Supplementary Information

Supplementary information to *Ocean's 14: Mixed sustainable marine development in the European Union*

The supplementary information includes a detailed description of the indicator selection and transformation and a .zip file with the raw data, the code used for the analysis, and the output data.

S1 Indicator Selection and Transformation

In the following, we discuss, for the ten targets associated with SDG 14, our selection and transformation of indicators.

S1.1 Target 14.1: By 2025, prevent and significantly reduce marine pollution of all kinds, particularly from land-based activities, including marine debris and nutrient pollution

Target 14.1a

Target 14.1 is supposed to be measured by two indicators: (a) Index of coastal eutrophication (ICEP), and (b) plastic debris density. ICEP shall be reported every five years and is not yet available as part of the official indicator set [United Nations, 2022, 2023d]. The UNSD currently assesses target 14.1.1a using an indicator of chlorophyll-A deviation (compared to a 2000-2004 average baseline) [United Nations, 2022]. Chlorophyll-A is a good proxy for eutrophication, but the UNEP method, which identifies eutrophication events when these differences exceed the global 90th percentile (P90) for specific months, may yield some positive values due to natural variability in the system. Thus, we use an approach developed by Eurostat that works with a 20-year (1998-2017) baseline and identifies eutrophication when P90 is exceeded in 25% of the available observations in any given year Von Schuckmann et al. [2022] as provided in Eurostat. According to Eurostat Metadata [Eurostat, 2023], this indicator is comparable to ICEP.

Since nitrogen and phosphorus are the main nutrients that cause eutrophication [Eurostat, 2019], we complement ICEP by including gross nutrient balance per hectare to measure the contribution of each country (pressure component) to eutrophication. The indicator shows the relation between inputs (e.g., fertilisers) and outputs (e.g., harvested crops) of nitrogen and phosphorus to the agricultural soil.

Target 14.1b

The second indicator (b) plastic debris density (measured in terms of beach litter originating from national land-based sources that end on the beach and in the ocean) is not available before 2015 or after 2021. Moreover, the values are calculated using numerical models that present large uncertainties associated with the amount and location of mismanaged plastic waste entering the ocean [United Nations Environment Programme, 2021]. As stated by United Nations Environment Programme, plastic waste that ends up in the ocean depends to a large extent on recycling rates. Therefore, we follow Rickels et al. and include plastic waste generation per capita and recovery rate of plastic packaging as indicators to account for the contribution of each country to plastic pollution. Data on this indicator are obtained from Eurostat, Eurostat.

Target 14.2: By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans

Progress against target 14.2 is supposed to be measured by the indicator *14.2.1 Number of countries using ecosystem-based approaches to managing marine areas* and aims to capture Integrated Coastal Zone Management (ICZM) and other area-based, integrated planning and management in place in waters under national jurisdiction [United Nations, 2023a]. Official data from UNStats is a binary variable (1 if a country implements ecosystem-based approaches to manage marine areas) covering eight of the 15 countries in our assessment. The first data collection cycle took place in 2021 and the next one will take place in 2025.

The Directive 2014/89/EU [2014], which establishes a framework for maritime spatial planning (MSP), mandates that EU countries establish an MSP as soon as possible and at the latest by 31 March 2021. The sooner a country establishes an MSP, the sooner it can start using ecosystem-based approaches to managing marine areas. Following Andriamahefazafy et al. [2022], we use a level of achievement indicator to measure the progress of countries towards implementing an MSP. We assess the level of implementation at each assessment year and use a categorical scale (not started, in progress, complete not implemented, implemented) to score countries. In this way, countries that implemented an MSP earlier score better overall. It is important to note that transposing the MSP Directive into national legislation is not considered as having an MSP under development. For example, Ireland transposed the MSP Directive into national legislation in 2016, but the MSP development process started later. On the contrary, when Portugal transposed the MSP Directive into national legislation in 2015, it also started developing the MSP by defining the regime of maritime spatial

planning instruments in the decree.

The United Nations Environment Programme [2021] recommends using a complementary indicator for target 14.2 that monitors ecological parameters and helps to reveal disturbances in ocean health that may have been overlooked in the MSP and can then be addressed in future management and planning. We follow this recommendation by including the Ocean Health Index (OHI) Habitat subgoal. This indicator measures the average condition of the marine habitats present in each region that provide critical habitat for a wide range of species (mangroves, coral reefs, seagrass beds, kelp forests, salt marshes, sea ice edge, tidal flats, and subtidal soft bottom) [Halpern et al., 2012]. Other relevant ecological parameters, such as biodiversity and water quality, are covered by other target indicators.

Target 14.3: Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels

Progress against target 14.3 is supposed to be measured by indicator *14.3.1 Average marine acidity (pH) measured at agreed suite of representative sampling stations*. The Intergovernmental Oceanographic Commission (IOC) is the organisation in charge of monitoring it, although data collection requires collaboration with several organisations. National data sets from National Statistical Offices should be reported annually (at least) [United Nations, 2023b]. Despite this, the official UNStats data covers only seven countries of the 15 included in our assessment. Moreover, data derived from the coastal sites focused on "water quality monitoring" that have been considered as ideal locations for monitoring ocean acidification provide evidence of the enormous natural variability in pH and other carbon chemistry parameters [Lubchenco et al., 2023]. To overcome the missing data for this indicator and the disadvantages of coastal sample stations, we use ensemble model data of pH provided by Chau et al. [2022] and Gregor and Gruber [2020]. The reconstructed datasets are based on in-situ data from the SOCAT and GLODAP projects. The North Atlantic stands out as a region with high data coverage and is the basin with the highest reconstruction skill Chau et al. [2022]. The root mean square error of pH with respect to GLODAP is low (0.024) [Gregor and Gruber, 2020]. Therefore, we feel confident in using these data as an approximation of country-level ocean acidification. The data uncertainty for the Baltic Sea is larger than for the Atlantic Ocean. Since the data from Chau et al. [2022] presents an overall lower uncertainty level, we use these data for the calculation of the scores and use [Gregor and Gruber, 2020] to corroborate the values. We use the gridded data from the esemble models and clip it to the EEZ of each country to calculate the average pH by country at each assessment year.

Indicator 14.3.1 is a state indicator and does not allow one to track the contribution of an individual country to ocean acidification. Lubchenco et al. [2023] recognise that it is critical to establish the links among

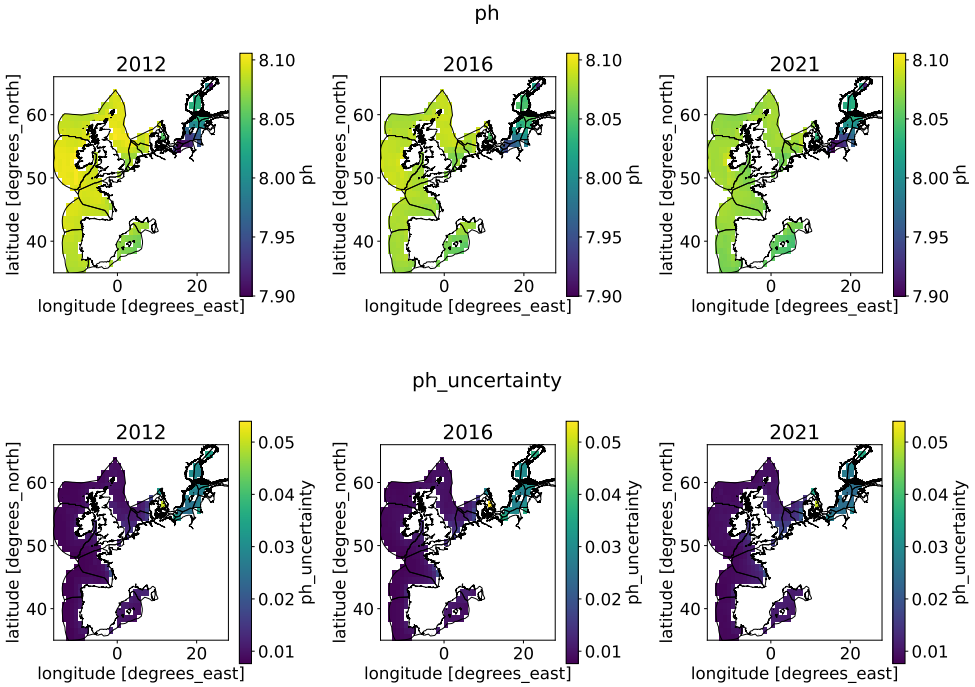

Figure S1: Top panel shows the gridded annual average pH values in the exclusive economic zones of EU coastal countries. Bottom panel shows the uncertainty values. Source: Chau et al. [2022]

acidification and other SDGs to connect policies that regulate CO2 emissions with local and national place-based actions. In line with Rickels et al. [2019], we use pressure indicators related to carbon emissions and select 'CO_2 per capita', which is calculated by applying the distance-to-target transformation to all data in the assessment period (2012-2021).

Target 14.4: By 2020, effectively regulate harvesting and end overfishing, illegal, unreported and unregulated fishing and destructive fishing practices and implement science-based management plans, in order to restore fish stocks in the shortest time feasible, at least to levels that can produce maximum sustainable yield as determined by their biological characteristics

Target 14.4 is supposed to be measured using the indicator 'Proportion of fish stocks within biologically sustainable levels'. A sustainable level is defined as an abundance that "is estimated [...] to be equal to or greater than the level that can produce the Maximum Sustainable Yield (MSY)" [United Nations, 2022]. The official UN database does not provide sufficient data for an assessment: data only available for 2017, 2018 and 2019, with one, nine, and one country covered, respectively.

We obtained data on 61 and 75 Fish Stocks covered by the ICES ecoregions to calculate two indicators: 8. F_{MSY}/F and 9. B/B_{MSY}, respectively. In this regard, F represents the actual fishing mortality while F_{MSY} is the value of fishing mortality that would be consistent with achieving MSY [ICES, 2012]. Therefore, values below 1 indicate that the current fishing mortality is higher than it should be according to the MSY approach. Similarly, B is the current biomass level and B_{MSY} is the biomass level that would be achieved after fishing at F_{MSY} for a long time. Values below 1 indicate that the current biomass level is lower than its sustainable level. If F_{MSY} (B_{MSY}) was not available, F_{pa} or F_{lim} (B_{pa} or B_{lim}) were taken as proxy, representing the precautionary and limit reference points, respectively.

After calculation, the indicators were cut off at a maximum of 1 and multiplied by 100 to allow a comparison with non-ICES indicators.

Data were obtained from ICES. Importantly, these data are subject to great intertemporal variation. Data for both indicators have changed retrospectively for 2012 and 2016 for a number of stocks (as can be seen when comparing the data with Rickels et al.). To account for these changes, we include data from the most recent stock assessment available.

Generally, ICES data was obtained at the fish-stock level. To assign these fish-stock level indicators to countries, they were calculated as averages, taking catches by countries as weights. Since F_{MSY}/F represents the current fishing pressure, the catches of the respective assessment year were taken. To account for past catches that may have led to today's depletion of stock, we applied a moving average of the last seven years when calculating B/B_{MSY}. This is the maximum time interval given in the ICES database for official nominal catches [ICES, 2023b] (catches date back to 2006). If possible, data on catches by country were obtained from this database, as it is easily accessible. However, according to personal correspondence with ICES, these catch numbers must be treated with caution, as they do not account for misreporting or discards. Therefore, in the event that the total number of official nominal catches [ICES, 2023b] by stock deviated from the value provided by ICES by more than 10%, the catches by country were manually extracted from the ICES advice PDFs [ICES, 2023c]. It should be noted that, at the time of assessment, ICES only provided catch data until 2020. Therefore, catches by country were taken for 2020 if the deviation was less than 10%. As country-catches are only relevant in relative terms and we consider it unlikely that relative catches by country changed substantially between 2020 and 2021, we assume that this does not distort our results.

Target 14.5: By 2020, conserve at least 10 per cent of coastal and marine areas, consistent with national and international law and based on the best available scientific information

Target 14.5 is supposed to be measured by the coverage of protected areas in relation to marine areas [United Nations, 2022]. The official indicator is the Average proportion of Marine Key Biodiversity Areas (KBAs) covered by protected areas. Examples of KBAs include sites that were found to be particularly important for biodiversity after analysing bird data or sites where the predominant share of at least one (critically) endangered or threatened species is present. This indicator adds information to statistics of marine area covered by protected areas by accounting for the variation in biodiversity importance between different sites. Since the indicator is already a percentage, the indicator from United Nations was taken without further transformation.

We complement the official UNSD indicator with Marine Protected Areas (MPAs) relative to the country's EEZ. Data on MPAs is obtained from European Environment Agency and data on the size of the EEZ are extracted from European Marine Observation and Data Network. The outermost regions were considered when calculating the EEZs, since "EU legislation and agreements are fully applicable in their territory" and therefore it can be expected that the MPA target also applies to these areas [Gouardères, Frédéric, 2023]. Specifically, we include the Canary Islands, the Azores, and Madeira. Indicators are transformed by comparing their value with the target of 30% coverage of marine protected areas European Commission [2020].

Target 14.6: By 2020, prohibit certain forms of fisheries subsidies which contribute to overcapacity and overfishing, eliminate subsidies that contribute to illegal, unreported and unregulated fishing and refrain from introducing new such subsidies, recognizing that appropriate and effective special and differential treatment for developing and least developed countries should be an integral part of the World Trade Organization fisheries subsidies negotiation

Target 14.6 is supposed to be measured by the "degree of implementation of international instruments aiming to combat illegal, unreported and unregulated fishing" [United Nations, 2022]. The official indicator takes into account the implementation of six instruments that aim to counteract Illegal, Unreported, and Unregulated (IUU) fishing. However, since all the 15 coastal countries in the EU score high on this indicator [United Nations, 2023d], it does not allow differentiation at the EU level. Therefore, we follow Andriamahe-

fazafy et al. and include the response indicators of the IUU index instead. This index covers not only five of the six instruments mentioned above, but also other indicators related to IUU fishing (e.g., the presence of mandatory vessel tracking for the commercial seagoing fleet or designated ports specified for entry by foreign vessels) [Global Initiative Against Transnational Organized Crime, Poseidon Aquatic Resource Management Ltd., 2023]. However, contrary to Andriamahefazafy et al., we exclude all response indicators with low or medium weight according to the IUU index (except those foreseen by the UN) and give equal weight to the nine selected indicators. This allows us to consistently calculate a composite IUU indicator under the concept of weak sustainability. The indicator is transformed using the distance-to-target method.

We follow Rickels et al. and include fisheries subsidies as an additional indicator. While the IUU index captures the strength of regulatory measures against IUU fishing, this indicator accounts for financial incentives that may lead to intensified IUU fishing if not effectively regulated. It is based on the Fisheries Support Estimate [Organisation for Economic Co-operation and Development, 2022], which provides data on payments received by fishermen. From the estimate, we select the payments that the OECD classifies as having a high risk of encouraging unsustainable fishing. This includes transfers based on input use, special insurance system for fishers, fuel tax concessions, and access to other countries' waters. The indicator is transformed using the distance-to-target taking the top 3 performing countries as a reference.

Lastly, we follow Rickels et al. and select catch-weighted Total Allowable Catch/Catch (TAC/Catch) as a third indicator for this target. With the previous two indicators accounting for regulations and incentives related to overfishing, this indicator directly measures the adherence of actual catches to TAC on a fish-stock level. A value less than 1 indicates that more fish are caught than is actually allowed by the quota. Data on this indicator originate from ICES. Transformation and assignment to countries work similar to F_{MSY}/F (see above).

Target 14.7: By 2030, increase the economic benefits to Small Island developing States and least developed countries from the sustainable use of marine resources, including through sustainable management of fisheries, aquaculture and tourism

Target 14.7 is supposed to be measured in terms of "sustainable fisheries as a proportion of GDP in small island developing states, least developed countries, and all countries". In line with Rickels et al., we argue that the economic dimension of SDG 14 should not be restricted to fisheries only. As we already account for sustainable fisheries in targets 14.4, 14.6 and 14.b, we go beyond this sector and select Livelihoods &

Economies (L&E) and Tourism (TR) indicators. In contrast to Rickels et al., we do not rely on global data from the Ocean Health Index but build our own indicators with which we aim to better represent European countries. To do so, we base our calculations on the methodology of the Baltic Health Index [Blenckner et al., 2021] for L&E and TR.

The aim of TR is to assess whether countries make the best use of their potential to provide recreational value to tourists in their coastal areas. We calculate it by dividing the gross value added (GVA) of coastal tourism accommodation [European Commission, 2023] by the number of nights spent at tourist accommodations in coastal areas of the respective country [Eurostat, 2023e]. We restricted our analysis to the GVA of accommodation (and thus excluded transport and other expenditures) as we assume that this value more directly relates to the number of nights spent at tourist accommodations.

Livelihoods & Economies is, obviously, divided into two sub-indicators: Livelihoods and Economies.

Economies capture the economic value associated with marine industries, using gross value added from marine sectors. Data on established blue economy sectors (living and non-living resources, ocean energy, ports activities, shipbuilding and repair, maritime transport and coastal tourism) were obtained from European Commission. Following Blenckner et al., the annual growth rate per sector and country has been compared to an expected growth rate of 1.5% and scaled from 0 to 100. The indicator at the country level is calculated using a weighted average, taking the contribution of each sector to the overall GVA of the countries' blue economy as weights. Differently to the BHI, the annual growth rates per year do not need to be estimated but can be calculated directly since data on GVA per sector, year, and country are readily available and cover the entire assessment period until 2020.

Ideally, the Livelihoods indicator captures both the quantity and the quality component of the livelihoods of people living in coastal areas [Blenckner et al., 2021]. Following Blenckner et al., the indicator is measured in terms of jobs in established marine sectors. While the BHI used national employment rates as a proxy for coastal employment, European Commission now allows the use of more specific data. To account for the quantity component of livelihoods, we take the number of employees in the marine sectors (in full-time equivalents) from European Commission and divide it by the number of people living in coastal areas. To calculate the latter, we consider regions on the coast or with $\geq 50\%$ of the population living within 50 km of the coastline, as given by Eurostat [2024]. To account for the quality component of livelihoods, we use the gross value added per hour worked by employees of the blue economy European Commission adjusted for Purchasing-Power-Parity (PPP). Household final consumption expenditure is used as analytical category for PPP Data stem from Eurostat.

Target 14.a: Increase scientific knowledge, develop research capacity and transfer marine technology, taking into account the Intergovernmental Oceanographic Commission Criteria and Guidelines on the Transfer of Marine Technology, in order to improve ocean health and to enhance the contribution of marine biodiversity to the development of developing countries, in particular small island developing States and least developed countries

Target 14.a is supposed to be measured in terms of the proportion of the total research budget allocated to research in the field of marine technology [United Nations, 2022]. Although only a subset of countries is covered (three, six and three of 15 countries in 2012, 2016 and 2021, respectively), we follow Rickels et al. and include this indicator as we aim to use official data wherever feasible.

This indicator is complemented by Scientific Advice/Total Allowable Catch (SAD/TAC) which accounts for the adherence to scientific advice when fishing quota are set. A value below 1 indicates non-adherence, as the quota exceeds catches corresponding to scientific advice for a specific stock. The assignment to countries and the transformation are similar to F_{MSY}/F as described above. Data on 69 fish stocks are obtained from ICES advice pdfs [ICES, 2023c].

Target 14.b: Provide access for small-scale artisanal fishers to marine resources and markets

Target 14.b is supposed to be measured in terms of the degree of application of a legal/regulatory/policy/institutional framework which recognises and protects access rights for small-scale fisheries. Official data are based on questionnaire data that capture the efforts of countries to promote access rights to small-scale fisheries [United Nations, 2022]. However, since all 15 EU coastal countries score high on this categorical indicator, a differentiation is not possible. Therefore, we use the OHI indicator for artisanal fishing opportunities (AFO), which describes the opportunities to conduct artisanal fishing when needed [Halpern et al., 2012]. In particular, we choose the OHI status indicator, as it includes the official UN indicator to measure opportunities for artisanal fishing. It complements this indicator by also considering the necessity of artisanal fishing (proxy: PPP-adjusted GDP per capita) as well as the sustainability of artisanal fishing (proxy: B/B_{MSY} values specific to artisanal and subsistence fishing). This allows for a more diverse picture of the assessed countries.

Furthermore, we take data from for Conservation of Nature to calculate the percentage of threatened fish

species. We consider species in the threat categories critically endangered, endangered, and vulnerable as threatened for our assessment. In contrast to the indicators under 14.4, this indicator is not catch-weighted and therefore gives equal weight to all fish stocks, also to those that are potentially less relevant to commercial fishing, as opposed to artisanal fishing. We are aware of the limitations of this indicator: According to International Union for Conservation of Nature, changes in threat status often do not represent real changes, but rather changes in knowledge or taxonomy. Therefore, simply comparing the absolute numbers of threatened species is misleading. As we, however, calculate changes in relative terms and assume that scientific advances are equally distributed over threatened and non-threatened species, we assume that this indicator is still meaningful. Furthermore, we are aggregating three threat categories; therefore, changes within these categories will not impact our indicator.

Target 14.c: Enhance the conservation and sustainable use of oceans and their resources by implementing international law as reflected in United Nations Convention on the Law of the Sea (UNCLOS), which provides the legal framework for the conservation and sustainable use of oceans and their resources, as recalled in paragraph 158 of "The future we want"

Target 14.c is supposed to be measured in terms of the number of countries making progress in ratifying, accepting and implementing through legal, policy and institutional frameworks, ocean-related instruments that implement international law, as reflected in the UNCLOS, for the conservation and sustainable use of the oceans and their resources [United Nations, 2022].

Progress against Target 14.c is supposed to be measured by indicator *14.c.1 Number of countries making progress in ratifying, accepting and implementing through legal, policy and institutional frameworks, ocean-related instruments that implement international law, as reflected in the United Nations Convention on the Law of the Sea, for the conservation and sustainable use of the oceans and their resources.* Data for this indicator are collected through questionnaires and its collection began in 2021 [United Nations, 2023c]. Data is only available for eight of the 15 countries in our assessment. Following Rickels et al. [2019], we use an alternative indicator that measures the governance dimension related to sustainable (ocean) development: Participation in agreements of the International Marine Organization (IMO Participation Rate). This is calculated as the participation rate in international sea protocols of the IMO. Data were collected from International Maritime Organization and calculated by counting the number of treaties each country accessioned and did not denounce by each assessment year.

S2 Data and Code

The data and code that support the findings of this study are openly available in OSF at doi.org/10.17605/OSF.IO/7P3ED.

References

Mialy Andriamahefazafy, Grégoire Touron-Gardic, A March, Giles Hosch, MLD Palomares, and Pierre Failler. Sustainable development goal 14: To what degree have we achieved the 2020 targets for our oceans? *Ocean & Coastal Management*, 227:106273, 2022. doi:10.1016/j.ocecoaman.2022.106273.

Thorsten Blenckner, Christian Möllmann, Julia Stewart Lowndes, Jennifer R Griffiths, Eleanore Campbell, Andrea De Cervo, Andrea Belgrano, Christoffer Boström, Vivi Fleming, Melanie Frazier, et al. The baltic health index (bhi): Assessing the social–ecological status of the baltic sea. *People and Nature*, 3(2): 359–375, 2021.

Thi Tuyet Trang Chau, Marion Gehlen, and Frédéric Chevallier. A seamless ensemble-based reconstruction of surface ocean pco 2 and air–sea co 2 fluxes over the global coastal and open oceans. *Biogeosciences*, 19 (4):1087–1109, 2022.

Directive 2014/89/EU. Directive 2014/89/EU of the European Parliament and of the Council of 23 July 2014 establishing a framework for maritime spatial planning. *Official Journal*, L257:135—-145, 2014.

European Commission. EU Biodiversity Strategy for 2030. Technical report, 2020. URL https://eur-lex.europa.eu/legal-content/EN/TXT/HTML/?uri=CELEX:52020DC0380.

European Commission. Eu blue economy observatory, 2023. URL https://blue-economy-observatory.ec.europa.eu/blue-economy-indicators_en.

European Environment Agency. Natura 2000 barometer, 2023. URL https://www.eea.europa.eu/data-and-maps/dashboards/natura-2000-barometer.

European Marine Observation and Data Network. Eez size. https://emodnet.ec.europa.eu/geonetwork/srv/eng/catalog.search#/metadata/d4a3fede-b0aa-485e-b4b2-77e8e3801fd0, 2023.

Eurostat. Gross nutrient balance, 2019. URL https://ec.europa.eu/eurostat/cache/metadata/en/aei_pr_gnb_esms.htm.

Eurostat. Marine waters affected by eutrophication - metadata, 2023. URL https://ec.europa.eu/eurostat/cache/metadata/en/sdg_14_60_esmsip2.htm.

Eurostat. Comparative price levels, 2023a. URL https://ec.europa.eu/eurostat/databrowser/view/TEC00120/default/table?lang=en.

Eurostat. Recovery rates for packaging waste, 2023b. URL https://ec.europa.eu/eurostat/databrowser/view/ten00062/default/table?lang=en.

Eurostat. Generation of waste by waste category, hazardousness and nace rev. 2 activity, 2023c. URL https://ec.europa.eu/eurostat/databrowser/view/ENV_WASGEN/default/table?lang=en.

Eurostat. Sustainable development goals database, 2023d. URL https://ec.europa.eu/eurostat/web/sdi/database.

Eurostat. Nights spent at tourist accommodation establishments by degree of urbanisation and coastal/non-coastal area and nuts 2 regions, 2023e. URL https://ec.europa.eu/eurostat/databrowser/view/TOUR_OCC_NIN2DC__custom_7065857/default/table?lang=en.

Eurostat. Population on 1 january by broad age group, sex and nuts 3 region, 2024.

International Union for Conservation of Nature. The iucn red list of threatened species. version 2023-1, 2023.

Global Initiative Against Transnational Organized Crime, Poseidon Aquatic Resource Management Ltd. Methodology for IUU Fishing Index. Technical report, 2023. URL https://www.iuufishingindex.net/methodology.pdf.

Gouardères, Frédéric. Outermost regions (ors), 2023. URL https://www.europarl.europa.eu/factsheets/en/sheet/100/outermost-regions-ors-.

Luke Gregor and Nicolas Gruber. Oceansoda-ethz: A global gridded dataset of the surface ocean carbonate system for seasonal to decadal studies of ocean acidification (v2023) (ncei accession 0220059). Technical report, NOAA, National Centers for Environmental Information. Dataset, 2020. URL https://doi.org/10.25921/m5wx-ja34. Accessed 21 July 2023.

Benjamin S Halpern, Catherine Longo, Darren Hardy, Karen L McLeod, Jameal F Samhouri, Steven K Katona, Kristin Kleisner, Sarah E Lester, Jennifer O'Leary, Marla Ranelletti, et al. An index to assess the health and benefits of the global ocean. *Nature*, 488(7413):615–620, 2012.

ICES. Acronyms and terminology. Technical report, 2012. URL https://www.ices.dk/community/documents/advice/acronyms_and_terminology.pdf.

ICES. Stock assessment graphs, 2023a. URL https://standardgraphs.ices.dk/stockList.aspx.

ICES. Official nominal catches, 2023b. URL https://www.ices.dk/data/dataset-collections/Pages/Fish-catch-and-stock-assessment.aspx.

ICES. Latest advice, 2023c. URL https://www.ices.dk/advice/Pages/Latest-Advice.aspx.

International Maritime Organization. Gisis: Status of treaties, 2024. URL https://gisis.imo.org/Public/ST/Treaties.aspx.

International Union for Conservation of Nature. Red list index. Technical report, no date. URL https://www.iucnredlist.org/assessment/red-list-index.

Jane Lubchenco, Emma F. Camp, Cristian A. Vargas, Dyhia Belhabib, Zuzy Anna, Diva J. Amon, Anna Metaxas, and Harriet Harden-Davies. Priorities for progress towards sustainable development goal 14 'life below water'. *Nature Ecology & Evolution*, 7:1564–1569, 2023. doi:10.1038/s41559-023-02208-4.

Organisation for Economic Co-operation and Development. Fisheries support estimate, 2022. URL https://stats.oecd.org/Index.aspx?DataSetCode=FISH_INDICATORS.

Wilfried Rickels, Christian Weigand, Patricia Grasse, Jörn Schmidt, and Rüdiger Voss. Does the european union achieve comprehensive blue growth? progress of eu coastal states in the baltic and north sea, and the atlantic ocean against sustainable development goal 14. *Marine Policy*, 106:103515, 2019.

United Nations. Sdg indicators - metadata repository, 2022. URL https://unstats.un.org/sdgs/metadata/.

United Nations. Target 14.2: By 2020, sustainably manage and protect marine and coastal ecosystems to avoid significant adverse impacts, including by strengthening their resilience, and take action for their restoration in order to achieve healthy and productive oceans - metadata, 2023a. URL https://unstats.un.org/sdgs/metadata/files/Metadata-14-02-01.pdf.

United Nations. Target 14.3: Minimize and address the impacts of ocean acidification, including through enhanced scientific cooperation at all levels - metadata, 2023b. URL https://unstats.un.org/sdgs/metadata/files/Metadata-14-03-01.pdf.

United Nations. Target 14.c: Enhance the conservation and sustainable use of oceans and their resources by implementing international law as reflected in the united nations convention on the law of the sea, which provides the legal framework for the conservation and sustainable use of oceans and their resources, as recalled in paragraph 158 of "the future we want" - metadata, 2023c. URL https://unstats.un.org/sdgs/metadata/files/Metadata-14-0c-01.pdf.

United Nations. Sdg indicators database, 2023d. URL https://unstats.un.org/sdgs/dataportal/database.

United Nations Environment Programme. Understanding the state of the ocean: A global manual on measuring sdg 14.1.1, sdg 14.2.1 and sdg 14.5.1, 2021. URL https://wedocs.unep.org/20.500.11822/35086.

K Von Schuckmann, PY Le Traon, M Menna, R Martellucci, G Notarstefano, E Mauri, R Gerin, M Pacciaroni, A Bussani, A Pirro, et al. Copernicus ocean state report, issue 6. *Journal of Operational Oceanography*, 15(sup1):1–220, 2022.