# OHI 2018: Updates to data and methods

## Global Fellows

The first cohort of Global Fellows (Iwen Su, Camila Vargas, and Ellie Campbell) conducted the 2018 global OHI assessment. Having fresh eyes on the project helped improve our organization and documentation which will make the global assessment even more reproducible. The Fellows also made significant improvements to our methods (e.g., http://ohi-science.org/news/fellowship-expanding-mariculture) and communication efforts, including creating their own website (<http://ohi-science.org/globalfellows/index.html>). Working with the Fellows was a great experience.

## Goals status and trend updates

We updated 8 of the 10 goals with additional years of data. The carbon storage and livelihoods and economies goals were not updated because these data sources are not updated and new data sources are unavailable.

*New data*

Watson (2017) catch data has replaced the Sea Around Us data for the fisheries subgoal.

*New methods*

Species condition: We now include only comprehensively assessed species (>90% of species assessed) because there is less regional bias in regard to the number of species with IUCN ratings; we have dramatically improved trend estimates using the change in IUCN status over time, which also allows us to estimate status for previous scenario years (previously, we used the same data for all scenario years); we now incorporate regional assessments for species.

Mariculture: We now include edible seaweeds in the mariculture model (previously, these were included in the natural products goal); regions with human populations, but no mariculture now receive a zero score, rather than an NA.

Natural products: We now exclude seaweeds used primarily as a food source (seaweeds not primarily used as food remain in the goal).

Fisheries: Given the recommendations in Afflerbach et al. (2018) we use the mean of stock status scores from the same region/year, rather than the median.

Iconic species: We improved methods of calculating trend

## Pressures

We updated 14 of the 20 pressures with additional years of data. Pathogen source data were updated, but there were no additional years of data. Trash, subtidal hard-bottom habitat destruction, and invasive species data 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 data*

We used Watson (2017) fisheries catch data to estimate high bycatch artisanal fishing pressures, rather than blast and poison data (which were not updated).

*New methods*

For the fishery pressures, we used the industrial vs. non-industrial and discards vs. reported and IUU to classify catch into each of the 4 pressure categories (commercial high and low bycatch and artisanal high and low bycatch).

For the soft-bottom habitat destruction, the Watson (2017) fishery catch data is now reported using different gear types, which necessitated modifications to our methods.

## Resilience

We updated 5 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 commercial and artisanal fishing practices (Mora), and mariculture (Trujillo).

*New data*

None.

*New methods*

We modified the approach to estimating species condition (see species condition subgoal status/trend calculations).

## Behind the scene changes

The following changes do not alter scores, but they will make future analyses faster and more accurate, and make our methods more transparent and replicable.

* Improved documentation of code used to produce the data layers used to calculate scores
* Functions to visualize scores and explore NA values
* Generated a library of teaching materials for the Ocean Health Index and open data science, including creating and posting videos of our trainings (https://www.youtube.com/playlist?list=PLX7J3qtjcll\_4s2oaKHuWdRdBMJz7tBAU)!
* Cleaned and streamlined ohi-global, particularly related to the livelihoods and economies goal, which was requiring us to preserve outdated data layers and functions.

The following were Global Fellows projects that will improve communication efforts:

* Website: http://ohi-science.org/globalfellows/
* Packagedown website to describe ohicore (<http://ohi-science.org/ohicore/>) functions used to calculate and visualize scores
* We have begun to develop a website that will allow people to explore the data used to calculate scores. Currently, we provide information for the mariculture subgoal.

## Notes

Unless otherwise noted, the issues referenced are here: <https://github.com/OHI-Science/globalfellows-issues/issues>

## Potential future improvements

SST, UV, others? (49, 34): Use reference period to calculate sd

Fisheries (47): Include management target B/Bmsy estimates in RAM derived data (currently include only TB/TBmsy and SSB/SSBmsy); think about our approach to identifying high and low bycatch;

Soft-bottom habitat destruction (Issues/issues 870)

Think about CW trend calculation

**Table 1 Goal/subgoal status and trend:** Description of updates to data and models (see issue 17 for more information).

|  |  |  |  |
| --- | --- | --- | --- |
| **Goal/subgoal**  **(Issues)** | **Updates to data** | **Updates to data preparation or model** | **Notes** |
| Artisanal opportunities | *Need*: Additional year of data  *Opportunity*: None | None | Small changes to source data resulted in small changes to scores (< ±5 points). We also gapfilled fewer regions due to improved World Bank reporting (35) |
| Species condition  (subgoal of biodiversity goal) | Additional year of IUCN and BirdLife data (we now obtain all range maps through IUCN, so we no longer supplement with Aquamap ranges) | Now include only comprehensively assessed species (>90% of species assessed); use change in IUCN status over time to estimate trend; now incorporate regional assessments for species;  technical improvements to accessing/analyzing data that had minimal or no impact on scores. | These changes (mostly the use of only comprehensively assessed species) typically resulted in 0-20 point reduction in status. However, trend estimates were overall much less extreme, so in some cases scores increased due to an increase in likely future status. The new trend method allows us to estimate status for each year (vs. using the same status across all scenario years), we still use the same trend estimate for each year. (issues/issues 868) |
| 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*: additional year of Watson catch data (trend and condition updated) | Watson fishing data (used to calculate soft-bottom habitat health based on destructive fishing practices) was modified so we had to update our gear type categories. | Changes to source data (and corresponding changes to methods) resulted in changes to habitat/biodiversity scores. Most changes to habitat were less than ±5, but a few regions changes by more than ±20.  (46, 20) |
| Fisheries  (subgoal of food provision goal) | *Catch*: Now use Watson catch data for fisheries scores  *B/Bmsy*: Additional year of RAM data; updated catch data for CMSY estimates of B/Bmsy | Now use the mean of stocks within the same region/year to gapfill stocks with no B/Bmsy values (vs. median in the past) based on Afflerbach et al. (2018). Artisanal catch is now included in fisheries catch and B/Bmsy estimates from the CMSY model. | The new catch data and B/Bmsy scores caused the scores to change fairly dramatically.  The change to the model (using mean to gapfill missing B/Bmsy values) typically changed scores by ≤ ±5 points.  (47; issues/issues 857/817) |
| Mariculture (subgoal of food provision goal) | *Production*: additional year of FAO harvest data  *Sustainability*: no updates  *Population*: new year of data | Now include edible seaweeds.  Regions with no mariculture harvest are given a zero rather than NA (regions with no human population are still given an NA).  Change to method of applying the 4 year rolling mean to use the current year and previous 3 years (vs. current, two subsequent, and one previous year) | Changes in source data and model resulted in some changes to scores, and there were far fewer NA values and more zero values. Including seaweeds changed some regions fairly dramatically (large increase in score for North and South Korea and Japan).  (8) |
| 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 (20) |
| Carbon storage | *Mangrove*: no updates  *Saltmarsh*: no updates  *Seagrass*: no updates | None | None |
| Clean waters | *Nutrient pollution*: None  *Chemical pollution*:  Shipping and ports: None  Land-based inorganic: None  Land-based organic: None  *Pathogens:* No additional years, but data updated by source  *Trash*: None | We used a larger spread of years to calculate trend and made small improvements to gapfilling missing data. | 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 (decreases: Gilbert Island, Benin, Togo, Maldives; increases: Seychelles) (15) |
| Iconic species  (subgoal of sense of place goal) | Additional year of IUCN status data | Improved trend calculation | Trend scores nearly always decreased due to change in trend calculation, but these resulted in very modest changes (<2 point drop in scores) (22) |
| Lasting special places (subgoal of sense of place) | Additional year of WDPA data | None | Some changes due to changes in source data |
| Natural products | Additional two years of FAO harvest data  Sustainability: Now use Watson catch data to estimate sustainability of fish oil harvest | Exclude some seaweed species that are primarily eaten | Most region scores were unchanged by exclusion of seaweed, but a few regions had large changes  Regions with fish oil product may have changed fairly dramatically due to updates to fishery data and model. |
| Tourism and recreation | *Tourism sustainability*: No update  *Employment*: new year of WEF data  *Travel warnings*: new year of data, significant changes to source data | Had to retranslate travel warnings into penalties | Some changes in score due to changes in source data for state department travel warnings (21) |
| Livelihoods and economies | None | None | None |

**Table 2 Pressures:** Description of updates to data and methods (see 17 for more information).

|  |  |  |  |
| --- | --- | --- | --- |
| **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) (6) |
| Social: Social Progress Index | Additional year of data | None | Updates to source data cause pressure scores to change < ±2 points in most cases (37) |
| Climate change: Ocean acidification | None, but additional year of data because there were projections to 2020 | None |  |
| Climate change: UV | Additional year data; revised data for years 2014-2015 | Now gapfill missing values in timeseries with data from previous and subsequent weeks | Very small changes in pressures (< ±1) (34) |
| Climate change: Sea level rise | Additional year data | None |  |
| Climate change: Sea surface temperature | Four additional years of data | None | Changes to scores due to additional years of data and the change in SD used to identify extreme events (49) |
| Pollution: Land-based nutrient pollution | None | None |  |
| Pollution: Chemical pollution | Organic land-based: None  Shipping ports: None  Inorganic land-based: None | None |  |
| Pollution: Trash | None | None |  |
| Pollution: Pathogens | No additional year, but source data modified | Improved gapfilling, change to reference point | Small changes to pressures (15) |
| Species: Genetic escapes | Additional year mariculture data, no updates to probability of invasiveness (Trujillo data) | Edible seaweeds added | Addition of seaweed altered pressures by small amount (< ±1.5) |
| Species: Targeted harvest | Additional year data | None | Small changes to pressure scores (<± 2) due to changes in source data (41) |
| Species: Invasive species | None | None |  |
| Commercial fisheries: high bycatch | Catch: Additional year data, change to reporting of source data  NPP: Additional year data | Use industrial discards catch to identify commercial high bycatch | Change in pressure (due to changes in data) typically between 0 and -5 (although some increases and a few outliers) (31) |
| Commercial fisheries: low bycatch | Catch: Additional year data, change to reporting of source data  NPP: Additional year data | Use industrial reported and IUU catch to identify commercial low bycatch | Small changes in pressures due to changes in data (typically < ±2) (31) |
| Artisanal fisheries: low bycatch | Catch: Additional year data, change to reporting of source data  NPP: Additional year data | Use non-industrial reported and IUU catch to identify artisanal low bycatch | Change in pressure (due to changes in data) typically between 0 and -5 (although some increases and a few outliers) (31) |
| Artisanal fisheries: high bycatch | Catch: Now use Watson catch data  NPP: Now use NPP data | Full methods update. We now use non-industrial discards catch to identify artisanal high bycatch  (previously used presence of blast/poison fishing) | Pressures typically dropped about 5 points due to these changes (31) |
| Habitat destruction: soft-bottom subtidal | Catch: Additional year data, change to reporting of source data | Modified gear type classification due to change in source data | Small changes to pressure scores due to changes to source data (typically < ±3) (46) |
| Habitat destruction:  Intertidal (nearshore population used as proxy) | Additional year of data | None |  |
| Habitat destruction: subtidal hard-bottom | None | None |  |

**Table 3 Resilience:** Description of updates to data and methods (see issues 17 for more information).

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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 |  |
| Species condition (3nm and eez) | Additional year of data | See Table 1 (species subgoal) | Changes to model causes resilience scores to decline between 0-6 points, in most cases |
| CITES signatories | No updates | None |  |
| Social Progress Index | Additional year of data | None | Updates to source data resulted in changes to resilience scores < ±2 points in most cases (37) |
| World Governance Indicators | Additional year of data | None | Updates to source data resulted in changes to resilience scores < ±0.5 points in most cases (6) |
| Effectiveness of commercial fisheries management (Mora data) | None | None |  |
| Effectiveness of artisanal fisheries management (Mora data) | None | None |  |
| CBD data (5 resilience measures): Management of habitat diversity; protection of biodiversity from following pressures: Mariculture, invasive species, tourism, pollution | None | None |  |
| Mariculture Sustainability Index | None | None |  |
| Global Competitiveness Index | Additional year of data | Small change to gapfilling | Changes to resilience is very small (< ±1 in most cases) (16) |