# OHI 2016: Changes since 2015

## Goals status and trend updates

All goals/subgoals were updated, except livelihoods and economies and coastal protection, due to data limitations (Table 1).

Additional years of data were available for the following goals/subgoals: artisanal opportunities, species condition, habitat and coastal protection (sea ice), mariculture, clean waters (land-based pollution), iconic species, lasting special places, natural products, tourism and recreation.

Improved data were available for the following goals/subgoals: fisheries (Sea Around Us data now provided at the raster level), species condition (bird data are now included), clean waters (trash trends are calculated using actual trash data, rather than proxy population data), iconic species (trend is now directly estimated from data).

## Pressures

We were able to improve and/or update 16 of the 20 pressure layers (Table 2). We added additional years of data for 7 pressures layers, and there were major improvements to source data for fisheries related pressures and sea level rise.

One of the most exciting changes was the addition of Social Progress Index (http://www.socialprogressimperative.org/global-index/) data as a “social” component of the pressure scores.

## Resilience

We restructured the resilience data/matrix within the OHI repositories so the data and calculations are more transparent and easier to understand and update (issues: 640, 614, 533, 528, 470, 624).

One of the most exciting changes was the addition of Social Progress Index (http://www.socialprogressimperative.org/global-index/) data as a “social” component of resilience scores.

We were only able to update two resilience layers: species condition and marine protected areas.

## Behind the scene changes

These improvements will not be obvious to most people, but they will make our methods more transparent and will make future analyses faster and more accurate.

We updated the ohicore package which houses the core functions used to calculate any OHI assessment (issues: 645, 537, 532). Changes included: improving the code used for the calculations, deleting unused functions, improving error/warning messages, and eliminating namespace conflicts which threw a bunch of errors when the package was loaded.

We improved how we prepare the data layers used in the OHI calculations:

* Files are now labeled and organized in a consistent way (see our operating procedures document: <https://rawgit.com/OHI-Science/ohiprep/master/src/dataOrganization_SOP.html>).
* We have been documenting the methods used to process the data used in an OHI assessment (an example: https://rawgit.com/OHI-Science/ohiprep/master/globalprep/prs\_oa/v2016/oa\_dataprep.html).
* We have created several document templates for consistency and efficiency of presentation (location of templates: <https://github.com/OHI-Science/ohiprep/tree/master/src/templates>).
* We have developed consistent methods of tracking gapfilled data (<http://journals.plos.org/plosone/article/asset?id=10.1371/journal.pone.0160377.PDF>).
* We clarified our citation policies (<http://ohi-science.org/citation-policy/>, issue 578).

We revised our method of calculating the trend dimension. Now trend is calculated as the percent change rather than the absolute change. This had little effect on scores, but this formulation is more consistent with the OHI model (Issues: 679, 675).

Note: See issues 464 and 310 for future ideas.

Table 1: Description of updates to data and models used to calculate the status and trend scores for the global Ocean Health Index.

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| --- | --- | --- | --- |
| **Goal/subgoal**  **(Issues)** | **Updates to data** | **Updates to data preparation or model** | **Notes** |
| Artisanal opportunities  (700, 683) | *Need*: Additional year of data, and a slightly different version of the WorldBank dataset to control for inflation  *Opportunity*: None | Reference point for “need” data is now the 95th quantile among regions (rather than max value) | The change in reference point increased scores |
| Species condition  (subgoal of biodiversity goal)  (623, 569, 526) | Additional year of IUCN and Aquamaps data | Added bird species  Used a new threshold for determining presence/absence of species in Aquamaps data.  In addition to informing our analysis this information will be useful to other researchers. The conclusions have been written up in a paper submitted to PLoS (O’Hara et al.) | The addition of bird data generally increased scores because there are several bird species that are widespread and doing well |
| 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 | The National Snow & Ice Data Center updated their data, but this did not affect our scores in any significant way. |
| Fisheries  (subgoal of food provision goal)  (668) | *Catch*: Improved Sea Around Us data (now provided as rasters at a 0.5 degree grid level and in categories such as commercial, subsistence, etc.); unfortunately, no additional years of data (2010 most recent year).  *B/Bmsy*: Now RAM B/Bmsy data used when possible (these data are based on formal stock assessments); updated values with new catch data using the data-limited CMSY method | Simplified method of calculating B/Bmsy. Previously, model priors depended on the region’s fisheries resilience score (based on Mora data). However, our analyses suggest this does not improve results.  Modified the taxonomic penalty for catch not identified to species because these penalties were magnified due to the use of the geometric mean to estimate average stock condition.  We explored several models (including ensemble approaches) besides the CMSY to generate B/Bmsy values, but none proved better than the CMSY approach | This year’s scores were very different than last year’s scores. This was due primarily to differences in the SAUP catch data. One of the main differences is that, in some places, more catch is now identified as “marine fishes not identified”. When catch is not identified to the species level, it is penalized in the fisheries model because this is considered an indicator of poor management. So this tended to decrease scores.  Other variables affecting scores:   * Changes to the taxonomic penalty in the model (increased scores) * Addition of RAM data for B/Bmsy scores * Changes to data-limited B/Bmsy calculations * Better resolution data |
| Mariculture (subgoal of food provision goal)  (707) | *Production*: additional year of FAO data  *Sustainability*: no updates  *Population*: updated methods (estimates calculated using higher resolution spatial data) | None | Retroactive changes to FAO data resulted in some differences in scores |
|  |  |  |  |
| 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 | The National Snow & Ice Data Center updated their data, but this did not affect our scores in any significant way. |
| Carbon storage | *Mangrove*: no updates  *Saltmarsh*: no updates  *Seagrass*: no updates | None | None |
| Clean waters  (679, 534) | *Nutrient pollution*: additional year of FAO fertilizer data (trend and pressure)  *Chemical pollution*:  Shipping and ports: no  updates  Land-based inorganic:  no updates  Land-based organic:   additional year of  FAO pesticide data  *Pathogens:* no updates  *Trash*: no updates to pressure data, but trend data was updated with a new dataset | Previously we used population as a proxy for the trash trend. Now we use trends in plastic disposal. | Replacing the trash trend data had a very small effect on scores. On average clean water scores decreased slightly, but less than 5 points. |
| Iconic species  (subgoal of sense of place goal)  (671, 569, 526) | Additional year of IUCN and Aquamaps data | Trend is now calculated using historical changes in IUCN risk category. This is a huge improvement over the previous method which relied on the IUCN population trend data. | Scores generally increased because the previous method overestimated trend effects. |
| Lasting special places (subgoal of sense of place)  (669, 511) | Additional year of WDPA data  Improved estimates of offshore/inland areas | None | Both: retroactive changes to source data and changes to area altered scores slightly |
| Natural products | Two additional years of FAO data | Corrected how fishery scores are integrated into score calculations (sustainability component of fish oil product) | Previously, the 2015 assessment used 2011 data, now it uses 2012 data  Retroactive changes to source data changed scores somewhat  Countries that have sporadic harvests have high variability in scores  The changes to fishery scores alter scores |
| Tourism and recreation | *Tourism sustainability*: none  *Employment*: new year of WEF data  *Travel warnings*: new year of data | Improved approach to dealing with travel warnings in the model | Retroactive changes to source data changed scores and there were a few changes to the travel warning classifications |
| Livelihoods and economies | None | None | None |

\*\* Overview of all changes in issue 614.

Table 2: Description of updates to data and methods used to calculate the pressure scores for the global Ocean Health Index.

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| **Goal/subgoal** | **Updates to data** | **Updates to data preparation or model** | **Notes** |
| Social: World Governance Index | Additional year of data | Small improvement to gapfilling | Small changes in a handful of countries |
| Social: Social Progress Index  (714) | New pressure layer | New pressure layer | Tended to increase pressure scores because SPI scores tend to be higher than WGI scores (the other component of social resilience) |
| Climate change: Ocean acidification  (667, 595) | Additional year of data | Improved rescaling method: values greater than biological threshold of 1 are rescaled based on their absolute change in aragonite saturation state weighted by distance to 1 (closer to 1, higher pressure value) | Pressure scores tended to decrease very slightly |
| Climate change: UV  (642) | Additional year data;  limited data to only one dataset (previous calculations used a different dataset for the reference point) | Improved reference point; New reference point is the 99.99th quantile of the entire time series | Very slight decrease in pressure score |
| Climate change: Sea level rise  (670) | Improved AVISO data (higher temporal resolution) | Clip pressure to near offshore areas (rather than including entire EEZ, which is not biologically relevant);  Improved reference point: 99.99th quantile across the entire timeseries | Very small (<5 points) increase in pressure score |
| Climate change: Sea surface temperature  (713) | None | Improved reference point: 99.99th quantile across the entire timeseries | Resulted in a slight increase in pressure scores (most regions < 2.5 points) |
| Pollution: Land-based nutrient pollution | Additional year of FAO fertilizer data | None |  |
| Pollution: Chemical pollution | Organic land-based: additional year FAO pesticide data  Shipping ports: None  Inorganic land-based: None | None |  |
| Pollution: Trash | None | None |  |
| Pollution: Pathogens | None | None |  |
| Species: Genetic escapes | Additional year data | None |  |
| Species: Targeted harvest | Additional year data | None | Retroactive changes to source data resulted in small changes to pressure score |
| Species: Invasive species | None | None |  |
| Commercial fisheries: high bycatch  (699) | Improved Sea Around US data (now provided at raster spatial scale) | Small change to reference point (99.99th quantile across the entire timeseries)  artisanal catch removed (not possible previously because catch data was not categorized into types) | Relatively small (<10 points) increase in pressure score |
| Commercial fisheries: low bycatch  (699) | Improved Sea Around US data (now provided at raster spatial scale) | Small change to reference point (99.99th quantile across the entire timeseries)  artisanal catch removed (not possible previously because catch data was not categorized into types) | Relatively small (<10 points) increase in pressure score |
| Artisanal fisheries: low bycatch  (703) | Improved Sea Around US data (now provided at raster spatial scale) | Catch includes: artisanal, subsistence, and recreational catch (SAUP catch data now categorized) | Relatively small (<5 points) increase in pressure score |
| Artisanal fisheries: high bycatch  (706) | None | Values now include blast and poison data (previously only included blast data)  Values are now averaged over 3nm offshore area rather than the entire EEZ, which aligns better with where artisanal fishing occurs | Tended to increase pressures in a few regions |
| Habitat destruction: soft-bottom subtidal  (705) | Improved Sea Around Us data (now provided at raster spatial scale) | Improved methods due to catch data at raster spatial scale | Relatively small (<10 points) increase in pressure score |
| Habitat destruction:  Intertidal (nearshore population used as proxy)  (707) | None | Improved estimate of population data using higher resolution spatial data  New approach to rescaling data | Generally increased pressure scores (0-15 points) |
| Habitat destruction: subtidal hard-bottom | None | None |  |

\*\* Overview of all changes in issue 614.