# OHI 2020: Updates to data and methods

## Global Fellows

The global fellow, Laura Ingulsrud, along with the help of Gage Clawson and Melanie Frazier conducted the 2020 OHI assessment. Sara Orofino and Maddie Berger (OHI+ fellows) also contributed to the prep of a couple of data layers. They were able to improve several data layers, and continued to improve our documentation. Major accomplishments include completely revamping the natural products goal to include more refined and less variable data, and implementing new mariculture sustainability data from Seafood Watch. Thanks to the work of Laura, the global OHI 2020 assessment was a huge success!

## Goals status and trend updates

We updated 7 of the 10 goals with additional years of data. Livelihoods and economies, clean waters, and carbon storage were not updated because original data sources are no longer updated and new data sources are unavailable.

*New methods/data*

Mariculture: Updated the sustainability scores from the old (2008) Trujillo scores, to new (2020) Monterey Bay Aquarium Seafood Watch aquaculture scores.

Natural Products:

* We now only include 3 natural product categories, ornamental fish, FOFM, and seaweeds. We removed corals, sponges, and shells from the calculations.
* The data for ornamental fish stayed the same, FAO commodity data.
  + We kept the methods for the scores and sustainability (blast and poison fishing) for ornamental fish the same.
* The data for FOFM is now pulled from the watson fisheries data.
  + We filtered for the forage fish species, and multiplied the tonnes per each species by 0.7 since "about 70% of fish meal and oil are produced from the harvest of small, open-ocean (pelagic) fish such as anchovies, herring, menhaden, capelin, anchovy, pilchard, sardines, and mackerel." (source: FAO). Our forage fish list was more comprehensive than this, and pulled from a paper by Halley Froehlich.
  + Then we used the same bbmsy methods as the fisheries sub goal to calculate a FOFM score.
* Seaweeds is now based on the FAO mariculture data, rather than the FAO exports data.
  + Calculations for seaweeds are largely the same (other than more refined source data), but Laura did do extensive literature review on which sea weed species are used for human consumption vs non-human consumption, which helped to refine the scores more.
  + Sustainability data is the same as the MAR sub goal (Seafood Watch 2020).
* After weighting each natural products' contribution in USD, FOFM largely drives the scores (just as it did before), but now we have more regions in the data with FOFM scores since we are using the Watson data.

Tourism and Recreation: Decided to **exclude** travel warnings from our calculations because in many cases, travel warnings are subjective to the country issuing the warning (in our case we were using the US travel warnings, gap filled by Canadian travel warnings).

Coral extent: Updated with a data set, Global Distribution of Coral Reefs (2018, <https://data.unep-wcmc.org/datasets/1>). Includes extent estimates for 4 new regions, but loses extent estimates for 2 regions, resulting in a net gain of 2 regions, and more coral extent in area km2.

## Pressures

We updated 11 of the 20 pressures with additional years of data. Trash, subtidal hard-bottom habitat destruction, and invasive species data sources are not being updated and we have not found good replacements. Nutrient and chemical pollution data were updated by FAO but we did not have the resources to process these data. Sea surface temperature, ocean acidification, and sea level rise all were not updated due to source data not being updated. We added a new pressure, coral harvest.

*New methods/data*

Coral harvest pressure: We introduced a coral harvest pressure, derived from the FAO commodities dataset. Previously we included coral harvest as a part of the natural products goal, however, we believe coral harvest to be largest harmful, and decided to transition this to a pressure instead. For this pressure we used coral health, extent, and FAO commodities data.

## Resilience

We updated 7 resilience measures were updated with additional years of data. There were no updates to the CITES signatories. The other resilience measures were not updated because these data are discontinued and new data sources are unavailable. This includes the responses to the CBD survey which quantifies region’s measures to protect diversity against pressures such as habitat destruction, mariculture, tourism, and water pollution, and global measures of how well regions regulate artisanal fishing practices (Mora). For the 2021 assessment we plan to use the updated Seafood Watch mariculture sustainability scores for the mariculture sustainability index resilience layer.

*New methods/data*

None.

**Table 1 Goal/subgoal status and trend:** Description of updates to data and models.

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| **Goal/subgoal**  **(Issues)** | **Updates to data** | **Updates to data preparation or model** | **Notes** |
| Artisanal opportunities | *Need*: Additional year of data  *Opportunity*: None | None | Scores generally tended to increase below 10 points. There were 3 outliers that decreased, and they were all attributed to the source data. |
| Species condition  (subgoal of biodiversity goal) | Additional year of IUCN and BirdLife data | None | Status scores generally decreased for most regions (<5), many of them small islands. This is likely attributed to the large update of the birdlife data that we did. |
| Habitat  (subgoal of biodiversity goal) | *Sea ice edge*: additional year of data (trend and condition updated)  *Mangrove*: no updates  *Saltmarsh*: no updates  *Seagrass*: no updates  *Coral*: Updated coral extent data  *Softbottom*: no updates | The coral extent data is now updated with the Global Distribution of Coral Reefs (<https://data.unep-wcmc.org/datasets/1>) dataset. | New data are available for saltmarsh, and seagrass. We have the skeleton code to update these (taken from the coral extent update), but will not update until next year. |
| Fisheries  (subgoal of food provision goal) | *Catch*: Watson data updated, 2 additional years of data (2016 and 2017).  *B/Bmsy*: Additional year of RAM data. Updated catch data for CMSY estimates of B/Bmsy | None | The new catch data and B/Bmsy scores caused the scores to change fairly dramatically (as always). |
| Mariculture (subgoal of food provision goal) | *Production*: additional year of FAO harvest data  *Sustainability*: New seafood watch data  *Harvest capacity*: static data | We now use updated sustainability scores from Seafood Watch. | The sustainability scores did not have too large of an effect on most regions, generally increasing scores <10. |
| Coastal protection | *Sea ice shoreline*: additional year of data (trend and condition updated)  *Mangrove*: no updates  *Saltmarsh*: no updates  *Seagrass*: no updates  *Coral*: Updated coral extent data | None | None, see notes for habitat subgoal. |
| Carbon storage | *Mangrove*: no updates  *Saltmarsh*: no updates  *Seagrass*: no updates | None | None, see notes for habitat subgoal. |
| Clean waters | *Nutrient pollution*: None  *Chemical pollution*:  Shipping and ports: None  Land-based inorganic: None  Land-based organic: None  *Pathogens:* None  *Trash*: None | None | None. We do have plans to implement a fertilizer runoff layer, but did not have time to update this for the 2020 assessment. |
| Iconic species  (subgoal of sense of place goal) | Additional year of IUCN status data | None | Some variation in status scores from last year. A couple regions had increases > 20 and <30 due to changes in source data. In particular, a few species had status changes. |
| Lasting special places (subgoal of sense of place) | Additional year of WDPA data | None | Some large changes in a few regions due to changes in source data. |
| Natural products | Additional two years of FAO harvest data  Seaweed sustainability: New Seafood Watch data  Ornamentals harvest: New layer (using the old natural products methods)  Fish oil harvest: New layer, derived from the fisheries sub goal. | Now exclude shells, corals, and sponges from the calculations. The fish oil data now comes from our fisheries sub goal, seaweed data is prepped from our mariculture sub goal, and the ornamentals data stayed the same. | Scores changed pretty dramatically due to the model changes. However, the scores did stabilize and are less variable year to year. |
| Tourism and recreation | *Tourism sustainability*: No update  *Employment*: 1 additional years of WEF data added  *Travel warnings*: deleted from index | Travel warnings are now excluded from index. | Scores overall increased for most regions, because we excluded travel warnings. For example, Somalia increased by nearly 40 points due to removing the travel warning penalty. |
| Livelihoods and economies | None | None | None |

**Table 2 Pressures:** Description of updates to data and methods.

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| **Pressure** | **Updates to data** | **Updates to data preparation or model** | **Notes** |
| Social: World Governance Index | Additional year data | None | Changes to source data resulted in very small changes to pressure scores (< ±0.5). |
| Social: Social Progress Index | Additional year data | None | None |
| Climate change: Ocean acidification | None, but additional year of data because there were projections to 2020 | None | None |
| Climate change: UV | Additional year data |  | Very small changes in pressures (< ±0.5). |
| Climate change: Sea level rise | Additional year data | None | None |
| Climate change: Sea surface temperature | None | None | None |
| Pollution: Land-based nutrient pollution | None | None | None |
| Pollution: Chemical pollution | Organic land-based: None  Shipping ports: None  Inorganic land-based: None | None | None |
| Pollution: Trash | None | None | None |
| Pollution: Pathogens | Additional 2 years of data |  | Small changes to pressures |
| Species: Genetic escapes | Additional year mariculture data, no updates to probability of invasiveness (Trujillo data) | None | All changes to pressure scores <2 due to changes to mariculture source data |
| Species: Targeted harvest | Additional year data | None | Small changes to pressure scores (<<<± 1) due to changes in source data |
| Species: Invasive species | None | None | None |
| Commercial fisheries: high bycatch | Catch: Updates to Watson data, but no additional year of data  NPP: None | None | Small changes |
| Commercial fisheries: low bycatch | Catch: Updates to Watson data, but no additional year of data  NPP: None | None | Small changes |
| Artisanal fisheries: low bycatch | Catch: Updates to Watson data, but no additional year of data  NPP: None | None | Small changes |
| Artisanal fisheries: high bycatch | Catch: Updates to Watson data, but no additional year of data  NPP: None | None | Small changes |
| Habitat destruction: soft-bottom subtidal | Catch: Updates to Watson data, but no additional year of data  NPP: None | None | Small changes |
| Habitat destruction:  Intertidal (nearshore population used as proxy) | Additional year of data | Correction to our coastal spatial file (some coastline was not showing up) | Most pressure scores decreased due to changes in source data, but in nearly all cases change was <2 points. The one larger change was due to improvements to our coastal raster file. |
| Habitat destruction: subtidal hard-bottom | None | None | None |

**Table 3 Resilience:** Description of updates to data and methods.

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| **Resilience** | **Updates to data** | **Updates to data preparation or model** | **Notes** |
| Coastal marine protected areas (3nm and eez) | Additional year of data | None | Changes to source data had small effects on resilience scores of most goals, although change in resilience was >5 and <15 for a couple regions/goals. |
| Species condition (3nm and eez) | Additional year of data | None | Changes to source data caused small increases in resilience scores in most cases (typically <1). |
| CITES signatories | None | None | None |
| Social Progress Index | Additional year of data | None | None |
| World Governance Indicators | Additional year of data | None | Updates to source data resulted in changes to resilience scores < ±0.5 points in most cases. |
| Effectiveness of commercial fisheries management | New data source  (Melycheck et al. 2017) | Adjustments made to accommodate new data | Very large changes to the data. The new measures of fisheries management were very different from previous data. However, translated to changes in resilience of <+/- 3 points. |
| Effectiveness of artisanal fisheries management (Mora data) | None | None | None |
| CBD data (5 resilience measures): Management of habitat diversity; protection of biodiversity from following pressures: Mariculture, invasive species, tourism, pollution | None | None | None |
| Mariculture Sustainability Index | None | None | None |
| Global Competitiveness Index | None | None | None |

**References**

Gentry, Rebecca R., Halley E. Froehlich, Dietmar Grimm, Peter Kareiva, Michael Parke, Michael Rust, Steven D. Gaines, and Benjamin S. Halpern. 2017. Mapping the Global Potential for Marine Aquaculture. *Nature Ecology & Evolution* 1, no. 9: 1317–24. <https://doi.org/10.1038/s41559-017-0257-9>.

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