Create-Your-Own-Map (CYOM) Manual

This is the User's Manual for the *AquaMaps Create-Your-Own-Map* (*CYOM*) Tool. For ease of use, the topics are arranged following a sequence of steps from calling a species distribution map, editing mapping parameters, regenerating the map, saving/publishing the new map online, and modifyingdeleting a reviewed map.

1.0 Getting started

A map is typically reviewed by a species expert or a researcher examining *AquaMaps* predictions against a species' known distribution. Doing a species search is the first step to checking and editing an AquaMap. Start from the *AquaMaps* Search page at www.aquamaps.org (Fig. 1). Then:

1. Go to the section **Search Marine Species by Scientific Name** located below the map in the search page.

2. Specify the scientific name in the **Genus** and **Species** fields. The search accepts current accepted species names and synonyms. A sample search is shown for the Glacier lantern fish *Benthosema glaciale.*

3. Click **Search**. This will return a list with one or several records, depending on the scientific name specified in the search.

4. Click on the **Scientific name** of a species on the list. This typically calls the computer-generated native range distribution map for the species (Fig. 2a). (Note: Links above the map allow toggling to **Year 2100 Native Range, Suitable Habitat** and **Point Map**.)

5. However, if more than one map exists for the species, a list of maps is shown where the most recent reviewed map version is listed first and the default-computer generated version last. An example is shown for the Atlantic cod *Gadus morhua* (Fig. 2b). Click on the thumbnail of the map to open in full view.
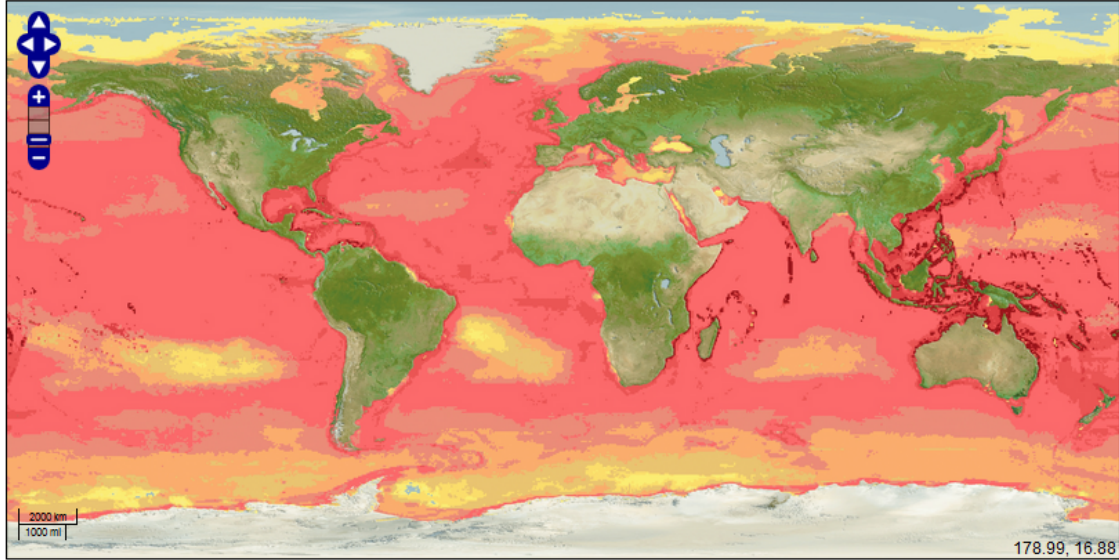
Figure 1: *AquaMaps* species search page, accessed via www.aquamaps.org
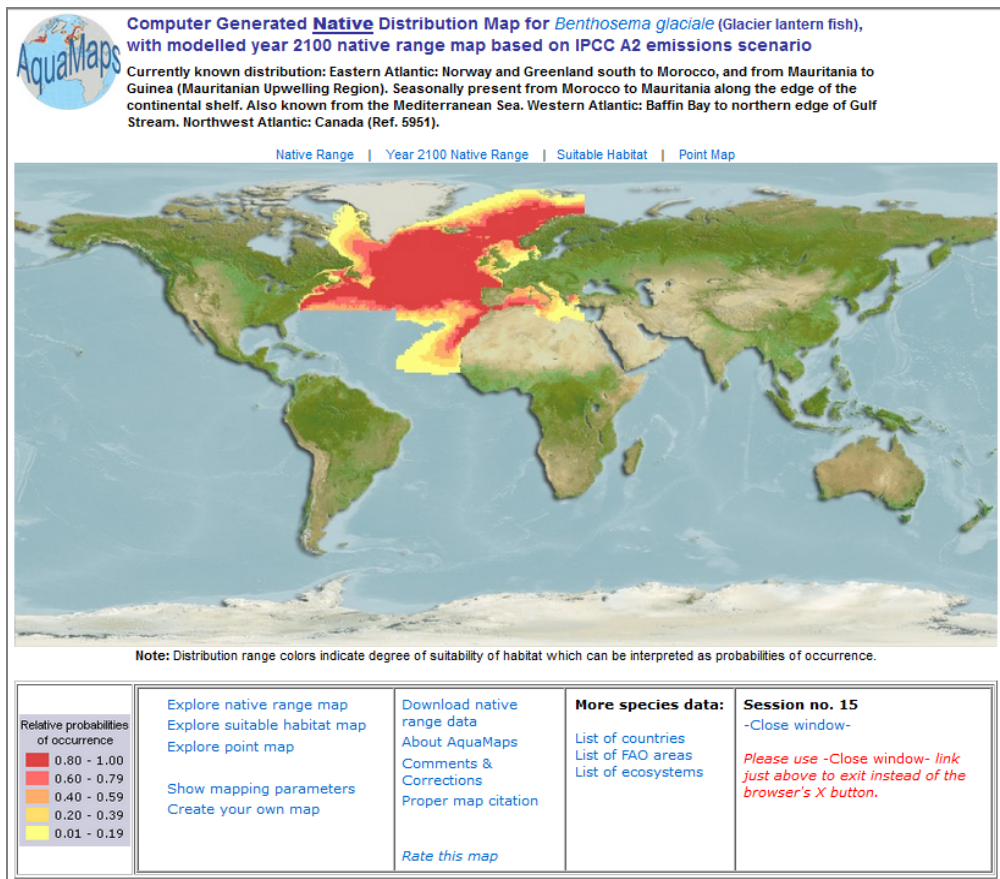
Figure 2a: Computer-generated native range distribution map returned by a map search for the Glacier lantern fish *B. glaciale*. Information on currently known distribution is found above the map while countries, FAO areas and ecosystems of reported occurrences can be accessed through the **More species data** section.

Figure 2b: Results of the species search for the Altantic cod *Gadus morhua*. The most recent reviewed map version is listed first and the default-computer generated version last.

2.0 Checking and editing the map

A basic check of an AquaMap involves comparing the predicted native distribution against a species' reported range. Information on the currently known native distribution of a species is provided above the map (Fig. 2a). Additional distribution information is also found in the **More species data** section below the map. This includes links to the list of countries, FAO fishery statistical areas, and ecosystems where a species is known to occur. Comparison can also be made by toggling to the **Point Map** which displays species occurrence records. A map may sometimes appear inaccurate due to incomplete or outdated input data, sampling biases, or data encoding errors. In such cases, a map may be corrected by editing mapping parameters and settings in the *CYOM*.

1. Click on the **Create your own map** link found beneath the species map (Fig. 2a). This open the *CYOM* tool interface (Fig. 3)

2. Examine mapping parameters and settings for the species. Note that the species' map can be improved or corrected by adjusting values or settings in four sections:

    - Area Restrictions
    - Occurrence Cells
    - Environmental Envelopes
    - Map View Settings

3. See **About AquaMaps** (upper right-hand section) for further information on the *AquaMaps* concept, algorithm and data sources (including other tools).

Figure 3: Create-Your-Own-Map (*CYOM*) interface showing default mapping parameters and settings for *B. glaciale*.

2.1 Working with AREA RESTRICTIONS

AREA RESTRICTIONS is the first section in the *CYOM* interface (Fig. 4). It describes the geographic extent of a species' distribution. The information is needed by *AquaMaps* to (1) identify half-degree cells that contain point data that fall within a species' known natural range ("good cells"), (2) compute the species' environmental envelopes, and (3) define the area for plotting the relative probabilities of species occurrence. Area restriction settings can be adjusted in any or all of the following sub-sections in Fig. 4.

Figure 4: Close-up of the AREA RESTRICTIONS section of the *CYOM* interface for *B. glaciale*.

FAO Areas (test field)

FAO areas are fisheries statistical areas that cover the known natural range of a species. They serve as a proxy for the bounding box in the absence of bounding box coordinates.

1. Review the listed FAO areas.

2. Add or remove FAO areas from the list by typing or deleting area codes, as necessary. FAO areas are two-digit codes representing subdivisions of the world's oceans used by FAO for reporting fisheries data. (Appendix 1).

Extended FAO Area(s) (checkbox)

The model's algorithm extends predictions pole-ward to FAO areas directly adjacent to those listed above. This allowance enables natural range boundaries defined by environmental conditions to emerge, instead of being delimited by arbitrary management areas.

3. Review the extended FAO areas listed.

4. Retain the default setting, or uncheck the box to disable this rule to exclude species from areas of false predicted presences. Alternatively, you can also modify the bounding box settings (see below).

Bounding box (numeric field)

A bounding box defines the latitudinal and longitudinal extent of the species' known natural range (e.g., based on a map or the literature).

5. Review the bounding box coordinates listed.

6. If necessary, change or complete the bounding box coordinates. The geographic coordinates are listed in the following order: northern limit, southern limit, western limit and eastern limit (i.e., N/S/W/E format).

7. Use whole degrees (although decimal-degrees is also an accepted format).

8. Use the negative sign (-) to indicate latitudes in the southern hemisphere or longitudes in the western hemisphere.

Pelagic (drop-down list)

The Pelagic flag indicates whether or not the distribution of a species is influenced by bottom depth. This information is used by the model when plotting the relative probabilities of species occurrences. "True" indicates the species is found in the water column, well above and independent of the bottom. "False" indicates the probability of occurrence depends on whether the bottom depth is within the depth range of the species.

9. Review the default Pelagic flag.

10. Retain the default setting or set the flag to "True" or "False", as appropriate for the species.

Use Mean Depth (drop-down list)

The Use Mean Depth flag indicates how the probability of species occurrence with respect to depth is computed. "True" means the probability of occurrence will be based on a comparison of a species' depth range to the mean depth of an area. "False" means it will be based on a comparison against the minimum and maximum depth of an area.

11. Review the default Use Mean Depth flag.

12. Retain the default setting or set the flag to "True" or "False", as appropriate for the species.

For Temperature and Salinity, use: (drop-down list)

AquaMaps uses either surface or bottom data sets when computing the temperature and salinity tolerance limits of a species. By default, surface values are used when the minimum depth of a species <= 200m, while bottom values are applied to species of deeper minimum depths.

13. Review the default temperature and salinity layer used for the species.

14. Retain the default setting or change the setting to either "surface values" or "bottom values", as appropriate for the species.

Recalculate Good Cells and Envelopes (command button)
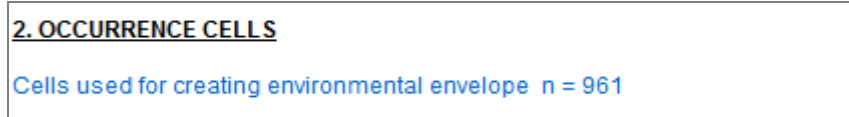
15. If you made changes in any of the Area Restrictions settings above, click this button to enable the model to recalculate the mapping parameters using the updated settings.

16. A notification will be displayed when the good cells and envelopes have been recalculated. If you have no other changes to make, you can proceed to the bottom of the *CYOM* page and click on the **Regenerate Map Data and View Map** button (see *2.5 Regenerating an edited map*). You can reserve this action for later if you wish to continue adjusting other map settings.

Restore Default Values (command button)

17.   Click this button if you want to discard the changes you made to the Area Restriction settings and reload the default map values. A notification will be displayed when the default system values have been loaded. If you have no other changes to make, you can proceed to the bottom of the *CYOM* page and click on the **Regenerate Map Data and View Map** button (see *2.5 Regenerating an edited map*). You can reserve this action for later if you with to continue adjusting other map settings.

2.2 Working with OCCURRENCE CELLS

OCCURRENCE CELLS is the second section in the *CYOM* interface (Fig. 5). *AquaMaps* assigns species point data to a grid of half-degree cells that cover the world's oceans. Each half degree cell has properties that describe the average depth, sea temperature, salinity, primary production, sea ice concentration, and distance to land of that cell. These are the environmental factors *AquaMaps* uses as predictors of species occurrence. Environmental properties in cells that contain point data within a species' native range are used to estimate the environmental envelopes (environmental tolerances) of a species. Cells or point data can be included or excluded from the list, or even new ones added, in order to improve the set of environmental parameters from which environmental envelopes are computed. Note that half-degree cells are counted only once regardless of how many point data fall within them. This eliminates any bias from sampling frequency.

2. OCCURRENCE CELLS

Cells used for creating environmental envelope n = 961

Figure 5: Close-up of the OCCURRENCE CELLS section of the *CYOM* interface for *B. glaciale*.

Click the link **Cells used for creating environmental envelope n =** (record count) to open the table of half-degree cell used for calculating environmental envelopes (Fig. 6).

Add a Good Cell by entering Latitude: [____] Longitude: [____] [Add to good cells] Refresh list

Total cells available for this species n = 1015   Cells used for creating environmental envelope n = 961   Close Window

Note: After making changes to this table: Click 'Recalculate Good Cells and Envelopes' button in the 'CREATE YOUR OWN MAP' window.

#	Include in generating envelope (Save / Select all)	Csquare Code	Good Cell	Based on Country Point?	Center Lat	Center Long	Depth (m)	Sea Temp. (°C) Surface	Bottom	Salinity (psu) Surface	Bottom	Primary Production	Sea Ice Conc. (% cover)	Distance to Land (km)	FAO
1	☐	7715:217:1	N	N	71.25	-157.25	69	-1.71	-1.11	30	32.61	129	0.66	7	18
2	☐	7715:216:1	N	N	71.25	-156.25	14	-1.71	-0.77	29.75	30.68	109	0.73	4	18
3	☐	7208:113:3	N	N	21.75	-83.25	1114	27.92	4.67	36	34.94	1397	0	25	31
4	☐	7307:216:2	N	N	31.25	-76.75	2668	25.07	3.14	36.29	34.95	377	0	338	31
5	☐	7307:245:4	N	N	34.75	-75.75	130	23.1	20.72	35.77	36.42	778	0	91	31
▼55	☑	7307:475:1	Y	N	37.25	-75.25	28	15.44	14.55	33.27	34.14	1198	0	89	21
56	☑	7307:465:3	Y	N	36.75	-75.25	26	18.43	15.52	32.43	33.92	1101	0	89	21
57	☑	7307:465:1	Y	N	36.25	-75.25	31	18.43	15.52	32.43	33.92	878	0	90	21
58	☑	7307:394:2	Y	N	39.25	-74.75	7	12.52	13.19	32.63	32.84	1282	0	8	21
59	☑	7307:384:2	Y	N	38.25	-74.75	26	14.23	10.28	32.63	33.44	1567	0	87	21
60	☑	7307:364:4	Y	N	36.75	-74.75	289	19.69	11.86	33.79	35.43	948	0	134	21
61	☑	7307:364:2	Y	N	36.25	-74.75	576	19.69	7.12	33.79	35.07	938	0	135	21
62	☑	7307:354:4	Y	N	35.75	-74.75	808	21.93	8.48	34.72	35.24	947	0	135	21
63	☑	7307:354:2	Y	N	35.25	-74.75	1905	21.93	3.66	34.72	34.98	880	0	136	21
64	☑	7307:374:3	Y	N	37.75	-74.25	312	16.9	10.49	33.27	35.28	914	0	132	21
65	☑	7307:374:1	Y	N	37.25	-74.25	1355	16.9	3.93	33.27	34.99	903	0	149	21

Figure 6: List of occurrence cells for *B.glaciale*. Checked records indicate good occurrence cells based on point data found within the known range of the species. Records highlighted in yellow (unchecked) are treated as outliers. In this example, only 961 out of 1015 occurrence cells are considered good data for calculating the environmental tolerances (environmental envelopes) of the species. A user can add point data to the list and recalculate the environmental envelopes of the species.

Including/excluding occurrence data from the list

By default, the table of occurrence cells shows the list of half-degree cells that contain point data attributed to a species based on data harvested from GBIF, and those in the FishBase and SeaLifeBase databases (Fig. 6). Cells tagged with a check mark contain point data that were used in computing the environmental envelopes of the species. Cells with point data that are out outside of the known distributional range are unchecked and highlighted in yellow. These are excluded from the computation.

1. Review the list of occurrence cells assigned to the species. Toggling to the **Point Map** in the species page (Fig. 2a) visualizes these in a color-coded point map indicating good and non-good cells. The summary line above the table shows the counts of cells available and used.

2. Use the check boxes to include or exclude more cells from the list. You can also opt to retain the default settings on the list.

3. Click on the **Save** button when done selecting/unselecting cells from the list. The summary line about the table showing cell counts will reflect changes made. (Skip this step if you did not make changes in the occurrence list.)

4. Click the **Close Window** link to return to the main *CYOM* page.

5. If you checked or unchecked cells from the list, remember to click the **Recalculate Good Cells and Envelopes** button back in the main *CYOM* interface to re-compute the species' environmental envelopes based on the changes you made.

Latitude/Longitude (numeric fields) - *Adding point data to the occurrence list*

Good cells are half-degree cells that contain point data within a species' known distribution range. You can also add good cells by typing the geographic coordinates in the corresponding **Latitude** and **Longitude** fields found above the occurrence cells table (Fig. 6).

6. Enter coordinates in decimal degree format. Use negative values to indicate latitude in the southern hemisphere and longitude in the western hemisphere.

7. Click on the **Add to good cells** button and a window showing the coordinates you entered and its corresponding half-degree cell and cell properties is displayed.

8. Examine the corresponding cell properties, and click on the link **Add to good cells which will be used for prediction in the 'Create Your Own Map' routine** on the right to accept.

9. A dialog box will display "New cell added". Click **OK** to proceed.

10. Another dialog box will then display "In CREATE YOUR OWN MAP - You must now 'Re-calculate Envelope and Good Cells'. You can opt to click the check box to prevent this reminder from creating additional dialogs. Click **OK** to proceed.

11. Click the **Refresh list** link found above the occurrence cells table (upper right) when done. Note that the **Cells used for creating environmental envelope** record count now includes the point(s) added.

12. Click the **Close Window** link to return to the main *CYOM* page.

13. Click the **Recalculate Good Cells and Envelopes** button back in the main *CYOM* interface to re-compute the species' environmental envelopes based on the changes you made.

2.3 Working with ENVIRONMENTAL ENVELOPES

ENVIRONMENTAL ENVELOPES is the third section in the *CYOM* interface (Fig. 7). An environmental envelope describes the range of tolerances of a species for a given environmental factor. These tolerances are presented as minimum (Min), preferred minimum (Pref Min), preferred maximum (Pref Max), and maximum (Max) threshold values. Environmental factors used by the model as predictors of species presence include depth, sea temperature, salinity, primary production, sea ice concentration, and distance to land. With the exception of depth, which is mostly based on the literature, species tolerance thresholds are computed from the environmental attributes of the half-degree cells enabled (checked) in the OCCURRENCE CELLS section.

Absolute and preferred minima and maxima thresholds are computed as follows:

- Min = 25th percentile - 1.5 × interquartile or absolute minimum in extracted data (whichever is lesser)

- Max = 75th percentile + 1.5 × interquartile or absolute maximum in extracted data (whichever is greater)

- Pref Min = 10th percentile of observed variation in an environmental parameter

- Pref Max = 90th percentile of observed variation in an environmental parameter

Figure 7: Close-up of the ENVIRONMENTAL ENVELOPES for *B. glaciale*, describing the estimated tolerance thresholds for the six predictors. (Distance to land is unchecked by default as this parameter mostly applies to marine mammals).

1. Review the environmental factors and threshold values in the species' environmental envelopes.

2. Retain the current settings, or manually change the threshold values and/or use the checkboxes to disable/enable environmental factors to use for predicting species occurrence.

3. If you made any changes, click on the **Save Changes in Environmental Ranges** button.

4. A dialog box will display indicating "Environmental ranges saved". Click **OK** to proceed.

5. A reminder to will show "You must now 'Regenerate Map Data' and then 'View Map' ". Click **OK** to proceed.

2.4 Working with MAP VIEW SETTING

MAP VIEW SETTING is the fourth section in the *CYOM* interface (Fig. 8). It determines how the predicted probabilities of species occurrence will be plotted on the map. There are three map view options:

- **Bounding Box** – the predicted probabilities of species occurrence will be plotted only in the area covered by the bounding box which is generally the closest approximation of the known native/endemic range of the species.

- **FAO Areas** – the predicted probabilities will be plotted to the limits of the FAO area(s) that encompass the known/endemic range of the species. This setting typically used when there is either incomplete or no bounding box data for the species.

- **Both (intersection)** – the probabilities of species occurrence will be plotted only over the area common to both bounding box and FAO area(s) of the species. This is the default setting.

Note: For species occurring in one hemisphere (can be verified by viewing the Point map), the map view option is set to 'Both' even if there is incomplete or no bounding box data because the algorithm sets the southern limit in the northern hemisphere or the northern limit in the southern hemisphere to 0°.

Figure 8: Close up of the MAP VIEW SETTINGS section for *B. glaciale* set to Both (intersection), indicating that the probabilities of occurrence will be plotted in the area where the both the species' bounding box and FAO area extents overlap.

1. Review the default map view setting for the species.

2. Retain this setting, or change the view setting by clicking on the appropriate radio button.

3. If you changed the setting, click on the **Save Change in View Map Option** button.

4. A reminder to will show "You must now 'Regenerate Map Data' and then 'View Map' ". Click **OK** to proceed.

2.5 Regenerating an edited map

This step enables you to re-draw the map, applying any changes you have made in the mapping parameters and settings following instructions in the previous sections of this manual. A map can be re-drawn for the predicted distribution range and probabilities of species occurrence in the current period and by the year 2100 using the command buttons at the bottom of the *CYOM* page (Fig. 9).

1. If you finished reviewing the mapping parameters and settings and have not made any changes in the *CYOM*, you can proceed to clicking the **View Map** button found at the bottom of the *CYOM* page. This will plot the same map seen in the species page. The resulting map however will be in interactive mode and will allow you to explore the map further.

2. If you have made changes in the *CYOM*, review your map settings to confirm all edits to be applied.

3. Click the **Regenerate Map Data and View Map** button, then click **OK** at the message prompt to proceed. This will re-draw the map of the predicted native range of the species at the current period. The map will be in interactive mode and will allow you to explore the map further.

4. To generate the predictive map for the year 2100, check the box to **Switch to 2100 Map**.

5. A dialog box will display indicating "You must regenerate map data when switching maps ". Click **OK** to proceed. (Check on the box to if you wish to disable this prompt.)

6. Click the **Regenerate Map Data and View Map** button to proceed. The resulting map plots the predicted native range of the species by the year 2100. It is also in interactive mode and will allow you to explore the map further.
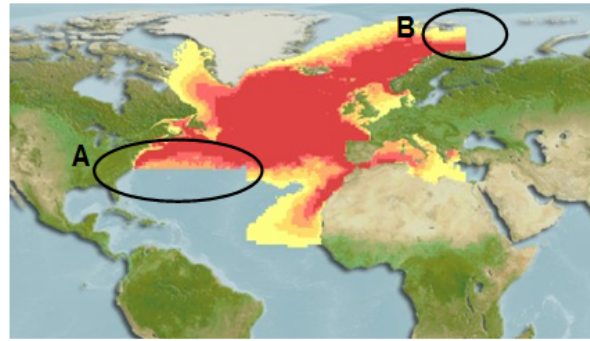

Figure 9: Close-up of the bottom of the Create-Your-Own-Map (*CYOM*) page. Shown are the Switch to 2100 Map, Map View Settings, and the command buttons for regenerating and viewing a map.

Note: Regenerated maps or maps in interactive mode are labeled **"User-Specified Map for <genus> <species>"**. See bottom of Fig. 10 and Fig. 11 for the example of the regenerated map for the Glacier lantern fish *B. glaciale*.

Figure 10 revisits the Glacier lantern fish *B. glaciale* example summarizing the problem with the computer-generated map and the edits/actions applied using the *CYOM* Tool to produce an improved map for the species.

|	
Problem with distribution map • Hard edges in the plotted distribution range *of B. glaciale* in the western central Atlantic **(A)**, and in the Barents Sea **(B)**	
Edits/actions applied in *CYOM* **A.** Added FAO area 31-Atlantic, Western Central **B.** Western and eastern bounding box limits adjusted to 81ºW and 61ºE (to extend further along US east coast & eastward in Barents Sea) **C.** Good cells and environmental envelopes recalculated **D.** Minimum sea surface salinity threshold increased to 18.4 (to exclude false prediction in Black Sea) **E.** Changes in environmental ranges saved **F.** Map regenerated	
Regenerated/Edited Map Regenerated native range AquaMap for *B. glaciale*, incorporating edits and adjustments in mapping parameters to improve the predicted distribution for this species	
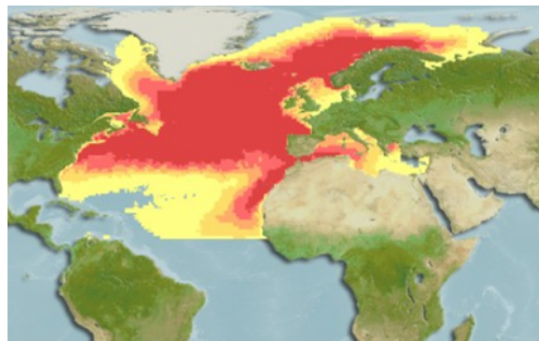
Figure 10: Summary of *B. glaciale* review process.

3.0 Saving and publishing an edited map

The distribution map regenerated in the previous section now incorporates the data and/or edits in mapping parameters and settings behind the reviewed map (see example for *B. glaciale* in Fig. 11). If the regenerated map meets the approval of the reviewer, the map should now be saved so that this improved version and its associated data and settings can be published and stored in aquamaps.org. Reviewed maps are listed along with the latest computer-generated *AquaMaps* for a species. If a reviewed map exists for a species exists, it is displayed as the default species distribution map in the FishBase and SeaLifeBase Species Summary pages. Otherwise, the default computer-generated map is displayed.

Note that prior registration with *AquaMaps* is required in order to save and publish an edited map in aquamaps.org. Contact Rainer Froese (rfroese@geomar.de) for fishes, and Ma. Lourdes Palomares (m.palomares@fisheries.ubc.ca) for non-fish species. An assigned activity password, ExpertID and user password will be provided when the registration has been completed.
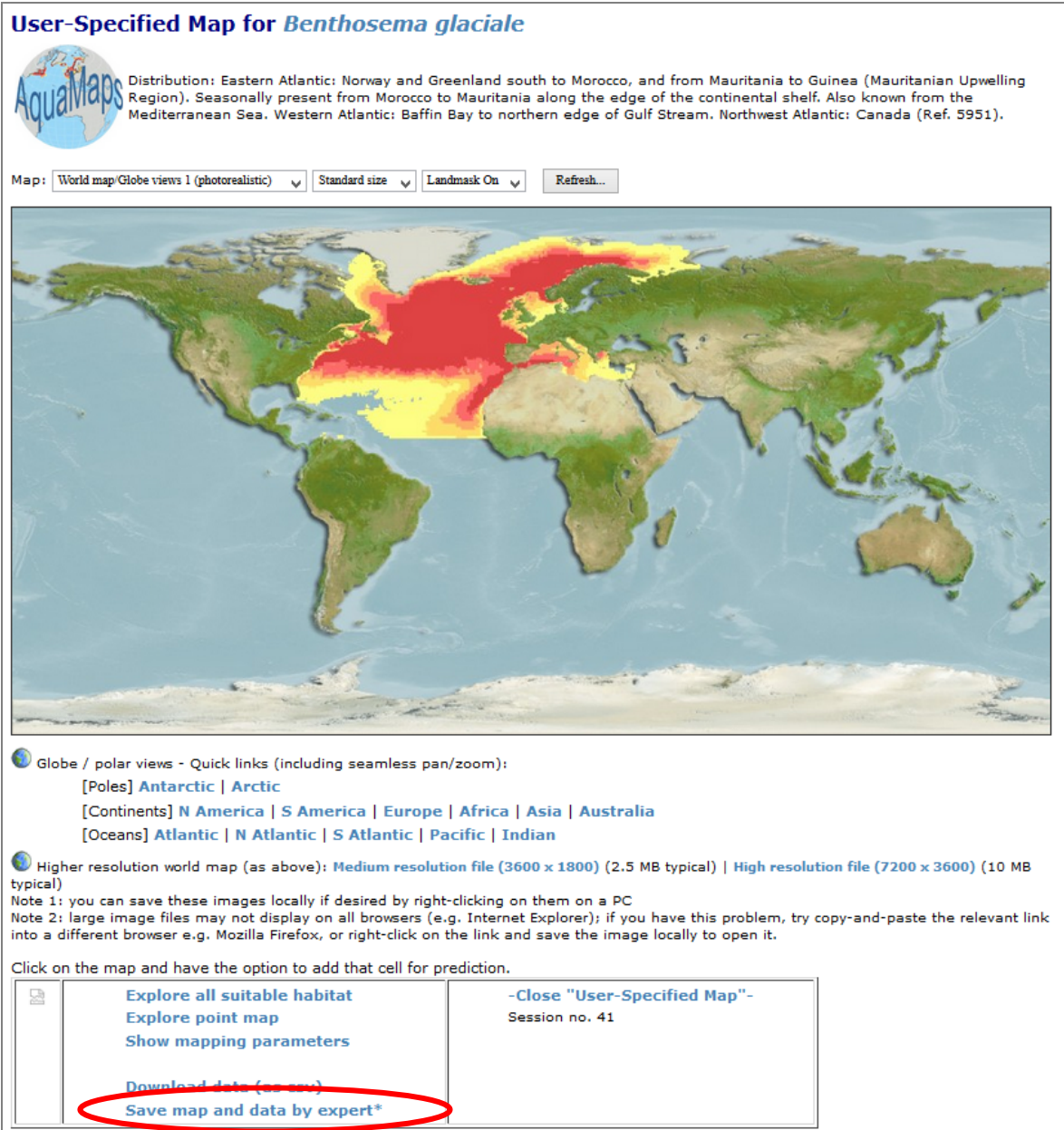
Figure 11: Regenerated map of *B. glaciale* based on data and edits specified by a reviewer. Link for saving map and associated data encircled in red.

1. Click on **Save map and data by expert*** (Fig. 11).

2. A window will appear. Enter the **activity password** and click Submit.

3. A form for saving a map will appear. Enter your **ExpertID** and **password**.

4. Enter brief notes to document edits/changes applied to the map in the **Remarks** field. Recommended contents could include:

   ▪ Problem(s) with the previous version of the map

   ▪ Action(s) taken/edits made to improve the map

   ▪ References used as basis for corrections made, if any

- Other important comments or notes

5. Give the map a star **Rating**. (See Fig. 12 for rating criteria).

6. Click **Save Expert Map**.

7. The map is saved and now available in aquamaps.org. You will be asked if you would like to announce the completed review through various channels. This step is optional. If you click **Yes**, an announcement of the reviewed map will be posted in the *FishBase*/*SeaLifeBase* and *AquaMaps* Facebook pages, as well as in the EU BON Biodiversity Portal. Click **No**, if you only want to save and publish the map in aquamaps.org without sending out reviewed map alerts.

Criteria	Rating				
	5	4	3	2	1
Environmental envelope	Envelope ok; no further edits recommended	Envelope ok; no further edits recommended	Envelope ok/species known to have large interannual changes in habitat usage are only inadequately captured by single annnual envelope;	Envelope ok but may still be improved adjusting parameters (>2); or available environmental parameters are unable to adequately describe species occurrence	Computer-generated (default) map
Area restrictions	Bounding box complete and with good fit to known distribtution	Bounding box complete and with good fit to known distribtution	Uses bounding box; no further improvements of bounding box possible but areas of false predicted presence remain	Uses bounding box but may need further improvements; defined by FAO areas that encompass entire known range	Computer-generated (default) map
Point data/good cells	Adequately large sample size; samples cover representative portion of species range;no apparent bias introduced;no good cells needed to be added/removed	Adequately large sample size; samples cover representative portion of species range;biases were corrected by adding or removing good cells	Medium sampe size and coverage of known species range but strong effort biases due to heterogenous sampling effort; possible point data bias/output can only be improved with addition/deletion of a large number good cells	Low sample size, non-representative coverage of species range by sampling	Computer-generated (default) map
Predicted range of occurrence	In very good agreement with known range/significant statistical relationship between predictions and independent survey data	In good agreement with known range	Approximates known range but possibly with some areas of false predicted presence or absence	Approximates known range but includes large areas of false predicted presence or absence	Computer-generated (default) map
Predicted relative likelihood of occurrence	In very good agreement with known relative occurrences/significant statistical relationship between predictions and independent survey data	In good agreement with known relative occurrences	Good correspondence with overall range but large discrepancies between predictions and known concentrations of high species occurrence	Good correspondence with overall range but large discrepancies between predictions and known concentrations of high species occurrence	Computer-generated (default) map

Figure 12: Five Star Rating scheme to guide a reviewer in evaluating the reliability of an *AquaMaps* native range prediction for a given species.

Note: A reviewed/edited map will not necessarily correspond to all conditions under each criterion within a given star rating, and will most likely vary across star ratings with respect to the different criteria. Thus, these criteria for rating are best used as a guide to approximate the degree of reliability of the predicted species distribution in the reviewed/edited map. The final rating is thus left to the discretion of the reviewer.

4.0 Modifying/Deleting a reviewed map

It is possible to make additional edits to a map you have already published on the AquaMaps website. Simply repeat the steps outlined above, starting from doing a species search (See *1.0 Getting Started* above) and clicking on the map you saved on the displayed list of maps for the species.

The Reviewer remarks and Star rating of a map you previously saved may also be modified, or the map itself can be deleted if, for instance, you want to redo and save a new version. These can be done through the species' map list returned following your species search (Fig. 13).
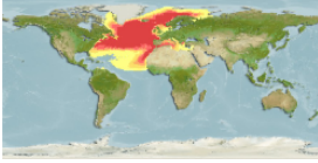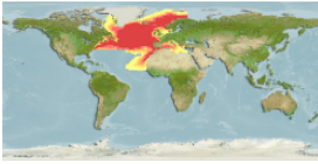

Figure 13: Returned list of AquaMaps for *Benthosema glaciale* following a species search through the AquaMaps species search page.

1. Browse the list of maps to locate the map version you previously saved and wish to delete.

2. Go to the **Remarks** column and click on **Modify** found below the remarks.

3. A window will appear showing your ExpertID. Enter your **password**, then click **Submit**.

4. The Editing/Deleting Expert-Reviewed/User-define Maps window will expand (Fig. 14).

5. Edit your remarks and/or change your star rating in the **Remarks** and/or **Rating** sections. Then, click **Save Changes**.

6. Or, click the **Delete Map** button found at the bottom of the page, as appropriate.

Figure 14: Editing/Deleting Expert-Reviewed/User-define Maps interface showing example for *Benthosema glaciale*. for Editing reviewer remarks or deleting the map requires password access.

Appendix 1: FAO Major Fishing Areas

Source: http://www.fao.org/fishery/area/search/en
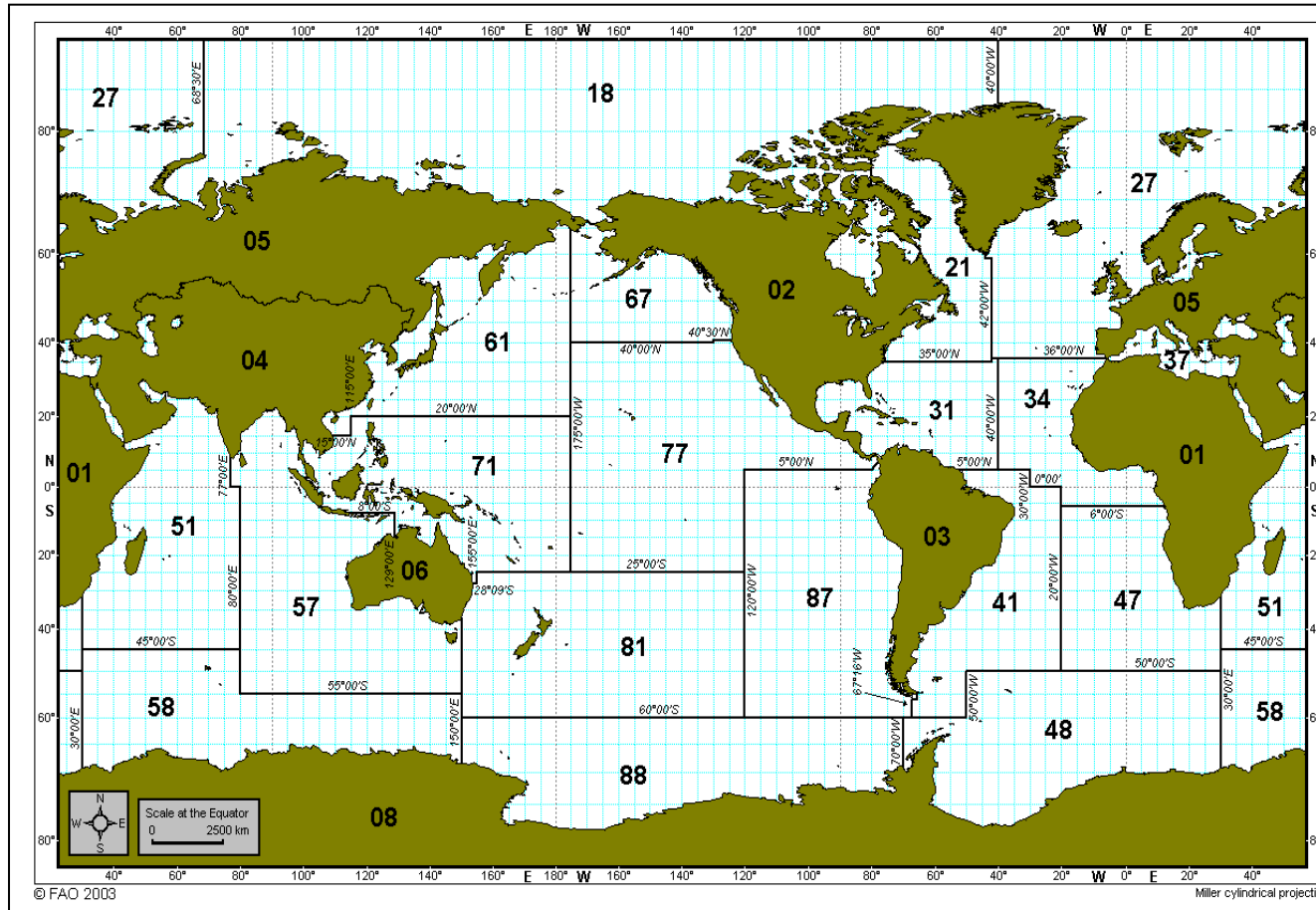
Atlantic Ocean and Adjacent seas
18 – Pacific, Antarctic
Arctic Ocean
31 - Atlantic,Western Central
34 - Atlantic,Eastern Central
37 - Mediterranean and Black Sea
41 - Atlantic,SouthWest
47 - Atlantic,SouthEast
48 - Atlantic,Antarctic
Indian Ocean and adjacent seas
51 - Indian Ocean,Western
57 - Indian Ocean,Eastern
58 - Indian Ocean,Antarctic
Pacific Ocean and adjacent seas
61 - Pacific,Northwest
67 - Pacific,Northeast
71 - Pacific,Western Central
77 - Pacific,Eastern Central
81 - Pacific,Southwest
87 - Pacific,Southeast
Southern oceans and adjacent seas
48 - Atlantic Antarctic