FindFISH Service

Quick access to expert knowledge is very valuable, especially in the context of decision-making, not only by fishermen, in order to diagnose under what hydrological conditions fisheries for four species: herring, sprat, cod and flounder should be the most abundant in resources. A digital/web service has been developed to meet these requirements. This is a service created as part of the FindFISH project, which provides results from developed models: hydrodynamic, biochemical and Fish - for specific species of fish caught industrially. The website works dynamically in the operational mode, enabling the visualization of forecasts in the form of maps, time and spatial series and tables.

The leader of the project "Knowledge Transfer Platform FindFISH - Numerical Forecasting System for the Marine Environment of the Gulf of Gdańsk for Fisheries" is the Institute of Oceanology of the Polish Academy of Sciences with its seat in Sopot, and the head of the project is prof. dr hab. Lidia Dzierzbicka-Głowacka.

The project is implemented in partnership with the Maritime Institute of the Gdynia Maritime University and the Sea Fishermen's Association - Organization of Producers based in Władysławowo. The project is co-financed from the European Regional Development Fund (ERDF) under the Regional Operational Program for the Pomeranian Voivodeship for 2014-2020, Priority Axis 01. Commercialization of knowledge, Measure 01.01. Expansion through innovation, Sub-measure 01.01.01. Expansion through innovation.

Model data

The results of the Gdańsk Bay 3D EcoFish ecosystem model for the hydrodynamic module, the biochemical module and the Fish module for the fish species studied under the project is a service available on the FindFISH website (www.findfish.pl) through the "FindFISH Service" tab on the navigation bar and selecting "Model data" through "Enter" (Figure 1A), and then "Sign in to your account" (Figure 1B). Access to the service requires the creation of an account and is paid (50 PLN/month). We invite you to use the system free of charge (www.findfish.pl) in February and March 2023. ENTER and check.

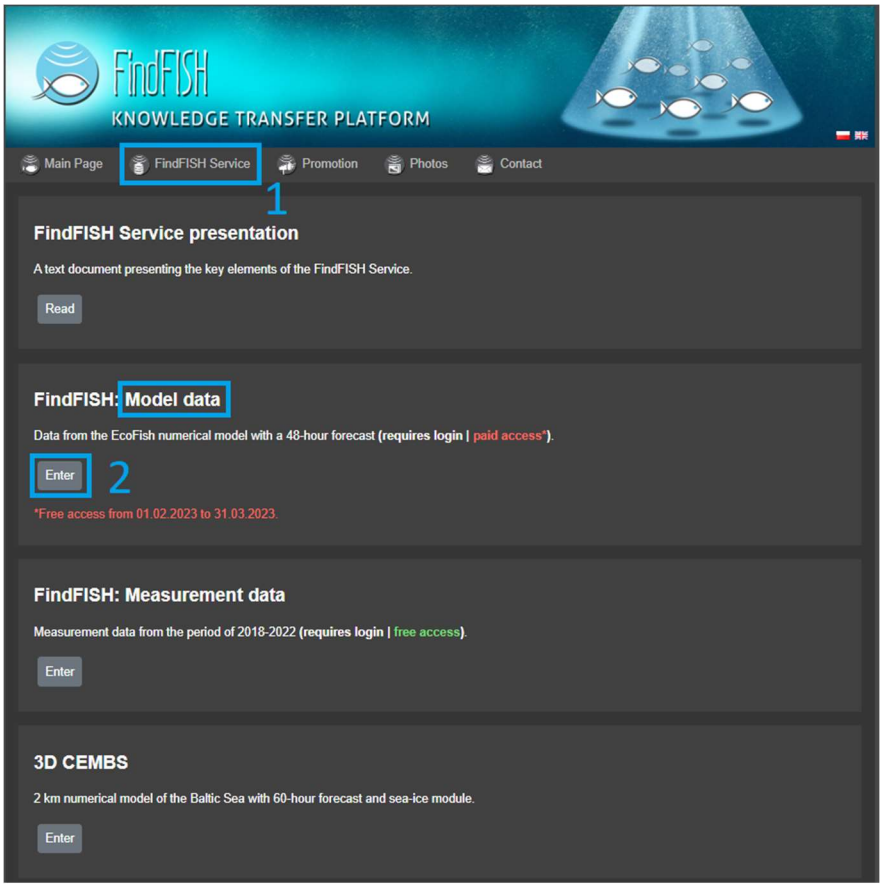

Fig. 1A. FindFISH project website and "Model Data" service selection page.

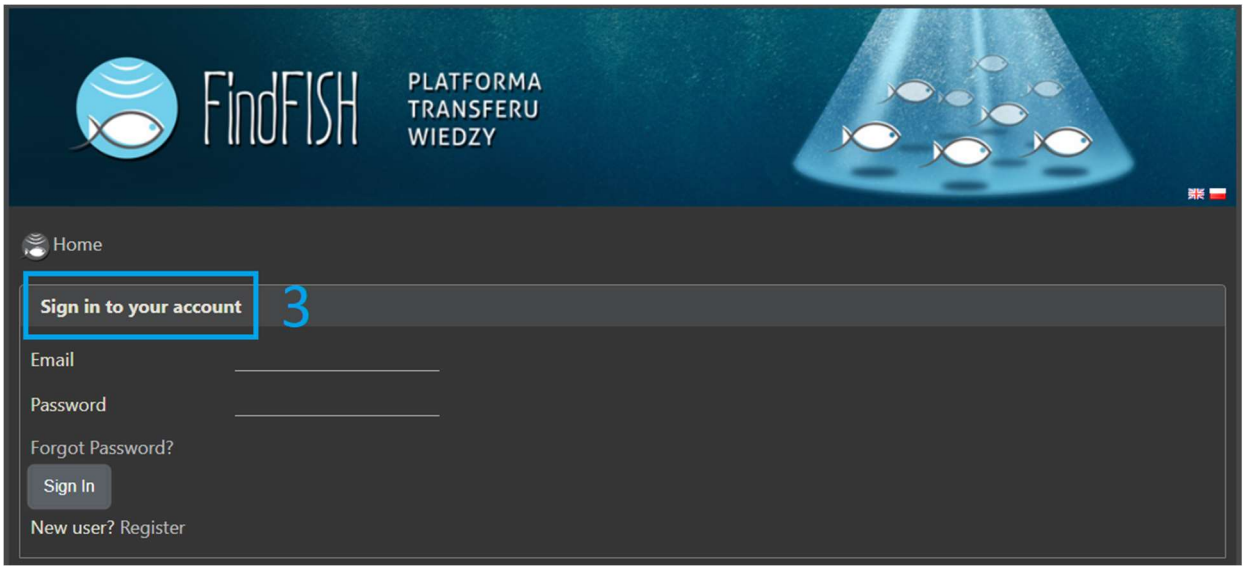

Fig. 1B. FindFISH project website and "Sign in to your account" section

Source: IOPAN own study

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The time period covered by the data in the FindFISH service starts from January 2017, up to the latest forecast, i.e. for the next 48 hours. For all model products (A) and variables (B), you can generate raster maps (C) for individual depths that represent the vertical level of the model. In addition, it is possible to create time (D1) and spatial (E) series for fixed periods in a selected location (after determining or indicating the desired latitude and longitude), as well as model data tables (D2) for the selected parameter (B).

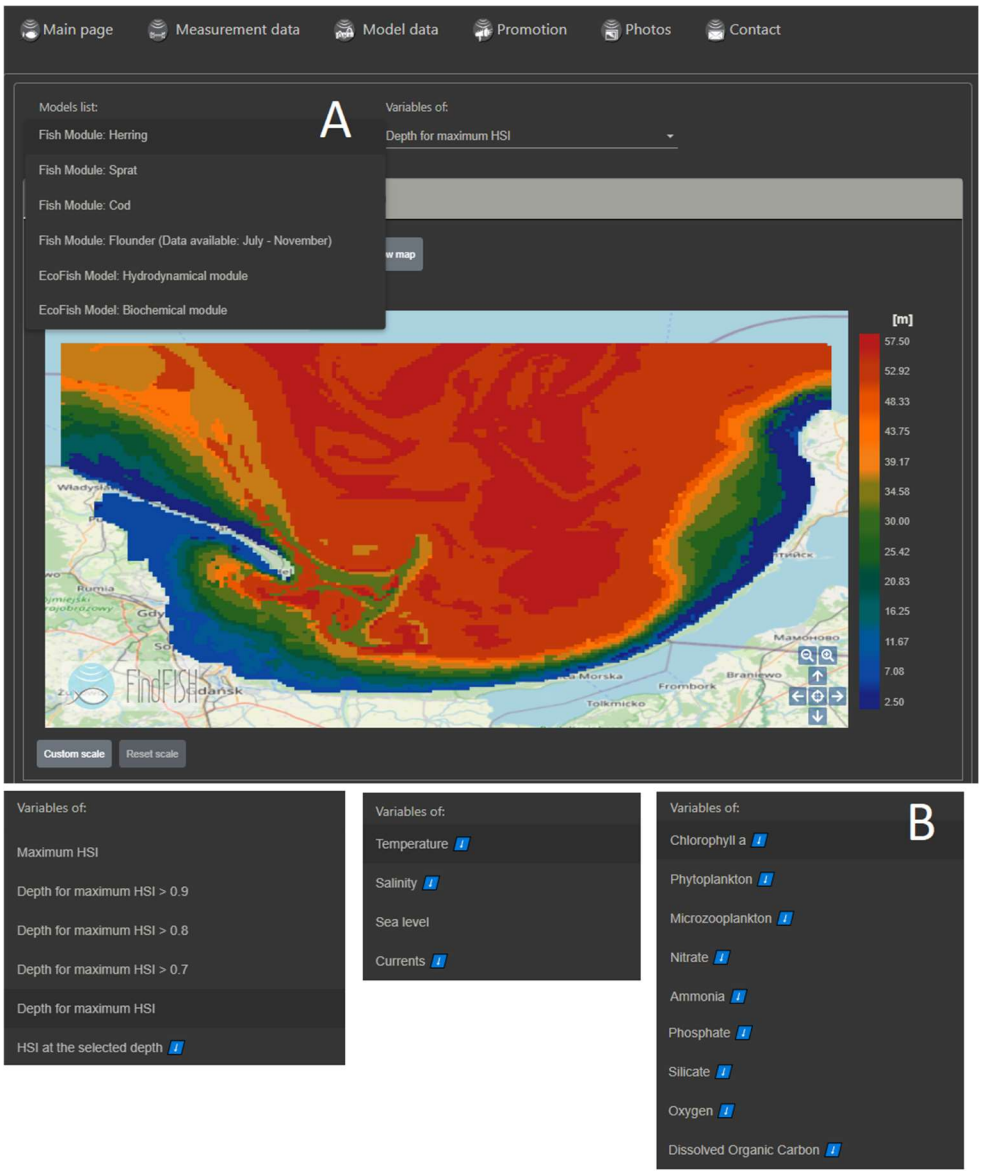

Fig. 2. The FindFISH project website and the selection of the "Model data" service - presentation: the selection of the model (A) and the selection of the Fish Module variable as well as the hydrodynamic and biochemical model (B).

Source: IO PAN own study

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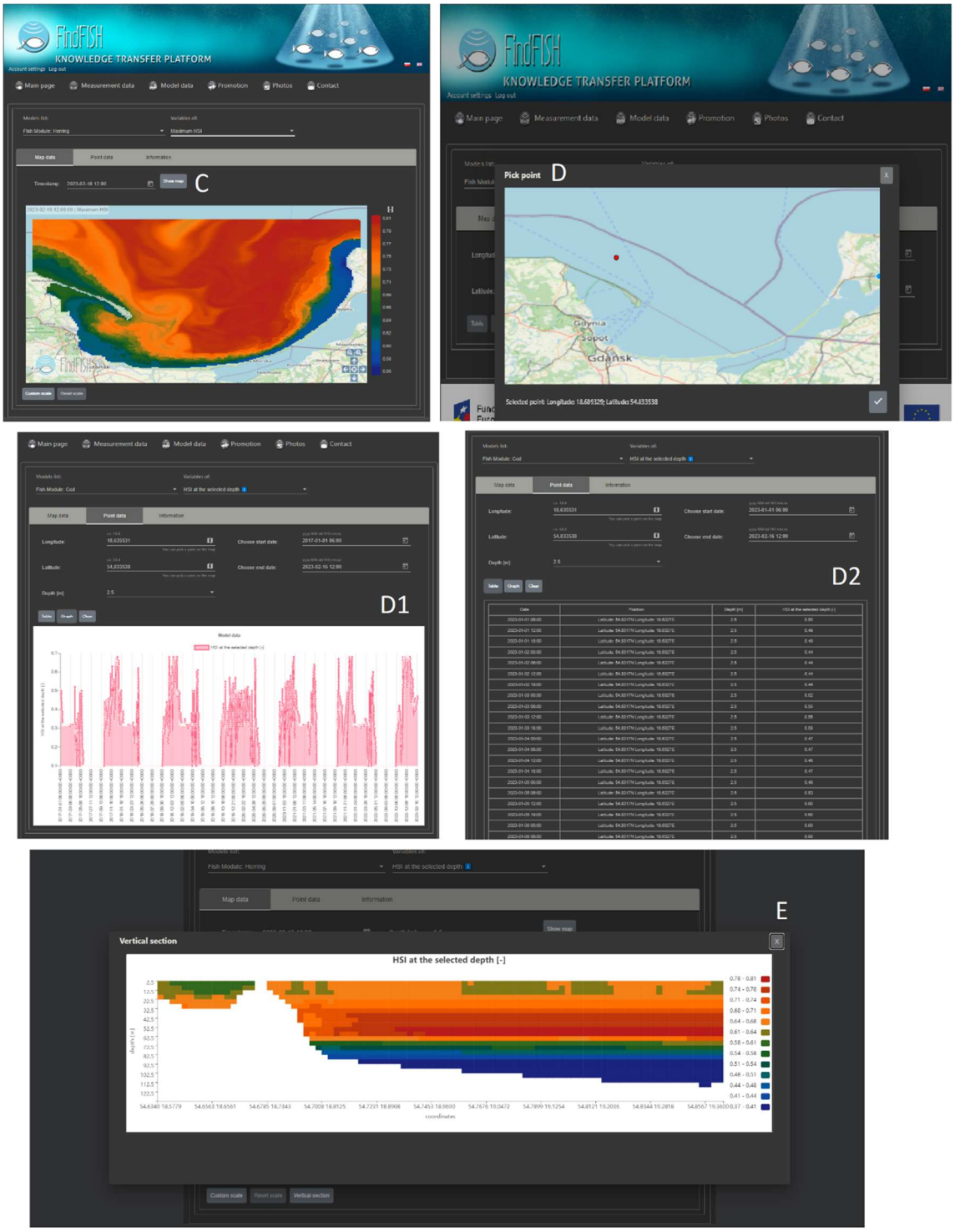

Fig. 2 (continued) The FindFISH project website and the selection of the "Model data" service – presentation of: results in the form of maps (C), graphs (D1) and tables (D2), for the selected point on the map (D) and for the selected time period, as well as for 3D variables in the form of vertical section between two selected points (E).

Source: IO PAN own study

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The following ways of presenting model data are available in FindFISH Service:

1. Spatial distribution (map): This is the default form of results presentation available in the "Map data" tab.
2. Spatial distribution (vertical section)*: Option available in the „Map data" tab. The „Vertical section" button allows you to select two locations on the map. After selection, a 2D plot is created with the spatial variation of the parameter between the selected locations from the surface to the bottom (*option available only for 3-dimensional (3D) variables).
3. Point time series (graph): Option available in the „Point data" tab. Select the location, depth, start and end date and press the „Graph" button. A graph is created showing the variability of the parameter at a selected location and time period.
4. Point time series (table): Option available in the „Point data" tab. Select the location, depth, start and end date and press the „Table" button. A table is created with the parameter values at selected location for consecutive days in the time period.

Through the "EcoFish Model – Hydrodynamical Module" service, forecasts of the following parameters are available: water temperature (°C), salinity (PSU), sea level (cm) and currents ($cm \cdot s^{-1}$) – value and direction, with a 48-hour forecast of these parameters. For example, maps for two hydrodynamic variables, temperature and currents at selected depths: 2.5 m and 27.5 m are presented below (Figures 3 and 4).

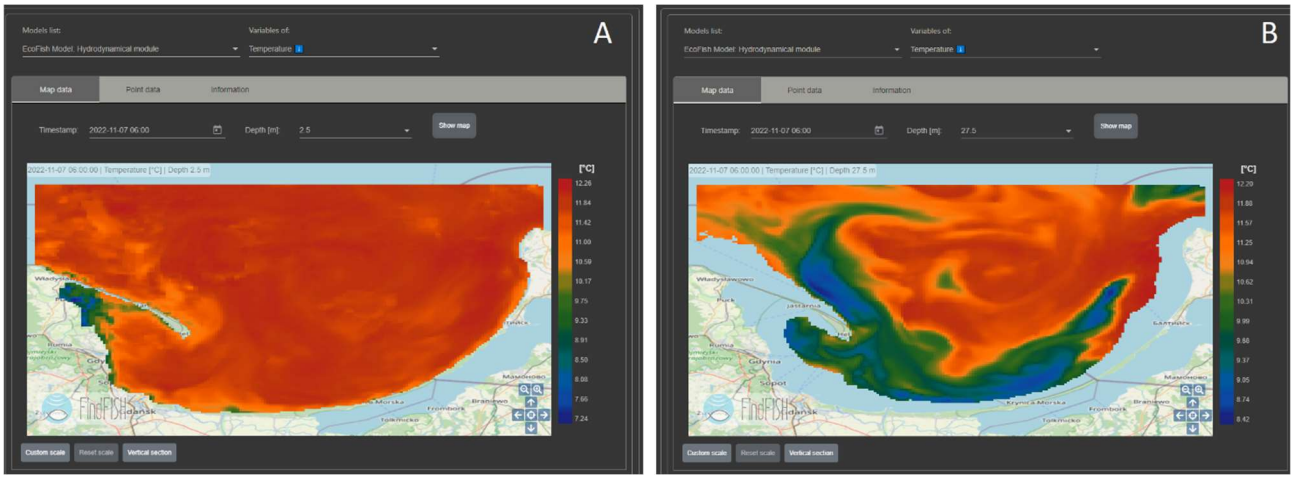

Fig. 3. Screenshot of the "EcoFish Model – Hydrodynamical Module" web portal service for the variable: temperature at a depth of 2.5 m (A) and 27.5 m (B) when selecting the "Map data" tab presentation.

Source: IO PAN own study

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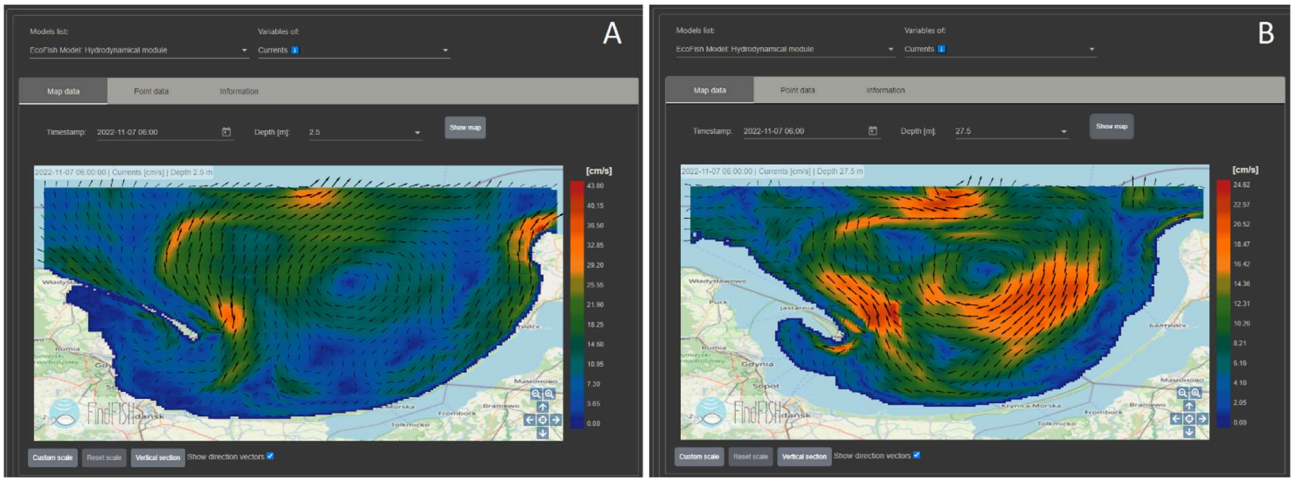

Fig. 4. Screenshot of the "EcoFish Model – Hydrodynamical Module" web portal service for the variable: currents at a depth of 2.5 m (A) and 27.5 m (B) when selecting the "Map data" tab presentation.

Source: IO PAN own study

Through the "EcoFish Model - Biochemical Module" service, forecasts of the following parameters are available: chlorophyll *a* concentration (mg m^{-3}), nitrates (mmol m^{-3}), ammonia (mmol m^{-3}), phosphates (mmol m^{-3}) and silicates (mmol m^{-3}), dissolved oxygen (mmol m^{-3}), dissolved organic carbon (mmol m^{-3}) phytoplankton biomass (mmol m^{-3}) and microzooplankton (mmol m^{-3}). As an example, maps are given for three biochemical variables, chlorophyll *a* concentration (Figure 5A), microzooplankton biomass (Figure 5B) and nitrate concentration at a depth of 2.5 m (Figure 6A) and 82.5 m (Figure 6B).

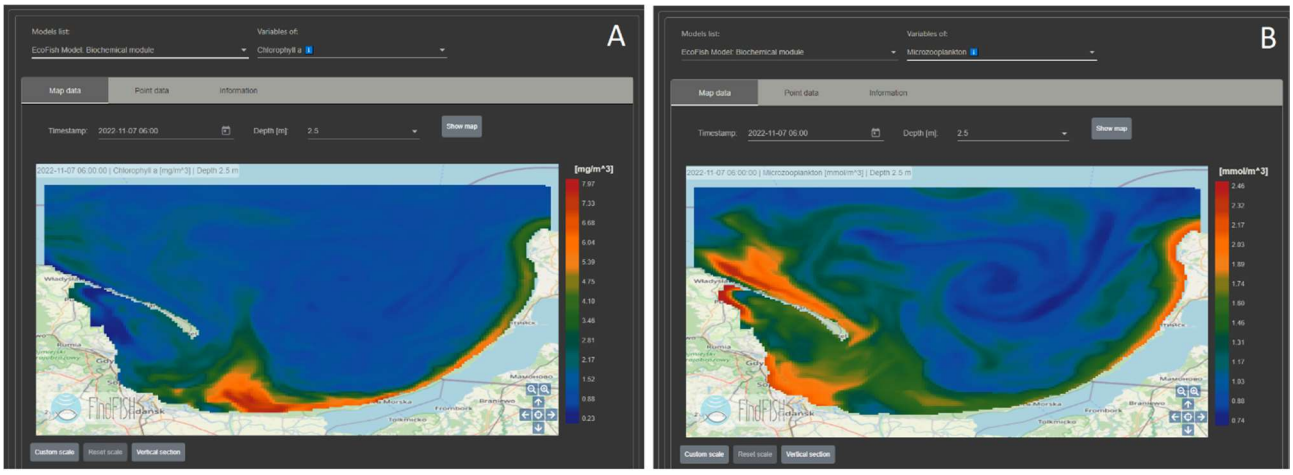

Fig. 5. Screenshot of the "EcoFish Model – Biochemical Module" web portal service for two variables: chlorophyll *a* concentration (A) and microzooplankton biomass (B) when selecting the "Map data" tab presentation.

Source: IO PAN own study

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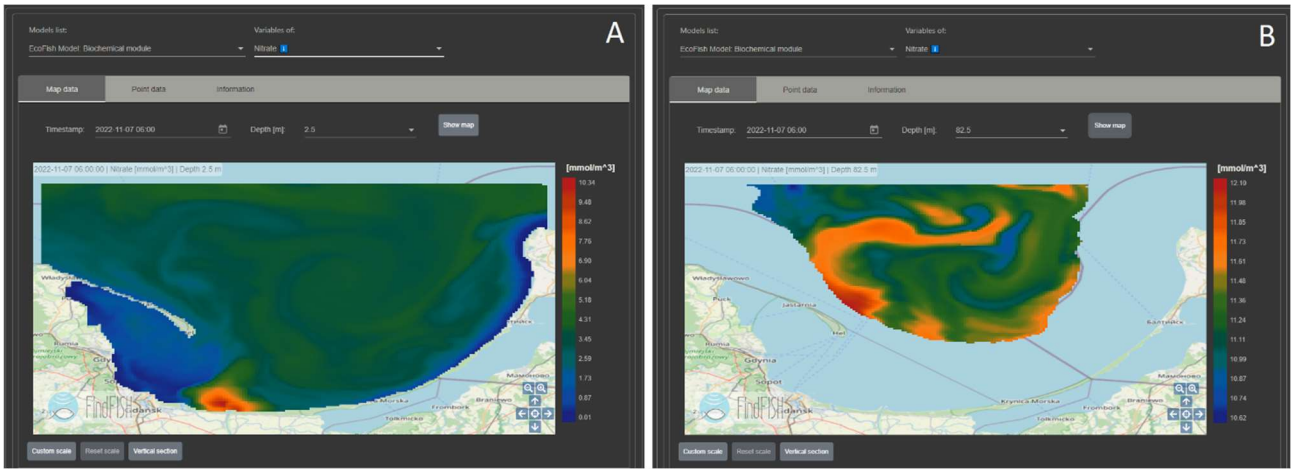

Fig. 6. Screenshot of the "EcoFish Model – Biochemical Module" web portal service for the variable: nitrate concentration at a depth of 2.5 m (A) and 82.5 m (B) when selecting the "Map data" tab presentation.

Source: IOPAN own study

Through the "Fish Module" service, presenting under what hydrological conditions fisheries for four species (herring, sprat, cod and flounder) should be the most abundant in resources, data are available: maximum HSI(*) in the water column, depth for maximum HSI > 0.9, depth for maximum HSI > 0.8, depth for maximum HSI > 0.7, depth for maximum HSI in the water column and HSI at the selected depth, with a 48-hour forecast of these parameters. As an example, maps are given for three variables regarding herring: HSI at the selected depth of 2.5 m (Figure 7A) and 47.5 m (Figure 7B), maximum HSI in the water column (Figure 8A) and depth for maximum HSI in the water column (Figure 8B).

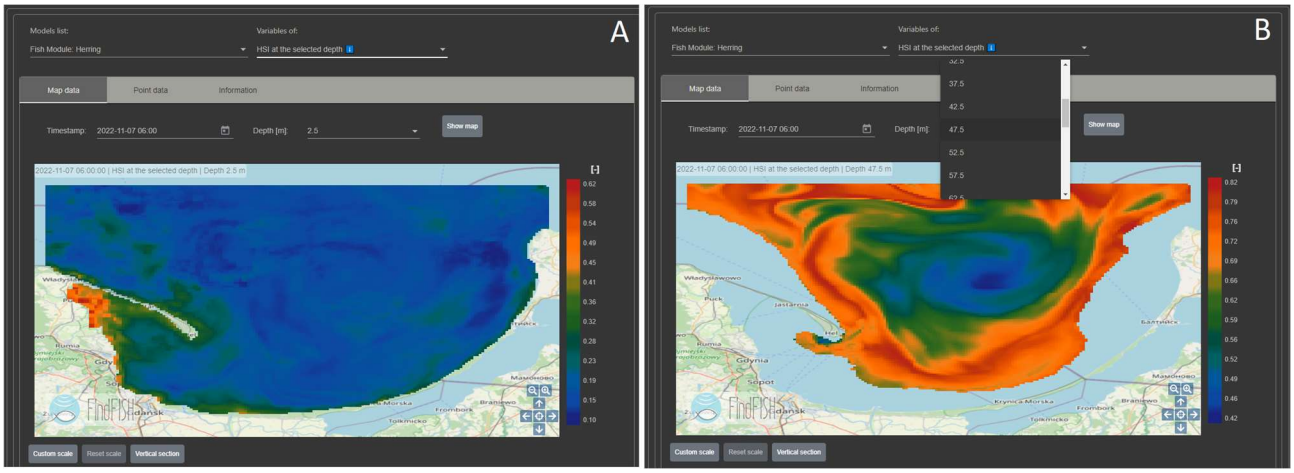

Fig. 7. Screenshot of the "Fish Module – Herring" web portal service for the variable: HSI at the selected depth of 2.5 m (A) and 47.5 m (B) when selecting the "Map data" tab presentation.

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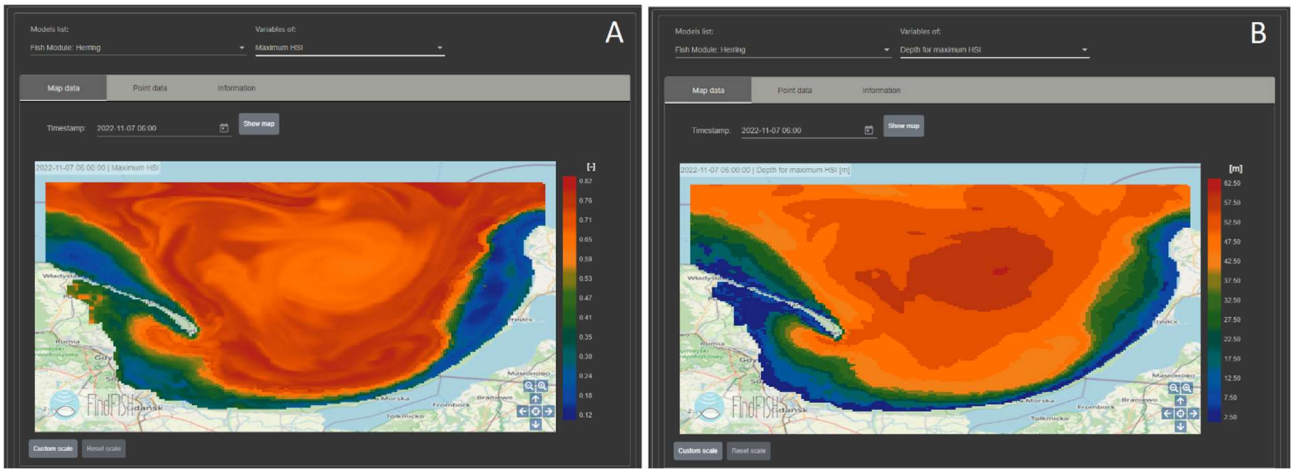

Fig. 8. Screenshot of the "Fish Module – Herring" web portal service for two variables: maximum HSI in the water column (A) and depth for maximum HSI in the water column (B) when selecting the "Map data" tab presentation.
Source: IO PAN own study

For example, presentation was provided by selecting "Point data" for the parameter - Maximum HSI in the water column, for herring at a given time period, e.g. year 2022, in the form of a graph (Figure 9) and a table (Figure 10).

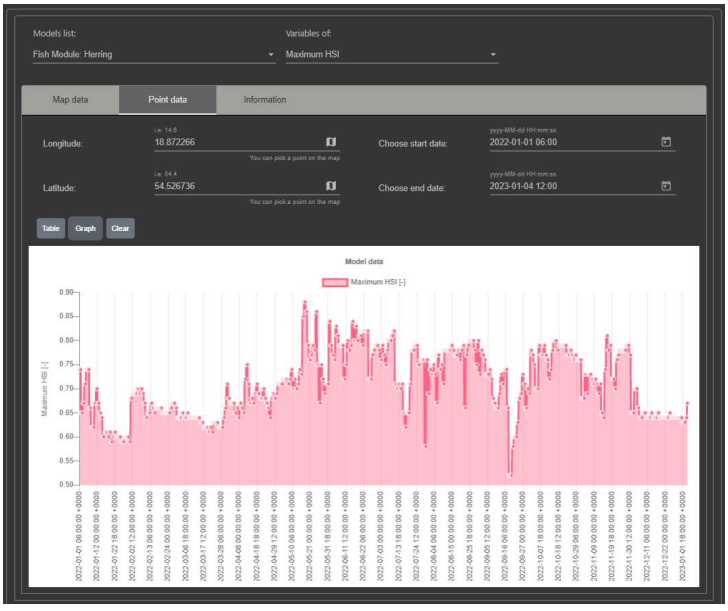

Fig. 9. Screenshot of the "Fish Module – Herring" web portal service for the variable: maximum HSI in the water column for year 2022 in the form of a graph when selecting the "Point data" tab presentation and "Graph" button.
Source: IO PAN own study

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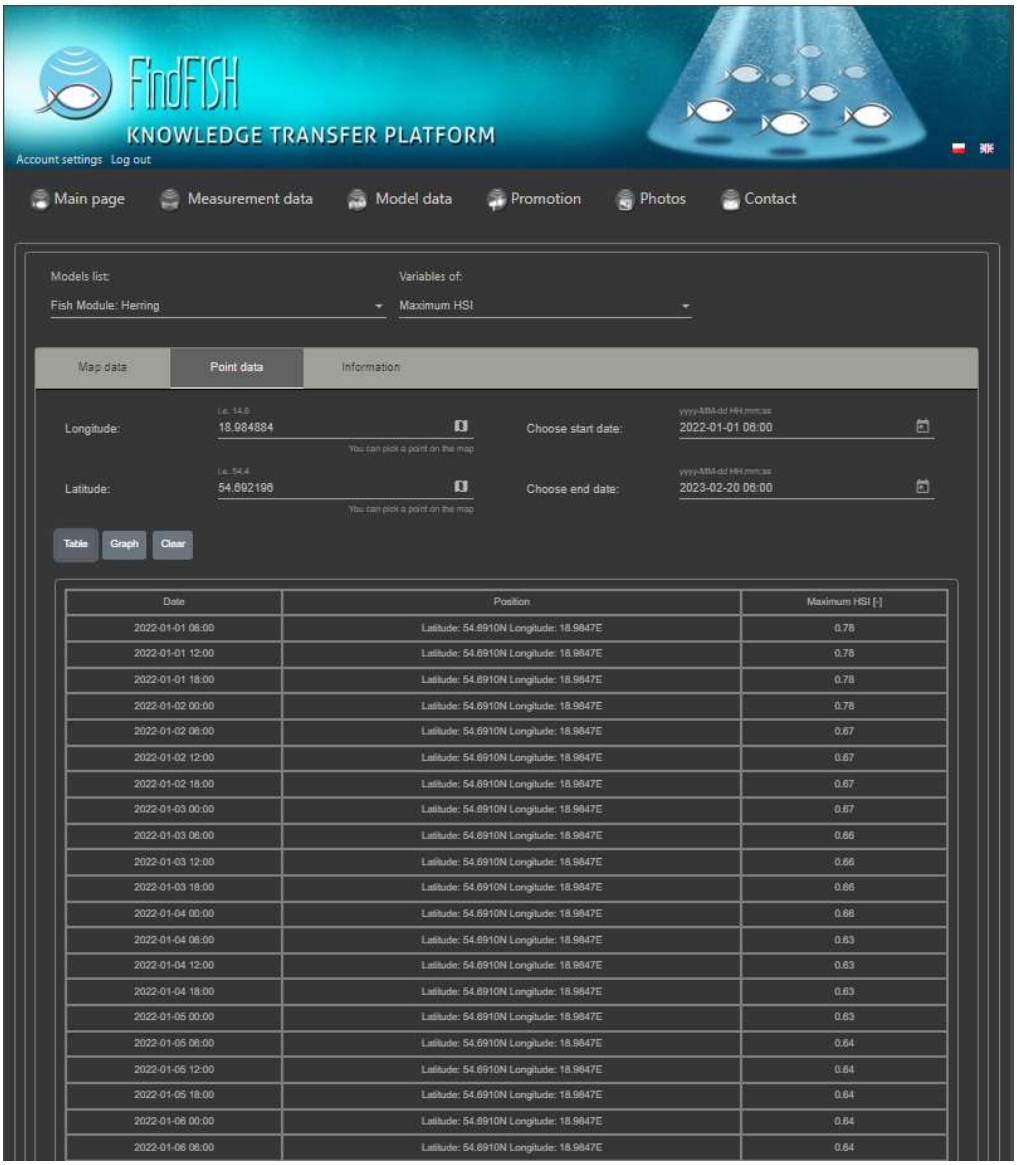

Fig. 10. Screenshot of the "Fish Module – Herring" web portal service for the variable: maximum HSI in the water column, in the form of a table for the selected period when selecting the "Point data" tab presentation and "Table" button.
Source: IO PAN own study

The service also gives the possibility of presenting data in a vertical section, only for 3-dimensional (3D) variables, by selecting two locations on the map (Fig. 11A). After selection, a 2D plot is created with spatial variation for the selected parameter between the selected locations from the surface to the bottom (Fig. 11B). In Figure 11, data presentation using "Vertical section" was added, for the HSI at the selected depth variable for herring.

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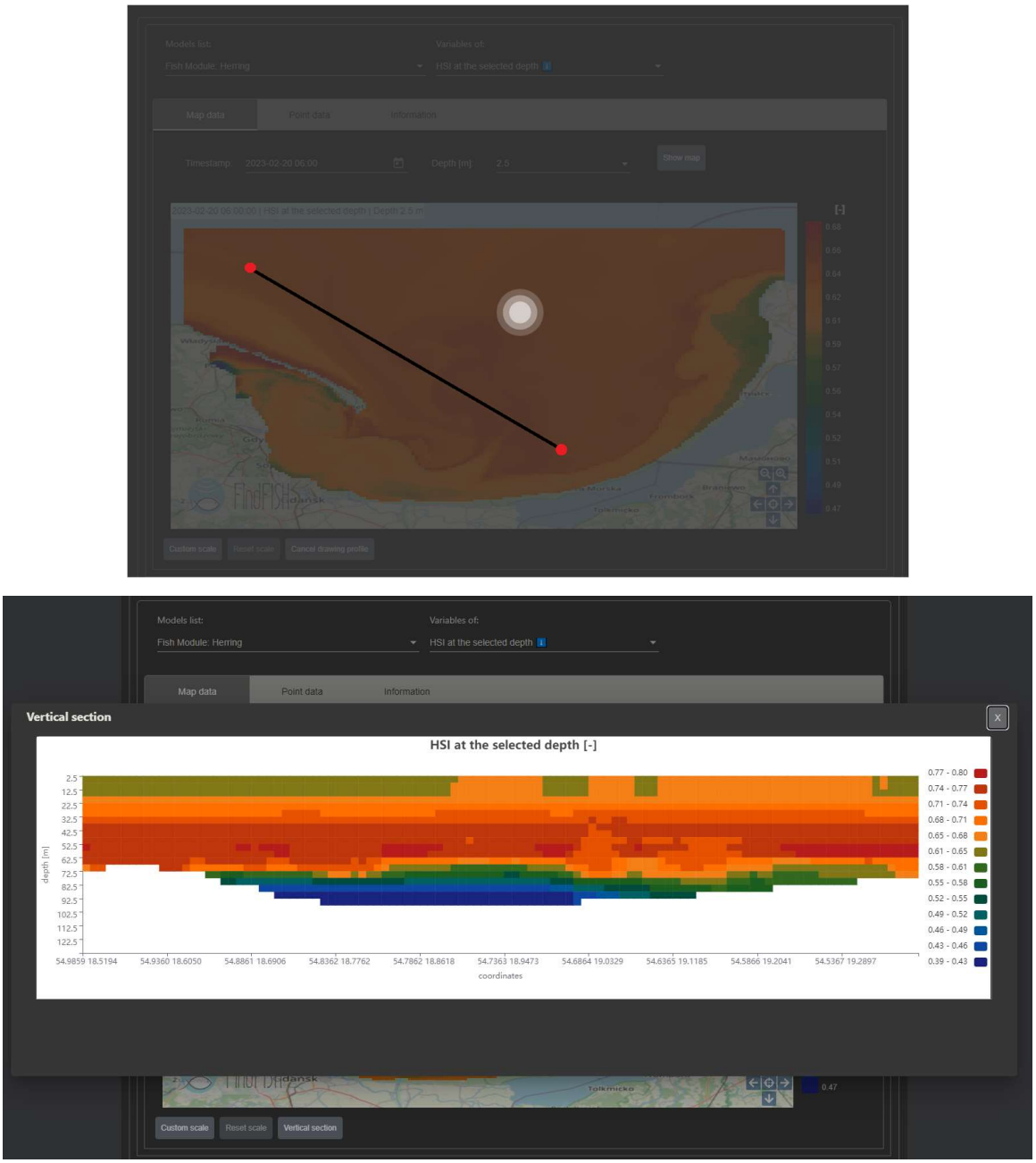

Fig. 11. Screenshot of the "Fish Module – Herring" web portal service for the variable: HSI at the selected depth, when selecting the "Map data" tab presentation and then "Vertical section" button.

Source: IO PAN own study

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(*) Habitat Suitability Index (HSI)

"It is the quotient of the numerical values expressing the habitat conditions in the study area and the values reflecting the optimal habitat conditions for a given species".

(A. Osmólska, M. Hędrzak, 2013)

HSI takes values in the range of [0,1]

HSI = 0 – the habitat does not meet the conditions for the existence of the species in any way

HSI = 1 – the habitat is characterized by optimal conditions for the existence of the species

To display the results of the Fish Module, select:

One of the available parameters:

- Maximum HSI – field showing the maximum HSI values in the water column
- Depth for maximum HSI > 0.9 – a field showing the depths (in meters) at which the maximum HSI occurs in the water column (limited to HSI > 0.9 only)
- Depth for maximum HSI > 0.8 – a field showing the depths (in meters) at which the maximum HSI occurs in the water column (limited to HSI > 0.8 only)
- Depth for maximum HSI > 0.7 – a field showing the depths (in meters) at which the maximum HSI occurs in the water column (limited to HSI > 0.7 only)
- Depth for maximum HSI – a field showing the depths (in meters) at which the maximum HSI occurs in the water column
- HSI at selected depth – a 3D field showing the HSI values at the selected depth

Calendar date

Depth (available only for the „HSI at the selected depth" parameter)

Confirm your selection with the „Show map" button.

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Occasional shortages of current forecasts may be caused by service work on the Tryton computing cluster and/or delays in access to forcing data.

Measurement data

The "Measurement data" service is used to present data from probes and fishing catches from the period of 2018-2022 (Figure 12). Quantitative and qualitative data (B) collected during fishing trips (A) and data from probes are presented in the form of tables (C) and graphs (D). Access to the service is free but requires an account.

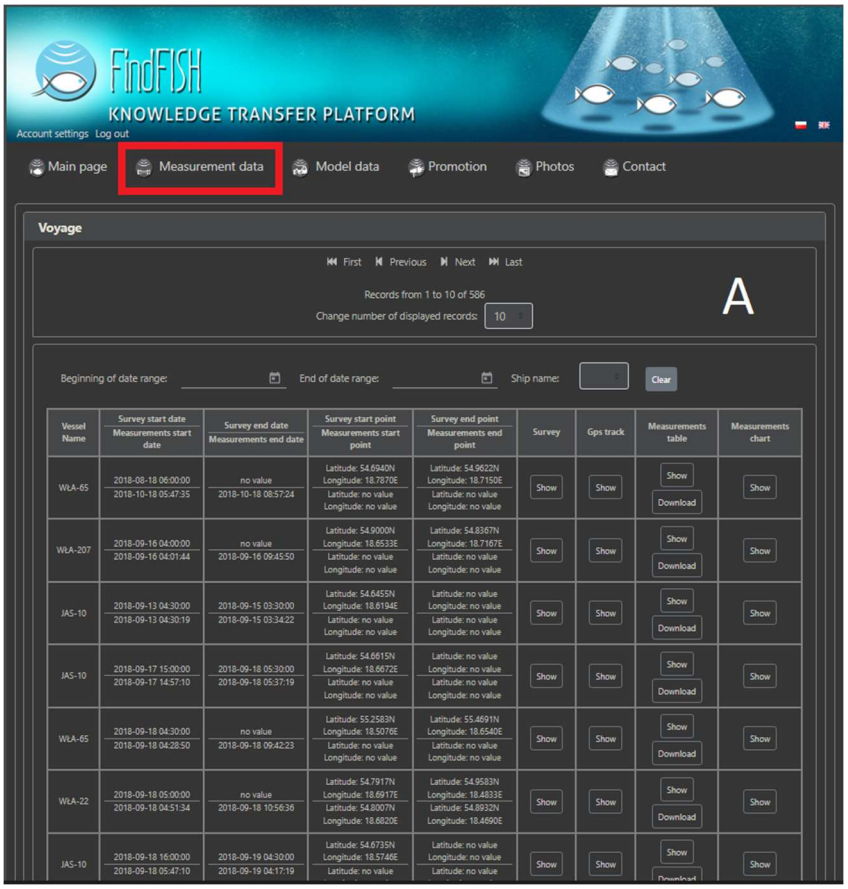

Fig. 12. FindFISH project website and the selection of the "Measurement data" service: selection of the fishing trip (A)

Source: IO PAN own study

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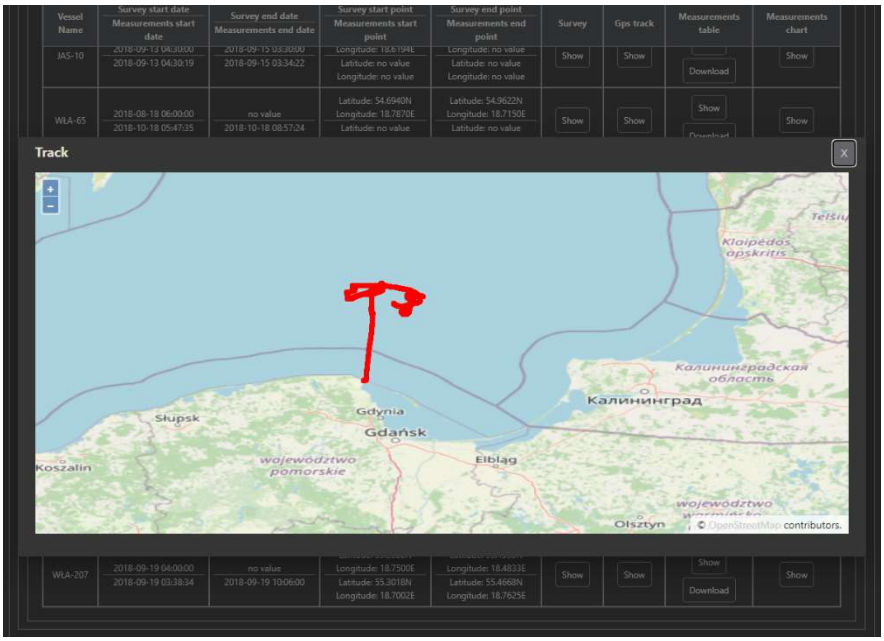

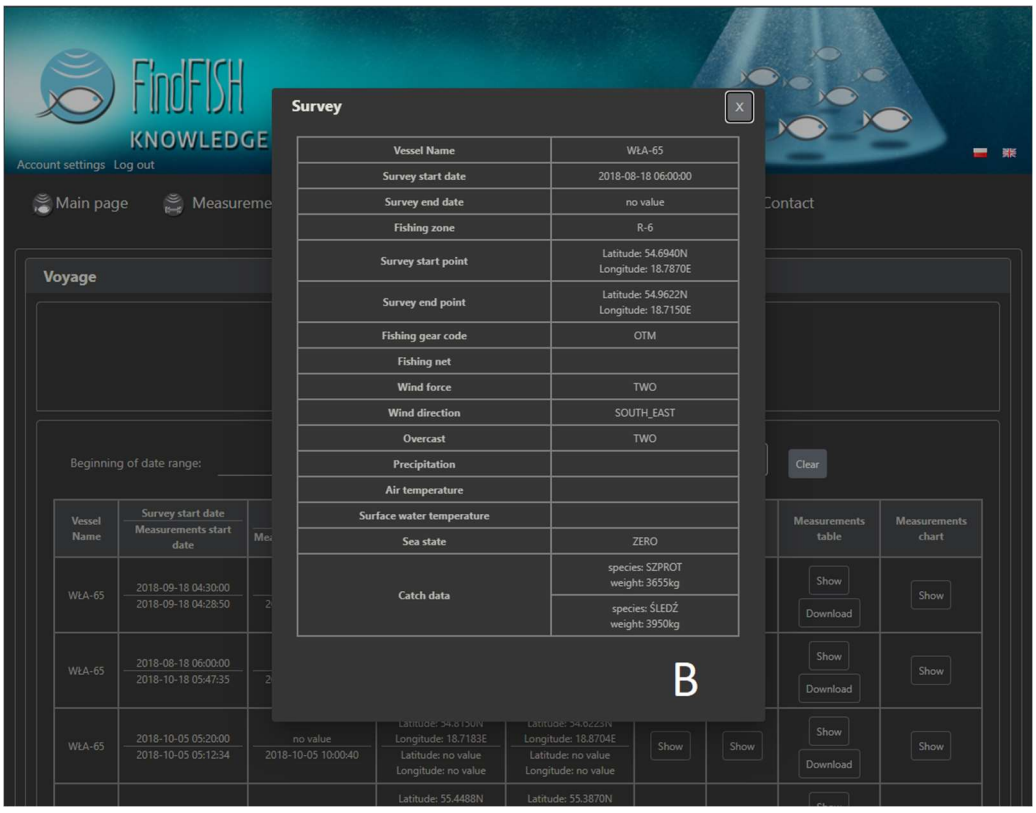

Fig. 12 (continued). FindFISH project website and the selection of the "Measurement data" service: quantitative and qualitative catch data (B)

Source: IO PAN own study

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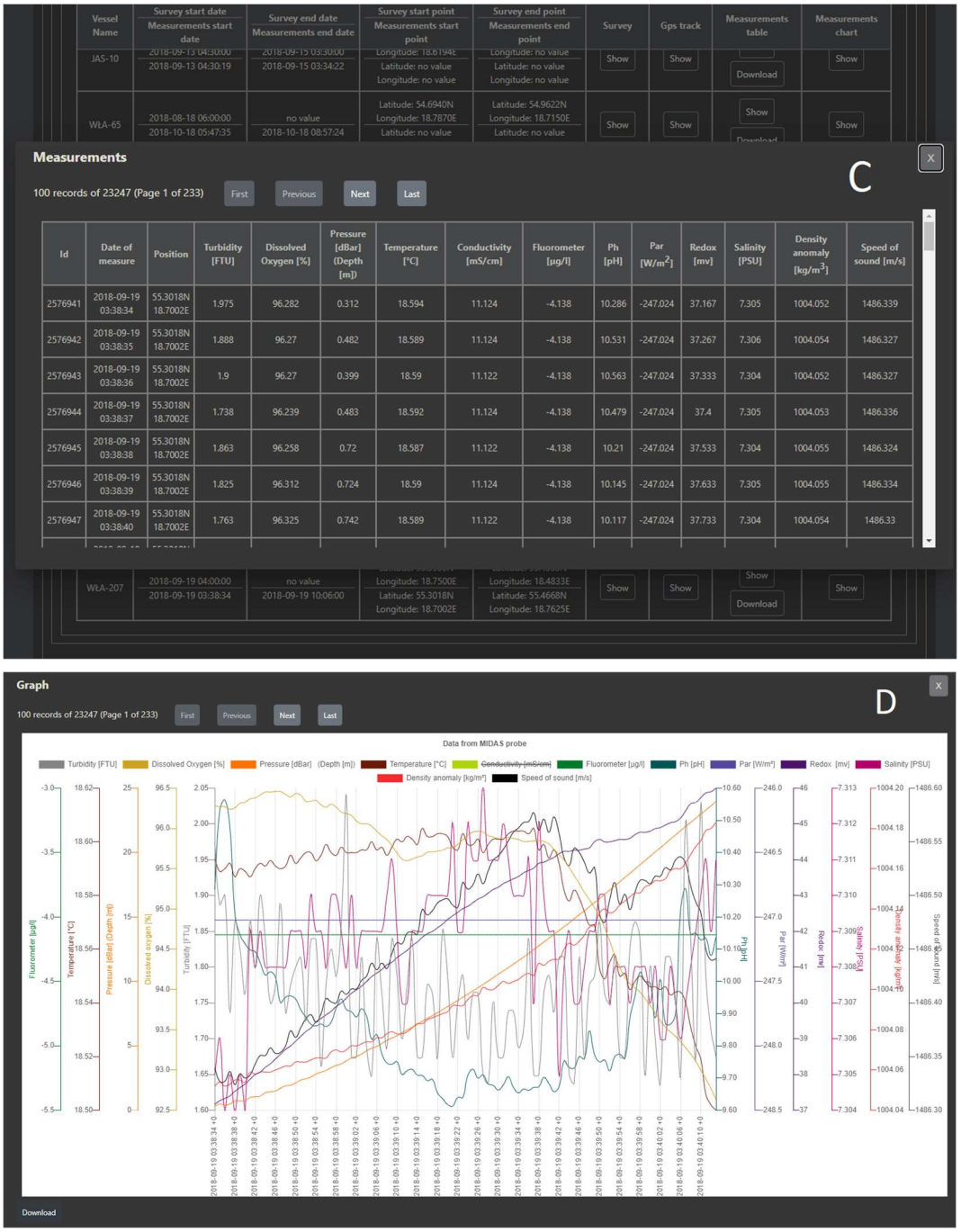

Fig. 12 (continued). FindFISH project website and the selection of the "Measurement data" service: measurement data in the form of table (C) and graph (D).

Source: IO PAN own study

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