick *et al.* 2000), were taken from FishBase (www.fishbase.org). For most exploited species, FishBase also provides r priors from a range of biological parameters, especially natural mortality (M), the von Bertalanffy growth parameter K , generation time, maximum age, and fecundity.

In practice, this amounts to producing, given a catch time series and a wide range of growth rate–carrying capacity (r and k) estimates, a multitude of biomass trajectories, and to identify the mean of r and k values that produce the viable trajectories. As for the constraints, they refer specifically to independent prior knowledge about (a) the reduction of biomass by fishing (in %) from carrying capacity at the start of the time series, here usually 1950 (or when known, the year when the fishery was opened, as would be the case for, e.g., orange roughy, *Hoplostethus atlanticus*, which began to be exploited in the 1970s); and (b) the reduction of biomass at the end of the time series (also relative to k). Such independent knowledge about stock depletion can be obtained from general knowledge about the fishery (“good”, “not as good as it used to be”, “bad”, “very bad”) and is translated into

broad ranges of carrying capacity such as $0.4-0.8*k$ (i.e., 40-80% of the biomass level at the start of the fishery or of a particular point in time where the biomass level is explicitly known) for “good” or $0.01-0.4*k$ for “bad”. Finally, the version of the CMSY model used here also implements a Bayesian version of the full Schaefer model (BSM), which uses time series of relative biomass (e.g., catch per unit of effort or CPUE) from official stock assessments when available, typically resulting in narrower estimates of fisheries reference points and good agreement with the age-based more-data-demanding assessments (see Froese *et al.* 2016a, 2018).

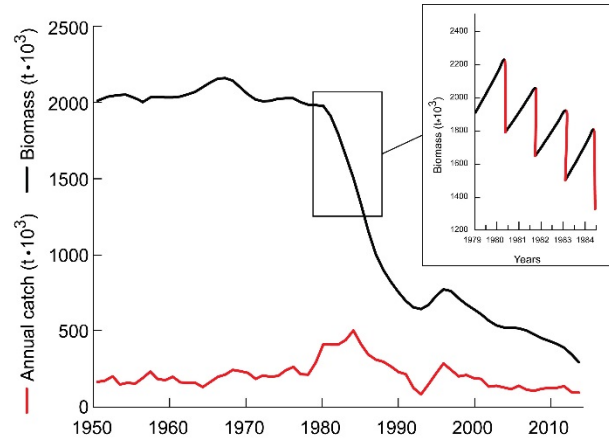


Figure 2. Illustrating the basic principle of the CMSY method: population biomass trajectories are projected from a start year (here 1950) where the biomass is assumed to be a (generally high) fraction of carrying capacity (k , or B_{∞}) which increase via annual growth increments (as a function of population growth rate, r , and B/B_{∞} , see Figure 1) and decrease due to catches (in red, see insert). The trajectories that are retained are those that do not crash the population and conform to various constraints (see text).

RESULTS AND DISCUSSION

The part of the *Sea Around Us* reconstructed catches that were disaggregated for 1446 species, represent around 17900 stocks from 232 MEs. Altogether, 2711 stocks (for 542 species) were identified, which represent 90% of the catch disaggregated to species level for the period 1990-2014. Of these, 15% were temporarily set aside because of serious problems with the underlying catch data (188 stocks) or because the catches are made up of $\geq 20\%$ discards (203 stocks; see below for section on problematic stocks and sources of bias). Furthermore, 271 stocks (representing 151 species) were considered to be ‘straddling’⁴. The lumping of straddling stocks into one large region (by FAO area or by ocean) or a combination of several MEs (see below) further reduced the number of stocks retained for these analyses to 1320 stocks and 483 species.

Of the 232 MEs, the Beaufort-Amundsen-Viscount Melville-Queen Maud, Beaufort Sea - continental coast and shelf, Bouvet Island, High Arctic Archipelago, Lancaster Sound, Macquarie Island, Ross Sea, Weddell Sea, Laptev Sea, and East Siberian Sea MEs were excluded from this analysis. These MEs are either in the Arctic Ocean, or in areas where Large Marine Protected Areas have been established and therefore, fishing has been stopped, or are largely inaccessible, or where only subsistence fisheries with catches below 1000 t are allowed. In addition, 30 MEs similar in nature or behaviour of the fisheries were pooled into 12 ‘super’-MEs, reducing the total number of MEs assessed to 215. These super-MEs were as follows: South and West Iceland + North and East Iceland; East Greenland Shelf + North Greenland; Gulf of Tonkin + Southern China; East China Sea + Yellow Sea; Northeastern New Zealand + Three Kings-North Cape; Arnhem Coast to Gulf of Carpentaria + Bonaparte Coast + Exmouth to Broome; South Australian Gulfs + Western Bassian + Bassian + Great Australian Bight; Manning-Hawkesbury + Tweed-Moreton + Cape Howe; Coral Sea + Central and Southern Great Barrier Reef + Torres Strait Northern Great Barrier Reef; Houtman + Shark Bay + Ningaloo; Gulf of Papua + Southeast Papua New Guinea; and North and East Barents Sea + White Sea.

About 20% of the super-MEs occur in Oceania, 19% in North America, 18% in Asia, 13% in Africa, 13% in South America, over 9% in Europe, about 8% for the Antarctic and 8% in the Arctic.

Almost half of the stocks assessed are from Asia and Oceania, which is an indication of the more speciose ecosystems making up these regions. About 30% of the stocks are from North and South America, while Africa and Europe make up just over 26% and those from Antarctica make up 1%

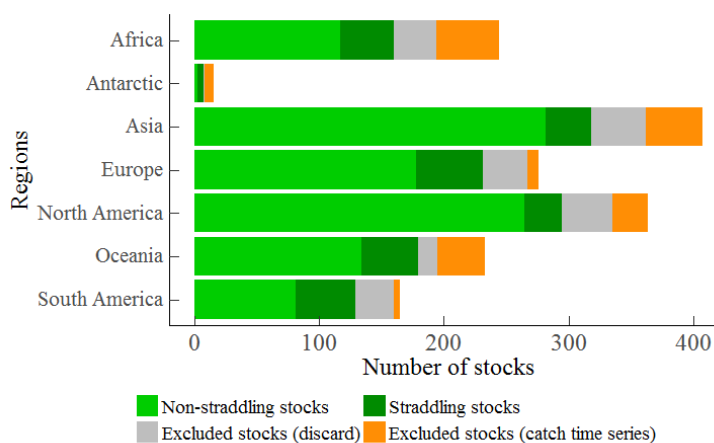


Figure 3. Summary of the number of stocks analyzed by marine ecoregion, including the number of stocks excluded from this analysis due to uncertainties in the underlying catch data or because more than 20% of the catch is from discard estimates.

⁴ Note that straddling stocks make up 100% of the analyzed stocks in 57 MEs considered here and that 16 straddling stocks were set aside for review later. This reduced the number of straddling stocks presented here to 255.

(Figure 3)⁵. For each assessed stock, we provide biomass B/B_{MSY} and exploitation F/F_{MSY} estimates based on either the CMSY or BSM results. The five-year (2010-2014) mean of B/B_{MSY} estimated for each of the 1320 stocks included here indicate that 8.2% of these stocks are collapsed ($B < 0.1 \cdot k$ or $B < 0.2 \cdot B_{MSY}$), 20.8% are grossly over-fished ($0.2 \cdot B_{MSY} \leq B < 0.5 \cdot B_{MSY}$), 25.6% are over-fished ($0.5 \cdot B_{MSY} \leq B < 0.8 \cdot B_{MSY}$), 27.0% are slightly over-fished ($0.8 \cdot B_{MSY} \leq B < 1.0 \cdot B_{MSY}$), and only 18.5% are of healthy stock size ($B \geq B_{MSY}$) and capable of producing catches close to MSY (Figure 4b)⁶. These results are similar to those obtained from a stock-status plot of global marine fisheries (see Figure 4a and Kleisner *et al.* 2013)⁷.

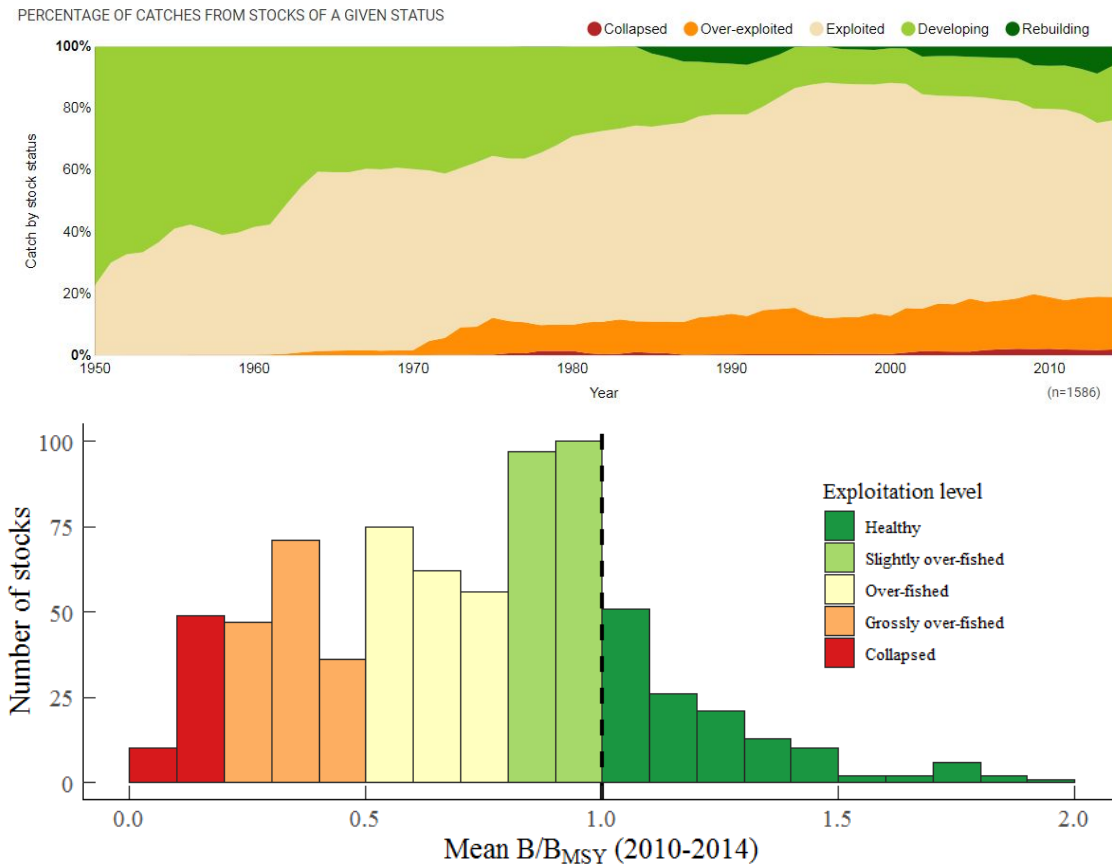


Figure 4. Two representations of the global status of fisheries. Upper panel: Stock-status plots for 1586 stocks downloaded from the *Sea Around Us* website, with the different colours documenting for each year the fraction of these stocks that have different catch levels relative to the maximum they achieved historically (see Kleisner *et al.* 2013). Lower panel: Frequency distribution of mean B/B_{MSY} over the most recent five-year period (2010-2014) for 1320 stocks analyzed in this study. Note the similarity of the messages conveyed by these two representations.

⁵ Summary histograms of number of stocks analyzed and excluded are presented for each region in Appendix II.

⁶ Frequency distribution histograms of B/B_{MSY} results for each region are presented in Appendix III.

⁷ See <http://www.seaaroundus.org/data/#/global/stock-status> for the stock status plots and <http://www.seaaroundus.org/stock-status-plots-method/> explaining the method applied by Kleisner and Pauly (2015).

If these populations were allowed to rebuild, they would be expected to generate higher sustainable catches. A preliminary conservative estimate gives the foregone catch for the examined stocks as 20 million tonnes (24%), when catches in 2014 are compared with 90% of MSY level catches. The 90% reduction accounts for the fact that predator-prey interactions make it impossible to achieve MSY for all stocks simultaneously. This study examined only stocks identified to species level. If the above percentage is scaled up to the total catch, this would amount to a preliminary estimate of about 26 million tonnes of foregone catch.

The stock assessments are currently presented, for each stock, in the form of a 2-page ‘Summary report’ described below (see also Figure 5). In the near future, the same data (or improved assessments, as the case might be) will be presented as interactive graphs for which underlying data can be downloaded.

Stock summaries reports

First page (Figure 5a)

Title: Common name of the species in the Marine Ecoregion.

Species: Scientific name of the species.

Stock Code: Identification code for species in an ME.

Marine Ecoregion: Name of Marine Ecoregion (or list of MEs, or FAO area or Ocean if straddling).

Region: RFMO area, FAO area, NAFO area, and/or ICES area the ME overlaps with.

Catch data source: *Sea Around Us* catch data for specified years, in tonnes (1000 kg).

URL for figure captions: This URL link takes the user to the method page where the detailed figure captions are available.

Catch graph: Catch data that were analyzed, with the estimate of MSY; the grey area indicates approximate 95% confidence limits.

Biomass graph: Estimate of relative biomass (B/B_{MSY}) with approximate 95% confidence limits.

Exploitation graph: Estimate of relative exploitation rate (F/F_{MSY}), with F_{MSY} accounting for reduced recruitment when the stock biomass drops below $0.5 B_{MSY}$. Grey area indicates approximate 95% confidence limits.

F/F_{MSY} vs B/B_{MSY} graph: Trajectory of relative stock size (B/B_{MSY}) vs relative exploitation (F/F_{MSY}), with approximate 50 %, 80 % and 90 % confidence limits for the end year.

Numeric results for management (based on CMSY or BSM analysis):

F_{MSY} : MSY-level rate of fishing mortality with approximate 95% confidence limits when the stock is within safe biological limits ($B > 0.5 B_{MSY}$).

F_{MSY} : MSY-level rate of fishing mortality with 95% confidence limits when stock is below safe biological limits ($B < 0.5 B_{MSY}$). F_{MSY} is then linearly reduced.

MSY: Maximum sustainable yield with approximate 95% confidence limits.

Atlantic cod in North Sea

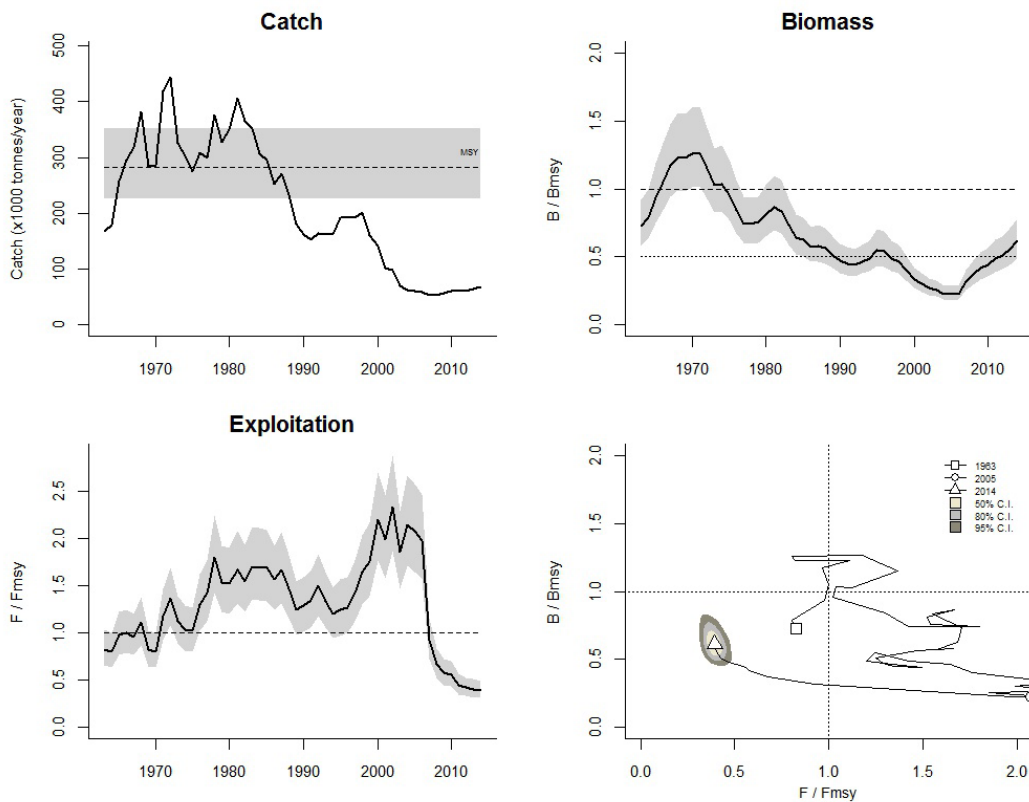
Species: *Gadus morhua*, Stock code: Gadu_mor_NorthSea.

Region: ICES areas 4.a; 4.b; 4.c; 3.a.21; 3.b.23; 7.d.

Marine Ecoregion: North Sea.

Reconstructed catch data used from years 1963 - 2014

For figure captions and method see <http://www.searoundus.org/cmsy-method>



Results for management (based on BSM analysis)

$F_{msy} = 0.211$, 95% CL = 0.166 - 0.27 (if $B > 1/2 B_{msy}$ then $F_{msy} = 0.5 r$)

$F_{msy} = 0.211$, 95% CL = 0.166 - 0.27 (r and F_{msy} are linearly reduced if $B < 1/2 B_{msy}$)

MSY = 282, 95% CL = 227 - 351; $B_{msy} = 1336$, 95% CL = 1034 - 1727 (1000 tonnes)

Biomass in last year = 824, 95% CL = 657 - 1042 (1000 tonnes)

B/B_{msy} in last year = 0.617, 95% CL = 0.492 - 0.78

Fishing mortality in last year = 0.0828, 95% CL = 0.0655 - 0.104

$F/F_{msy} = 0.392$, 95% CL = 0.31 - 0.492

Comment:

Figure 5A. Summary report for the Atlantic cod, *Gadus morhua*, in the North Sea. A: Page 1, presenting results for management use, which indicates the stock assessment model adapted for the stock (CMSY or BSM).

B_{MSY}: Biomass required to produce MSY, in 1000 tonnes, with approximate 95% confidence limits.

Biomass in last year: Estimate of biomass (B) in the last year in 1000 tonnes with approximate 95% confidence limits.

B/B_{MSY} in last year: Estimate of relative biomass in the last year with approximate 95% confidence limits.

Fishing mortality in the last year: Estimate of fishing mortality (F) in the last year with approximate 95% confidence limits. Units in year⁻¹.

F/F_{MSY}: Estimate of relative exploitation rate in the last year with approximate 95% confidence limits.

Comment: Description on any adjustments to priors or to CMSY method defaults done on the stock.

Second page (Figure 5b)

A: Catch graph: The *Sea Around Us* catch time series indicated by the bold black line. The three-year moving average indicated by the thinner blue line. Red circles indicate the highest and lowest catch used in the derivation of priors.

B: Finding viable r-k: The r-k log space that was explored, with dark grey points being r-k pairs found to be compatible with the catches and the prior information.

C: Analysis of viable r-k: The most probable r-k pair among the dark grey r-k points are indicated by a blue cross, which also indicates the approximate 95% confidence limits. If a BSM analysis was performed, the black points show possible r-k pairs, with the red cross indicating the most probable r-k pair with approximate 95% confidence limits.

D: Biomass: Estimate of relative biomass from CMSY shown by the blue solid line with blue dotted lines indicating approximate 95% confidence limits. If relative abundance data were available and used, an additional red solid line is shown, scaled to the BSM estimate of $B_{MSY} = 0.5 k$, with red dotted lines indicating the approximate 95% confidence intervals. The vertical blue lines indicate the prior biomass ranges.

E: Exploitation rate: CMSY estimates of exploitation rates in blue. BSM estimates of exploitation rates are in red.

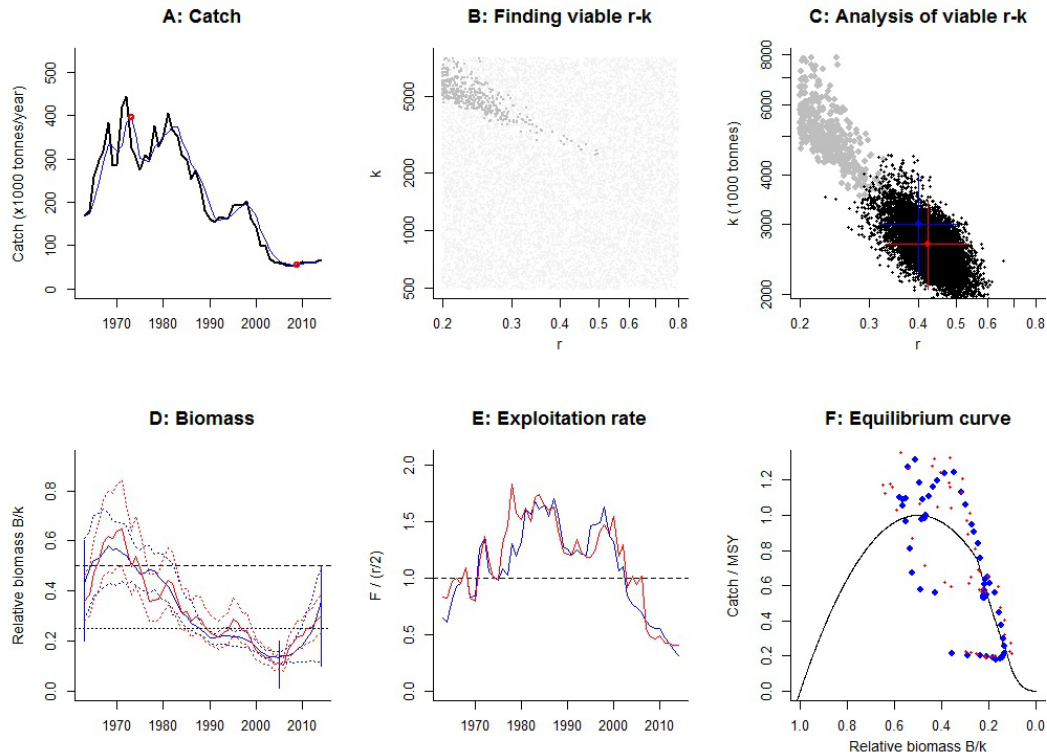
F: Equilibrium curve: The Schaefer equilibrium curve of catch/MSY relative to B/k with an indent at $B/k < 0.25$ to account for reduced recruitment at low stock sizes. The blue dots are CMSY estimates with red dots being BSM estimates, if present.

Results of CMSY analysis with total number of viable trajectories given of r-k pairs:

r: Maximum intrinsic rate of population growth estimated by CMSY r-k pairs with approximate 95% confidence limits. Units in year⁻¹.

k: Carrying capacity or unexploited size of stock, in 1000 tonnes, with approximate 95% confidence limits.

MSY: Maximum sustainable yield from CMSY with approximate 95% confidence limits, in 1000 tonnes per year.



Results of CMSY analysis with altogether 424 viable trajectories for 409 r-k pairs

$r = 0.402$, 95% CL = 0.32 - 0.503; $k = 3005$, 95% CL = 2242 - 4028 (1000 tonnes)
 MSY = 302, 95% CL = 264 - 344 (1000 tonnes/year)
 Relative biomass last year = 0.359 k , 95% CL = 0.117 - 0.487
 Exploitation $F/(r/2)$ in last year = 0.316

Results from Bayesian Schaefer model using catch and CPUE

$r = 0.423$, 95% CL = 0.332 - 0.539; $k = 2672$, 95% CL = 2067 - 3454
 MSY = 282, 95% CL = 227 - 351 (1000 tonnes/year)
 Relative biomass in last year = 0.308 k , 95% CL = 0.246 - 0.39
 Exploitation $F/(r/2)$ in last year = 0.392
 $q = 0.158$, 95% CL = 0.128 - 0.195
 Prior range of $q = 0.129 - 0.517$
 Relative abundance data type = CPUE
 Prior initial relative biomass = 0.2 - 0.6 expert
 Prior intermediate relative biomass = 0.01 - 0.2 in year 2005 expert
 Prior final relative biomass = 0.1 - 0.5 expert
 Prior range for $r = 0.2 - 0.8$ default, prior range for $k = 495 - 7925$ (1000 tonnes) default
 Source for relative biomass:
<http://www.ices.dk/sites/pub/Publication%20Reports/Advice/2016/2016/cod-347d.pdf>

Figure 5B. Summary report for the Atlantic cod, *Gadus morhua*, in the North Sea. B: Page 2, presenting the results of the CMSY analyses and the Bayesian Schaefer model for cases when CPUE from independent sources are available. For this particular stock, the BSM results (informed by independent CPUE estimates) were accepted as the more credible analysis.

Relative biomass last year: Estimate of biomass (B) in the last year in 1000 tonnes with approximate 95% confidence limits.

Exploitation $F/(r/2)$ in last year: Exploitation rate for the last year of time series.

Results from Bayesian Schaefer model (BSM) using catch & CPUE (section will appear only if relative abundance data were available and used).

r: Maximum intrinsic rate of population growth estimated by CMSY r-k pairs with approximate 95% confidence limits. Units in year⁻¹.

k: Carrying capacity or unexploited size of stock with approximate 95% confidence limits.

Relative biomass (last year): Estimate of relative biomass (B/k) in the last year in 1000 tonnes with approximate 95% confidence limits.

Exploitation $F/(r/2)$ in last year: Relative exploitation rate for the last year of time series.

q: catchability coefficient. Required to relate relative abundance to biomass.

Prior range of q: Low and high limits of range for q.

Relative abundance data type: There are three possibilities, 'None,' 'CPUE,' 'Biomass.'

Prior initial relative biomass: Can be user input or default values.

Prior intermediate relative biomass: Can be either input by users or default values.

Prior final relative biomass: Can be either input by users or default values.

Prior range for r: Intrinsic rate of population growth. Can be either input by users or default ranges (from resilience).

Prior range for k: Initial range of k used, calculated from prior r and catch.

Source for relative biomass: URL to source of relative biomass, if available.

Problematic stocks and sources of bias

The CMSY method is robust and usually converges to a solution, even when confronted with problematic data (Martell and Froese, 2013; Froese *et al.* 2016a, 2016b; 2018). However, in such cases, parameter estimates may be inaccurate. Below, we describe in qualitative terms, problematic catch data and their impact(s) on the resulting assessments and/or our decision concerning the stocks so affected. We temporarily excluded 391 stocks from this analysis, exhibiting one or more of these sources of bias. These stocks will be reanalyzed in the second phase of the project.

Catch data partly or entirely manufactured in response to government pressure to increase catches

This catch data type, which appears to be occurring mainly in East and Southeast Asian countries (e.g., Philippines, Indonesia, Myanmar, and China), is usually characterized by early flat or slowly increasing catches from 1950 to the 1970s or 1980s, followed by a linear or an exponential increase in later years, which may cease in the 21st Century or not. In such cases, the best biomass trend estimated by the CMSY method tends to be flat topped in the first decade, then to decrease moderately in later years. In other words, this data type leads to biomass estimates that are likely underestimating the real decline of biomass that has occurred (Figure 6). Because such catch trends are unlikely but not impossible, these cases were included in the analysis, although with this caveat.

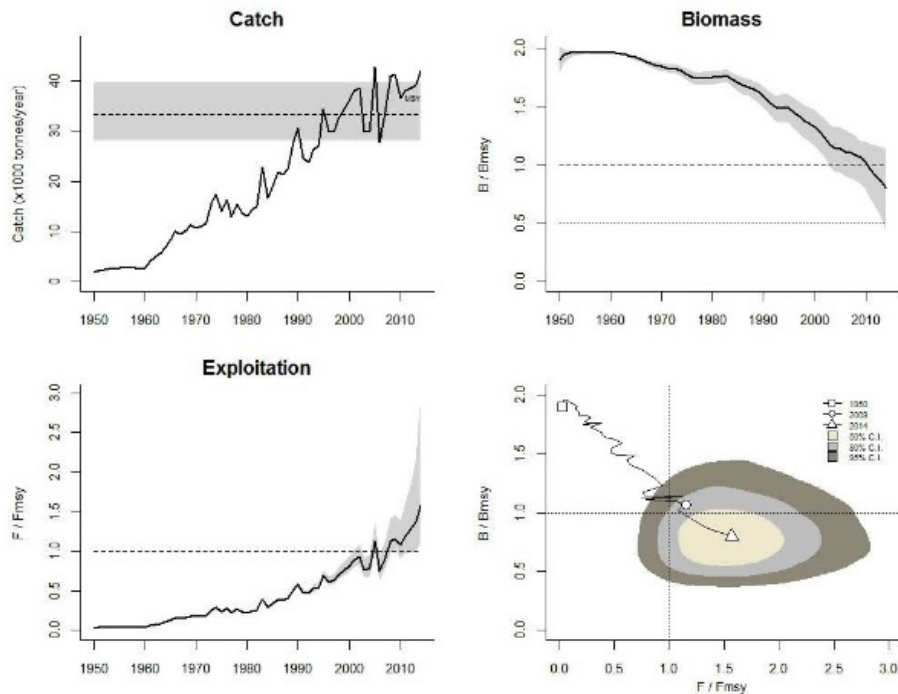


Figure 6. CMSY results for management for Barramundi (*Lates calcarifer*) in the Sunda Shelf/Java Sea marine ecoregion, based on catch reconstruction data for the Indonesia (Central) EEZ. The low catches in the 1950s and the slow, but steady increase in annual catches is suggestive of unrealistic catch statistics, leading to the decline in biomass being underestimated.

Catch data pertaining to fish or invertebrate species of which a large fraction is discarded

This catch data type emerged through the catch reconstructions of the *Sea Around Us*, which not only accounted for discards, but also attempted to disaggregate at least some of the estimates of discarded amounts into their most likely component species. However, in many cases, only one taxonomic composition data set, pertaining to a single study in time, was available for each disaggregation, resulting in the same percentage composition being applied throughout the discard time series. To prevent such time-static data from unduly affecting our assessments, the majority of species were assessed only if their reconstructed catches consisted of 80% or more of landed catches (i.e., if 20% or more of a species was discarded, it was not assessed; see Figure 7). This occurred in 267 stocks (128 species) in 97 MEs, which we opted to exclude in this analysis. One of the few exceptions to this rule was Alaska pollock (*Theragra chalcogramma*) caught in the Russian Far East, as this species, since the collapse of the USSR, is caught for its gonads (exported to Japan), with the carcass being discarded.

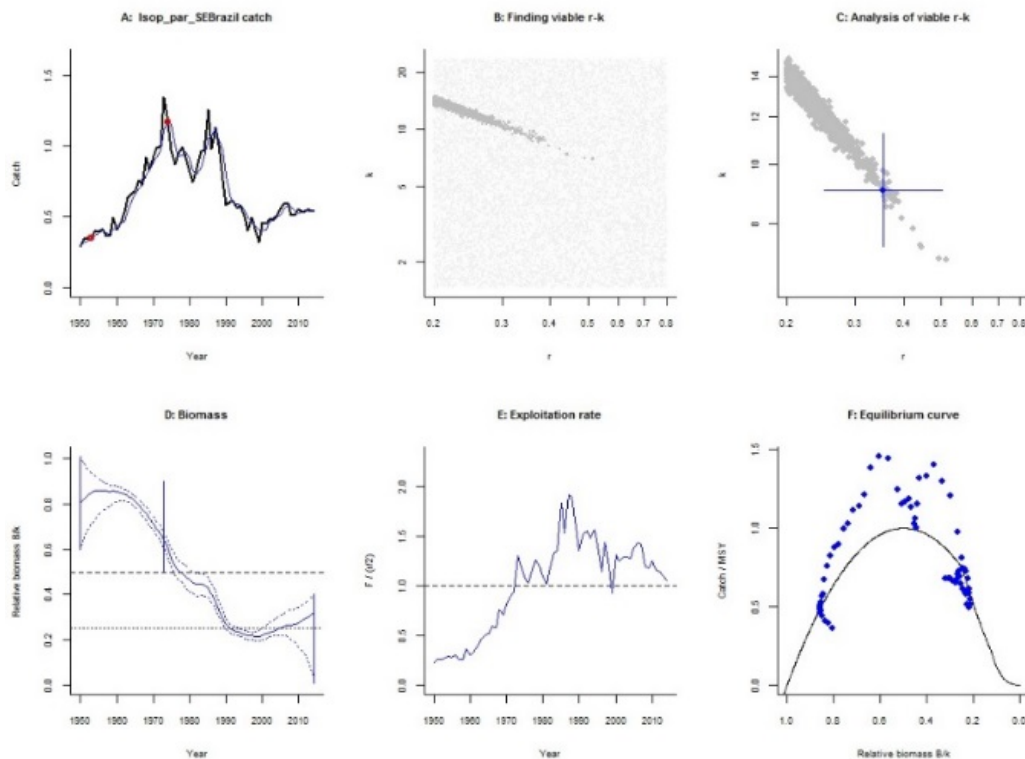


Figure 7. Results of the CMSY analysis for bigtooth corvina (*Isopisthus parvipinnis*) in Southeastern Brazil, which was excluded from the final B/B_{MSY} analyses because 94% of its catches were subsequently discarded.

Catch data initially not covering the entire fishery, and which are improved (gradually or not), but not retroactively.

This type of bias, which generates catch time series that appear stable, or even increasing while actual catches are declining, has been recently identified and labelled ‘presentist’ bias by Zeller and Pauly (2018), and may be seen as a special case of the ‘shifting baselines of fisheries’ identified by Pauly (1995). The effects of this bias on stock assessment using the CMSY method is similar to that caused by manufactured catch data (see above), which in a sense they are. An example is provided by plaice (*Pleuronectes platessa*) in the North Sea⁸, where catches were strongly underreported before 1980, resulting in a much higher CMSY prediction of abundance, much lower CMSY prediction of exploitation, compared to the official CPUE data. CMSY predictions compare well with official estimates of abundance and exploitation after 1980, when catch data are more accurate.

This bias can be rectified by applying local (expert) knowledge on the status of the fisheries before 1950, and which might reflect the evolution of fishing technology from the start of the 20th Century and its impact on the status of the stocks in areas where fishing increased linearly or exponentially in a short period of time. For instance, landings of the Atlantic cod (*Gadus morhua*) in the Gulf of Maine were estimated to be between 60,000-80,000 t in the 1860s, which fell to around 20,000 t in the 1930s (Alexander *et al.* 2009). This historical trend in cod catches provided evidence that the 1950 cod catch originated from an already depleted stock. Thus, the default assumption that low catches suggest high biomass at the start of our time series (1950) is here erroneous, and would tend to overestimate the biomass at the start of the time series. We corrected for this bias by: (i) setting the 1950 biomass level at 1-30% of the pre 1950-levels; (ii) setting the 1982 biomass level to 20-60%; and (iii) setting the 2014 biomass level to 1-20% fitting to the CPUE data from Palmer (2014; Figure 8). Note that the final years are not affected by the 1950 biomass estimate.

There are many stocks which were subject to industrial fishing before the 1950s. However, not all of these will have the data available as we did for cod in the Gulf of Maine, even though they are indispensable for correcting this bias. A solution, for cases where no historical trends are available, would be to assume that low catches in 1950 are the consequence of low biomass for stocks that are likely to have been exploited before 1950, i.e., stocks historically known to be important food fish to the local communities.

⁸ The estimated discarded catch for this stock is over 30% of its total catch in this ME. This stock was thus excluded from this analysis.

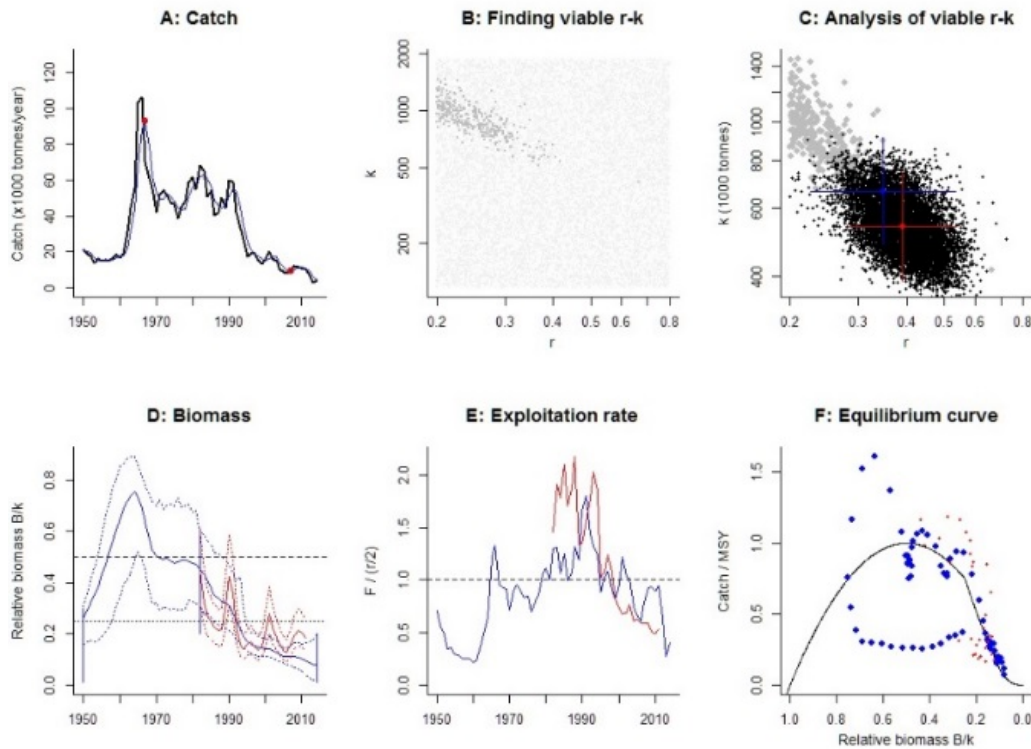


Figure 8. Results of the CMSY analyses for the Atlantic cod (*Gadus morhua*) in the Gulf of Maine, Bay of Fundy marine ecoregion. Historical landings data prior to the 1950s (see Alexander *et al.* 2009) suggest that a stock depletion occurred in the 1930s. The low catch levels in Panel A are thus due to low levels of biomass, which justified decreasing the relative biomass levels in Panel D to $B/k=0.01-0.3$. CPUE data from Palmer (2014) was used to fit biomass levels at $B/k=0.2-0.6$ for 1982 and end biomass at $B/k=0.01-0.2$. MSY was estimated at about 55,000 t, and the B/B_{MSY} estimates from 2009-2014 are below $B/k=0.5$, i.e., this stock is recruitment-impaired.

Catch data reflecting regime shifts

The fluctuations of catches from a given stock generally reflect the fluctuation of the underlying biomass (Kleisner *et al.* 2013; Pauly 2013). The latter can be very strong, and themselves reflect fundamental changes in the ecosystems. An example is the alternation of the South American sardine (*Sardinops sagax*) and anchoveta (*Engraulis ringens*) dominated periods in the Peruvian Upwelling Ecosystem (see contributions in Pauly *et al.* 1989; Gu nette *et al.* 2008), which effectively leads to the alternation of at least two different carrying capacities (k) for these species. The Northern-Central stock of Peruvian anchoveta, occurring in both the Guayaquil, Central Peru ME (see Figure 9) and Humboldtian MEs is a good example of this issue. The period from 1970 to 1995 is sardine-dominated.

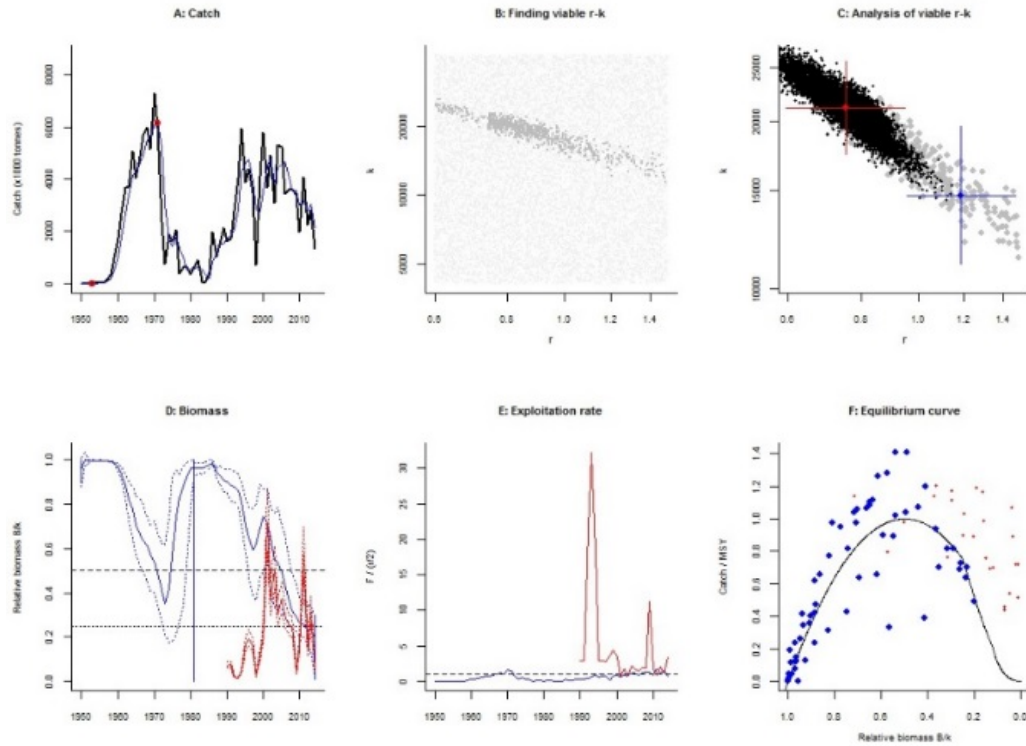


Figure 9. Default results of the CMSY analyses for the Peruvian anchoveta (*Engraulis ringens*) in the Guayaquil Central Peru marine ecoregion. Regime shifts are usually indicated by periods with strongly different catch levels (before 1970 and after 1995). Note different biomass estimate of CMSY (blue) from CPUE (red) in panel D.

In such cases, the CMSY method, which assumes that a stock in a given ecosystem has only one carrying capacity, will not, if unaided, identify sensible estimates of r and k . This can be mitigated by replacing the default settings by narrow informative biomass priors.

Catch data from stocks straddling two or more Marine Ecoregions

When the distribution range of a species or population overlaps with two or more MEs, analyzing the catch from only one ME would induce errors, as the fraction of the stock in one or the other ME, and accessible to one or the other fishing fleet, can vary seasonally and/or between years. Thus, the CMSY assessment for such a stock combines catch data for all affected MEs into a single assessment for the entire stock spanning more than one ME, as this stock is in essence a ‘straddling stock’. The results can be accessed from each ME, but the resultant management advice applies to the combined fisheries in all affected MEs. An example is provided for the Atlantic mackerel (*Scomber scombrus*) which is a straddling stock within the Mediterranean Sea, which spans 7 MEs plus the Black Sea (Figure 10). A list of straddling stocks and where they straddle (MEs, FAO area or ocean) is provided in Appendix IV.

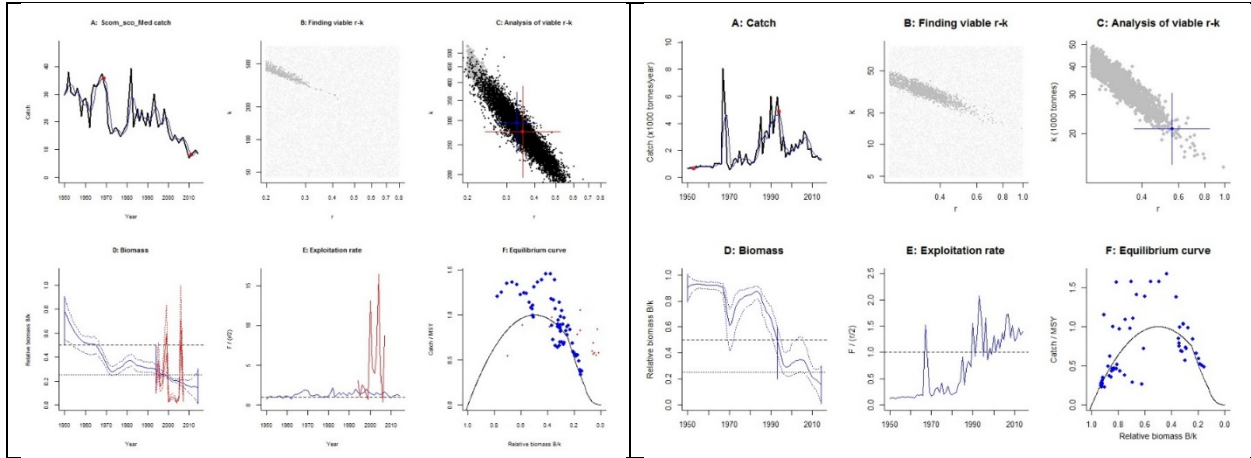


Figure 10. Results of the CMSY for the Atlantic mackerel (*Scomber scombrus*) combined as one stock for the Mediterranean Sea (left panels) and as a separate stock for the Aegean Sea (right panels).

Marginal catches in straddling stocks

Marine Ecoregions (MEs), as defined by Spalding *et al.* (2007) are overwhelmingly coastal, which is the reason why their global network overlaps with the EEZs of the world's maritime countries. This causes problems when a fish population is mostly oceanic, and reaches only occasionally into a country EEZ where it can be caught by coastal fisheries. This is the case for horse mackerel (*Trachurus murphyi*) off Peru, as shown by Muck and Sanchez (1987; see Figure 11). This is the reason why this stock (analyzed for the Pacific Southeast, FAO area 87) and a few others with similar characteristics are assessed as one straddling stock over a wider region.

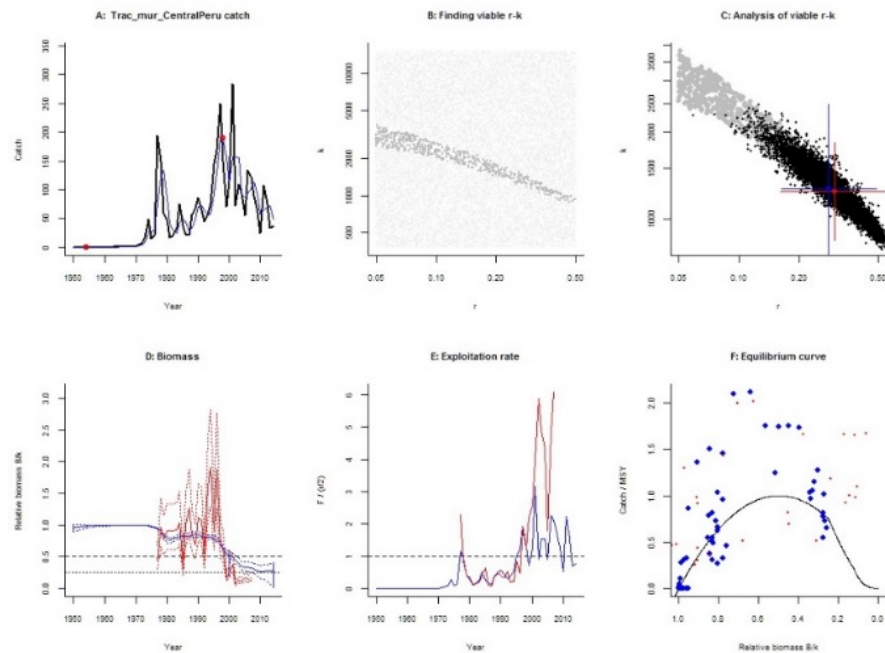


Figure 11. Results of the CMSY for the horse mackerel (*Trachurus murphyi*), which occurs off Peru and is accessed by its coastal fisheries, but is treated in these analyses as a straddling species within the FAO area 87 (Pacific, Southeast).

Increasing carrying capacity of a stock due to the extermination of its predators

As frequently occurs with invertebrates such as shrimps and cephalopods, but also with small (forage) fish, population increase will tend to occur following the depletion (by fishing) of their predators (Pauly 1982; Doubleday *et al.* 2016; Christensen *et al.* 2014). This, in effect corresponds to a decrease in natural mortality and an increase of the carrying capacity for these former 'prey' organisms. The effect of such change in carrying capacity on evaluation methods

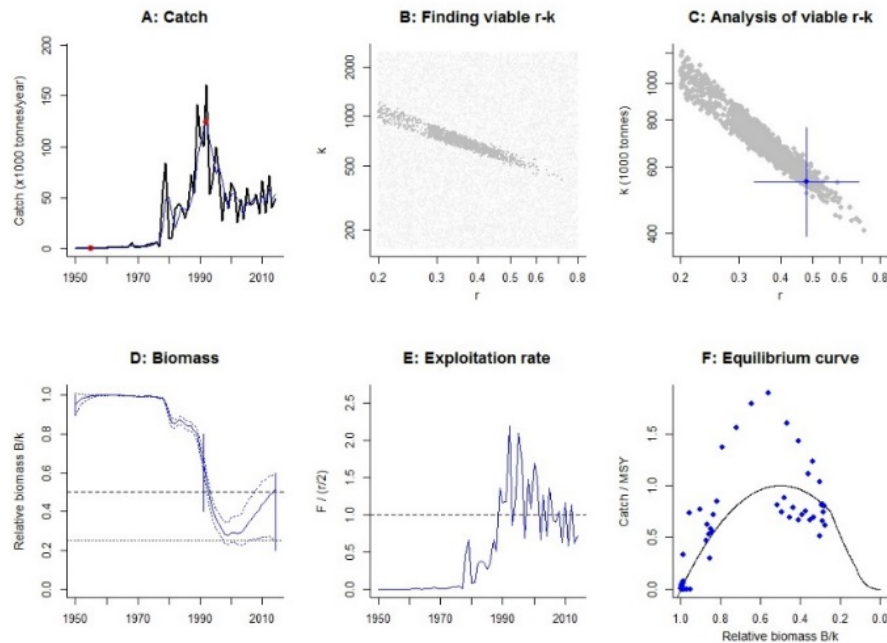


Figure 12. Results of the CMSY for the Patagonian squid (*Doryteuthis gahi*) in the Southwest Atlantic (combining the MEs of Patagonian Shelf, Southeastern Brazil, Rio de la Plata, Uruguay-Buenos Aires Shelf, Rio Grande, North Patagonia Gulfs, and Malvinas/Falklands). The increase in catches in the 1990s is due to the overexploitation of its ground fish predators (see Caddy and Roundhouse 1998).

that assume its stationarity is that the biomass at the end of the time series is underestimated. For example, results of the CMSY assessment for the Patagonian squid (*Doryteuthis gahi*) in the Southwest Atlantic (Figure 12) indicate biomass levels which are 80-100% of the original biomass, corresponding to low catches in the 1950s-1970s. As catches increased in the 1980s, the CMSY method assumed that the biomass decreased to below the MSY level ($B/k=0.5$), even for a short-lived highly productive species. However, Caddy and Roundhouse (1998) argued that the assumption of larger cephalopod standing stocks before the fishery started is likely an error. Instead, they presented evidence indicating that the rapid decline in ground fishes (competitors and predators of cephalopods) due to overexploitation in heavily fished areas favoured a corresponding increase in cephalopod abundance. The biomass trend which results from such behaviour, as seen in many of the cephalopod and shrimp stocks we assessed here, can be corrected for this bias by setting the start of series relative biomass to $B/k=0.2-0.6$, and setting the middle relative biomass at the peak of the catch trend to $B/k=0.6-1.0$.

Increasing carrying capacity via poleward expansion due to climate change

One of the many effects of global and ocean warming is that since the 1970s, fish shift their distributions poleward, as shown in multiple contributions covering one or a few species (e.g., Perry *et al.* 2005), or the bulk of the exploited marine fauna (Cheung *et al.* 2013), with various models predicting the intensification of these migrations (see, e.g., Cheung *et al.* 2009). One of the implications of these migrations is that the area inhabited by cold temperate species of the Northern hemisphere will expand, and benefit species such as haddock (*Melanogrammus*

aeglefinus) or northern blue whiting (*Micromesistius poutassou*), thus increasing their carrying capacity (k) in the ME they inhabit. This will affect the biomass trends estimated by the CMSY model so that they are estimated to decline with the sharp decline in the catches in their MEs of origin in the latter years of the time series. This is the case for the haddock in the Barents Sea, where the strong catches in the 1950s-1980s were followed by a rapid decline in the early 1990s, a signal

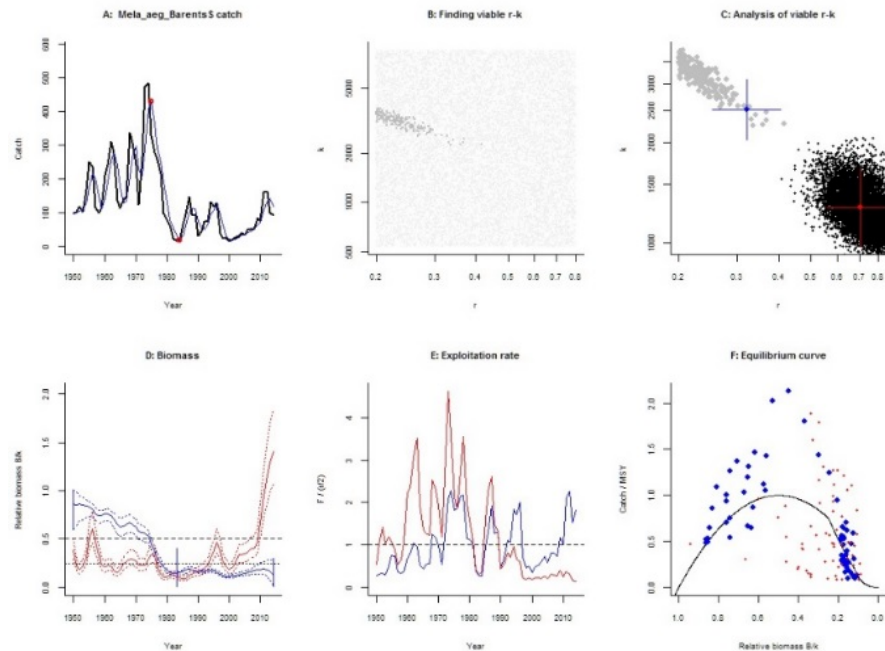


Figure 13. Results of the CMSY analyses for the haddock (*Melanogrammus aeglefinus*) from the Barents Sea. Note the decline in catches from the 1990s to the 2000s, which might signal overexploitation of the stock and reduction of the relative biomass B/k below the critical level of $B/B_{MSY}=0.5$. However, note the estimates of spawning stock biomass (ICES 2016) which indicate higher levels of B/k . This discrepancy can be attributed to the extension of the haddock stock towards northern waters.

interpreted by the CMSY model as overexploitation of the stock (Figure 13). However, the spawning stock biomass available from ICES (2016) indicate an increasing trend in the past decade (red line in graph D: Biomass of Figure 13), which is similar to observations of distribution extensions and large abundance increases by several north Atlantic stocks documented in Kulka *et al.* (2011). In such cases, we opted to combine the stocks into MEs where this extension might occur (i.e., treating them as straddling). Thus, our haddock stock from the MEs (White Sea, North and East Barents Sea, Northern Norway and Finmark, Southern Norway) in the ICES areas 27.2.a.1, 27.a.2, and 27.1.b was combined as haddock in the Barents Sea to Southern Norway. Note that the same does not apply to southern hemisphere temperate species, which will increasingly be running out of shelf at the southern tips of the continents (Africa, South America, Australia).

Decreasing carrying capacity due to thermal stress and deoxygenation

The converse of a potentially increasing carrying capacity due to climate change and poleward expansion (above) is a reduction in carrying capacity due to thermal stress in the tropics and eventually the subtropics, possibly intensified by deoxygenation brought by the factors that also cause dead zones (Diaz and Rosenberg 2008) or increased ocean stratification and habitat compression (Prince and Goodyear 2006). However, the detailed and accurate catch and abundance data that would be required to demonstrate this effect are not available, and thus we leave this issue to a later study.

Stocks in the Countries where OCEANA Operates

In the following, the stock assessments that were performed for the entire world are illustrated via some of the results obtained for MEs overlapping with the EEZ of countries where OCEANA has national offices (or the EU regional office; see Figure 14.). Therein, emphasis is given to the biomass trends of the stocks that were covered, as these can provide the information required for a traffic light system reflective of the stock status. Note that the chunks of EEZs for each country and the list of MEs per EEZ are available in Appendix IV. Also, given that the stock assessment results are now available in the *Sea Around Us* website, we only included examples for the most dominant stocks in all of the MEs in a country where OCEANA operates. For each sample stock, we present the management results (i.e., page 1 of the PDF files available from the *Sea Around Us* website) showing the time series of B/B_{MSY} and F/F_{MSY} calculated either via the CMSY (Belize, Brazil, Mexico, and the Philippines) or the traditional BSM using biomass indices from other stock assessment methods (Canada, Chile, European countries, Peru, and the United States). Finally, we include a summary of the stock status per country resulting from the CMSY analyses of the MEs that include the EEZs of these countries. Note, however, that for Belize, these results are for the Belizean EEZ and not for the Western Caribbean ME, since it represents only small portion of this large ME (i.e., to avoid that the catch time series behaviour of other EEZs in the ME from dominating the results).

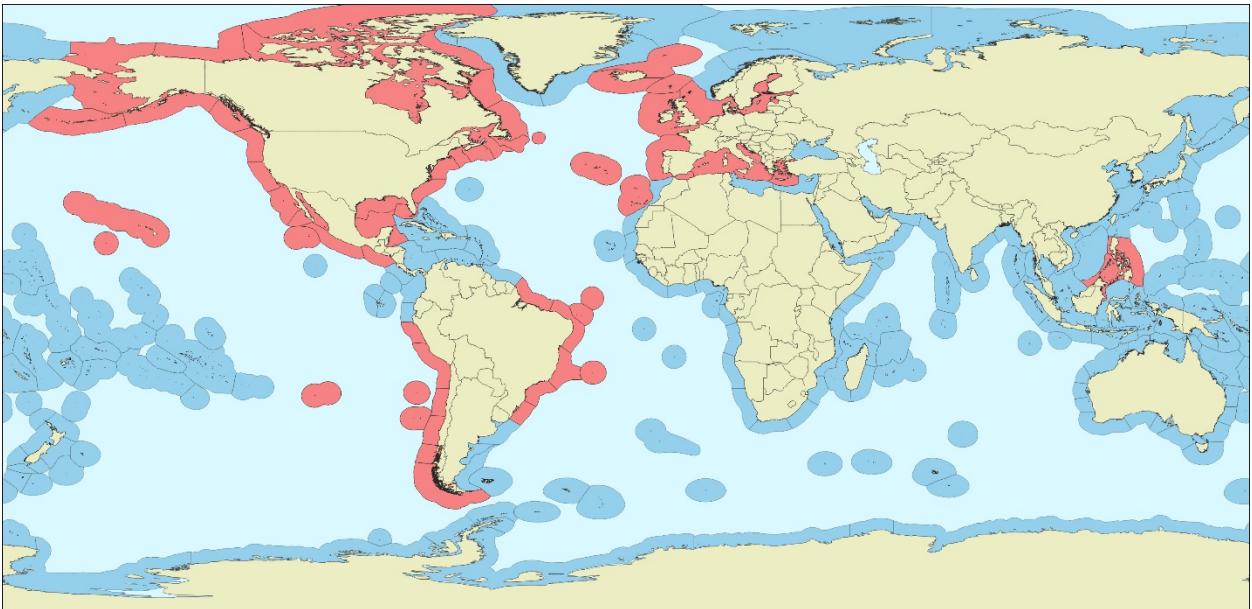


Figure 14. The 232 Marine Ecoregions of the World (modified from Spalding *et al.* 2007). The 64 Marine Ecoregions overlapping with the Exclusive Economic Zones of countries in which OCEANA operates are shown in red.

Belize

The Belizean EEZ is entirely within the Western Caribbean marine ecoregion. The 27 stocks analyzed (14 non-straddling; 13 straddling) here used the catch from within the Belizean EEZ and not those from the Western Caribbean ME. Straddling stocks range from FAO Statistical area Western Central Atlantic Ocean to the entire Atlantic Ocean (covering up to 6 FAO areas). 7 stocks with catch time series issues need to be reviewed and were temporarily excluded from this analysis. The Queen conch (*Lobatus gigas*) is dominant among the non-straddling stocks. (Figure 15). Yellowfin tuna (*Thunnus albacares*), which straddles the entire Atlantic Ocean, is the most important straddling stock. Overall, the CMSY analyses indicate that none of these stocks are collapsed, 85% fall in one of the three overfished categories, and only 15% are healthy and capable of producing MSY (see Figure 15).

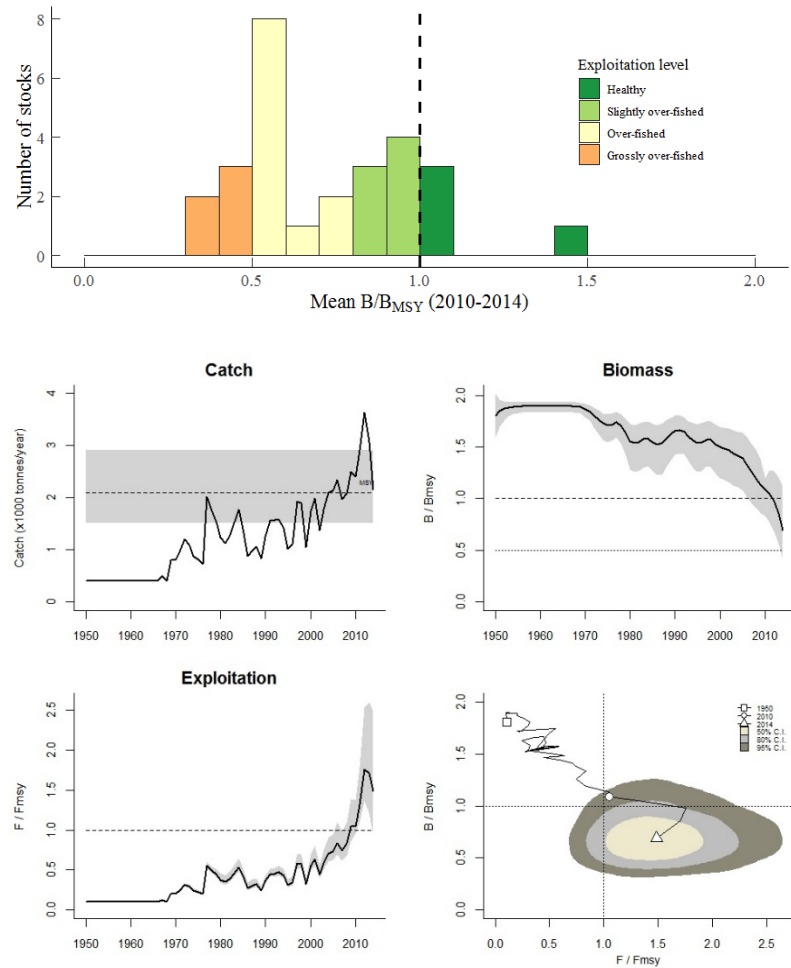


Figure 15. Upper panel: Status of stocks in Belize resulting from the CMSY analyses. Lower panel: Western Caribbean stock of Queen conch (*Lobatus gigas*) with mean B/B_{MSY} (2010-2014) at 0.94 (slightly-overfished).

Brazil

Brazil's 4 chunks of EEZs encompass 8 MEs, for which 86 stocks were analyzed (48 non-straddling; 38 straddling). Straddling stocks range from 2-7 combined MEs to the entire Atlantic Ocean (covering up to 6 FAO areas). We temporarily excluded 30 stocks from this analysis where estimated discards were >20% of the catch. The Atlantic seabob (*Xiphopenaeus kroyeri*; Figure 16) is dominant among the non-straddling stocks, while Brazilian sardinella (*Sardinella brasiliensis*) is the most important straddling stock. Overall, the CMSY analyses indicate that 1% of these stocks are collapsed, 79% fall in one of the three overfished categories and only 20% are healthy and capable of producing MSY (see Figure 16).

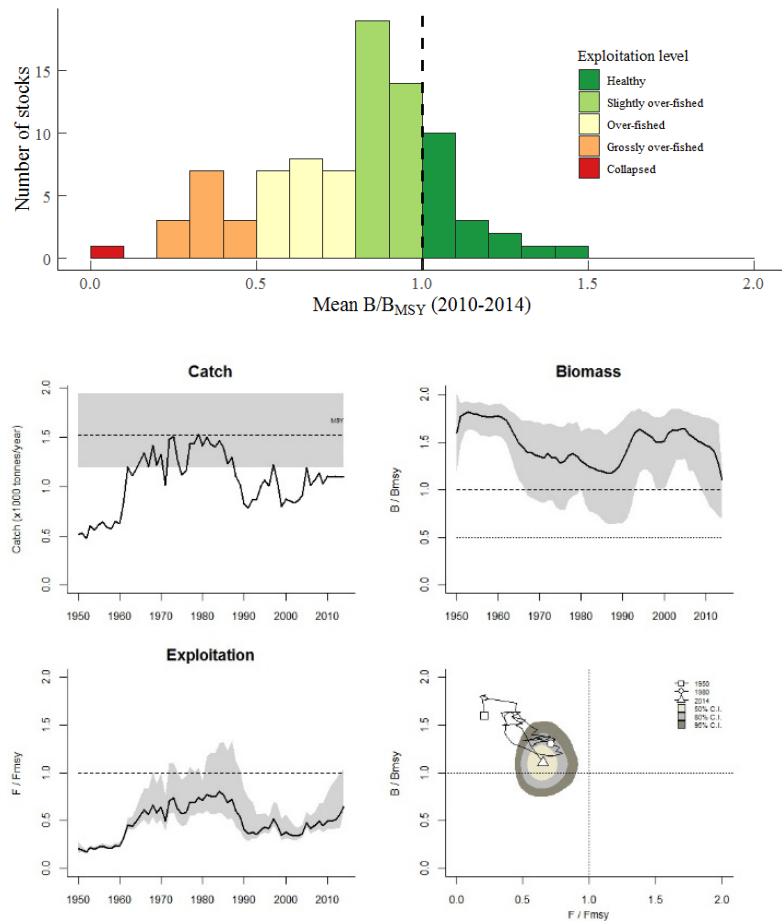


Figure 16. Upper panel: Status of stocks in Brazil resulting from the CMSY analyses. Lower Panel: Southeastern Brazil stock of Atlantic seabob (*Xiphopenaeus kroyeri*), with mean B/B_{MSY} (2010-2014) at 1.3 (healthy and capable of producing MSY).

Canada

Canada's 3 chunks of EEZs encompass 15 MEs, for which 123 stocks were analyzed (94 non-straddling; 29 straddling). Straddling stocks range from only 2 MEs, such as Baffin Bay and the West Greenland Shelf, to larger areas, for example, from Florida waters all the way to the Scotian Shelf. We excluded 10 stocks from this analysis where estimated discards were >20% of the catch. Eight stocks were temporarily excluded, pending review of their catch time series. The Atlantic herring (*Clupea harengus* in the Gulf of St. Lawrence – Eastern Scotian Shelf; Figure 17) is dominant among the non-straddling stocks, while northern shrimp (*Pandalus borealis*) is the most important straddling stock. Overall, the CMSY analyses indicate that 17% of these stocks are collapsed, 63% fall in one of the three overfished categories and only 20% are healthy and capable of producing MSY (see Figure 17).

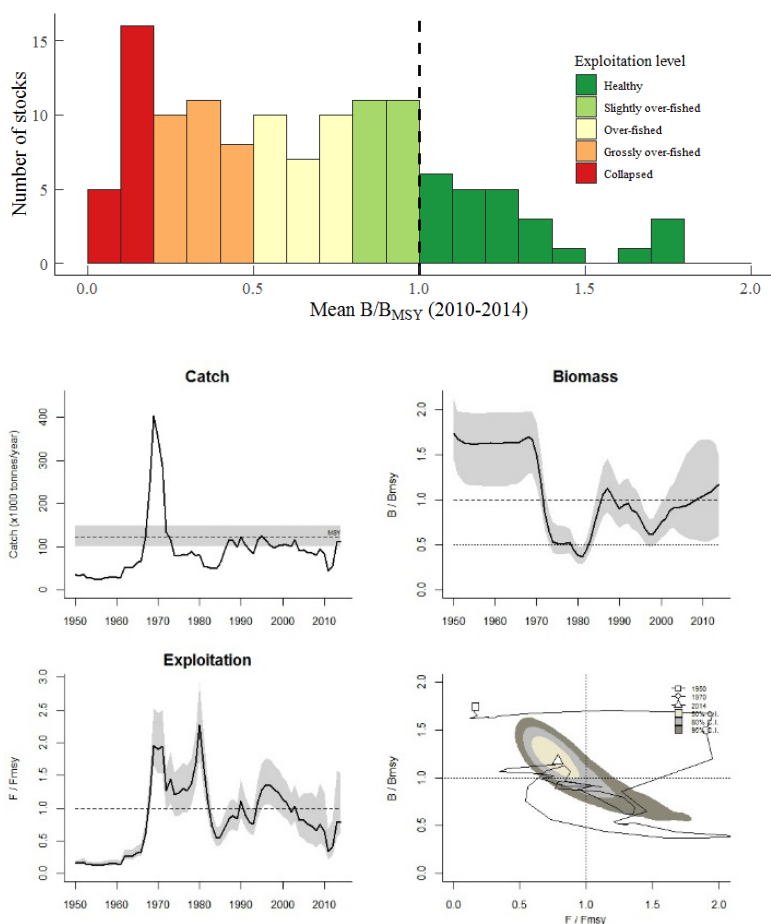


Figure 17. Upper panel: Status of stocks in Canada resulting from the CMSY analyses. Lower Panel: Gulf of St. Lawrence – Eastern Scotian Shelf stock of Atlantic herring (*Clupea harengus*), with mean B/B_{MSY} (2010-2014) at 1.1 (healthy and capable of producing MSY).

Chile

Chile's 5 chunks of EEZs encompass 7 MEs, for which 27 stocks were analyzed (7 non-straddling; 20 straddling). Straddling stocks range from 3-4 combined MEs to the entire Pacific Ocean (covering up to 6 FAO Statistical Areas). We temporarily excluded 2 stocks where the catch time series need review. The Peruvian anchoveta (*Engraulis ringens* in the Humboldtian; Figure 18) is dominant among the non-straddling stock, while Chilean jack mackerel (*Trachurus murphyi*) is the most important straddling stock. Overall, the CMSY analyses indicate that 7% of these stocks are collapsed, 74% fall in one of the three overfished categories and only 19% are healthy and capable of producing MSY.

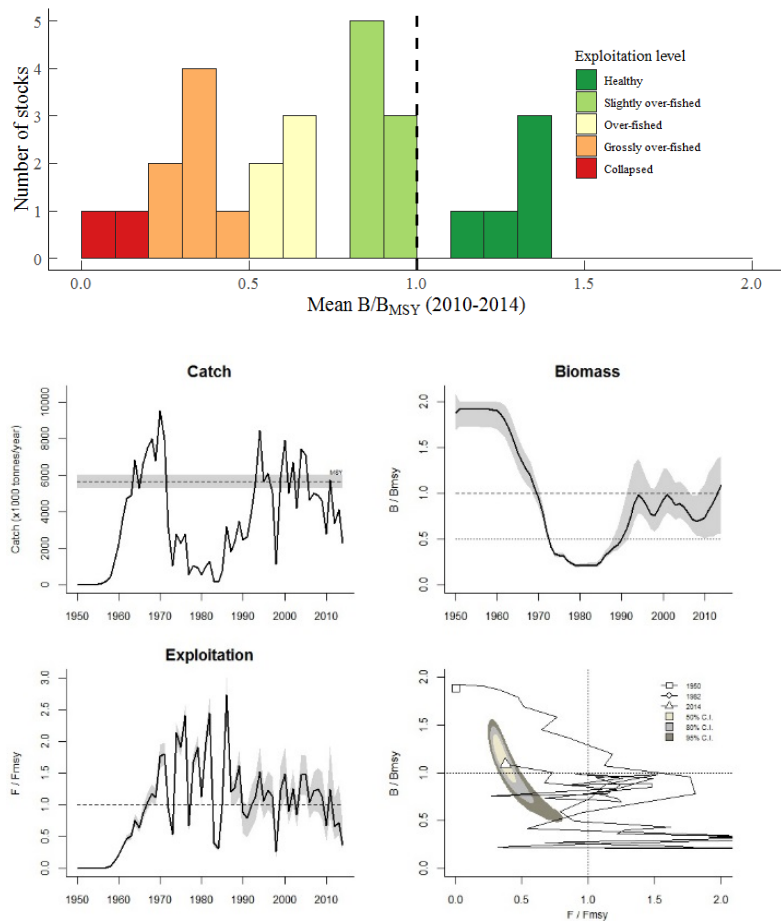


Figure 18. Upper panel: Status of stocks in Chile resulting from the CMSY analyses. Lower Panel: Humboldtian stock of Anchoveta (*Engraulis ringens*), with mean B/B_{MSY} (2010-2014) at 0.89 (overfished).

Mexico

Mexico has EEZs both on its Pacific and Atlantic coasts. Jointly, they encompass 8 MEs, for which 76 stocks were analyzed (49 non-straddling; 27 straddling). Straddling stocks range from 2-5 combined MEs for the entire Atlantic Ocean (Covering 6 FAO Statistical areas). We temporarily excluded 30 stocks for which the catch time series need review. The Pacific sardine (*Sardinops sagax* in the Cortezian ME; Figure 19) is dominant among the non-straddling stocks, while Pacific saury (*Cololabis saira*) is the most important straddling stock. Overall, the CMSY analyses indicate that 7% of these stocks are collapsed, 76% fall in one of the three overfished categories and only 17% are healthy and capable of producing MSY (Figure 19).

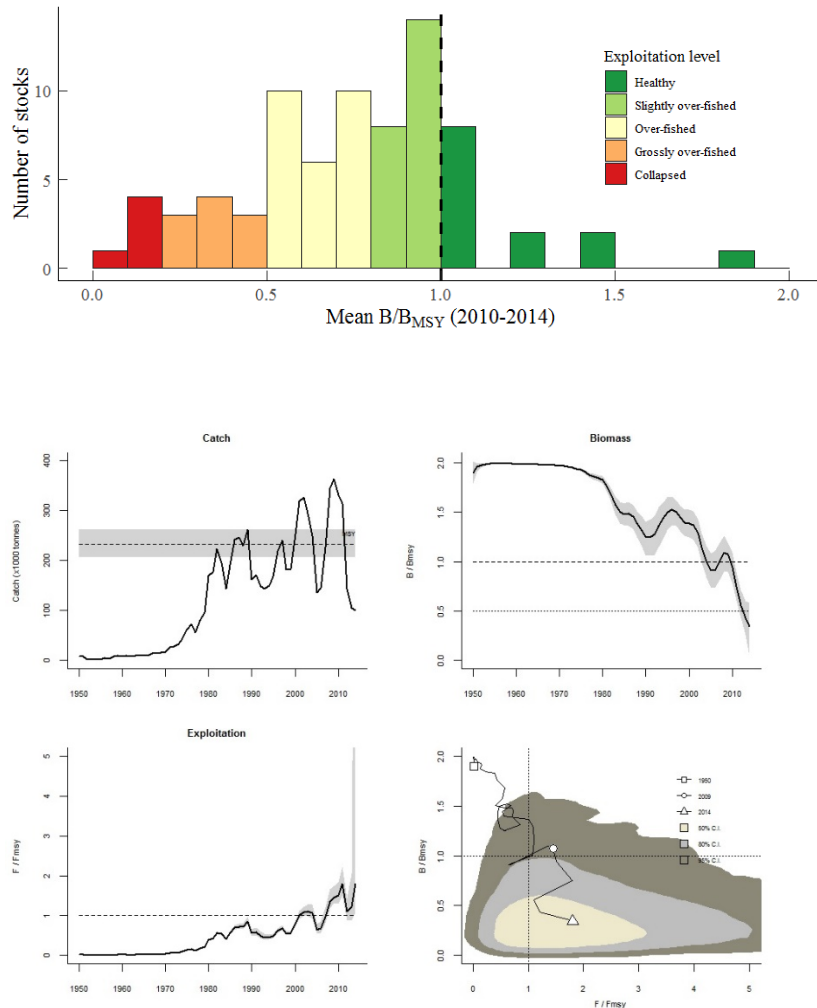


Figure 19. Upper panel: Status of stocks in Mexico resulting from the CMSY analyses. Lower Panel: Cortezian stock of Pacific sardine (*Sardinops sagax*), with mean B/B_{MSY} (2010-2014) at 0.62 (overfished).

Peru

Peru encompasses 3 MEs, for which 20 stocks were analyzed (4 non-straddling; 16 straddling). Straddling stocks range from across 2 MEs, such as Guayaquil and Central Peru, and from Panama waters to northern Chile (up to 6 FAO Statistical Areas). No stocks needed to be excluded from this analysis. The Peruvian anchoveta (*Engraulis ringens*; Figure 20) is the most dominant of the non-straddling stocks, while Pacific sardine (*Sardinops sagax*) is the most important straddling stock. Overall, the CMSY analyses indicate that 15% of these stocks are collapsed, 77% fall in one of the three overfished categories and only 18% are healthy and capable of producing MSY (Figure 20).

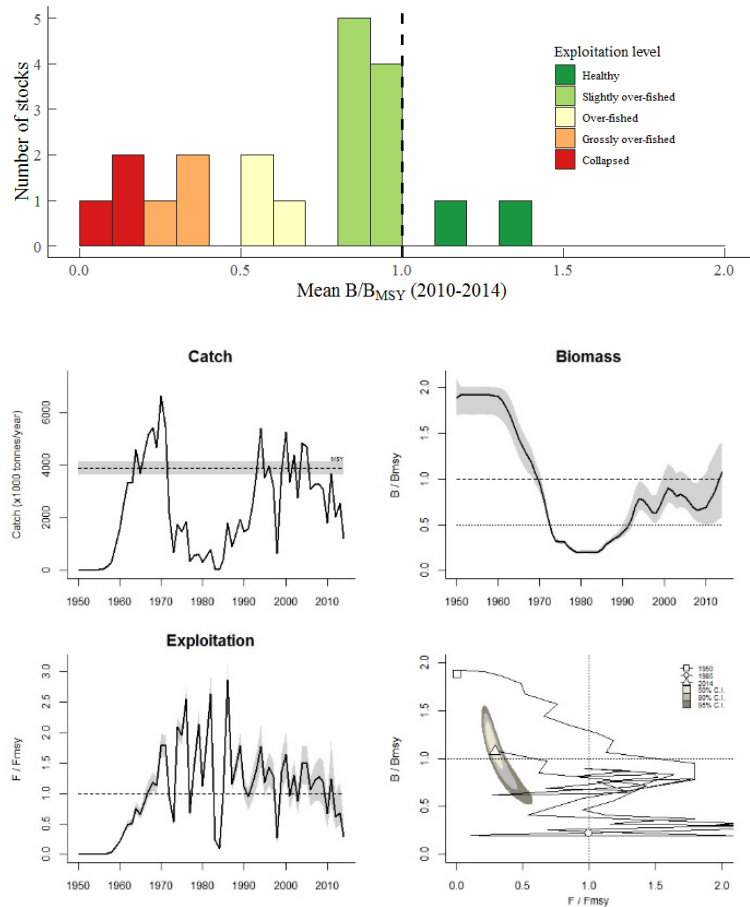


Figure 20. Upper panel: Status of stocks in Peru resulting from the CMSY analyses. Lower Panel: Central Peru stock of Anchoveta (*Engraulis ringens*), with mean B/B_{MSY} (2010-2014) at 0.87 (overfished).

Philippines

The Philippine Islands encompass 3 MEs, for which 44 stocks were analyzed (22 non-straddling; 21 straddling). Many of the straddling stocks from the Philippines center around the Palawan/North Borneo ME, stretching as far north as the South China Sea Oceanic Islands and as far south as the Banda Sea (4-5 combined MEs). Other stocks occupy larger areas such as the entire Pacific Ocean (1-3 FAO Statistical Areas). We temporarily excluded 4 stocks where the catch time series need review. The Shortfin scad (*Decapterus macrosoma*; Figure 21) is dominant among the non-straddling stocks, while Skipjack tuna (*Katsuwonus pelamis*) is the most important straddling stock. Overall, the CMSY analyses indicate that 5% of these stocks are collapsed, 77% fall in one of the three overfished categories and only 18% are healthy and capable of producing MSY (Figure 21).

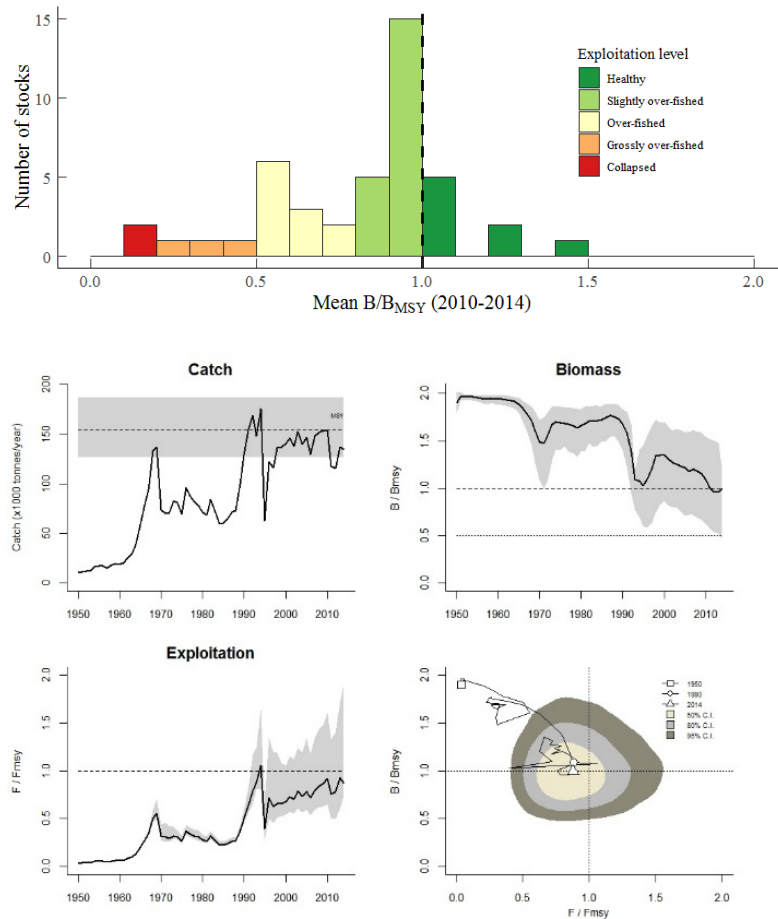


Figure 21. Upper panel: Status of stocks in the Philippines resulting from the CMSY analyses. Lower Panel: Eastern Philippines stock of Shortfin scad (*Decapterus macrosoma*), with mean B/B_{MSY} (2010-2014) at 0.93 (slightly overfished).

United States

The United States' 25 EEZ chunks encompass 7 MEs, for which 151 stocks were analyzed (113 non-straddling; 38 straddling). Straddling stocks range from across two MEs, such as the Carolinian and Virginian, to the entire western seaboard of the United States from Oregon to Baja California, and including Hawaii. We excluded 20 stocks from this analysis where estimated discards were >20% of the catch; and temporarily excluded 13 stocks pending review of their catch time series. The Alaska pollock (*Theragra chalcogramma*; Figure 21) is dominant among the non-straddling stocks, while the Gulf menhaden (*Brevoortia patronus*) is the most important straddling stock. Overall, the CMSY analyses indicate that 9% of these stocks are collapsed, 67% fall in one of the three overfished categories and 24% are healthy and capable of producing MSY.

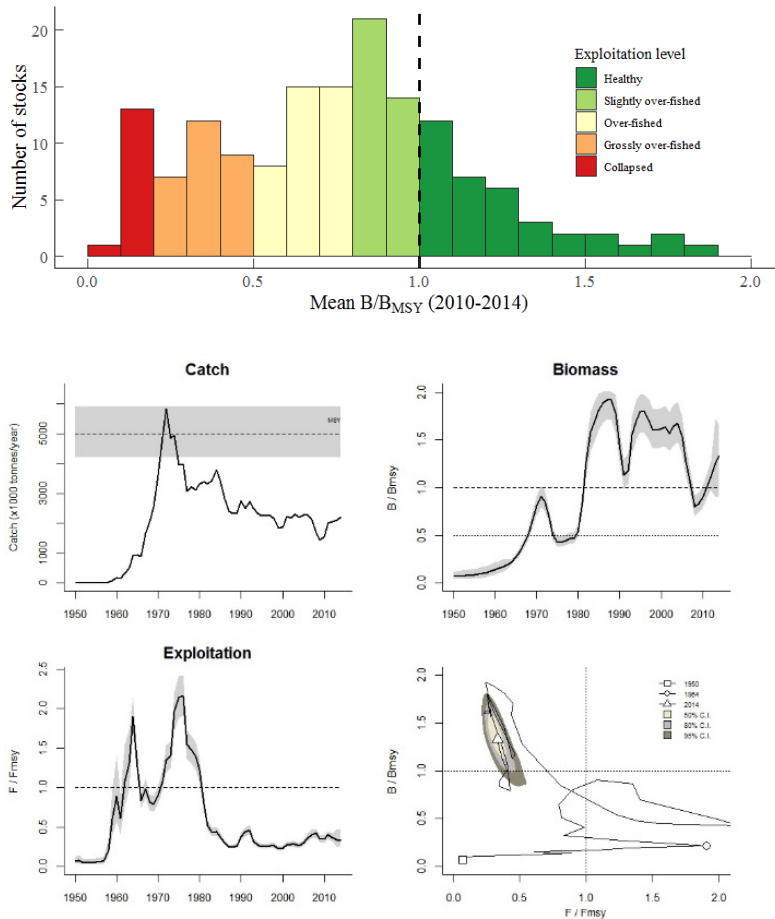


Figure 21. Upper panel: Status of stocks in the USA resulting from the CMSY analyses. Lower Panel: Eastern Bering Sea stock of Alaska Pollock (*Theragra chalcogramma*), with mean B/B_{MSY} (2010-2014) at 1.12 (healthy).

European Union Countries

Our coverage of Europe consists of 208 stocks in 28 regions, which include 21 straddling stocks from 8 combined MEs and 3 FAO areas. Where available, the biomass indices by ICES, NOAA and other authorities, were used. As a consequence, the results in this study are very similar to the results presented to OCEANA by Froese *et al.*

(2016b), and formally published by Froese *et al.* (2018). Thus, they are not further discussed here. However, they can be examined country-by-country on the website of the *Sea Around Us*, as described by our next topic. Figure 22, however, presents the summary of the CMSY analyses. These suggest that 6% of these stocks are collapsed, 80% fall in one of the three overfished categories and only 14% are healthy and capable of producing MSY.

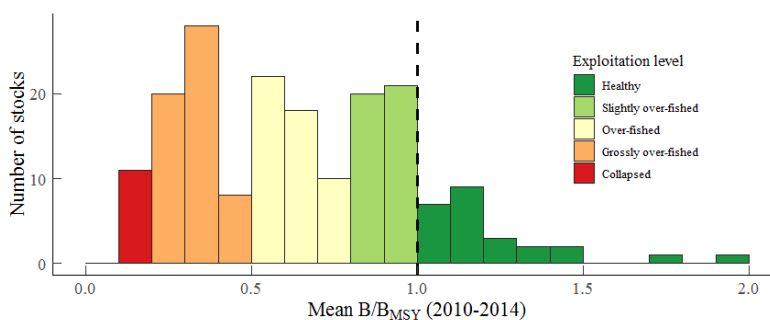


Figure 22. Status of stocks in European Union countries resulting from the CMSY analyses.

Stocks assessments on the *Sea Around Us* website

Accessing the currently available summaries

The 2-page summaries of the stock assessments performed for this study, and deemed reliable enough, can be accessed on the *Sea Around Us* website (www.seaaroundus.org) by clicking ‘Our interactive graphs’ (left panel) on the landing page. Then, there are two options for accessing the stock assessments:

1. Choose an EEZ, and when it appears, scroll down until you get to ‘Marine Ecoregion(s)’. There, you will find the name of one, or several MEs overlapping with the EEZ in question; click on the name of the ME of interest, and once it appears, scroll down to find a list of assessed species. Click on the one you want to see, and the 2-page summary PDF will appear, as presented in Figure 5;
2. Use the toolbar to select Marine Ecoregion (‘ME’); when a map of MEs appears, use it or use the toolbar to select an ME. Once the ME page appears, scroll down to find a list of assessed species. Click on the one you want to see, and the 2-page summary PDF will appear, as presented in Figure 5.

The next steps

In the second year of this project, the stock assessment work of the *Sea Around Us* will include the following:

1. We will redo the preliminary stock assessments presented here, following an update of the *Sea Around Us* catch data which will correct for all straightforwardly fixable data problems identified in the course of the first year of this study;
2. Many of the stocks that were assessed without being constrained by independent estimates of relative biomass will be reassessed under such constraints. This applies especially to stocks in the waters of developing countries, for which relative biomass data can likely be found (contrary to a widespread opinion), but only after intensive searching;
3. Some parts of the RAM Legacy Database of stock assessments and similar databases pertaining to stocks predominantly in developed countries may also be used to provide constraints, thus preventing a situation where their contents may be used in an attempt at invalidating the *Sea Around Us* assessment (see also below). However, in cases where the biomass indices from the RAM Legacy Database do not represent our stocks, or when the time series of catches used for the stock assessment had been truncated (as is often the case, see Préfontaine 2009), we will either ignore these indices and search for historical indicators of biomass levels to adjust the ‘start’, ‘mid’ or ‘end’ B/k values;
4. A module will be added to the *Sea Around Us* website that will allow presenting stock assessments as interactive graphs, i.e., all the graphs currently presented in form of PDFs. This web-module will also document, for each stock, all the constraints involved, and download all data behind all graphs, which may be rerun on the user’s computer. This module will follow the *Sea Around Us* open data policy;

Overall, this project, which has succeeded in making hundreds of (sometimes preliminary) stock assessments available to many countries that never saw any, will build on this success, improve these stock assessments and their underlying catch database, and disseminate the result, which should help toward rebuilding the many stocks which, as this study shows, require rebuilding throughout the world.

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APPENDIX I: LIST OF MARINE ECOREGIONS BY EEZS

EEZ	Marine Ecoregion	Marine Ecoregion	EEZ
Albania	Adriatic Sea	Adriatic Sea	Albania
Algeria	Alboran Sea	Adriatic Sea	Bosnia & Herzegovina
Algeria	Western Mediterranean	Adriatic Sea	Croatia
American Samoa	Phoenix/Tokelau/Northern Cook Islands	Adriatic Sea	Italy (mainland)
American Samoa	Samoa Islands	Adriatic Sea	Montenegro
Andaman & Nicobar Isl. (India)	Andaman and Nicobar Islands	Adriatic Sea	Slovenia
Angola	Angolan	Aegean Sea	Crete (Greece)
Anguilla (UK)	Eastern Caribbean	Aegean Sea	Greece (without Crete)
Antigua & Barbuda	Eastern Caribbean	Aegean Sea	Turkey (Marmara Sea)
Argentina	North Patagonian Gulfs	Aegean Sea	Turkey (Mediterranean Sea)
Argentina	Patagonian Shelf	Agulhas Bank	South Africa (Atlantic and Cape)
Argentina	Rio de la Plata	Alboran Sea	Algeria
Argentina	Uruguay-Buenos Aires Shelf	Alboran Sea	Morocco (Mediterranean)
Aruba (Netherlands)	Southern Caribbean	Alboran Sea	Spain (mainland, Med and Gulf of Cadiz)
Ascension Isl. (UK)	St. Helena and Ascension Islands	Aleutian Islands	USA (Alaska, Subarctic)
Australia	Arnhem Coast to Gulf of Carpentaria	Amazonia	Brazil (mainland)
Australia	Bassian	Amsterdam-St Paul	St Paul & Amsterdam Isl. (France)
Australia	Bonaparte Coast	Andaman and Nicobar Islands	Andaman & Nicobar Isl. (India)
Australia	Cape Howe	Andaman Sea Coral Coast	Myanmar
Australia	Central and Southern Great Barrier Reef	Andaman Sea Coral Coast	Thailand (Andaman Sea)
Australia	Coral Sea	Angolan	Angola
Australia	Exmouth to Broome	Arabian (Persian) Gulf	Bahrain
Australia	Great Australian Bight	Arabian (Persian) Gulf	Iran (Persian Gulf)
Australia	Houtman	Arabian (Persian) Gulf	Iraq
Australia	Leeuwin	Arabian (Persian) Gulf	Kuwait
Australia	Manning-Hawkesbury	Arabian (Persian) Gulf	Oman (Musandam)
Australia	Ningaloo	Arabian (Persian) Gulf	Qatar
Australia	Shark Bay	Arabian (Persian) Gulf	Saudi Arabia (Persian Gulf)
Australia	South Australian Gulfs	Arabian (Persian) Gulf	United Arab Emirates
Australia	Torres Strait Northern Great Barrier Reef	Arafura Sea	Indonesia (Eastern)
Australia	Tweed-Moreton	Araucanian	Chile (mainland)
Australia	Western Bassian	Arnhem Coast to Gulf of Carpentaria	Australia
Azores Isl. (Portugal)	Azores Canaries Madeira	Auckland Island	New Zealand
Bahamas	Bahamian	Azores Canaries Madeira	Azores Isl. (Portugal)
Bahrain	Arabian (Persian) Gulf	Azores Canaries Madeira	Canary Isl. (Spain)
Balearic Island (Spain)	Western Mediterranean	Azores Canaries Madeira	Madeira Isl. (Portugal)
Bangladesh	Northern Bay of Bengal	Baffin Bay - Davis Strait	Canada (East Coast)

EEZ	Marine Ecoregion	Marine Ecoregion	EEZ
Barbados	Eastern Caribbean	Bahamian	Bahamas
Belgium	North Sea	Bahamian	Dominican Republic
Belize	Western Caribbean	Bahamian	Puerto Rico (USA)
Benin	Gulf of Guinea Central	Bahamian	Turks & Caicos Isl. (UK)
Bermuda (UK)	Bermuda	Baltic Sea	Denmark (Baltic Sea)
Bonaire (Netherlands)	Southern Caribbean	Baltic Sea	Estonia
Bosnia & Herzegovina	Adriatic Sea	Baltic Sea	Finland
Bouvet Isl. (Norway)	Bouvet Island	Baltic Sea	Germany (Baltic Sea)
Brazil (mainland)	Amazonia	Baltic Sea	Latvia
Brazil (mainland)	Eastern Brazil	Baltic Sea	Lithuania
Brazil (mainland)	Northeastern Brazil	Baltic Sea	Poland
Brazil (mainland)	Rio Grande	Baltic Sea	Russia (Baltic Sea)
Brazil (mainland)	Southeastern Brazil	Baltic Sea	Sweden (Baltic)
British Virgin Isl. (UK)	Eastern Caribbean	Banda Sea	Indonesia (Eastern)
Brunei Darussalam	Palawan/North Borneo	Bassian	Australia
Brunei Darussalam	South China Sea Oceanic Islands	Beaufort Sea - continental coast and shelf	Canada (Arctic)
Bulgaria	Black Sea	Beaufort Sea - continental coast and shelf	USA (Alaska, Arctic)
Cambodia	Gulf of Thailand	Beaufort-Amundsen-Viscount Melville-Queen Maud	Canada (Arctic)
Cameroon	Gulf of Guinea Central	Bermuda	Bermuda (UK)
Canada (Arctic)	Beaufort Sea - continental coast and shelf	Bight of Sofala/Swamp Coast	Mozambique
Canada (Arctic)	Beaufort-Amundsen-Viscount Melville-Queen Maud	Bismarck Sea	Papua New Guinea
Canada (Arctic)	High Arctic Archipelago	Black Sea	Bulgaria
Canada (Arctic)	Hudson Complex	Black Sea	Georgia
Canada (Arctic)	Lancaster Sound	Black Sea	Romania
Canada (East Coast)	Baffin Bay - Davis Strait	Black Sea	Russia (Black Sea)
Canada (East Coast)	Gulf of Maine/Bay of Fundy	Black Sea	Turkey (Black Sea)
Canada (East Coast)	Gulf of St. Lawrence - Eastern Scotian Shelf	Black Sea	Ukraine
Canada (East Coast)	Northern Grand Banks - Southern Labrador	Bonaparte Coast	Australia
Canada (East Coast)	Northern Labrador	Bounty and Antipodes Islands	New Zealand
Canada (East Coast)	Scotian Shelf	Bouvet Island	Bouvet Isl. (Norway)
Canada (East Coast)	Southern Grand Banks - South Newfoundland	Campbell Island	New Zealand
Canada (Pacific)	North American Pacific Fjordland	Cape Howe	Australia
Canada (Pacific)	Oregon, Washington, Vancouver Coast and Shelf	Cape Verde	Cape Verde
Canada (Pacific)	Puget Trough/Georgia Basin	Cargados Carajos/Tromelin Island	Mauritius
Canary Isl. (Spain)	Azores Canaries Madeira	Cargados Carajos/Tromelin Island	Tromelin Isl. (France)
Cape Verde	Cape Verde	Carolinian	USA (East Coast)
Cayman Isl. (UK)	Greater Antilles	Celtic Seas	Channel Isl. (UK)
Chagos Archipelago (UK)	Chagos	Celtic Seas	Ireland

EEZ	Marine Ecoregion	Marine Ecoregion	EEZ
Channel Isl. (UK)	Celtic Seas	Celtic Seas	United Kingdom (UK)
Chile (mainland)	Araucanian	Central and Southern Great Barrier Reef	Australia
Chile (mainland)	Central Chile	Central Chile	Chile (mainland)
Chile (mainland)	Channels and Fjords of Southern Chile	Central Kuroshio Current	Japan (main islands)
Chile (mainland)	Chiloense	Central New Zealand	New Zealand
Chile (mainland)	Humboldtian	Central Peru	Peru
China	East China Sea	Central Somali Coast	Somalia
China	Gulf of Tonkin	Chagos	Chagos Archipelago (UK)
China	South China Sea Oceanic Islands	Chagos	Mauritius
China	Southern China	Channels and Fjords of Southern Chile	Chile (mainland)
China	Yellow Sea	Chatham Island	New Zealand
Christmas (Australia) Isl.	Cocos-Keeling/Christmas Island	Chiapas-Nicaragua	El Salvador
Clipperton (France) Isl.	Clipperton	Chiapas-Nicaragua	Guatemala (Pacific)
Cocos (Keeling) (Australia) Isl.	Cocos-Keeling/Christmas Island	Chiapas-Nicaragua	Honduras (Pacific)
Colombia (Caribbean)	Southern Caribbean	Chiapas-Nicaragua	Mexico (Pacific)
Colombia (Caribbean)	Southwestern Caribbean	Chiapas-Nicaragua	Nicaragua (Pacific)
Colombia (Pacific)	Panama Bight	Chiloense	Chile (mainland)
Comoros Isl.	Western and Northern Madagascar	Chukchi Sea	Russia (Laptev to Chukchi Sea)
Congo (ex-Zaire)	Gulf of Guinea South	Chukchi Sea	USA (Alaska, Arctic)
Congo, R. of	Gulf of Guinea South	Clipperton	Clipperton Isl. (France)
Cook Islands	Phoenix/Tokelau/Northern Cook Islands	Cocos Islands	Costa Rica (Pacific)
Cook Islands	Southern Cook/Austral Islands	Cocos-Keeling/Christmas Island	Christmas Isl. (Australia)
Corsica (France)	Western Mediterranean	Cocos-Keeling/Christmas Island	Cocos (Keeling) Isl. (Australia)
Costa Rica (Caribbean)	Southwestern Caribbean	Coral Sea	Australia
Costa Rica (Pacific)	Cocos Islands	Cortezian	Mexico (Pacific)
Costa Rica (Pacific)	Nicoya	Crozet Islands	Crozet Isl. (France)
Côte d'Ivoire	Gulf of Guinea Upwelling	Delagoa	Mozambique
Crete (Greece)	Aegean Sea	Delagoa	South Africa (Indian Ocean Coast)
Croatia	Adriatic Sea	East African Coral Coast	Kenya
Crozet Isl. (France)	Crozet Islands	East African Coral Coast	Mozambique
Cuba	Greater Antilles	East African Coral Coast	Tanzania
Curacao (Netherlands)	Southern Caribbean	East Caroline Islands	Micronesia (Federated States of)
Cyprus (North)	Levantine Sea	East China Sea	China
Cyprus (South)	Levantine Sea	East China Sea	Japan (main islands)
Denmark (Baltic Sea)	Baltic Sea	East China Sea	Korea (South)
Denmark (Baltic Sea)	North Sea	East Greenland Shelf	Greenland (Denmark)
Denmark (North Sea)	North Sea	East Siberian Sea	Russia (Laptev to Chukchi Sea)
Desventuradas (Chile) Isl.	Juan Fernandez and Desventuradas	Easter Island	Easter Isl. (Chile)

EEZ	Marine Ecoregion	Marine Ecoregion	EEZ
Djibouti	Gulf of Aden	Eastern Bering Sea	USA (Alaska, Subarctic)
Dominica	Eastern Caribbean	Eastern Brazil	Brazil (mainland)
Dominican Republic	Bahamian	Eastern Caribbean	Anguilla (UK)
Dominican Republic	Greater Antilles	Eastern Caribbean	Antigua & Barbuda
Easter Isl. (Chile)	Easter Island	Eastern Caribbean	Barbados
Ecuador (mainland)	Guayaquil	Eastern Caribbean	British Virgin Isl. (UK)
Ecuador (mainland)	Panama Bight	Eastern Caribbean	Dominica
Egypt (Mediterranean)	Levantine Sea	Eastern Caribbean	Grenada
Egypt (Red Sea)	Northern and Central Red Sea	Eastern Caribbean	Guadeloupe (France)
El Salvador	Chiapas-Nicaragua	Eastern Caribbean	Martinique (France)
Equatorial Guinea	Gulf of Guinea Islands	Eastern Caribbean	Montserrat (UK)
Eritrea	Southern Red Sea	Eastern Caribbean	Saba and Sint Eustaius (Netherlands)
Estonia	Baltic Sea	Eastern Caribbean	Saint Kitts & Nevis
Faeroe Isl. (Denmark)	Faeroe Plateau	Eastern Caribbean	Saint Lucia
Falkland Isl. (UK)	Malvinas/Falklands	Eastern Caribbean	Saint Vincent & the Grenadines
Fernando de Noronha (Brazil)	Fernando de Naronha and Atoll das Rocas	Eastern Caribbean	Sint Maarten (Netherlands)
Fiji	Fiji Islands	Eastern Caribbean	St Barthelemy (France)
Fiji	Gilbert/Ellis Islands	Eastern Caribbean	St Martin (France)
Finland	Baltic Sea	Eastern Caribbean	US Virgin Isl.
France (Atlantic Coast)	South European Atlantic Shelf	Eastern Galapagos Islands	Galapagos Isl. (Ecuador)
France (Mediterranean)	Western Mediterranean	Eastern India	India (mainland)
French Guiana	Guianan	Eastern Philippines	Philippines
French Polynesia	Marquesas	Exmouth to Broome	Australia
French Polynesia	Rapa-Pitcairn	Faeroe Plateau	Faeroe Isl. (Denmark)
French Polynesia	Society Islands	Fernando de Naronha and Atoll das Rocas	Fernando de Noronha (Brazil)
French Polynesia	Southern Cook/Austral Islands	Fiji Islands	Fiji
French Polynesia	Tuamotus	Floridian	USA (Gulf of Mexico)
Gabon	Gulf of Guinea South	Gilbert/Ellis Islands	Fiji
Galapagos (Ecuador)	Isl. Eastern Galapagos Islands	Gilbert/Ellis Islands	Kiribati (Gilbert Islands)
Galapagos (Ecuador)	Isl. Northern Galapagos Islands	Gilbert/Ellis Islands	Nauru
Galapagos (Ecuador)	Isl. Western Galapagos Islands	Gilbert/Ellis Islands	Tuvalu
Gambia	Sahelian Upwelling	Great Australian Bight	Australia
Gaza Strip	Levantine Sea	Greater Antilles	Cayman Isl. (UK)
Georgia	Black Sea	Greater Antilles	Cuba
Germany (Baltic Sea)	Baltic Sea	Greater Antilles	Dominican Republic
Germany (Baltic Sea)	North Sea	Greater Antilles	Haiti
Germany (North Sea)	North Sea	Greater Antilles	Jamaica
Ghana	Gulf of Guinea Central	Greater Antilles	Puerto Rico (USA)
Ghana	Gulf of Guinea Upwelling	Guayaquil	Ecuador (mainland)
Glorieuse Islands (France)	Western and Northern Madagascar	Guayaquil	Peru
Greece (without Crete)	Aegean Sea	Guianan	French Guiana
Greece (without Crete)	Ionian Sea	Guianan	Guyana
Greenland (Denmark)	East Greenland Shelf	Guianan	Suriname

EEZ	Marine Ecoregion	Marine Ecoregion	EEZ
Greenland (Denmark)	North Greenland	Guianan	Trinidad & Tobago
Greenland (Denmark)	West Greenland Shelf	Gulf of Aden	Djibouti
Grenada	Eastern Caribbean	Gulf of Aden	Somalia
Guadeloupe (France)	Eastern Caribbean	Gulf of Aden	Yemen (Arabian Sea)
Guam (USA)	Mariana Islands	Gulf of Alaska	USA (Alaska, Subarctic)
Guatemala (Caribbean)	Western Caribbean	Gulf of Guinea Central	Benin
Guatemala (Pacific)	Chiapas-Nicaragua	Gulf of Guinea Central	Cameroon
Guinea	Gulf of Guinea West	Gulf of Guinea Central	Ghana
Guinea-Bissau	Gulf of Guinea West	Gulf of Guinea Central	Nigeria
Guinea-Bissau	Sahelian Upwelling	Gulf of Guinea Central	Togo
Guyana	Guianan	Gulf of Guinea Islands	Equatorial Guinea
Haiti	Greater Antilles	Gulf of Guinea Islands	Sao Tome & Principe
Hawaii Main Islands (USA)	Hawaii	Gulf of Guinea South	Congo (ex-Zaire)
Hawaii Northwest Islands (USA)	Hawaii	Gulf of Guinea South	Congo, R. of
Heard & McDonald Isl. (Australia)	Heard and Macdonald Islands	Gulf of Guinea South	Gabon
Honduras (Caribbean)	Southwestern Caribbean	Gulf of Guinea Upwelling	Côte d'Ivoire
Honduras (Caribbean)	Western Caribbean	Gulf of Guinea Upwelling	Ghana
Honduras (Pacific)	Chiapas-Nicaragua	Gulf of Guinea West	Guinea
Hong Kong (China)	Southern China	Gulf of Guinea West	Guinea-Bissau
Howland & Baker Isl. (USA)	Phoenix/Tokelau/Northern Cook Islands	Gulf of Guinea West	Liberia
Iceland	North and East Iceland	Gulf of Guinea West	Sierra Leone
Iceland	South and West Iceland	Gulf of Maine/Bay of Fundy	Canada (East Coast)
India (mainland)	Eastern India	Gulf of Maine/Bay of Fundy	USA (East Coast)
India (mainland)	Maldives	Gulf of Oman	Iran (Sea of Oman)
India (mainland)	Northern Bay of Bengal	Gulf of Oman	Oman
India (mainland)	Western India	Gulf of Oman	Oman (Musandam)
Indonesia (Central)	Sunda Shelf/Java Sea	Gulf of Oman	Pakistan
Indonesia (Eastern)	Arafura Sea	Gulf of Oman	United Arab Emirates (Fujairah)
Indonesia (Eastern)	Banda Sea	Gulf of Papua	Papua New Guinea
Indonesia (Eastern)	Halmahera	Gulf of St. Lawrence - Eastern Scotian Shelf	Canada (East Coast)
Indonesia (Eastern)	Lesser Sunda	Gulf of St. Lawrence - Eastern Scotian Shelf	Saint Pierre & Miquelon (France)
Indonesia (Eastern)	Northeast Sulawesi	Gulf of Thailand	Cambodia
Indonesia (Eastern)	Papua	Gulf of Thailand	Thailand (Gulf of Thailand)
Indonesia (Eastern)	Sulawesi Sea/Makassar Strait	Gulf of Tonkin	China
Indonesia (Indian Ocean)	Malacca Strait	Gulf of Tonkin	Viet Nam
Indonesia (Indian Ocean)	Southern Java	Halmahera	Indonesia (Eastern)
Indonesia (Indian Ocean)	Western Sumatra	Hawaii	Hawaii Main Islands (USA)
Iran (Persian Gulf)	Arabian (Persian) Gulf	Hawaii	Hawaii Northwest Islands (USA)
Iran (Sea of Oman)	Gulf of Oman	Hawaii	Johnston Atoll (USA)
Iraq	Arabian (Persian) Gulf	Heard and Macdonald Islands	Heard & McDonald Isl. (Australia)
Ireland	Celtic Seas	High Arctic Archipelago	Canada (Arctic)

EEZ	Marine Ecoregion	Marine Ecoregion	EEZ
Israel (Mediterranean)	Levantine Sea	Houtman	Australia
Israel (Red Sea)	Northern and Central Red Sea	Hudson Complex	Canada (Arctic)
Italy (mainland)	Adriatic Sea	Humboldtian	Chile (mainland)
Italy (mainland)	Ionian Sea	Humboldtian	Peru
Italy (mainland)	Western Mediterranean	Ionian Sea	Greece (without Crete)
Jamaica	Greater Antilles	Ionian Sea	Italy (mainland)
Jan Mayen Isl. (Norway)	North and East Iceland	Ionian Sea	Malta
Japan (Daito Islands)	South Kuroshio	Ionian Sea	Sicily (Italy)
Japan (main islands)	Central Kuroshio Current	Juan Fernandez and Desventuradas	Desventuradas Isl. (Chile)
Japan (main islands)	East China Sea	Juan Fernandez and Desventuradas	Juan Fernandez Islands (Chile)
Japan (main islands)	Northeastern Honshu	Kamchatka Shelf and Coast	Russia (Far East)
Japan (main islands)	Oyashio Current	Kara Sea	Russia (Kara Sea)
Japan (main islands)	Sea of Japan/East Sea	Kerguelen Islands	Kerguelen Isl. (France)
Japan (main islands)	South Kuroshio	Kermadec Island	Kermadec Isl. (New Zealand)
Japan (Ogasawara Islands)	Ogasawara Islands	Lancaster Sound	Canada (Arctic)
Jarvis Isl. (USA)	Line Islands	Laptev Sea	Russia (Laptev to Chukchi Sea)
Johnston Atoll (USA)	Hawaii	Leeuwin	Australia
Jordan	Northern and Central Red Sea	Lesser Sunda	Indonesia (Eastern)
Juan Fernandez Islands (Chile)	Juan Fernandez and Desventuradas	Lesser Sunda	Timor Leste
Kenya	East African Coral Coast	Levantine Sea	Cyprus (North)
Kenya	Northern Monsoon Current Coast	Levantine Sea	Cyprus (South)
Kerguelen Isl. (France)	Kerguelen Islands	Levantine Sea	Egypt (Mediterranean)
Kermadec Isl. (New Zealand)	Kermadec Island	Levantine Sea	Gaza Strip
Kiribati (Gilbert Islands)	Gilbert/Ellis Islands	Levantine Sea	Israel (Mediterranean)
Kiribati (Line Islands)	Line Islands	Levantine Sea	Lebanon
Kiribati (Line Islands)	Tuamotus	Levantine Sea	Syria
Kiribati (Phoenix Islands)	Phoenix/Tokelau/Northern Cook Islands	Levantine Sea	Turkey (Mediterranean Sea)
Korea (South)	East China Sea	Line Islands	Jarvis Isl. (USA)
Korea (South)	Sea of Japan/East Sea	Line Islands	Kiribati (Line Islands)
Korea (South)	Yellow Sea	Line Islands	Palmyra Atoll & Kingman Reef (USA)
Kuwait	Arabian (Persian) Gulf	Lord Howe and Norfolk Islands	Lord Howe Isl. (Australia)
Latvia	Baltic Sea	Lord Howe and Norfolk Islands	Norfolk Isl. (Australia)
Lebanon	Levantine Sea	Macquarie Island	Macquarie Isl. (Australia)
Liberia	Gulf of Guinea West	Magdalena Transition	Mexico (Pacific)
Libya	Tunisian Plateau/Gulf of Sidra	Malacca Strait	Indonesia (Indian Ocean)
Lithuania	Baltic Sea	Malacca Strait	Malaysia (Peninsula West)
Lord Howe Isl. (Australia)	Lord Howe and Norfolk Islands	Malacca Strait	Singapore

EEZ	Marine Ecoregion	Marine Ecoregion	EEZ
Macquarie (Australia)	Isl. Macquarie Island	Maldives	India (mainland)
Madagascar	Southeast Madagascar	Maldives	Maldives
Madagascar	Western and Northern Madagascar	Malvinas/Falklands	Falkland Isl. (UK)
Madeira Isl. (Portugal)	Azores Canaries Madeira	Manning-Hawkesbury	Australia
Malaysia (Peninsula East)	Sunda Shelf/Java Sea	Mariana Islands	Guam (USA)
Malaysia (Peninsula West)	Malacca Strait	Mariana Islands	Northern Marianas (USA)
Malaysia (Sabah)	Palawan/North Borneo	Marquesas	French Polynesia
Malaysia (Sabah)	South China Sea Oceanic Islands	Marshall Islands	Marshall Isl.
Malaysia (Sarawak)	Sunda Shelf/Java Sea	Marshall Islands	Wake Isl. (USA)
Maldives	Maldives	Mascarene Islands	Mauritius
Malta	Ionian Sea	Mascarene Islands	Réunion (France)
Malta	Tunisian Plateau/Gulf of Sidra	Mexican Tropical Pacific	Mexico (Pacific)
Marshall Isl.	Marshall Islands	Namaqua	Namibia
Martinique (France)	Eastern Caribbean	Namaqua	South Africa (Atlantic and Cape)
Mauritania	Sahelian Upwelling	Namib	Namibia
Mauritius	Cargados Carajos/Tromelin Island	Natal	South Africa (Atlantic and Cape)
Mauritius	Chagos	Natal	South Africa (Indian Ocean Coast)
Mauritius	Mascarene Islands	New Caledonia	New Caledonia (France)
Mayotte (France)	Western and Northern Madagascar	Nicoya	Costa Rica (Pacific)
Mexico (Atlantic)	Southern Gulf of Mexico	Nicoya	Panama (Pacific)
Mexico (Atlantic)	Western Caribbean	Ningaloo	Australia
Mexico (Pacific)	Chiapas-Nicaragua	North American Pacific Fjordland	Canada (Pacific)
Mexico (Pacific)	Cortezian	North American Pacific Fjordland	USA (Alaska, Subarctic)
Mexico (Pacific)	Magdalena Transition	North and East Barents Sea	Russia (Barents Sea)
Mexico (Pacific)	Mexican Tropical Pacific	North and East Barents Sea	Svalbard Isl. (Norway)
Mexico (Pacific)	Revillagigedos	North and East Iceland	Iceland
Mexico (Pacific)	Southern California Bight	North and East Iceland	Jan Mayen Isl. (Norway)
Micronesia (Federated States of)	East Caroline Islands	North Greenland	Greenland (Denmark)
Micronesia (Federated States of)	West Caroline Islands	North Patagonian Gulfs	Argentina
Montenegro	Adriatic Sea	North Sea	Belgium
Montserrat (UK)	Eastern Caribbean	North Sea	Denmark (Baltic Sea)
Morocco (Central)	Saharan Upwelling	North Sea	Denmark (North Sea)
Morocco (Mediterranean)	Alboran Sea	North Sea	Germany (Baltic Sea)
Morocco (South)	Saharan Upwelling	North Sea	Germany (North Sea)
Mozambique	Bight of Sofala/Swamp Coast	North Sea	Netherlands
Mozambique	Delagoa	North Sea	Sweden (West Coast)
Mozambique	East African Coral Coast	North Sea	United Kingdom (UK)

EEZ	Marine Ecoregion	Marine Ecoregion	EEZ
Mozambique Channel Isl. (France)	Western and Northern Madagascar	Northeast Sulawesi	Indonesia (Eastern)
Myanmar	Andaman Sea Coral Coast	Northeastern Brazil	Brazil (mainland)
Myanmar	Northern Bay of Bengal	Northeastern Honshu	Japan (main islands)
Namibia	Namaqua	Northeastern New Zealand	New Zealand
Namibia	Namib	Northern and Central Red Sea	Egypt (Red Sea)
Nauru	Gilbert/Ellis Islands	Northern and Central Red Sea	Israel (Red Sea)
Netherlands	North Sea	Northern and Central Red Sea	Jordan
New Caledonia (France)	New Caledonia	Northern and Central Red Sea	Saudi Arabia (Red Sea)
New Zealand	Auckland Island	Northern and Central Red Sea	Sudan
New Zealand	Bounty and Antipodes Islands	Northern Bay of Bengal	Bangladesh
New Zealand	Campbell Island	Northern Bay of Bengal	India (mainland)
New Zealand	Central New Zealand	Northern Bay of Bengal	Myanmar
New Zealand	Chatham Island	Northern California	USA (West Coast)
New Zealand	Northeastern New Zealand	Northern Galapagos Islands	Galapagos Isl. (Ecuador)
New Zealand	Snares Island	Northern Grand Banks - Southern Labrador	Canada (East Coast)
New Zealand	South New Zealand	Northern Gulf of Mexico	USA (Gulf of Mexico)
New Zealand	Three Kings-North Cape	Northern Labrador	Canada (East Coast)
Nicaragua (Caribbean)	Southwestern Caribbean	Northern Monsoon Current Coast	Kenya
Nicaragua (Pacific)	Chiapas-Nicaragua	Northern Monsoon Current Coast	Somalia
Nigeria	Gulf of Guinea Central	Northern Norway and Finnmark	Norway
Niue (New Zealand)	Tonga Islands	Ogasawara Islands	Japan (Ogasawara Islands)
Norfolk Isl. (Australia)	Lord Howe and Norfolk Islands	Oregon, Washington, Vancouver Coast and Shelf	Canada (Pacific)
Northern Marianas (USA)	Mariana Islands	Oregon, Washington, Vancouver Coast and Shelf	USA (West Coast)
Norway	Northern Norway and Finnmark	Oyashio Current	Japan (main islands)
Norway	Southern Norway	Oyashio Current	Russia (Far East)
Oman	Gulf of Oman	Palawan/North Borneo	Brunei Darussalam
Oman	Western Arabian Sea	Palawan/North Borneo	Malaysia (Sabah)
Oman (Musandam)	Arabian (Persian) Gulf	Palawan/North Borneo	Philippines
Oman (Musandam)	Gulf of Oman	Panama Bight	Colombia (Pacific)
Pakistan	Gulf of Oman	Panama Bight	Ecuador (mainland)
Pakistan	Western India	Panama Bight	Panama (Pacific)
Palau	West Caroline Islands	Papua	Indonesia (Eastern)
Palmyra Atoll & Kingman Reef (USA)	Line Islands	Patagonian Shelf	Argentina
Panama (Caribbean)	Southwestern Caribbean	Phoenix/Tokelau/Northern Cook Islands	American Samoa
Panama (Pacific)	Nicoya	Phoenix/Tokelau/Northern Cook Islands	Cook Islands
Panama (Pacific)	Panama Bight	Phoenix/Tokelau/Northern Cook Islands	Howland & Baker Isl. (USA)
Papua New Guinea	Bismarck Sea	Phoenix/Tokelau/Northern Cook Islands	Kiribati (Phoenix Islands)

EEZ	Marine Ecoregion	Marine Ecoregion	EEZ
Papua New Guinea	Gulf of Papua	Phoenix/Tokelau/Northern Cook Islands	Tokelau (New Zealand)
Papua New Guinea	Solomon Archipelago	Prince Edward Islands	Prince Edward Isl. (South Africa)
Papua New Guinea	Solomon Sea	Puget Trough/Georgia Basin	Canada (Pacific)
Papua New Guinea	Southeast Papua New Guinea	Puget Trough/Georgia Basin	USA (West Coast)
Peru	Central Peru	Rapa-Pitcairn	French Polynesia
Peru	Guayaquil	Rapa-Pitcairn	Pitcairn (UK)
Peru	Humboldtian	Revillagigedos	Mexico (Pacific)
Philippines	Eastern Philippines	Rio de la Plata	Argentina
Philippines	Palawan/North Borneo	Rio de la Plata	Uruguay
Philippines	South China Sea Oceanic Islands	Rio Grande	Brazil (mainland)
Pitcairn (UK)	Rapa-Pitcairn	Saharan Upwelling	Morocco (Central)
Poland	Baltic Sea	Saharan Upwelling	Morocco (South)
Portugal (mainland)	South European Atlantic Shelf	Sahelian Upwelling	Gambia
Prince Edward Isl. (South Africa)	Prince Edward Islands	Sahelian Upwelling	Guinea-Bissau
Puerto Rico (USA)	Bahamian	Sahelian Upwelling	Mauritania
Puerto Rico (USA)	Greater Antilles	Sahelian Upwelling	Senegal
Qatar	Arabian (Persian) Gulf	Samoa Islands	American Samoa
Réunion (France)	Mascarene Islands	Samoa Islands	Samoa
Romania	Black Sea	Samoa Islands	Tonga
Russia (Baltic Sea)	Baltic Sea	Samoa Islands	Wallis & Futuna Isl. (France)
Russia (Barents Sea)	North and East Barents Sea	Sao Pedro and Sao Paulo Islands	St Paul and St. Peter Archipelago (Brazil)
Russia (Barents Sea)	White Sea	Scotian Shelf	Canada (East Coast)
Russia (Black Sea)	Black Sea	Sea of Japan/East Sea	Japan (main islands)
Russia (Far East)	Kamchatka Shelf and Coast	Sea of Japan/East Sea	Korea (South)
Russia (Far East)	Oyashio Current	Sea of Japan/East Sea	Russia (Far East)
Russia (Far East)	Sea of Japan/East Sea	Sea of Okhotsk	Russia (Far East)
Russia (Far East)	Sea of Okhotsk	Seychelles	Seychelles
Russia (Kara Sea)	Kara Sea	Shark Bay	Australia
Russia (Laptev to Chukchi Sea)	Chukchi Sea	Snares Island	New Zealand
Russia (Laptev to Chukchi Sea)	East Siberian Sea	Society Islands	French Polynesia
Russia (Laptev to Chukchi Sea)	Laptev Sea	Solomon Archipelago	Papua New Guinea
Saba and Sint Eustaius (Netherlands)	Eastern Caribbean	Solomon Archipelago	Solomon Isl.
Saint Helena (UK)	St. Helena and Ascension Islands	Solomon Sea	Papua New Guinea
Saint Kitts & Nevis	Eastern Caribbean	South and West Iceland	Iceland
Saint Lucia	Eastern Caribbean	South Australian Gulfs	Australia
Saint Pierre & Miquelon (France)	Gulf of St. Lawrence - Eastern Scotian Shelf	South China Sea Oceanic Islands	Brunei Darussalam
Saint Pierre & Miquelon (France)	Southern Grand Banks - South Newfoundland	South China Sea Oceanic Islands	China
Saint Vincent & the Grenadines	Eastern Caribbean	South China Sea Oceanic Islands	Malaysia (Sabah)
Samoa	Samoa Islands	South China Sea Oceanic Islands	Philippines

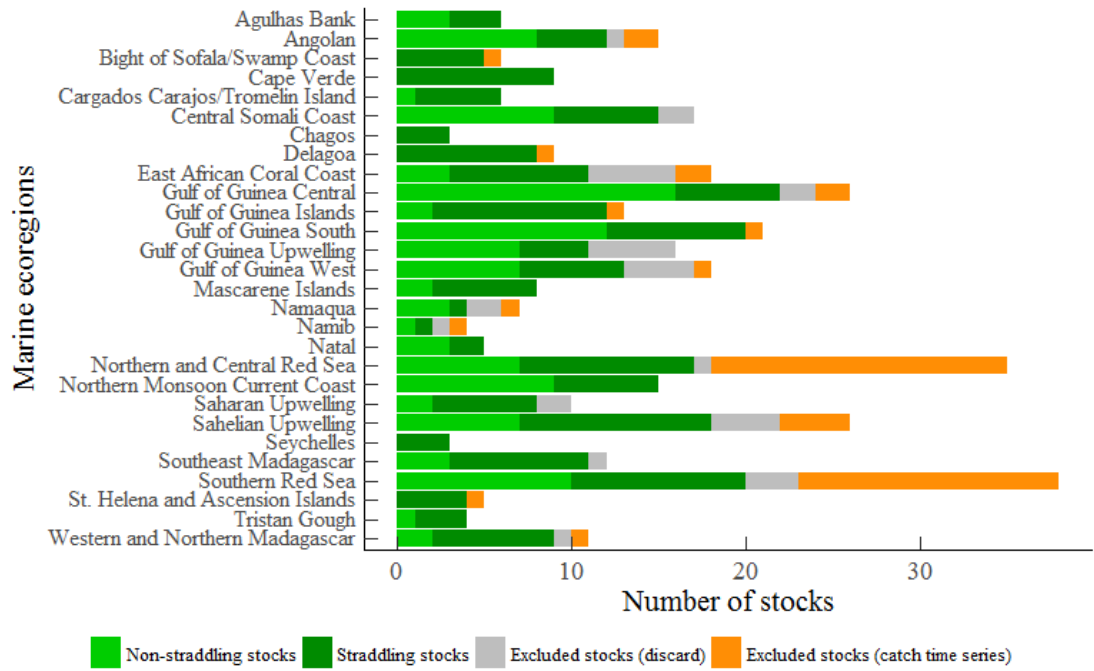
EEZ	Marine Ecoregion	Marine Ecoregion	EEZ
Sao Tome & Principe	Gulf of Guinea Islands	South China Sea Oceanic Islands	Taiwan
Sardinia (Italy)	Western Mediterranean	South China Sea Oceanic Islands	Viet Nam
Saudi Arabia (Persian Gulf)	Arabian (Persian) Gulf	South European Shelf	France (Atlantic Coast)
Saudi Arabia (Red Sea)	Northern and Central Red Sea	South European Shelf	Portugal (mainland)
Saudi Arabia (Red Sea)	Southern Red Sea	South European Shelf	Spain (Northwest)
Senegal	Sahelian Upwelling	South Georgia	South Georgia & Sandwich Isl. (UK)
Seychelles	Seychelles	South India and Sri Lanka	Sri Lanka
Sicily (Italy)	Ionian Sea	South Kuroshio	Japan (Daito Islands)
Sicily (Italy)	Western Mediterranean	South Kuroshio	Japan (main islands)
Sierra Leone	Gulf of Guinea West	South New Zealand	New Zealand
Singapore	Malacca Strait	South Orkney Islands	South Orkney Islands (UK)
Sint Maarten (Netherlands)	Eastern Caribbean	South Sandwich Islands	South Georgia & Sandwich Isl. (UK)
Slovenia	Adriatic Sea	Southeast Madagascar	Madagascar
Solomon Isl.	Solomon Archipelago	Southeast Papua New Guinea	Papua New Guinea
Solomon Isl.	Vanuatu	Southeastern Brazil	Brazil (mainland)
Somalia	Central Somali Coast	Southern California Bight	Mexico (Pacific)
Somalia	Gulf of Aden	Southern Caribbean	Aruba (Netherlands)
Somalia	Northern Monsoon Current Coast	Southern Caribbean	Bonaire (Netherlands)
South Africa (Atlantic and Cape)	Agulhas Bank	Southern Caribbean	Colombia (Caribbean)
South Africa (Atlantic and Cape)	Namaqua	Southern Caribbean	Curacao (Netherlands)
South Africa (Atlantic and Cape)	Natal	Southern Caribbean	Trinidad & Tobago
South Africa (Indian Ocean Coast)	Delagoa	Southern Caribbean	Venezuela
South Africa (Indian Ocean Coast)	Natal	Southern China	China
South Georgia & Sandwich Isl. (UK)	South Georgia	Southern China	Hong Kong (China)
South Georgia & Sandwich Isl. (UK)	South Sandwich Islands	Southern China	Taiwan
South Orkney Islands (UK)	South Orkney Islands	Southern Islands	Cook/Austral Cook Islands
Spain (mainland, Med and Gulf of Cadiz)	Alboran Sea	Southern Islands	Cook/Austral French Polynesia
Spain (mainland, Med and Gulf of Cadiz)	Western Mediterranean	Southern Grand Banks - South Newfoundland	Canada (East Coast)
Spain (Northwest)	South European Shelf	Southern Grand Banks - South Newfoundland	Saint Pierre & Miquelon (France)
Sri Lanka	South India and Sri Lanka	Southern Gulf of Mexico	Mexico (Atlantic)
St Barthelemy (France)	Eastern Caribbean	Southern Java	Indonesia (Indian Ocean)
St Martin (France)	Eastern Caribbean	Southern Norway	Norway
St Paul & Amsterdam Isl. (France)	Amsterdam-St Paul	Southern Red Sea	Eritrea

EEZ	Marine Ecoregion	Marine Ecoregion	EEZ
St Paul and St. Peter Archipelago (Brazil)	Sao Pedro and Sao Paulo Islands	Southern Red Sea	Saudi Arabia (Red Sea)
Sudan	Northern and Central Red Sea	Southern Red Sea	Sudan
Sudan	Southern Red Sea	Southern Red Sea	Yemen (Red Sea)
Suriname	Guianan	Southern Vietnam	Viet Nam
Svalbard Isl. (Norway)	North and East Barents Sea	Southwestern Caribbean	Colombia (Caribbean)
Sweden (Baltic)	Baltic Sea	Southwestern Caribbean	Costa Rica (Caribbean)
Sweden (West Coast)	North Sea	Southwestern Caribbean	Honduras (Caribbean)
Syria	Levantine Sea	Southwestern Caribbean	Nicaragua (Caribbean)
Taiwan	South China Sea Oceanic Islands	Southwestern Caribbean	Panama (Caribbean)
Taiwan	Southern China	St. Helena and Ascension Islands	Ascension Isl. (UK)
Tanzania	East African Coral Coast	St. Helena and Ascension Islands	Saint Helena (UK)
Thailand (Andaman Sea)	Andaman Sea Coral Coast	Sulawesi Sea/Makassar Strait	Indonesia (Eastern)
Thailand (Gulf of Thailand)	Gulf of Thailand	Sunda Shelf/Java Sea	Indonesia (Central)
Timor Leste	Lesser Sunda	Sunda Shelf/Java Sea	Malaysia (Peninsula East)
Togo	Gulf of Guinea Central	Sunda Shelf/Java Sea	Malaysia (Sarawak)
Tokelau (New Zealand)	Phoenix/Tokelau/Northern Cook Islands	Three Kings-North Cape	New Zealand
Tonga	Samoa Islands	Tonga Islands	Niue (New Zealand)
Tonga	Tonga Islands	Tonga Islands	Tonga
Trindade & Martim Vaz Isl. (Brazil)	Trindade and Martin Vaz Islands	Torres Strait Northern Great Barrier Reef	Australia
Trinidad & Tobago	Guianan	Trindade and Martin Vaz Islands	Trindade & Martim Vaz Isl. (Brazil)
Trinidad & Tobago	Southern Caribbean	Tristan Gough	Tristan da Cunha Isl. (UK)
Tristan da Cunha Isl. (UK)	Tristan Gough	Tuamotus	French Polynesia
Tromelin Isl. (France)	Cargados Carajos/Tromelin Island	Tuamotus	Kiribati (Line Islands)
Tunisia	Tunisian Plateau/Gulf of Sidra	Tunisian Plateau/Gulf of Sidra	Libya
Tunisia	Western Mediterranean	Tunisian Plateau/Gulf of Sidra	Malta
Turkey (Black Sea)	Black Sea	Tunisian Plateau/Gulf of Sidra	Tunisia
Turkey (Marmara Sea)	Aegean Sea	Tweed-Moreton	Australia
Turkey (Mediterranean Sea)	Aegean Sea	Uruguay-Buenos Aires Shelf	Argentina
Turkey (Mediterranean Sea)	Levantine Sea	Uruguay-Buenos Aires Shelf	Uruguay
Turks & Caicos Isl. (UK)	Bahamian	Vanuatu	Solomon Isl.
Tuvalu	Gilbert/Ellis Islands	Vanuatu	Vanuatu
Ukraine	Black Sea	Virginian	USA (East Coast)
United Arab Emirates	Arabian (Persian) Gulf	West Caroline Islands	Micronesia (Federated States of)
United Arab Emirates (Fujairah)	Gulf of Oman	West Caroline Islands	Palau

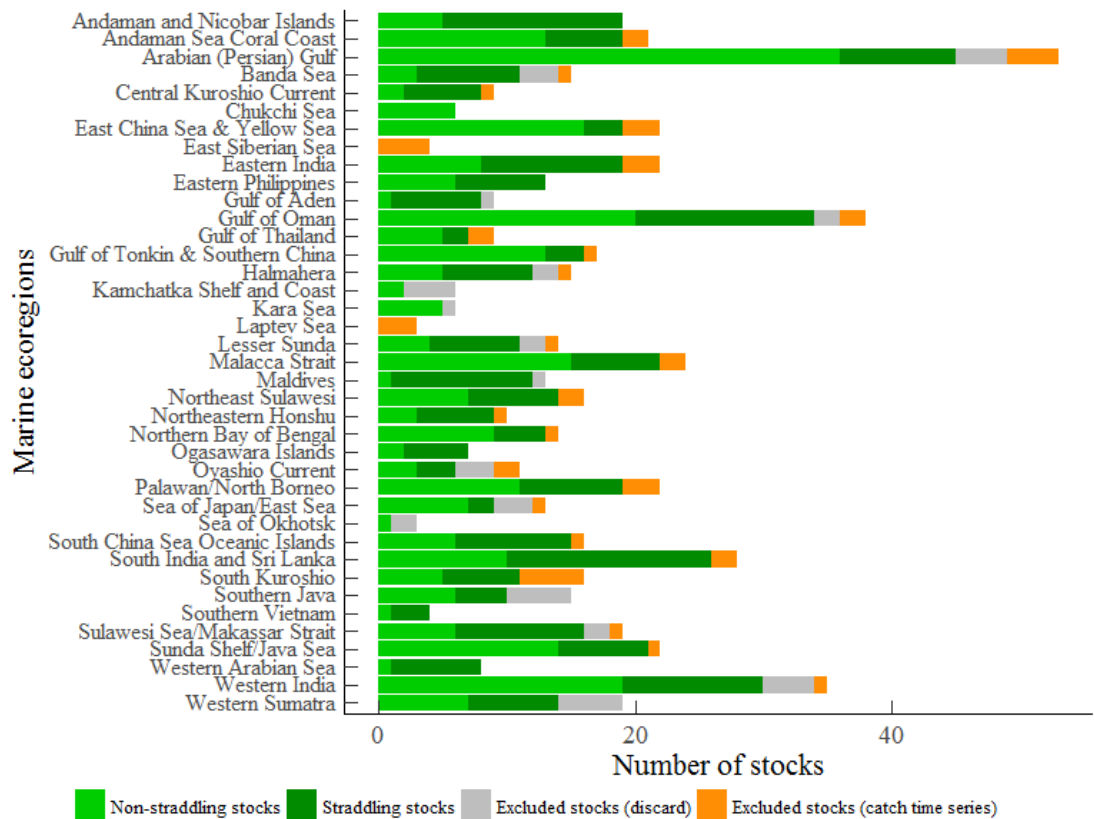
EEZ	Marine Ecoregion	Marine Ecoregion	EEZ
United Kingdom (UK)	Celtic Seas	West Greenland Shelf	Greenland (Denmark)
United Kingdom (UK)	North Sea	Western and Northern Madagascar	Comoros Isl.
Uruguay	Rio de la Plata	Western and Northern Madagascar	Glorieuse Islands (France)
Uruguay	Uruguay-Buenos Aires Shelf	Western and Northern Madagascar	Madagascar
US Virgin Isl.	Eastern Caribbean	Western and Northern Madagascar	Mayotte (France)
USA (Alaska, Arctic)	Beaufort Sea - continental coast and shelf	Western and Northern Madagascar	Mozambique Channel Isl. (France)
USA (Alaska, Arctic)	Chukchi Sea	Western Arabian Sea	Oman
USA (Alaska, Subarctic)	Aleutian Islands	Western Bassian	Australia
USA (Alaska, Subarctic)	Eastern Bering Sea	Western Caribbean	Belize
USA (Alaska, Subarctic)	Gulf of Alaska	Western Caribbean	Guatemala (Caribbean)
USA (Alaska, Subarctic)	North American Pacific Fjordland	Western Caribbean	Honduras (Caribbean)
USA (East Coast)	Carolinian	Western Caribbean	Mexico (Atlantic)
USA (East Coast)	Gulf of Maine/Bay of Fundy	Western Galapagos Islands	Galapagos Isl. (Ecuador)
USA (East Coast)	Virginian	Western India	India (mainland)
USA (Gulf of Mexico)	Floridian	Western India	Pakistan
USA (Gulf of Mexico)	Northern Gulf of Mexico	Western Mediterranean	Algeria
USA (West Coast)	Northern California	Western Mediterranean	Balearic Island (Spain)
USA (West Coast)	Oregon, Washington, Vancouver Coast and Shelf	Western Mediterranean	Corsica (France)
USA (West Coast)	Puget Trough/Georgia Basin	Western Mediterranean	France (Mediterranean)
Vanuatu	Vanuatu	Western Mediterranean	Italy (mainland)
Venezuela	Southern Caribbean	Western Mediterranean	Sardinia (Italy)
Viet Nam	Gulf of Tonkin	Western Mediterranean	Sicily (Italy)
Viet Nam	South China Sea Oceanic Islands	Western Mediterranean	Spain (mainland, Med and Gulf of Cadiz)
Viet Nam	Southern Vietnam	Western Mediterranean	Tunisia
Wake Isl. (USA)	Marshall Islands	Western Sumatra	Indonesia (Indian Ocean)
Wallis & Futuna Isl. (France)	Samoa Islands	White Sea	Russia (Barents Sea)
Yemen (Arabian Sea)	Gulf of Aden	Yellow Sea	China
Yemen (Red Sea)	Southern Red Sea	Yellow Sea	Korea (South)

APPENDIX II: SUMMARIES OF NUMBER OF STOCKS BY REGION AND BY CONTINENT

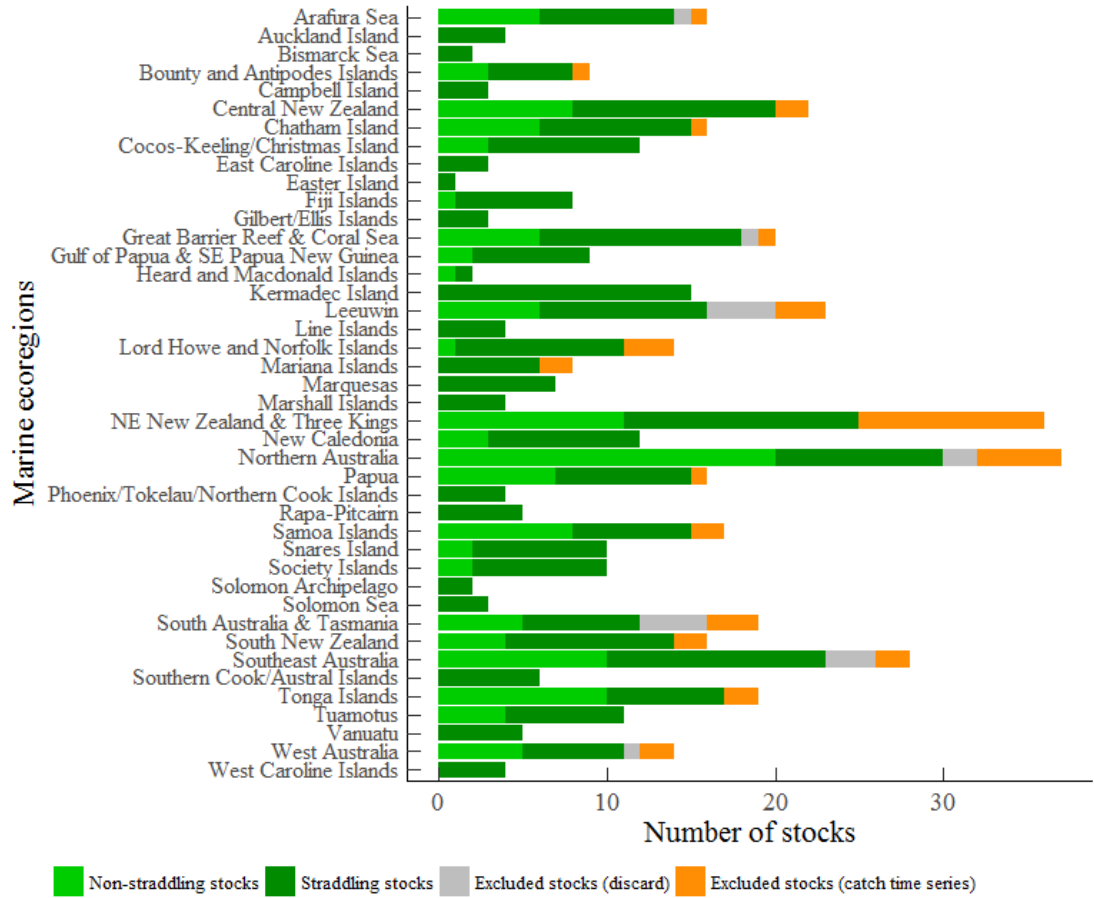
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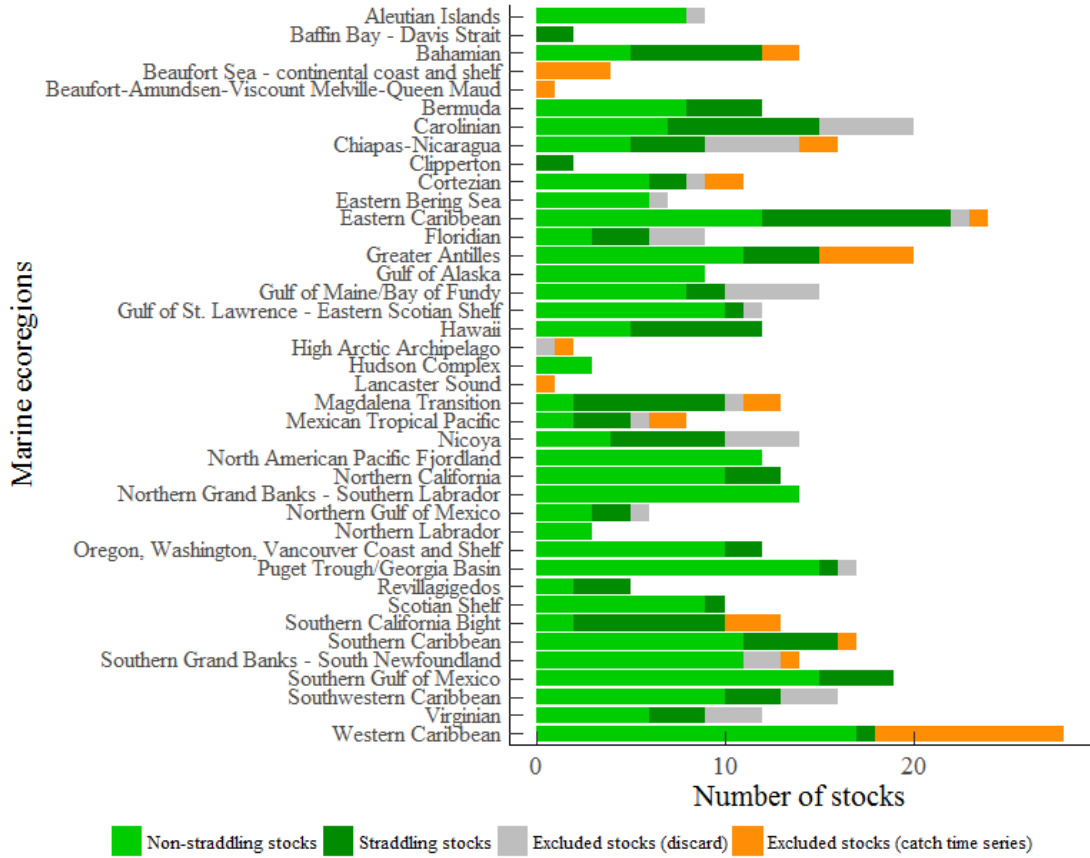
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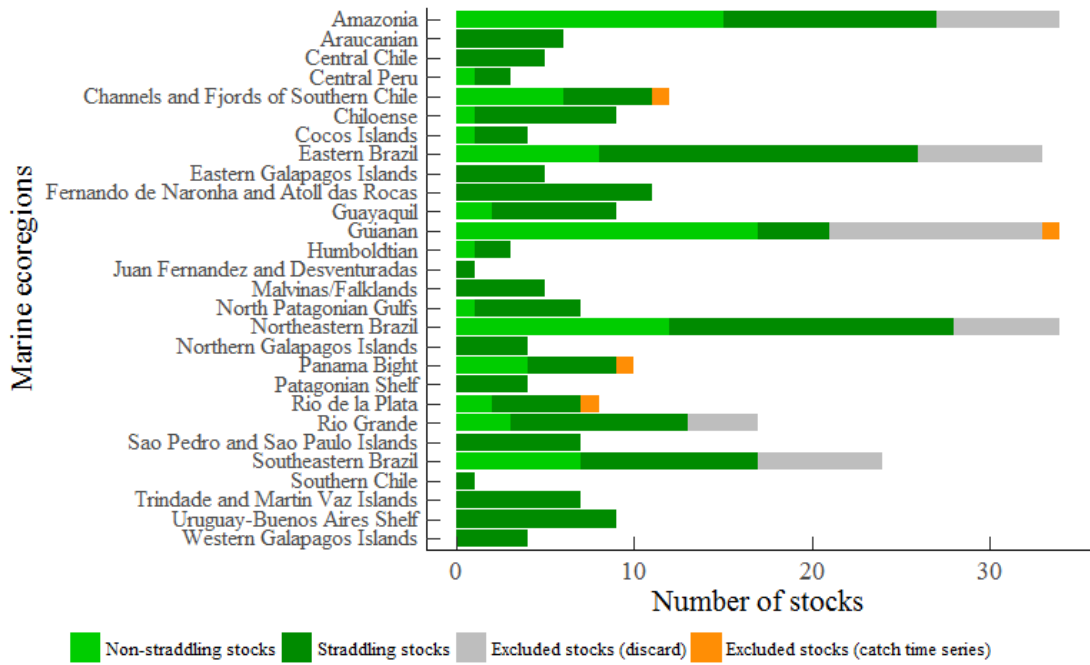
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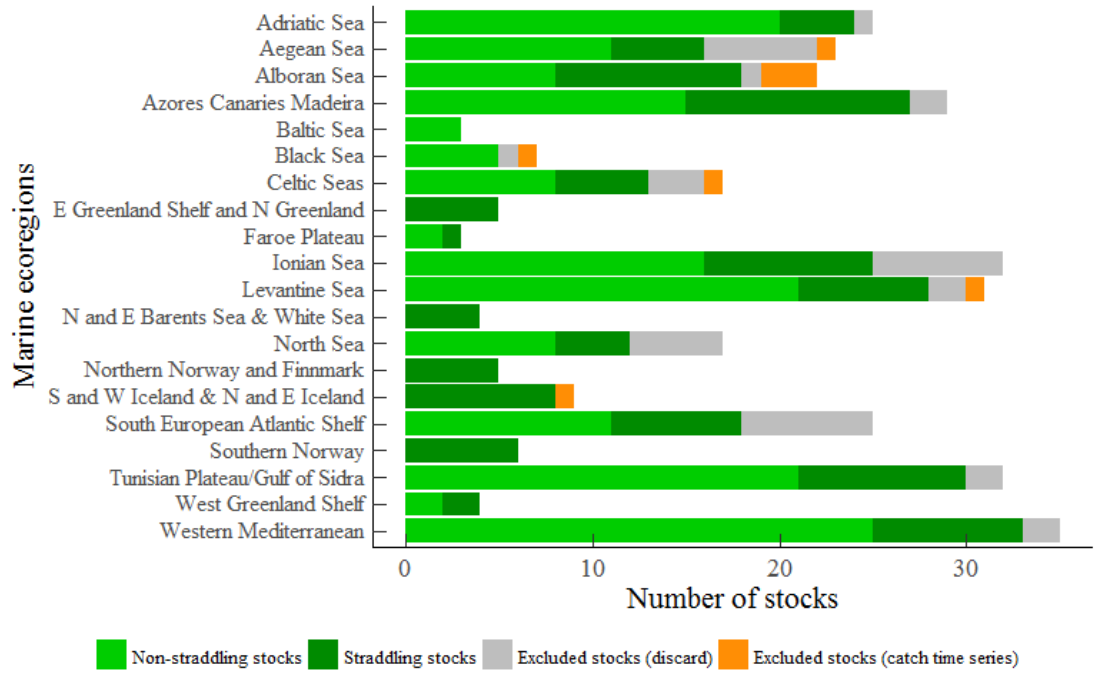
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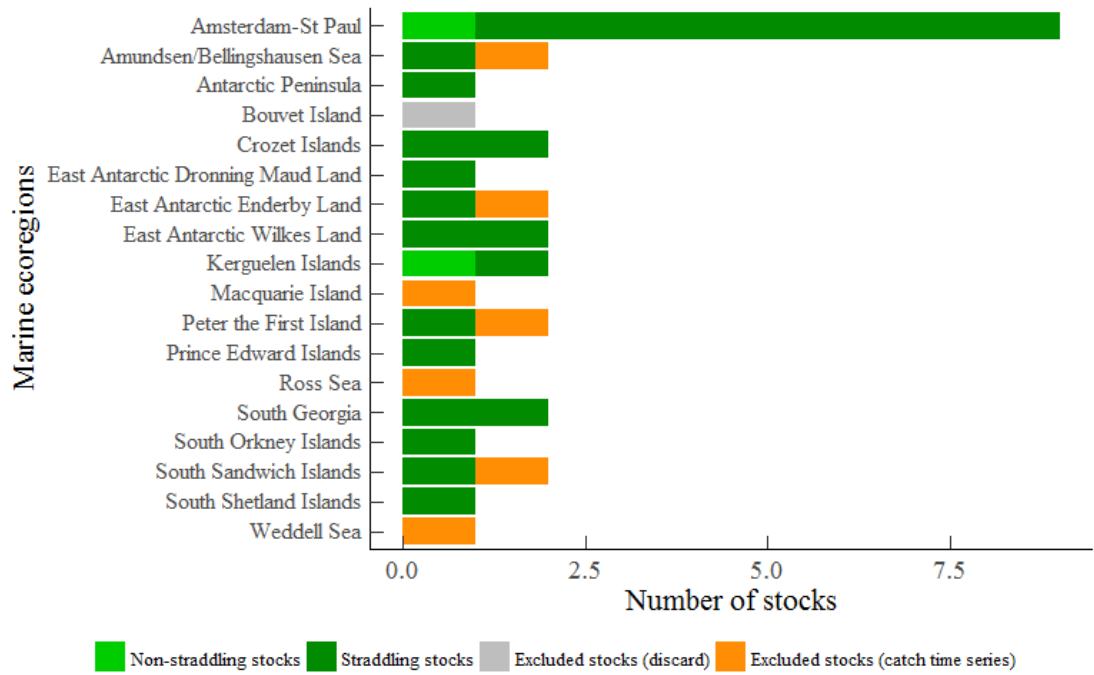
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Europe

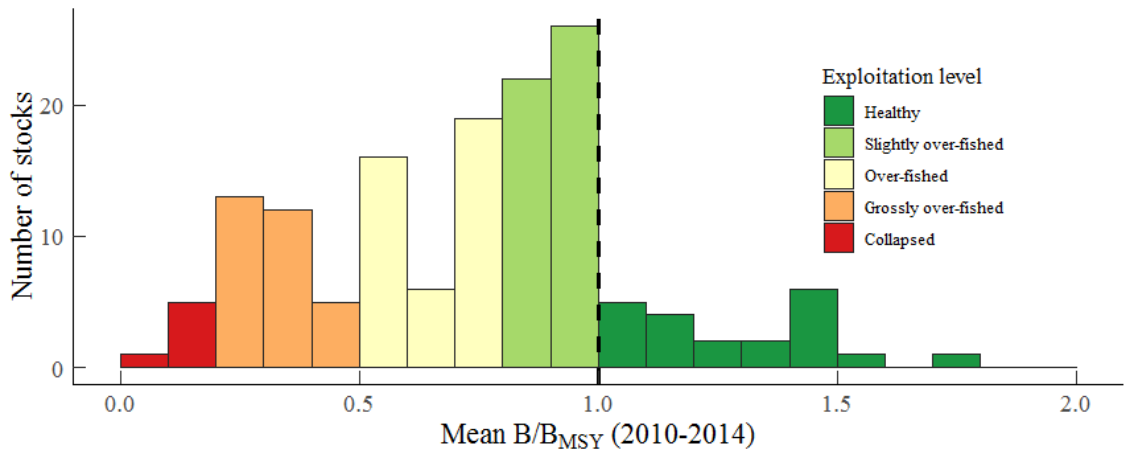


Antarctica

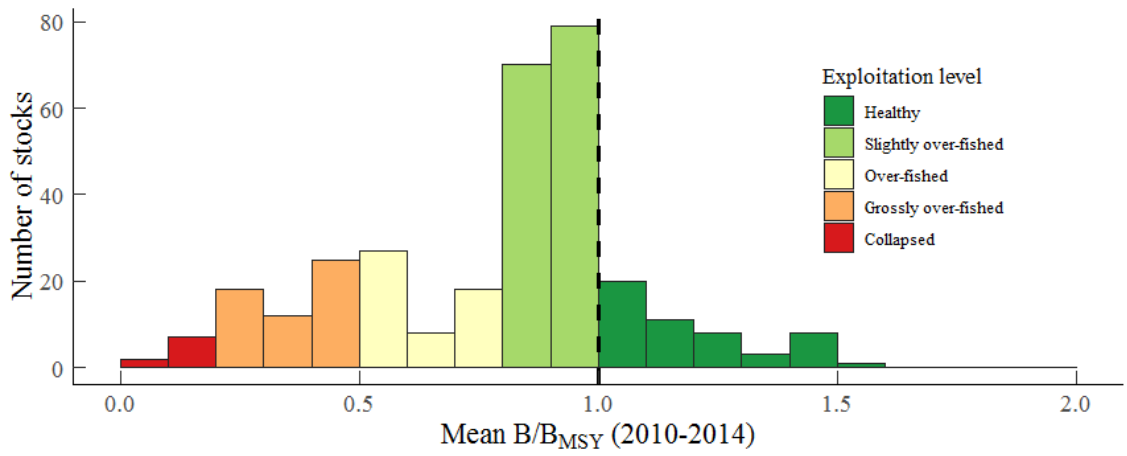


APPENDIX III: SUMMARIES OF B/B_{MSY} RESULTS BY REGION AND BY CONTINENT

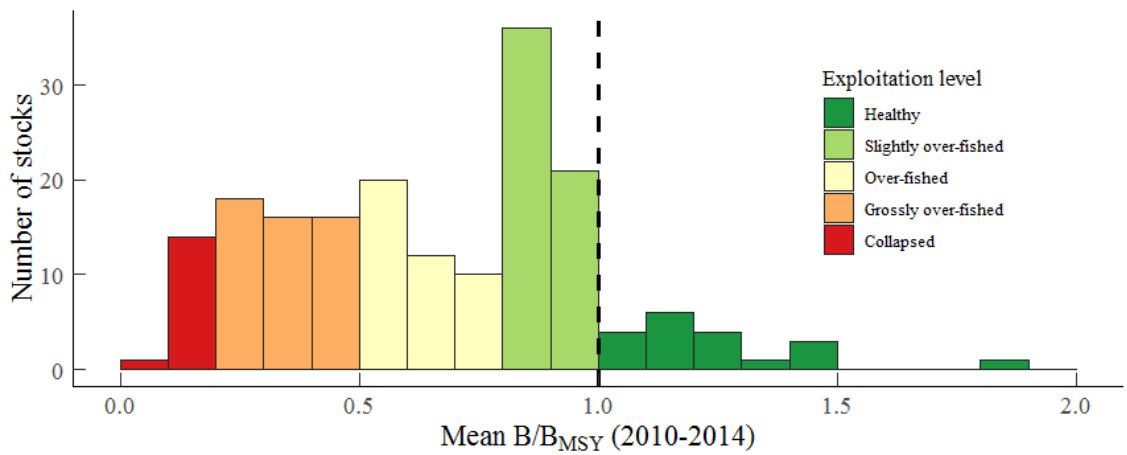
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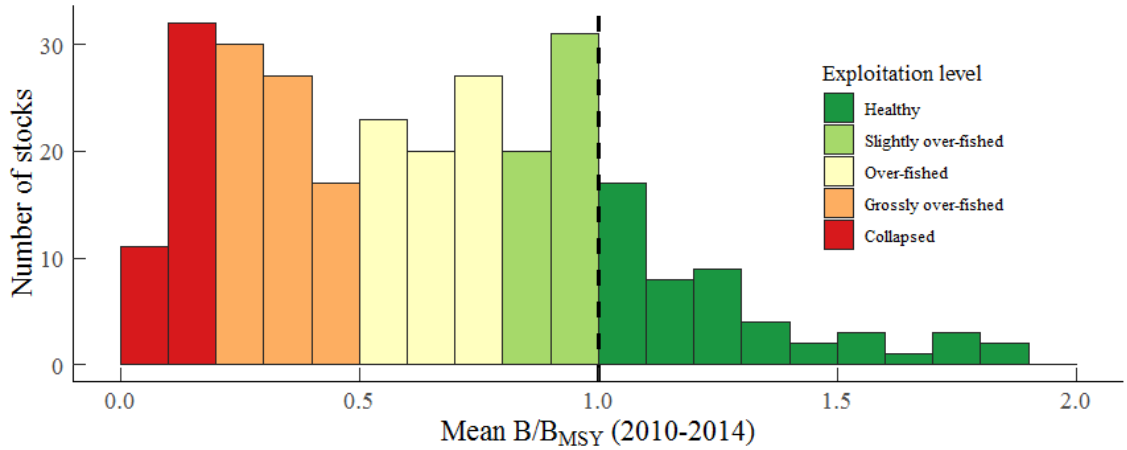
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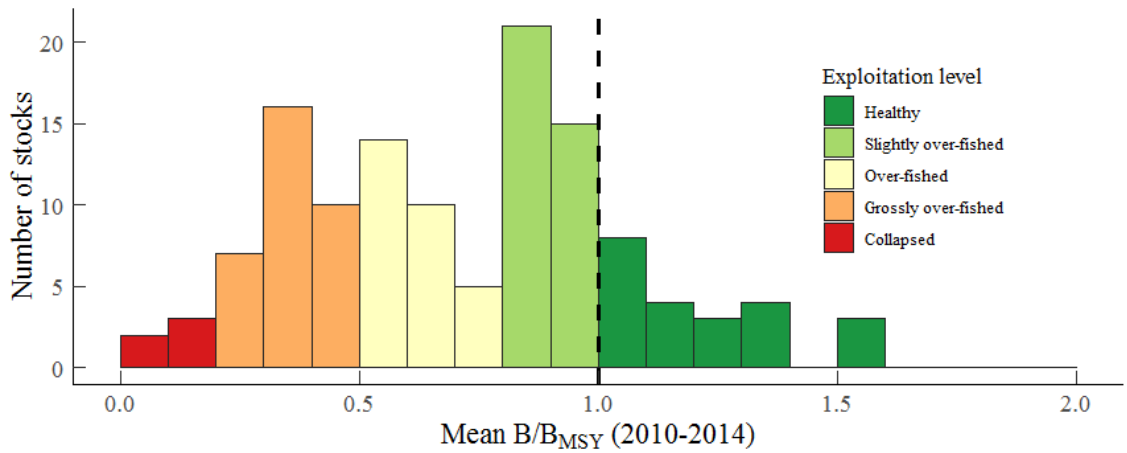
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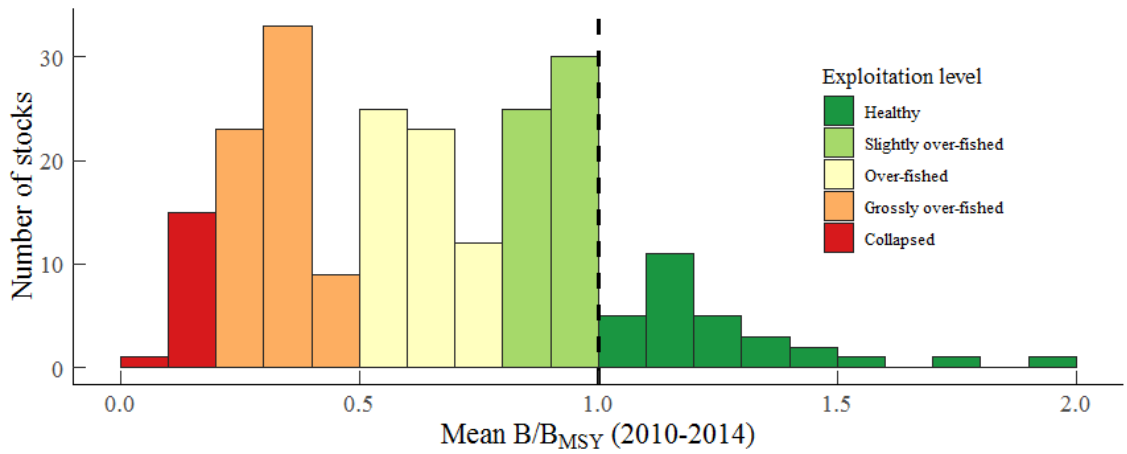
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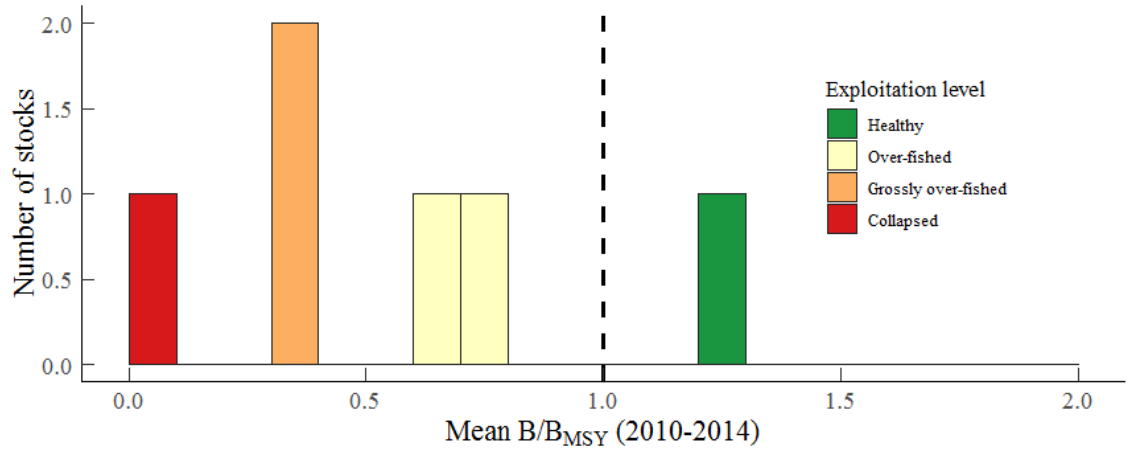
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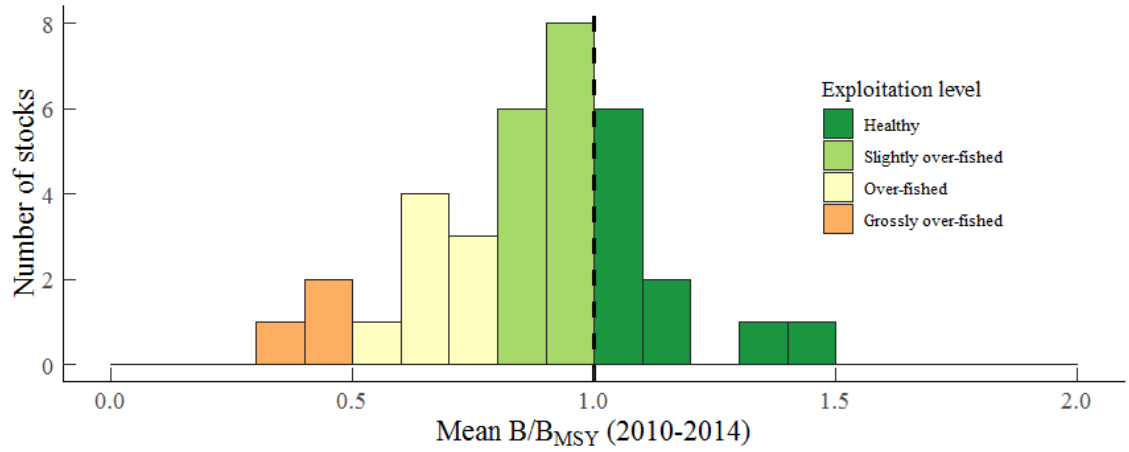
Europe



Antarctica



Wide-ranging stocks ('straddling')



APPENDIX IV: LIST OF STRADDLING STOCKS BY REGION

Scientific name	Common name	MEs, FAO area, Ocean
<i>Acanthocybium solandri</i>	Wahoo	Atlantic Ocean
<i>Acanthocybium solandri</i>	Wahoo	Indian Ocean
<i>Acanthocybium solandri</i>	Wahoo	Western Pacific Ocean
<i>Alopias superciliosus</i>	Bigeye thresher	Indian Ocean
<i>Alopias vulpinus</i>	Thresher	Indian Ocean
<i>Alopias vulpinus</i>	Thresher	Western Pacific Ocean
<i>Anchoa nasus</i>	Longnose anchovy	Panamian Bight, Guayaquil and Central Peru
<i>Anguilla anguilla</i>	European eel	Mediterranean
<i>Arripis trutta</i>	Australian salmon	Bassian, Western Bassian, Great Australia Bight, Southern Australian Gulfs, Leeuwin and Houtman
<i>Artemesia longinaris</i>	Argentine stiletto shrimp	Southeastern Brazil, Rio de la Plata, Uruguay-Buenos Aires Shelf, Rio Grande
<i>Auxis rochei</i>	Bullet tuna	Indian Ocean
<i>Auxis rochei</i>	Bullet tuna	Mediterranean
<i>Auxis thazard</i>	Frigate tuna	Atlantic Ocean
<i>Auxis thazard</i>	Frigate tuna	Indian Ocean
<i>Auxis thazard</i>	Frigate tuna	Northern and Central Red Sea & Southern Red Sea
<i>Auxis thazard</i>	Frigate tuna	Western Pacific Ocean
<i>Balistes capriscus</i>	Grey triggerfish	Atlantic, Southwest
<i>Beryx splendens</i>	Splendid alfonso	Atlantic, Northeast
<i>Brevoortia patronus</i>	Gulf menhaden	Floridian & Northern Gulf of Mexico
<i>Brevoortia tyrannus</i>	Atlantic menhaden	Carolinian & Virginian & Scotian & Gulf of Maine/Bay of Fundy
<i>Caranx rhonchus</i>	False scad	Sahelian Upwelling, Saharan Upwelling, Gulf of Guinea West, Gulf of Guinea Upwelling
<i>Carcharhinus falciformis</i>	Silky shark	Indian Ocean
<i>Carcharhinus falciformis</i>	Silky shark	Pacific, Eastern Central
<i>Carcharhinus falciformis</i>	Silky shark	Pacific, Southwest
<i>Carcharhinus longimanus</i>	Oceanic whitetip shark	Pacific, Southwest
<i>Carcharhinus longimanus</i>	Oceanic whitetip shark	Southern Pacific Ocean
<i>Carcharhinus obscurus</i>	Dusky shark	Indian Ocean, Eastern and Pacific, Western Central
<i>Carcharhinus plumbeus</i>	Sandbar shark	Cape Howe, Manning-Hawkesbury, Tweed-Moreton, Central and Southern Great Barrier Reef, Torres Strait Northern Great Barrier Reef, Arnhem Coast to Gulf of Carpentaria, Bonaparte Coast, Exmouth to Broome, Ningaloo, Shark Bay and Houtman
<i>Cephalopholis boenak</i>	Chocolate hind	Arnhem Coast to Gulf of Carpentaria and Bonaparte Coast and Arafura Sea
<i>Cetengraulis edentulus</i>	Atlantic anchoveta	Eastern Brazil, Southeastern Brazil
<i>Cetorhinus maximus</i>	Basking shark	Pacific, Southwest
<i>Chloroscombrus chrysurus</i>	Atlantic bumper	Brazil
<i>Clupea bentincki</i>	Araucanian herring	Chiloense, Araucanian, Central Chile
<i>Clupea harengus</i>	Atlantic herring	White Sea, North and East Barents Sea, Northern Norway and Finmark, Southern Norway, North Sea
<i>Cololabis saira</i>	Pacific saury	Pacific Northwest, Northeast and Eastern Central

Scientific name	Common name	MEs, FAO area, Ocean
<i>Coryphaena hippurus</i>	Common dolphinfish	Atlantic Ocean
<i>Coryphaena hippurus</i>	Common dolphinfish	Eastern Pacific Ocean
<i>Coryphaena hippurus</i>	Common dolphinfish	Indian Ocean
<i>Coryphaena hippurus</i>	Common dolphinfish	Mediterranean
<i>Coryphaena hippurus</i>	Common dolphinfish	Western Pacific Ocean
<i>Cynoscion acoupa</i>	Acoupa weakfish	Amazonia, Northeastern Brazil
<i>Cynoscion acoupa</i>	Acoupa weakfish	Eastern Brazil, Southeastern Brazil, Rio Grande
<i>Cynoscion jamaicensis</i>	Jamaica weakfish	Eastern Brazil, Amazonia, Northeastern Brazil, Guianan
<i>Cynoscion striatus</i>	Striped weakfish	Eastern Brazil, Southeastern Brazil, Northeastern Brazil, Rio de la Plata, Uruguay-Buenos Aires Shelf, Rio Grande
<i>Decapterus macarellus</i>	Mackerel scad	Cape Verde, Azores Canaries Madeira, Saharan Upwelling, Sahelian Upwelling, Gulf of Guinea West, Gulf of Guinea Upwelling, Gulf of Guinea Central, Gulf of Guinea Islands and Gulf of Guinea South
<i>Decapterus russelli</i>	Indian scad	Banda Sea, Halmahera, Sulawesi Sea/Makassar Strait and Palawan/North Borneo
<i>Dissostichus eleginoides</i>	Patagonian toothfish	Prince Edward Island, Crozet Island, Heard and Macdonald Islands, and Kerguelen Islands
<i>Dissostichus eleginoides</i>	Patagonian toothfish	South Georgia and South Sandwich Islands
<i>Dissostichus mawsoni</i>	Antarctic toothfish	East Antarctic Dronning Maud Land, East Antarctic Enderby Land and East Antarctic Wilkes Land
<i>Doryteuthis gahi</i>	Patagonian squid	Patagonian Shelf, Southeastern Brazil, Rio de la Plata, Uruguay-Buenos Aires Shelf, Rio Grande, North Patagonian Gulfs, Malvinas/Falklands
<i>Dosidicus gigas</i>	Jumbo flying squid	Pacific, Eastern Central
<i>Dosidicus gigas</i>	Jumbo flying squid	Pacific, Southeast
<i>Elagatis bipinnulata</i>	Rainbow runner	Northern and Central Red Sea & Southern Red Sea
<i>Encrasicholina heteroloba</i>	Shorthead anchovy	Northern and Central Red Sea & Southern Red Sea
<i>Engraulis anchoita</i>	Argentine anchovy	Southeastern Brazil, Rio de la Plata, Uruguay-Buenos Aires Shelf, Rio Grande, North Patagonian Gulfs
<i>Engraulis capensis</i>	Southern African anchovy	Natal & Agulhas Bank
<i>Engraulis encrasicolus</i>	European anchovy	Saharan Upwelling, Sahelian Upwelling, Gulf of Guinea West, Gulf of Guinea Upwelling, Gulf of Guinea Central, Gulf of Guinea Islands, Gulf of Guinea South, Angolan, Namib, Namaqua and Agulhas Bank
<i>Engraulis japonicus</i>	Japanese anchovy	Central Kuroshio Current & Northeastern Honshu & Oyashio Current
<i>Engraulis japonicus</i>	Japanese anchovy	South China Sea Oceanic Islands, Southern China, Eastern Philippines and Palawan/North Borneo
<i>Engraulis mordax</i>	Californian anchovy	Southern California Bight and Magdalena Transition
<i>Engraulis ringens</i>	Anchoveta	Chiloense, Araucanian, Central Chile
<i>Engraulis ringens</i>	Anchoveta	Guayaquil and Central Peru

Scientific name	Common name	MEs, FAO area, Ocean
<i>Euphausia superba</i>	Antarctic krill	Antarctic all Mes
<i>Euthynnus affinis</i>	Kawakawa	Indian Ocean
<i>Euthynnus affinis</i>	Kawakawa	Northern and Central Red Sea & Southern Red Sea
<i>Euthynnus affinis</i>	Kawakawa	Western Pacific Ocean
<i>Euthynnus alletteratus</i>	Little tunny	Atlantic Ocean
<i>Euthynnus alletteratus</i>	Little tunny	Gulf of Guinea Central, Gulf of Guinea Islands, Gulf of Guinea South and Angolan
<i>Euthynnus alletteratus</i>	Little tunny	Mediterranean
<i>Euthynnus alletteratus</i>	Little tunny	Sahelian Upwelling, Saharan Upwelling, Gulf of Guinea West, Cape Verde and Azores
<i>Gadus morhua</i>	Atlantic cod	Canaries Madeira
<i>Gadus morhua</i>	Atlantic cod	White Sea, North and East Barents Sea, Northern Norway and Finmark, Southern Norway
<i>Gadus morhua</i>	Atlantic cod	East Greenland Shelf and North Greenland
<i>Gadus morhua</i>	Atlantic cod	South and West Iceland and North and East Iceland
<i>Galeocerdo cuvier</i>	Tiger shark	Pacific, Western Central
<i>Galeorhinus galeus</i>	Tope shark	Australia
<i>Galeorhinus galeus</i>	Tope shark	Chatham Island, Northeastern New Zealand, Three Kings-North Cape, Central New Zealand, South New Zealand, Campbell Island, Snares Island, Bounty and Antipodes and Auckland Island
<i>Genypterus blacodes</i>	Pink cusk-eel	Bassian, Western Bassian, Great Australia Bight, and South Australia Gulfs and Leeuwin
<i>Genypterus blacodes</i>	Pink cusk-eel	Chatham Island and Central New Zealand
<i>Genypterus blacodes</i>	Pink cusk-eel	Patagonian Shelf, Uruguay-Buenos Aires Shelf, North Patagonian Gulfs
<i>Genypterus blacodes</i>	Pink cusk-eel	Auckland Island, Snares, Campbell, and South New Zealand
<i>Hoplostethus atlanticus</i>	Orange roughy	Bassian, Western Bassian, Great Australia Bight, South Australia Gulfs, Cape Howe and Leeuwin
<i>Hoplostethus atlanticus</i>	Orange roughy	Chatham Island, Campbell Island, Auckland Island, Snares Island, South New Zealand, Central New Zealand, Northeastern New Zealand, Three Kings-North Cape and Bounty and Antipodes Islands
<i>Illex argentinus</i>	Argentine shortfin squid	Southeastern Brazil, Rio de la Plata, Uruguay-Buenos Aires Shelf, Rio Grande, North Patagonian Gulfs, Malvinas/Falklands, Patagonian Shelf
<i>Istiophorus albicans</i>	Atlantic sailfish	East Atlantic
<i>Istiophorus albicans</i>	Atlantic sailfish	Western Atlantic Ocean
<i>Istiompax indica</i>	Black marlin	Indian Ocean
<i>Istiompax indica</i>	Black marlin	Southern Pacific Ocean
<i>Istiophorus platypterus</i>	Indo-Pacific sailfish	Eastern Pacific Ocean
<i>Istiophorus platypterus</i>	Indo-Pacific sailfish	Indian Ocean
<i>Istiophorus platypterus</i>	Indo-Pacific sailfish	Northern and Central Red Sea & Southern Red Sea
<i>Isurus oxyrinchus</i>	Shortfin mako	Atlantic, Southwest
<i>Isurus oxyrinchus</i>	Shortfin mako	South Pacific Ocean
<i>Kajikia audax</i>	Striped marlin	Pacific Western Central and Pacific Southwest

Scientific name	Common name	MEs, FAO area, Ocean
<i>Katsuwonus pelamis</i>	Skipjack tuna	Eastern Atlantic Ocean
<i>Katsuwonus pelamis</i>	Skipjack tuna	Eastern Pacific Ocean
<i>Katsuwonus pelamis</i>	Skipjack tuna	Indian Ocean
<i>Katsuwonus pelamis</i>	Skipjack tuna	Mediterranean
<i>Katsuwonus pelamis</i>	Skipjack tuna	Northern and Central Red Sea & Southern Red Sea
<i>Katsuwonus pelamis</i>	Skipjack tuna	Western Atlantic Ocean
<i>Katsuwonus pelamis</i>	Skipjack tuna	Western Pacific Ocean
<i>Litopenaeus schmitti</i>	Southern white shrimp	Brazil
<i>Lutjanus purpureus</i>	Southern red snapper	Eastern Brazil, Amazonia, Northeastern Brazil, Guianan
<i>Macruronus magellanicus</i>	Patagonian grenadier	Chiloense, Patagonian Shelf, Channels and Fjords of Southern Chile, Uruguay-Buenos Aires Shelf
<i>Macruronus novaezelandiae</i>	Blue grenadier	Central New Zealand, Northeastern New Zealand, Chatham Island
<i>Macruronus novaezelandiae</i>	Blue grenadier	Central New Zealand, South New Zealand, Campbell Island, Snares Island, Bounty and Antipodes and Auckland Island
<i>Macruronus novaezelandiae</i>	Blue grenadier	Leeuwin, Bassian, Western Bassian, Great Australia Bight, and South Australia Gulfs
<i>Makaira nigricans</i>	Blue marlin	Atlantic Ocean
<i>Mallotus villosus</i>	Capelin	East Greenland Shelf and North Greenland
<i>Mallotus villosus</i>	Capelin	North Sea, Southern Norway, Northern Norway and Finmark, North and East Barents Sea and White Sea
<i>Melanogrammus aeglefinus</i>	Haddock	White Sea, North and East Barents Sea, Northern Norway and Finmark, Southern Norway
<i>Melanogrammus aeglefinus</i>	Haddock	South and West Iceland and North and East Iceland
<i>Melicertus latisulcatus</i>	Western king prawn	Malacca Strait and Andaman and Nicobar Islands
<i>Merluccius australis</i>	Southern hake	Channels and Fjords of Southern Chile
<i>Merluccius australis</i>	Southern hake	Chiloense, Channels and Fjords of Southern Chile
<i>Merluccius australis</i>	Southern hake	Cambell Island, Auckland Island, Snares Island, South New Zealand and Bounty and Antipodes, Central New Zealand and Northeastern New Zealand
<i>Merluccius hubbsi</i>	Argentine hake	Patagonian Shelf, North Patagonian Gulfs
<i>Merluccius hubbsi</i>	Argentine hake	Uruguay-Buenos Aires Shelf, Rio Grande
<i>Merluccius merluccius</i>	European hake	Faroe Plateau, Celtic Sea, North Sea and South European Atlantic Shelf
<i>Micromesistius australis</i>	Southern blue whiting	Malvinas/Falklands, Patagonian Shelf, Uruguay-Buenos Aires Shelf, North Patagonian Gulfs
<i>Micromesistius australis</i>	Southern blue whiting	Chatham Island, Northeastern New Zealand, Three Kings-North Cape, Central New Zealand, South New Zealand, Campbell Island, Snares Island, Bounty and Antipodes and Auckland Island
<i>Micropogonias furnieri</i>	Whitemouth croaker	Rio de la Plata, Uruguay-Buenos Aires Shelf, Rio Grande
<i>Micromesistius poutassou</i>	Blue whiting	Atlantic, Northeast

Scientific name	Common name	MEs, FAO area, Ocean
<i>Micromesistius poutassou</i>	Blue whiting	Mediterranean
<i>Molva molva</i>	Ling	Faroe Plateau, Celtic Sea, North Sea and South European Atlantic Shelf
<i>Mugil cephalus</i>	Flathead grey mullet	Northern Gulf of Maine & Floridian & Carolinian & Virginian & Gulf of Maine Bay of Fundy
<i>Mytilus chilensis</i>	Chilean mussel	Channels and Fjords of Southern Chile
<i>Nemadactylus macropterus</i>	Tarakihi	Bassian, Cape Howe, Great Australian Bight, Houtman, Leeuwin, Manning-Hawkesbury, Shark Bay, South Australian Gulfs, and Western Bassian
<i>Ocyurus chrysurus</i>	Yellowtail snapper	Southern Caribbean and Southwestern Caribbean
<i>Opisthonema libertate</i>	Pacific thread herring	Guayaquil and Panama Bight
<i>Opisthonema oglinum</i>	Atlantic thread herring	Brazil
<i>Pagrus auratus</i>	Silver seabream	Central and Southern Great Barrier Reef, Torres Strait Northern Great Barrier Reef, Coral Sea, Cape Howe, Manning-Hawkesbury and Tweed-Moreton
<i>Pagrus auratus</i>	Silver seabream	Chatham Island, Campbell Island, Auckland Island, Snares Island, South New Zealand, Central New Zealand, Northeastern New Zealand, Three Kings-North Cape and Bounty and Antipodes Islands
<i>Pandalus borealis</i>	Northern prawn	North and East Iceland & South and West Iceland
<i>Pandalus borealis</i>	Northern shrimp	West Greenland Shelf
<i>Paralichthys dentatus</i>	Summer flounder	Carolinian & Virginian & Gulf of Maine/Bay of Fundy
<i>Patagonotothen ramsayi</i>	Longtail southern cod	Patagonian Shelf, Malvinas/Falklands,
<i>Pleoticus muelleri</i>	Argentine red shrimp	Patagonian Shelf, Uruguay-Buenos Aires Shelf, North Patagonian Gulfs
<i>Pleoticus muelleri</i>	Argentine red shrimp	Uruguay-Buenos Aires, Rio de la Plata
<i>Pollachius virens</i>	Saithe	White Sea, North and East Barents Sea, Northern Norway and Finmark, Southern Norway
<i>Pollachius virens</i>	Saithe	South and West Iceland and North and East Iceland
<i>Pomatomus saltatrix</i>	Bluefish	Brazil
<i>Pomatomus saltatrix</i>	Bluefish	Carolinian & Virginian
<i>Pomatomus saltatrix</i>	Bluefish	Indian Ocean, Eastern and Pacific, Western Central
<i>Prionace glauca</i>	Blue shark	Atlantic Ocean
<i>Prionace glauca</i>	Blue shark	Indian Ocean
<i>Prionace glauca</i>	Blue shark	Mediterranean
<i>Prionace glauca</i>	Blue shark	Pacific, Southwest and Pacific, Southeast
<i>Rachycentron canadum</i>	Cobia	Eastern India, Western India and South India and Sri Lanka
<i>Rachycentron canadum</i>	Cobia	Sahelian Upwelling, Saharan Upwelling, Gulf of Guinea West
<i>Rachycentron canadum</i>	Cobia	Northern and Central Red Sea & Southern Red Sea
<i>Rastrelliger brachysoma</i>	Short mackerel	Malacca Strait and Andaman and Nicobar Islands
<i>Rastrelliger brachysoma</i>	Short mackerel	Western Pacific Ocean

Scientific name	Common name	MEs, FAO area, Ocean
<i>Rastrelliger kanagurta</i>	Indian mackerel	Indian Ocean
<i>Rastrelliger kanagurta</i>	Indian mackerel	Northern and Central Red Sea & Southern Red Sea
<i>Rastrelliger kanagurta</i>	Indian mackerel	Western Pacific Ocean
<i>Reinhardtius hippoglossoides</i>	Greenland halibut	Baffin Bay - Davis Strait & West Greenland Shelf
<i>Reinhardtius hippoglossoides</i>	Greenland halibut	East Greenland Shelf and North Greenland
<i>Rexea solandri</i>	Silver gemfish	Shark Bay, Ningaloo, Houtman, Leeuwin, Bassian, Western Bassian, Great Australia Bight, and South Australia Gulfs
<i>Sardinella aurita</i>	Round sardinella	Mediterranean
<i>Sardinella aurita</i>	Round sardinella	Sahelian Upwelling and Saharian Upwelling
<i>Sardinella brasiliensis</i>	Brazilian sardinella	Brazil
<i>Sarda chiliensis</i>	Eastern Pacific bonito	Southern California Bight and Magdalena Transition
<i>Sardinella fimbriata</i>	Fringescale sardinella	Western Pacific Ocean
<i>Sardinella lemuru</i>	Bali sardinella	Banda Sea, Halmahera, Sulawesi Sea, Palawan/North Borneo, and Eastern Philippines
<i>Sardinella lemuru</i>	Bali sardinella	Houtman, Ningaloo, Shark Bay and Exmouth to Broome
<i>Sardinella longiceps</i>	Indian oil sardine	Indian Ocean
<i>Sardinella maderensis</i>	Madeiran sardinella	Sahelian Upwelling and Saharian Upwelling
<i>Sardina pilchardus</i>	European pilchard	Sahelian Upwelling and Saharian Upwelling
<i>Sardinops sagax</i>	Pacific sardine	Chiloense, Araucanian, Central Chile
<i>Sardinops sagax</i>	Pacific sardine	Gulf of Guinea South, Angolan and Namib
<i>Sardinops sagax</i>	Pacific sardine	Namaqua, Agulhas Bank, Natal and Delagoa
<i>Sardinops sagax</i>	Pacific sardine	Humboldtian, Central Peru, Guayaquil and Panama Bight
<i>Sardinops sagax</i>	Pacific sardine	Oregon, Washington, Vancouver Coast and Shelf, Northern California, Southern California Bight, Magdalena Transition and Mexican Tropical Pacific
<i>Sardinops sagax</i>	Pacific sardine	Western Pacific Ocean
<i>Sarda sarda</i>	Atlantic bonito	Mediterranean
<i>Sarda sarda</i>	Atlantic bonito	North and Central Eastern Atlantic Ocean
<i>Sarda sarda</i>	Atlantic bonito	Western Central Atlantic Ocean
<i>Scomber colias</i>	Atlantic chub mackerel	Azores Canaries Madeira and Saharan Upwelling
<i>Scomber australasicus</i>	Blue mackerel	Chatham Island, Northeastern New Zealand, Three Kings-North Cape, Central New Zealand, South New Zealand, Campbell Island, Snares Island, Bounty and Antipodes and Auckland Island
<i>Scomber australasicus</i>	Blue mackerel	Pacific, Southwest
<i>Scomberomorus brasiliensis</i>	Serra Spanish mackerel	Fernando de Naronha and Atoll das Rocas, Eastern Brazil, Southeastern Brazil, Amazonia, Northeastern Brazil, Guianan
<i>Scomberomorus cavalla</i>	King mackerel	Carolinian & Virginian & Gulf of Maine/Bay of Fundy
<i>Scomberomorus cavalla</i>	King mackerel	Fernando de Naronha and Atoll das Rocas, Eastern Brazil, Amazonia, Northeastern Brazil, Guianan
<i>Scomberomorus cavalla</i>	King mackerel	Northern Gulf of Mexico and Southern Gulf of Mexico

Scientific name	Common name	MEs, FAO area, Ocean
<i>Scomber colias</i>	Atlantic chub mackerel	Mediterranean
<i>Scomber colias</i>	European pilchard	Atlantic Northeast and Atlantic Eastern Central
<i>Scomberomorus commerson</i>	Narrowbarred Spanish mackerel	Central and Southern Great Barrier Reef, Coral Sea, Manning-Hawkesbury, Torres Strait Northern Great Barrier Reef and Tweed-Moreton
<i>Scomberomorus commerson</i>	Narrowbarred Spanish mackerel	Indian Ocean
<i>Scomberomorus commerson</i>	Narrowbarred Spanish mackerel	Mediterranean
<i>Scomberomorus commerson</i>	Narrowbarred Spanish mackerel	Northern and Central Red Sea & Southern Red Sea
<i>Scomberomorus commerson</i>	Narrowbarred Spanish mackerel	Western Pacific Ocean
<i>Scomberomorus guttatus</i>	Indo-Pacific king mackerel	Indian Ocean
<i>Scomber japonicus</i>	Chub mackerel	North East Pacific
<i>Scomber japonicus</i>	Scomber japonicus	Pacific Northwest Ocean
<i>Scomber japonicus</i>	Chub mackerel	South East Pacific
<i>Scomberomorus maculatus</i>	Atlantic Spanish mackerel	Carolinian & Virginian & Northern Gulf of Mexico & Floridian & Southern Gulf of Mexico
<i>Scomber scombrus</i>	Atlantic mackerel	Atlantic, Northwest
<i>Scomber scombrus</i>	Atlantic mackerel	Mediterranean
<i>Scomber scombrus</i>	Atlantic mackerel	North East Atlantic
<i>Scomberomorus tritor</i>	Round sardinella	Saharan Upwelling, Sahelian Upwelling, Azores Canaries Madeira, Gulf of Guinea West, Gulf of Guinea Upwelling, Gulf of Guinea Central, Gulf of Guinea Islands, Gulf of Guinea South, Angolan and Namib
<i>Sebastes mentella</i>	Beaked redfish	East Greenland Shelf and North Greenland
<i>Sebastes mentella</i>	Beaked redfish	North and East Iceland & South and West Iceland
<i>Sebastes norvegicus</i>	Golden redfish	Celtic Seas, East Greenland Shelf, Faroe Plateau, North and East Iceland, North Greenland and South and West Iceland
<i>Selar crumenophthalmus</i>	Bigeye scad	Cape Verde, Azores Canaries Madeira, Saharan Upwelling, Sahelian Upwelling, Gulf of Guinea West, Gulf of Guinea Upwelling, Gulf of Guinea Central, Gulf of Guinea Islands, Gulf of Guinea South, Angolan, Namib, Namaqua and Angulhas Bank
<i>Seriolella punctata</i>	Silver warehou	Chatham Island, Campbell Island, Auckland Island, Snares Island, South New Zealand, Central New Zealand, Northeastern New Zealand, Three Kings-North Cape and Bounty and Antipodes Islands
<i>Seriolella punctata</i>	Silver warehou	Leeuwin, Cape Howe, Manning-Hawkesbury, Bassian, Western Bassian, Great Australia Bight, and South Australia Gulfs
<i>Sphyraena barracuda</i>	Great barracuda	Indian Ocean
<i>Sphyrna lewini</i>	Scalloped hammerhead	Indian Ocean
<i>Sphyrna lewini</i>	Scalloped hammerhead	Pacific, Eastern Central
<i>Sphyrna zygaena</i>	Smooth hammerhead	Atlantic Ocean
<i>Squalus acanthias</i>	Piked dogfish	Gulf of Maine/Bay of Fundy, Virginian and Carolinian

Scientific name	Common name	MEs, FAO area, Ocean
<i>Squalus acanthias</i>	Piked dogfish	Chatham Island, Northeastern New Zealand, Three Kings-North Cape, Central New Zealand, South New Zealand, Campbell Island, Snares Island, Bounty and Antipodes and Auckland Island
<i>Tenualosa ilisha</i>	Hilsa shad	Northern Bay of Bengal, Eastern India, South India and Sri Lanka
<i>Theragra chalcogramma</i>	Alaska pollock	Northeastern Honshu and Oyashio Current
<i>Thunnus alalunga</i>	Albacore	Indian Ocean
<i>Thunnus alalunga</i>	Albacore	North Atlantic
<i>Thunnus alalunga</i>	Albacore	North Pacific
<i>Thunnus alalunga</i>	Albacore	Atlantic Ocean, South
<i>Thunnus alalunga</i>	Albacore	South Pacific Ocean
<i>Thunnus albacares</i>	Yellowfin tuna	Atlantic Ocean
<i>Thunnus albacares</i>	Yellowfin tuna	Eastern Pacific Ocean
<i>Thunnus albacares</i>	Yellowfin tuna	Indian Ocean
<i>Thunnus albacares</i>	Yellowfin tuna	Northern and Central Red Sea & Southern Red Sea
<i>Thunnus albacares</i>	Yellowfin tuna	Western Pacific Ocean
<i>Thunnus atlanticus</i>	Blackfin tuna	Eastern Caribbean, Bahamian, Carolinian and Virginian
<i>Thunnus maccoyii</i>	Southern bluefin tuna	South Atlantic, Southwest Pacific and Indian Ocean
<i>Thunnus obesus</i>	Bigeye tuna	Atlantic Ocean
<i>Thunnus obesus</i>	Bigeye tuna	Eastern Pacific Ocean
<i>Thunnus obesus</i>	Bigeye tuna	Indian Ocean
<i>Thunnus obesus</i>	Bigeye tuna	Western Pacific Ocean
<i>Thunnus orientalis</i>	Pacific bluefin tuna	Pacific Ocean
<i>Thunnus thynnus</i>	Atlantic bluefin tuna	East Atlantic and Mediterranean
<i>Thunnus thynnus</i>	Atlantic bluefin tuna	Western Atlantic Ocean
<i>Thunnus tonggol</i>	Longtail tuna	Indian Ocean
<i>Thunnus tonggol</i>	Longtail tuna	Northern and Central Red Sea & Southern Red Sea
<i>Thunnus tonggol</i>	Longtail tuna	Western Pacific Ocean
<i>Thyrsites atun</i>	Snoek	Chatham Island, Northeastern New Zealand, Three Kings-North Cape, Central New Zealand, South New Zealand, Campbell Island, Snares Island, Bounty and Antipodes and Auckland Island
<i>Todarodes pacificus</i>	Japanese flying squid	Pacific Northwest
<i>Trachurus japonicus</i>	Japanese jack mackerel	Northeastern Honshu, South Kuroshio, Central Kuroshio and Oyashio Current
<i>Trachurus mediterraneus</i>	Mediterranean horse mackerel	Mediterranean
<i>Trachurus murphyi</i>	Chilean jack mackerel	South East Pacific
<i>Trachurus trachurus</i>	Atlantic horse mackerel	Mediterranean
<i>Trachurus trachurus</i>	Atlantic horse mackerel	Sahelian Upwelling, Saharan Upwelling, Gulf of Guinea West, Gulf of Guinea Upwelling
<i>Trachurus trachurus</i>	Atlantic horse mackerel	Faroe Plateau, Celtic Sea, North Sea, Southern Norway, Northern Norway and Finmark, and South European Atlantic Shelf
<i>Trachurus trecae</i>	Cunene horse mackerel	Saharan Upwelling, Sahelian Upwelling, Gulf of Guinea West, Gulf of Guinea Upwelling, Gulf of Guinea Central, Gulf of Guinea Islands, Gulf of Guinea South, Angolan and Namib
<i>Trichiurus lepturus</i>	Largehead hairtail	Atlantic, Southwest

Scientific name	Common name	MEs, FAO area, Ocean
<i>Trichiurus lepturus</i>	Largehead hairtail	Mediterranean
<i>Tylosurus crocodilus</i>	Hound needlefish	Northern and Central Red Sea & Southern Red Sea
<i>Xiphias gladius</i>	Swordfish	Indian Ocean
<i>Xiphias gladius</i>	Swordfish	Alboran Sea
<i>Xiphias gladius</i>	Swordfish	North Atlantic
<i>Xiphias gladius</i>	Swordfish	Pacific, Southwest
<i>Xiphias gladius</i>	Swordfish	South Atlantic
<i>Xiphopenaeus kroyeri</i>	Atlantic seabob	Eastern Brazil, Amazonia, Northeastern Brazil

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