# OHI 2019: Updates to data and methods

## Global Fellows

Global Fellows Molly Williams and Gage Clawson conducted the 2019 global OHI assessment. They were able to improve several data layers and have continued to improve our documentation. One major accomplishment is that we have begun writing a guide, the OHI Global Guide, that describes the step by step process of updating OHI global scores. This will be helpful to future OHI endeavors, global and otherwise. Thanks to the work of the Fellows, the global OHI 2019 assessment has been a success. Go Fellows!!!

## Goals status and trend updates

We updated 9 of the 10 goals with additional years of data. The livelihoods and economies goal was not updated because original data sources are no longer updated and new data sources are unavailable. We also ensure, for several data layers, that uninhabited regions are given an NA value when the data is related to humans (e.g., economic need).

*New methods/data*

Mariculture: We have updated reference points so they are based on the biological potential for marine aquaculture given the work of Gentry et al. 2017.

Fisheries: For catch we include 90 more RAM data estimates of B/Bmsy by including management target estimates of B/Bmsy (we previously included only TB/TBmsy and SSB/SSBmsy). We now also exclude bycatch from our estimates of total catch.

Natural Products: Exclude products if there are <5 years of harvest data within the past 10 years (previously, we used all years of data). This should make this model more stable and not penalize countries for not producing products with no recent history of production.

## Pressures

We updated 13 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.

*New methods/data*

We fixed an error in our coastal raster which was causing much of Russia’s coastline to be eliminated (influenced the intertidal habitat destruction pressure layer).

## Resilience

We updated 6 of the 14 resilience measures 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, global measures of how well regions regulate artisanal fishing practices (Mora), and mariculture (Trujillo).

*New methods/data*

Fisheries Management Index: We have replaced the Mora data for fisheries management with data from Melnychuck et al. 2017.

**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 | Uninhabited/low population (<3000) regions given an NA for need. | 10 additional regions now receive NA score. Scores tended to decrease overall (<5 points) due to changes in source data. |
| Species condition  (subgoal of biodiversity goal) | Additional year of IUCN and BirdLife data | None | Status scores generally increased for most regions (<2.5). However, Ukraine and Romania had increases of ~7.5. |
| 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*: no updates  *Softbottom*: no updates | None | New data are available for saltmarsh, seagrass, and coral extent. We have prepared these data, but did not include them in this year’s assessment because we must first develop the methods to obtain corresponding trend and condition information. |
| Fisheries  (subgoal of food provision goal) | *Catch*: Watson data updated, but no additional year of data  *B/Bmsy*: Additional year of RAM data with an additional 90 species included; updated catch data for CMSY estimates of B/Bmsy | Now exclude bycatch from catch totals used to estimate catch values used to weight species condition scores and calculate B/Bmsy with CMSY method. | The new catch data and B/Bmsy scores caused the scores to change fairly dramatically. |
| Mariculture (subgoal of food provision goal) | *Production*: additional year of FAO harvest data  *Sustainability*: no updates  *Harvest capacity*: new data source | We now use a biologically relevant reference point based on production capacity of aquaculture within each region (Gentry et al. 2017) | The new reference point had a dramatic effect on scores. Many more regions receive a 100 score and NA scores. But overall, there was a general decrease in scores because countries are not producing at capacity. |
| Coastal protection | *Sea ice shoreline*: additional year of data (trend and condition updated)  *Mangrove*: no updates  *Saltmarsh*: no updates  *Seagrass*: no updates  *Coral*: no updates | 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:* Two additional years of data  *Trash*: None | None | There were some changes to scores, primarily due to updates in source data. Most of these were relatively small (<10), but a few regions had relatively large changes. |
| 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 <50 due to changes in source data. In particular, a few species had status changes from Data Deficient. |
| 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  Sustainability: None | Now exclude products with <5 years of production within the past 10 years. | A few regions changed fairly dramatically due to changes in source data and changes to model. |
| Tourism and recreation | *Tourism sustainability*: No update  *Employment*: 2 additional years of WEF data added  *Travel warnings*: new year of data | None | Scores overall decreased for most regions, and some regions had fairly significant changes to scores (>=+/- 20 points). |
| 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>.

Melnychuk, Michael C., Emily Peterson, Matthew Elliott, and Ray Hilborn. 2017. Fisheries Management Impacts on Target Species Status. *Proceedings of the National Academy of Sciences* 114, no. 1: 178–83. <https://doi.org/10.1073/pnas.1609915114>.