A generic database for tagging data and much more

Julien Barde, Norbert Billet

[1]Institut de Recherche pour le dévelopement, UMR EME 212, 65 avenue Jean Monnet, 34200 Sète, France

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Summary

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Improving fisheries data management to focus on EAF

EAF requires data from various disciplines:

- different species (birds, mammals. . .) and observed characteristics:
  - fishery data (one source of ecological observations among others):
    - before EAF: mainly target species,
    - after: many species with different roles (by-cacth, preys. . .),
  - trophic data, contaminants, fatty acids. . . ,
  - . . . tagging data, telemetry (spaghetti, pop-up. . .) useful to calibrate models (growth. . .),
- . . . to be combined with environmental parameters (gridded data),
  - from sensors (remote sensing or in situ: satellite / aerial, CTD. . .),
  - from models.

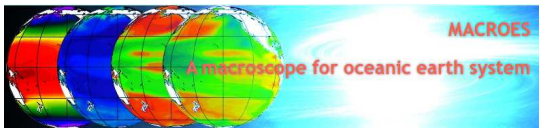
Motivation for a new database

- Current situation is a nightmare: too many databases (one per data type), heterogeneous and distributed (RDBMS, codes. . .),
- None of them enables to administrate all these kinds of data.

Set up a long term Information System (IS)

IRD projects related to management of tagging / EAF data:

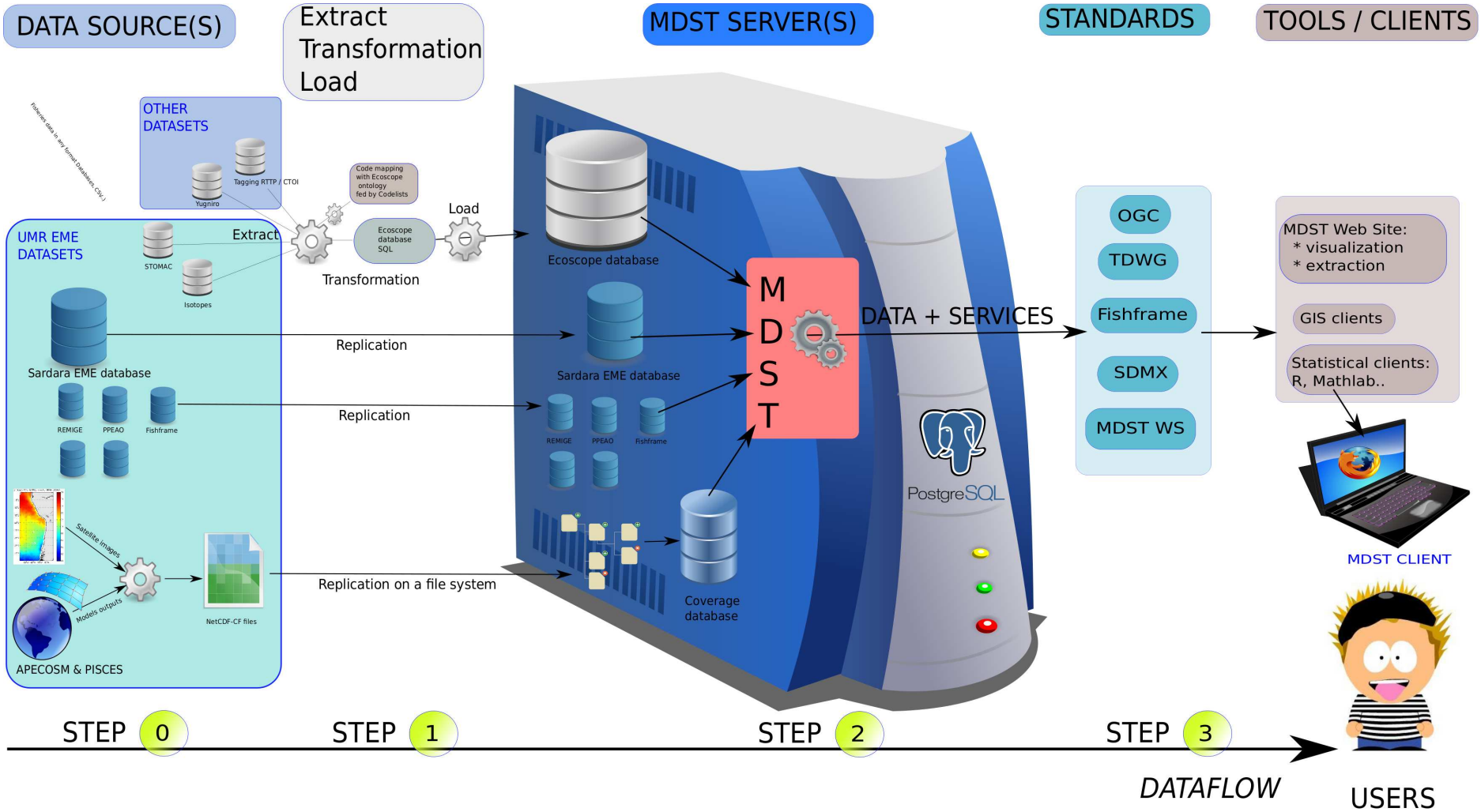
- REMIGE (ANR): 4 years (top predators),
- MACROES (ANR): 4 years (continuum of Remige, climate change),
- iMarine (FP7): 30 months (interoperability),
- . . . and future project: EMOTION (ANR). . .



A single IS whatever the project: Ecoscope / MDST

- Goal: create a new database and IS to administrate as much data as possible within a single model / architecture.
- Reuse and improve it according to projects and fundings,
- Make a first version available through opensource licence

Overview: main steps



Summary

. . . means nothing but replication(s) of observations

Tagging = replication(s) of measures on same individuals collected in different contexts:

- (1): deployment of the tag (scientific context): limitated types of observations,
- (0..n): observations inbetween (depending on tags: tracking. . .),
- (1): final recovery (dead tags or individuals): many possible observations according to the context.

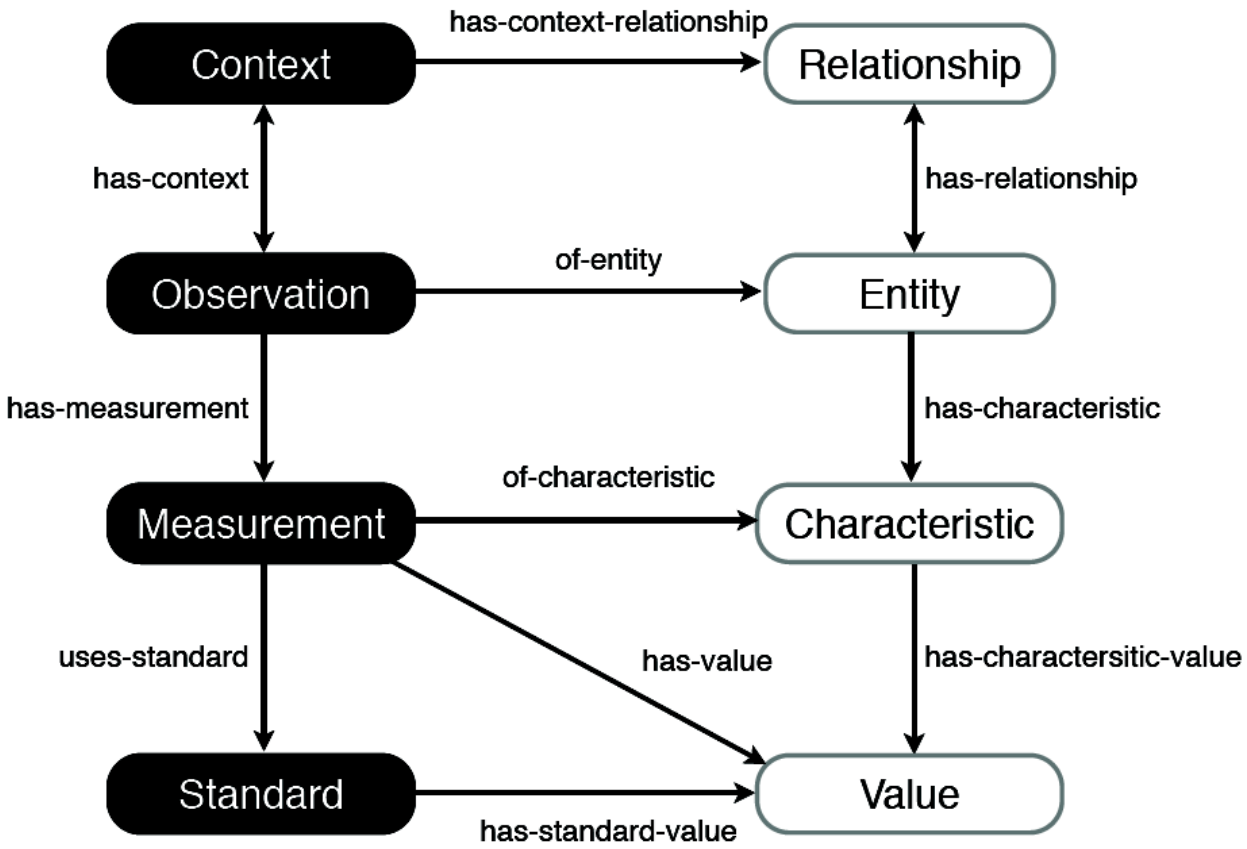
Tagging data = ?

- multiple kinds of (replicated) observations,
- multiple contexts for data collection: heterogeneity of quality.

Fisheries databases models don't fit the needs to manage tagging data: observations just made once.

Tagging & Ecological observations

Observation = "measurements directly linked to real-world phenomena".



[Bowers, 2008]

Tagging & Ecological observations

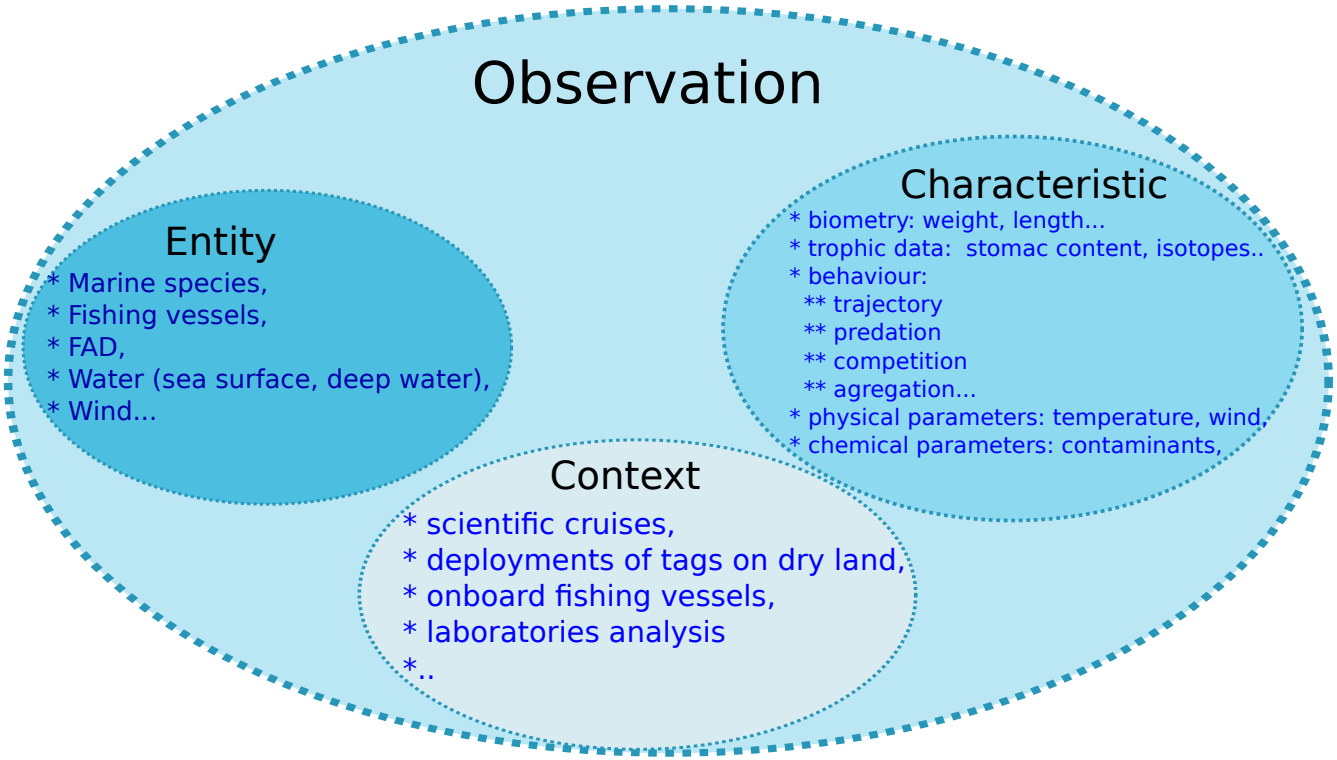
Observation = {characteristic of an entity, measure & value, context}

- entity? species, vessels, FAD, school, tissue samples. . . ,
- characteristic? weight, length, location. . . ,
- context? people/projects, location, date / period, sampling protocols,
- examples:
  - 1003={*activity of Kermantxo, tagging operation, 03/05/2006 11am*},
  - {*length of albacares 1234, 77 cm, 1003*},
  - 2434={*activity of Torre Gullia, fishing operation, 15/01/2007 5pm*},
  - {*weight of albacares 1234, 12.5 kg, 2434*},
  - {*length of albacares 1234, 82.8 cm, 2434*}.

Fisheries databases models = semantic traps:

- fishing effort *vs* observation effort, fishing gear *vs* sampling protocol,
- by-cacth / discards *vs* species / individuals,
- PS fishing operation *vs* school occurence. . .

EAF data & Ecological observations



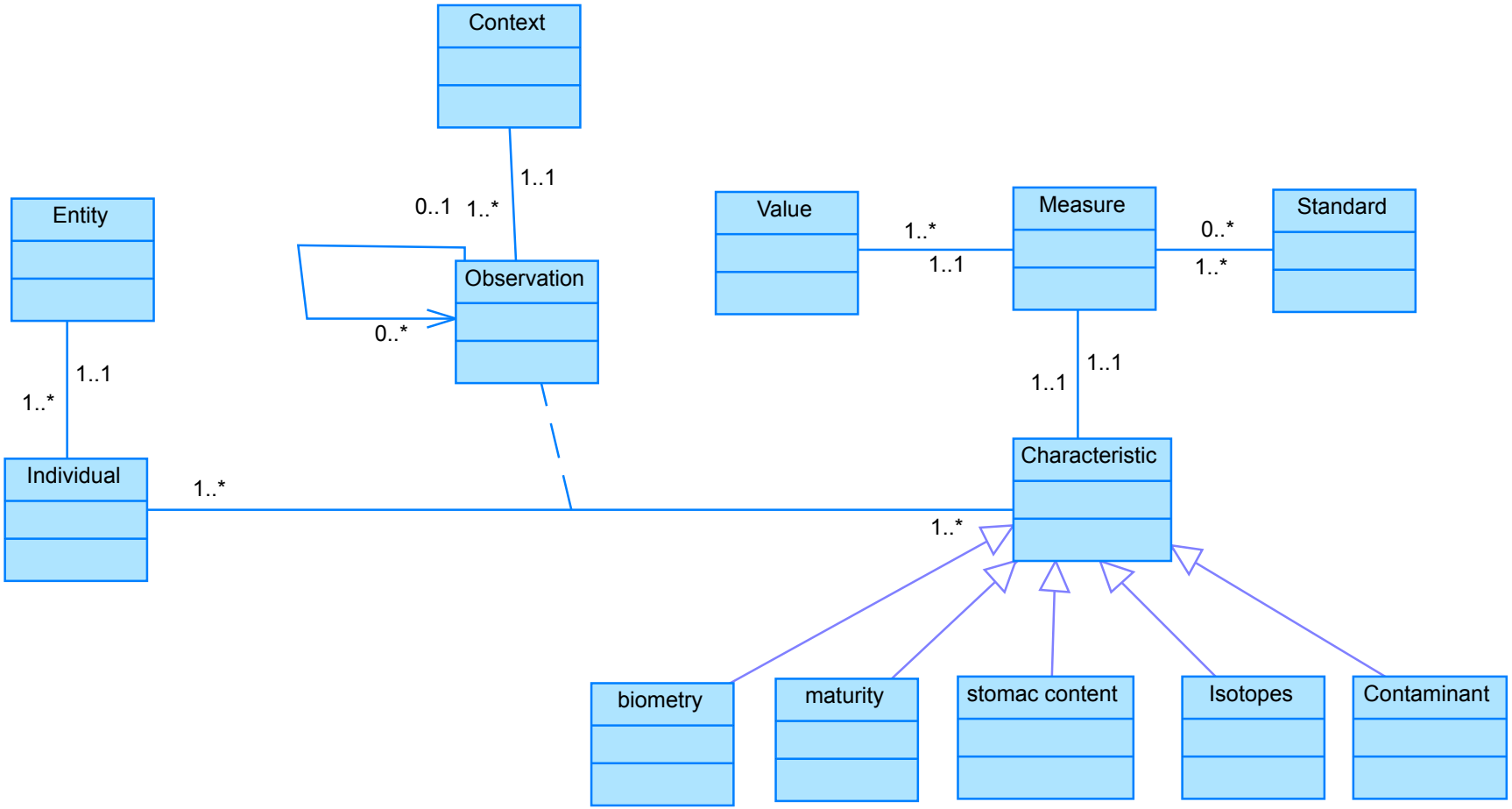
A generic database model for tagging data. . .

- . . . has to be a generic enough for various kinds of observations,
- . . . can be used to store EAF data (including fisheries data).

Summary

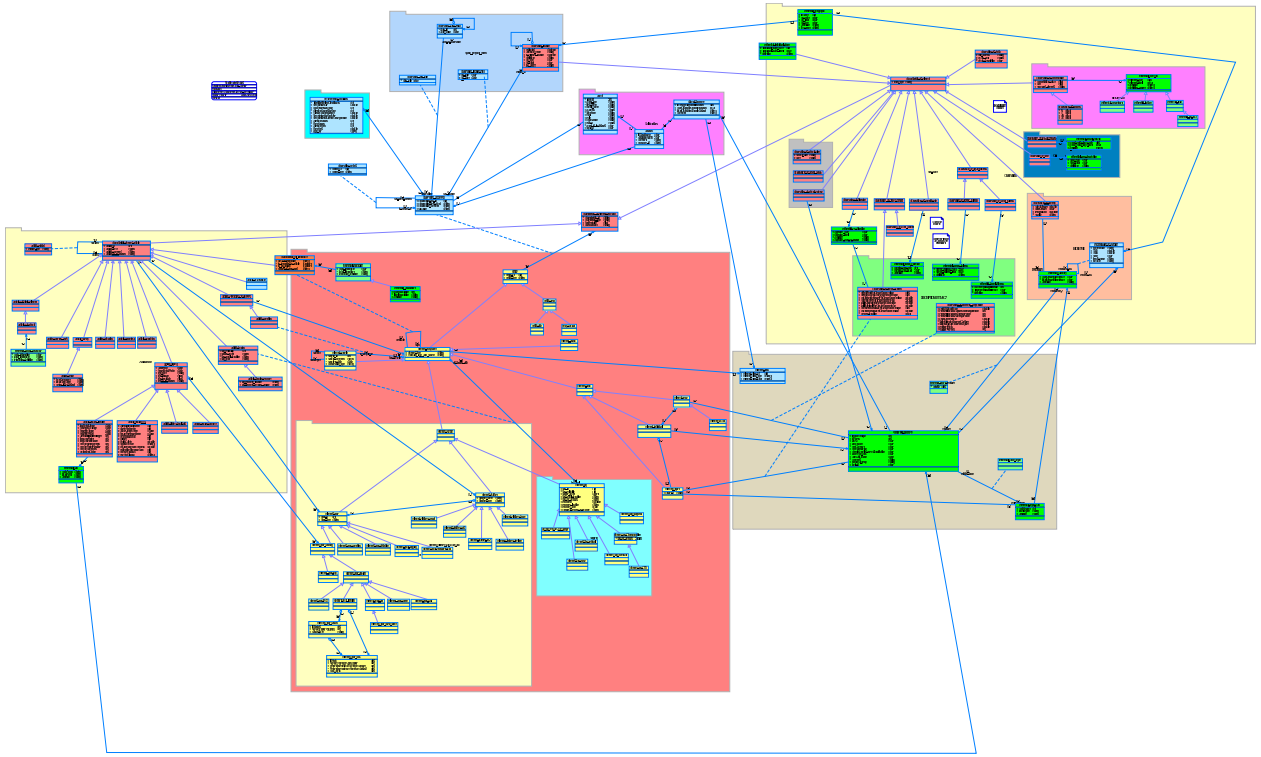
A new database model to store data (step 0)

It starts like this. . .



A new database model to store data (step 0)

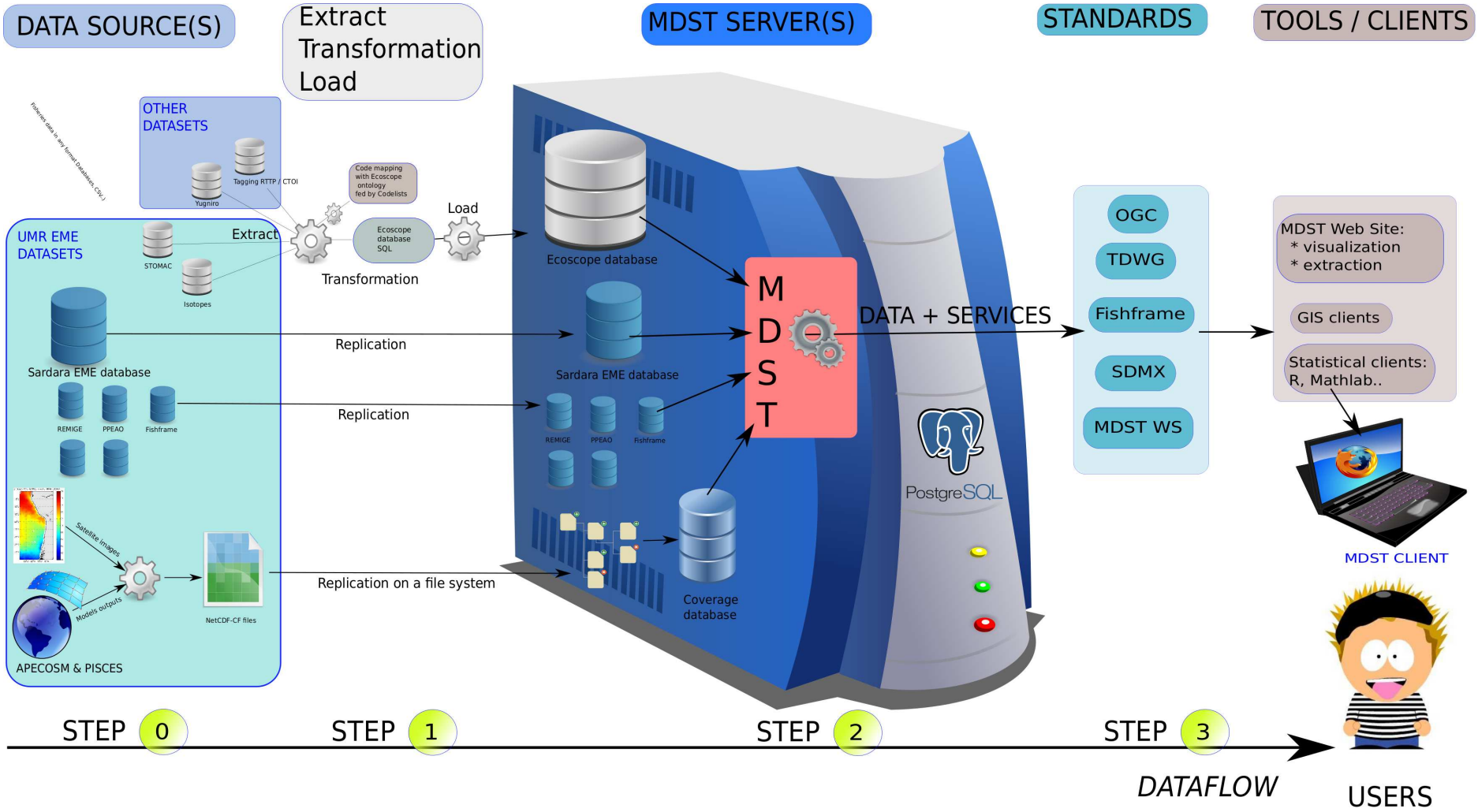
. . . and it ends up like this.



Implementation

- Postgres & Postgis 2.0,
- A set of common services for all data managed in this database. . .

Loading tagging data in the new database (step 1)



Loading tagging data in the new database (step 1)

Extract, Transform, Load (ETL), this step requires to::

- change codes (Worms. . .),
- change uom,
- change semantic of tables and attributes (columns),
- spatialize data.

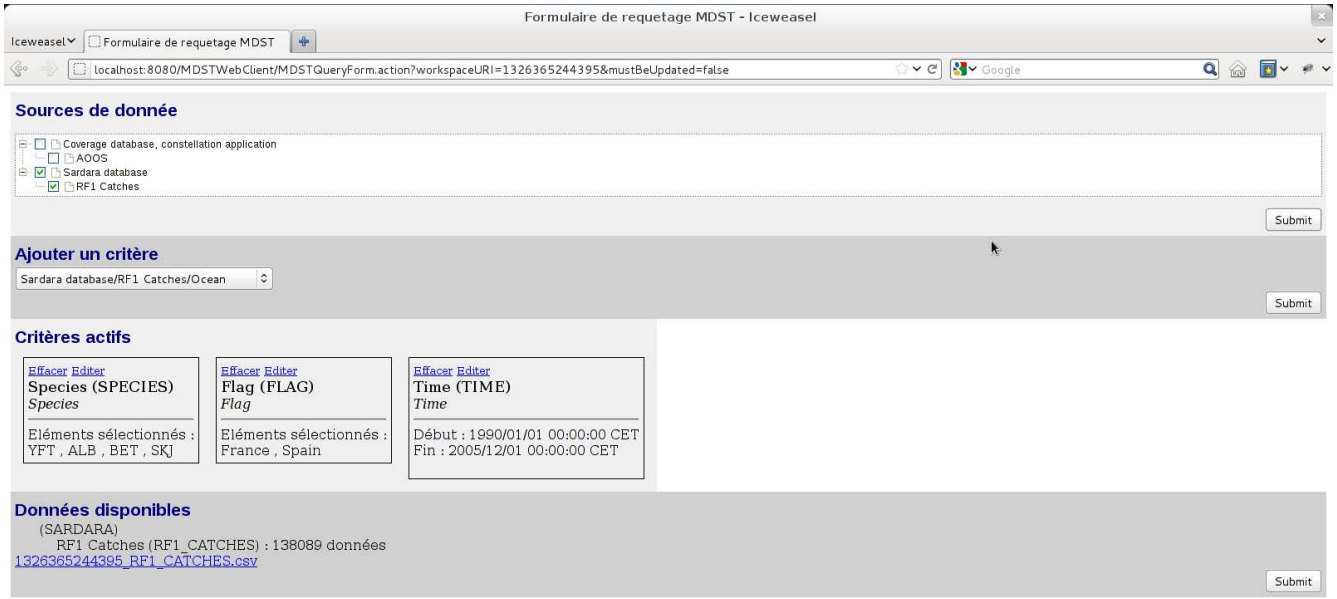
However the system can combine different approachs:

- transformation of data (a lot of work),
- no transformation (data is served as it is):
  - data stay in the data source,
  - conversion from access to postgres,
  - data types (spatialization. . .) and codes (worms. . .).

Dedicated data access on top of the database (step 2)

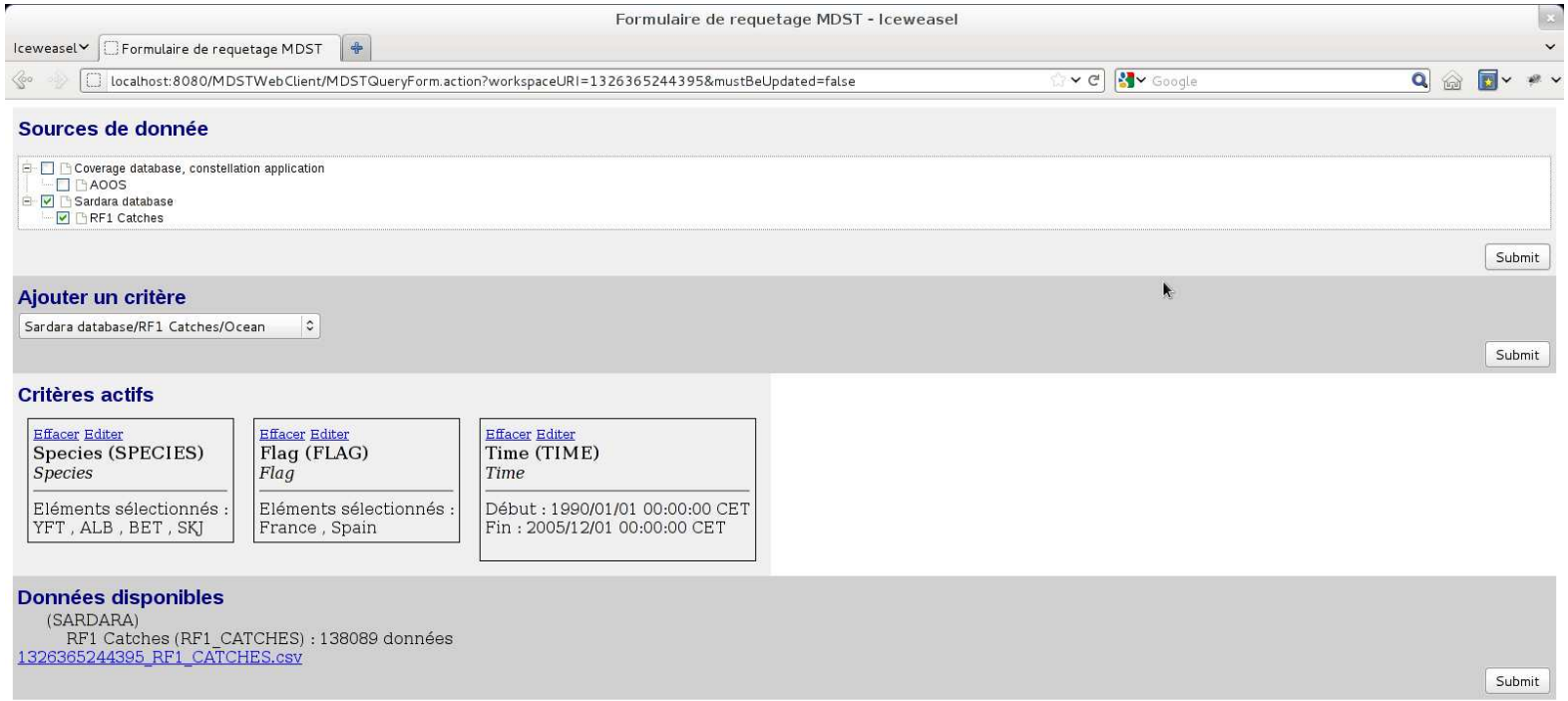
MACROES MDST server is a Web portal + other data access / services:

- the Web portal enables data access with a single html form whatever the number of data sources,
- . . . SQL queries,
- . . . Web Services,
- interoperability enables the data to be reused by other data sources.



Connection of data: hybrid approach of MDST (step 2 bis)

Similar GUIs wheter dataset has been transformed or not:



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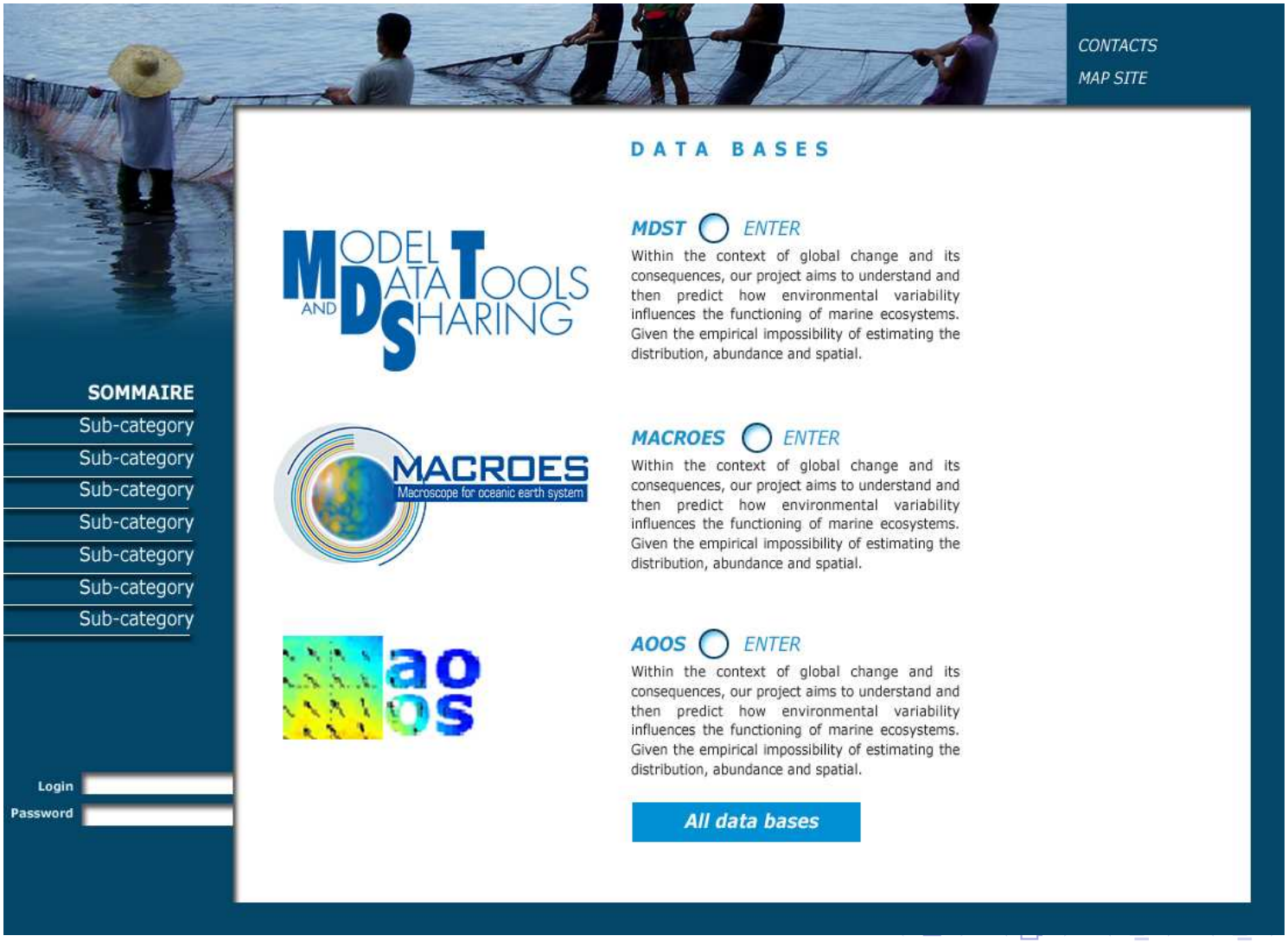

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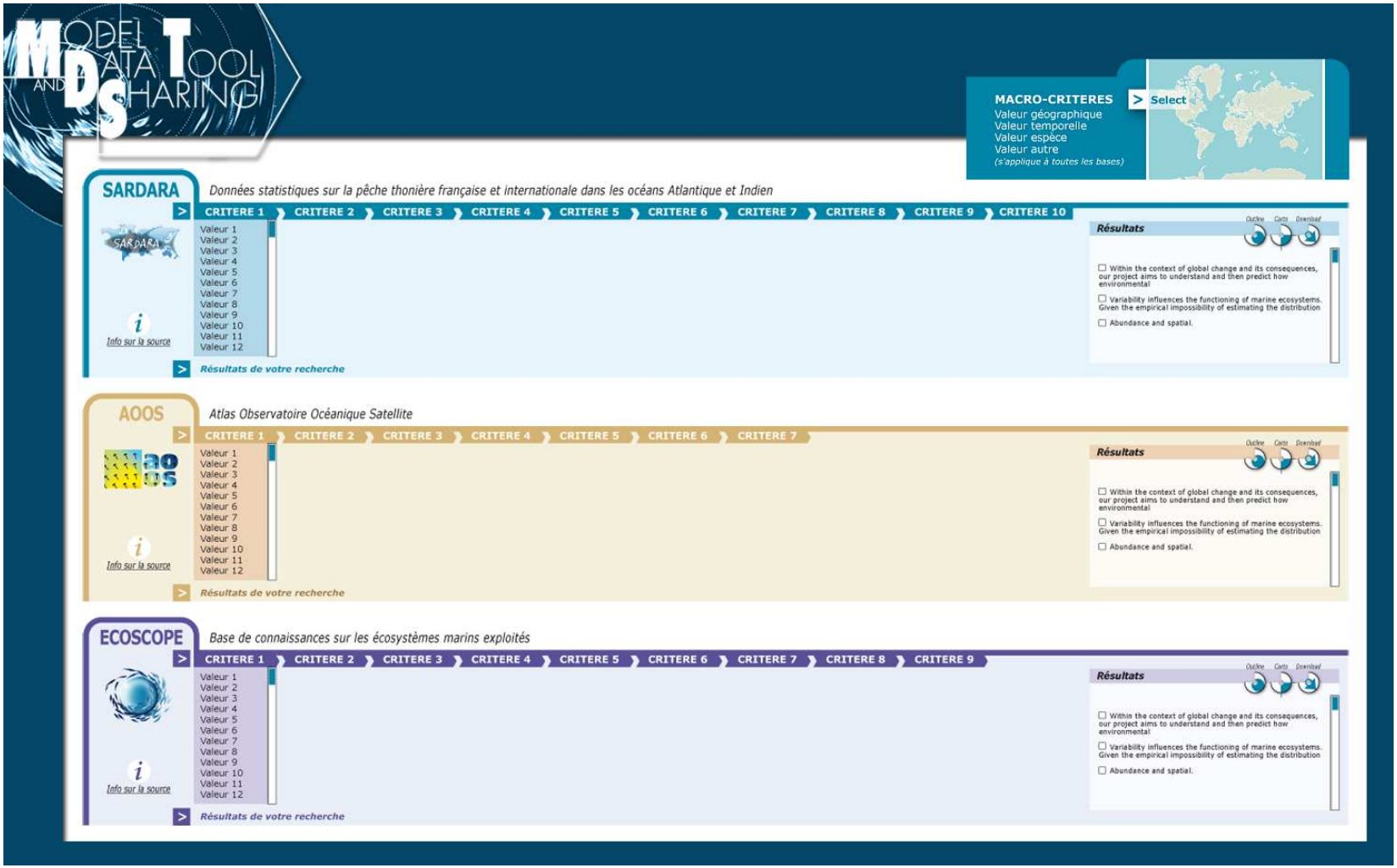

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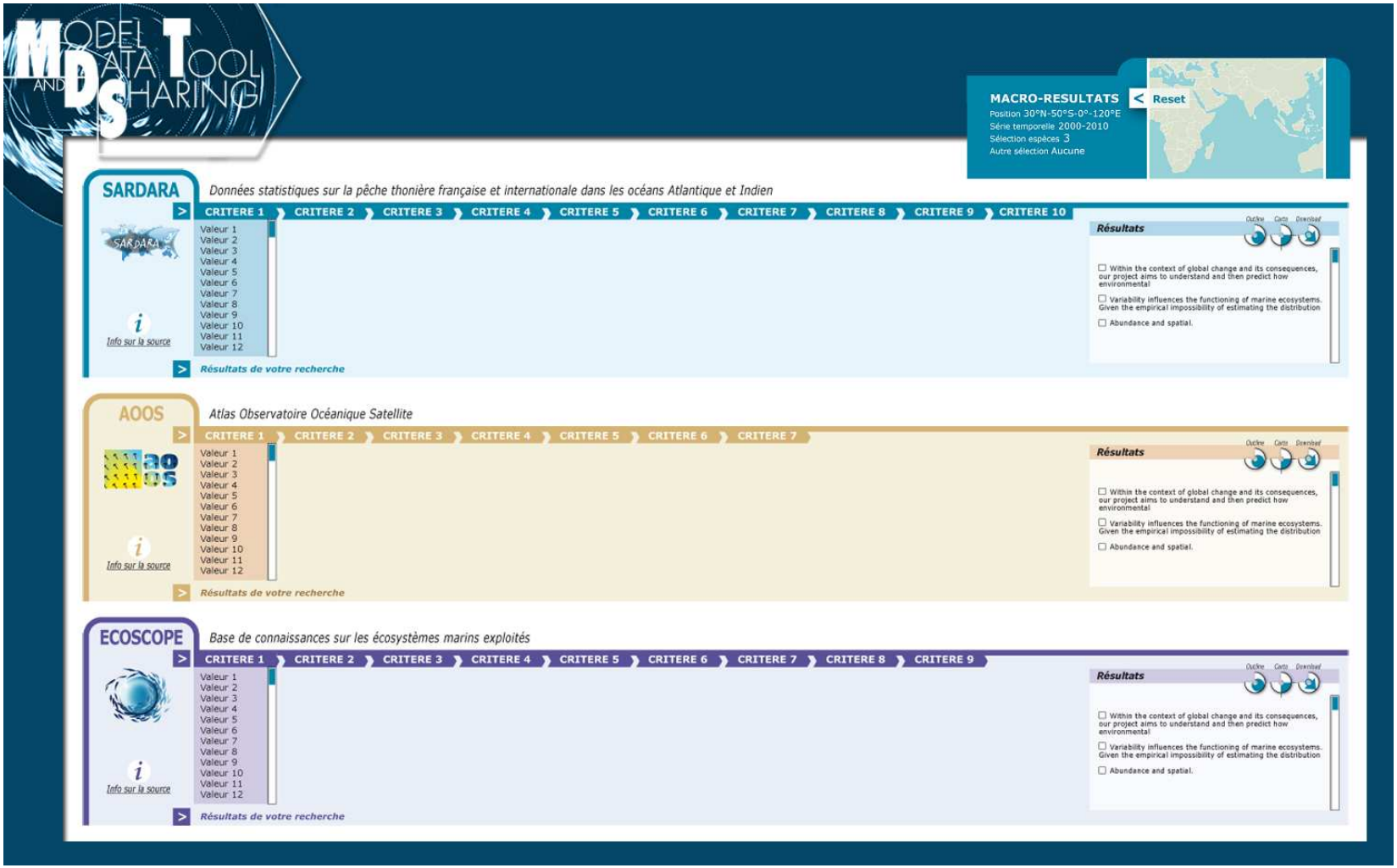

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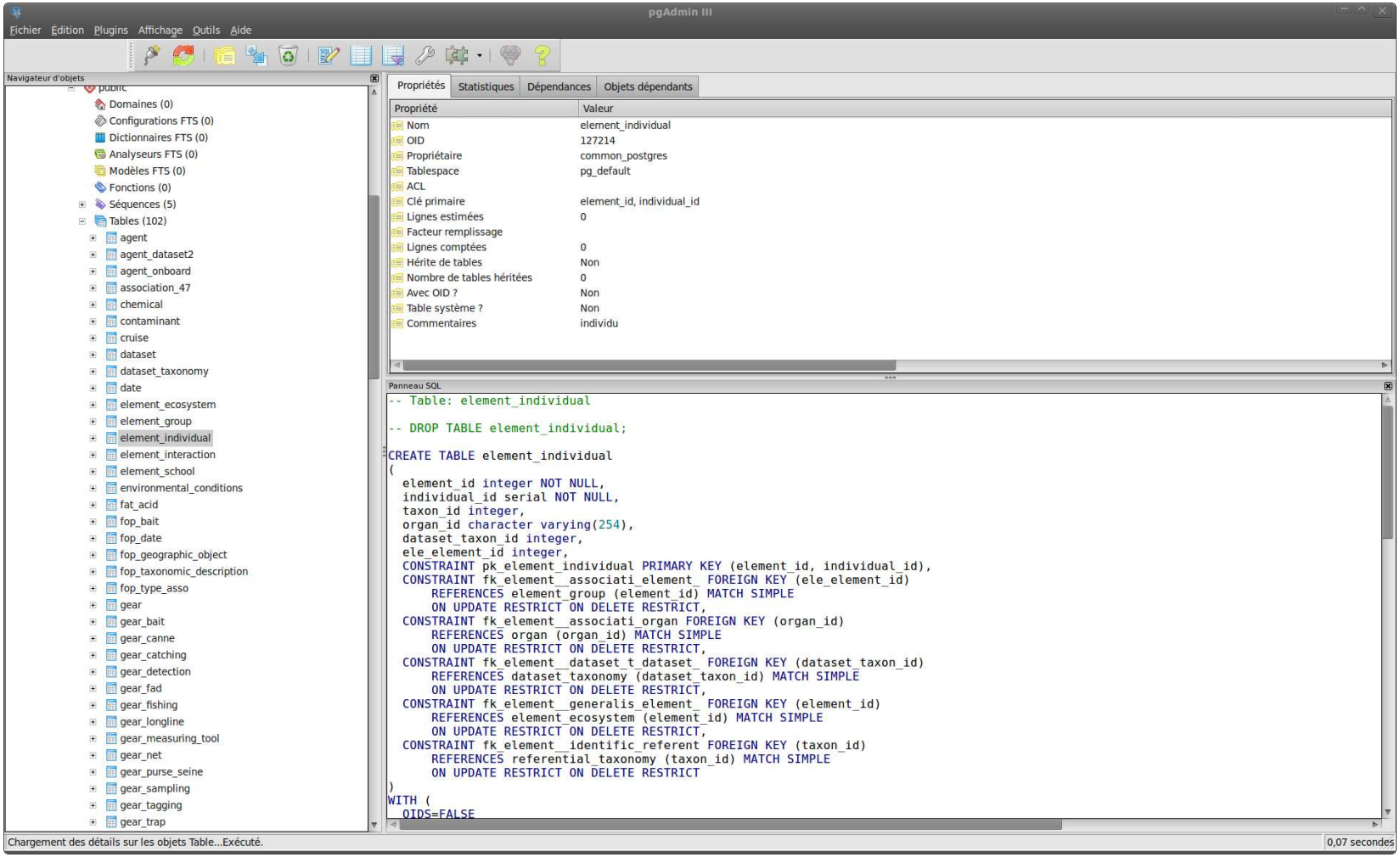

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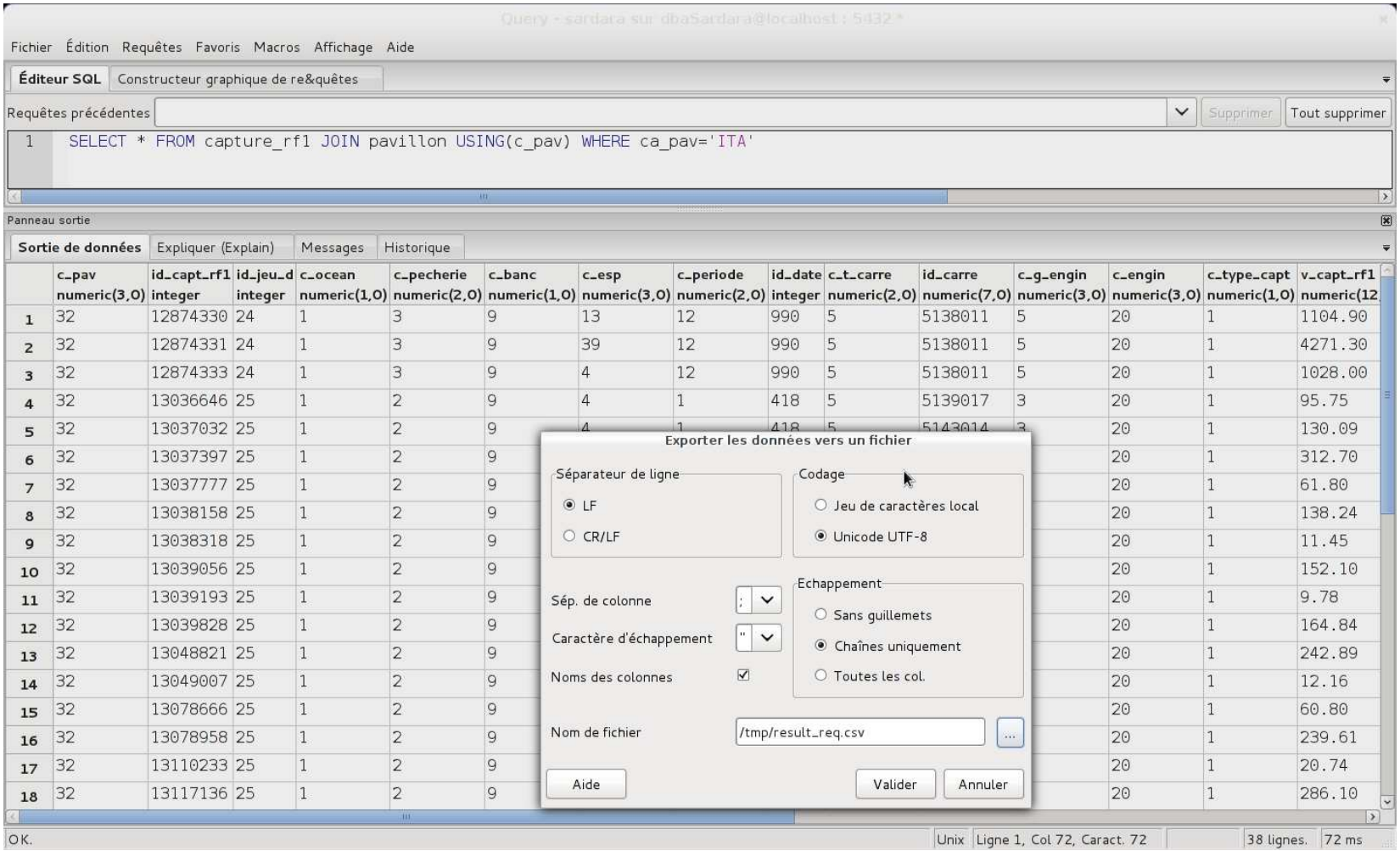

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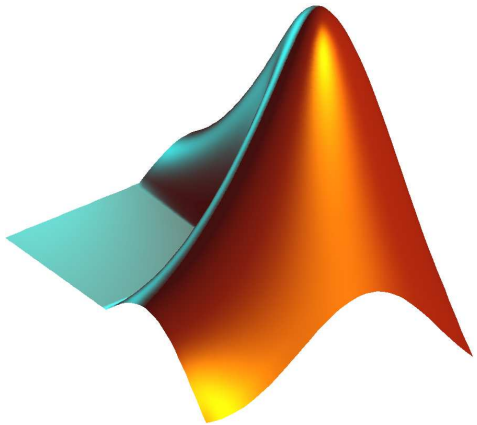

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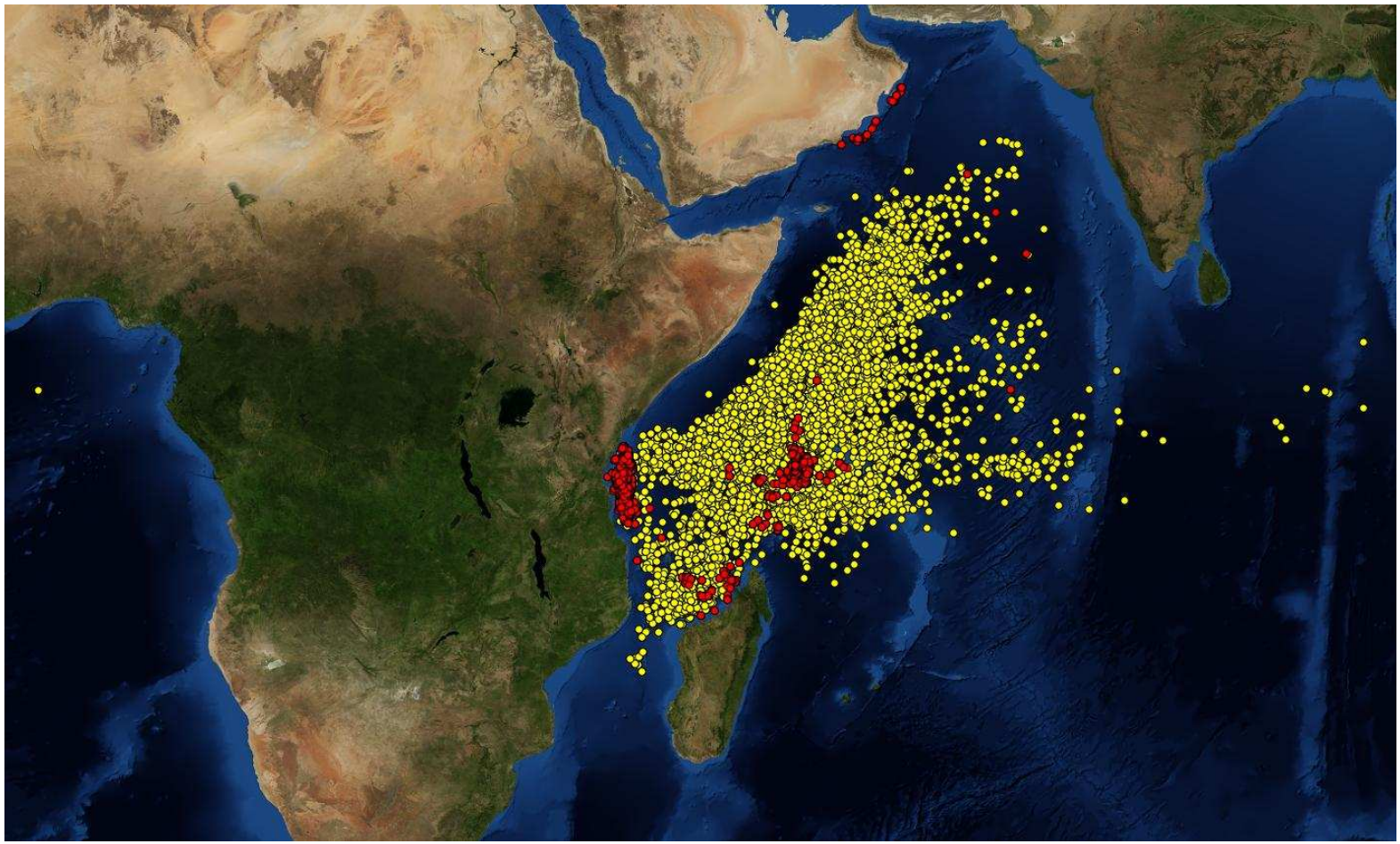

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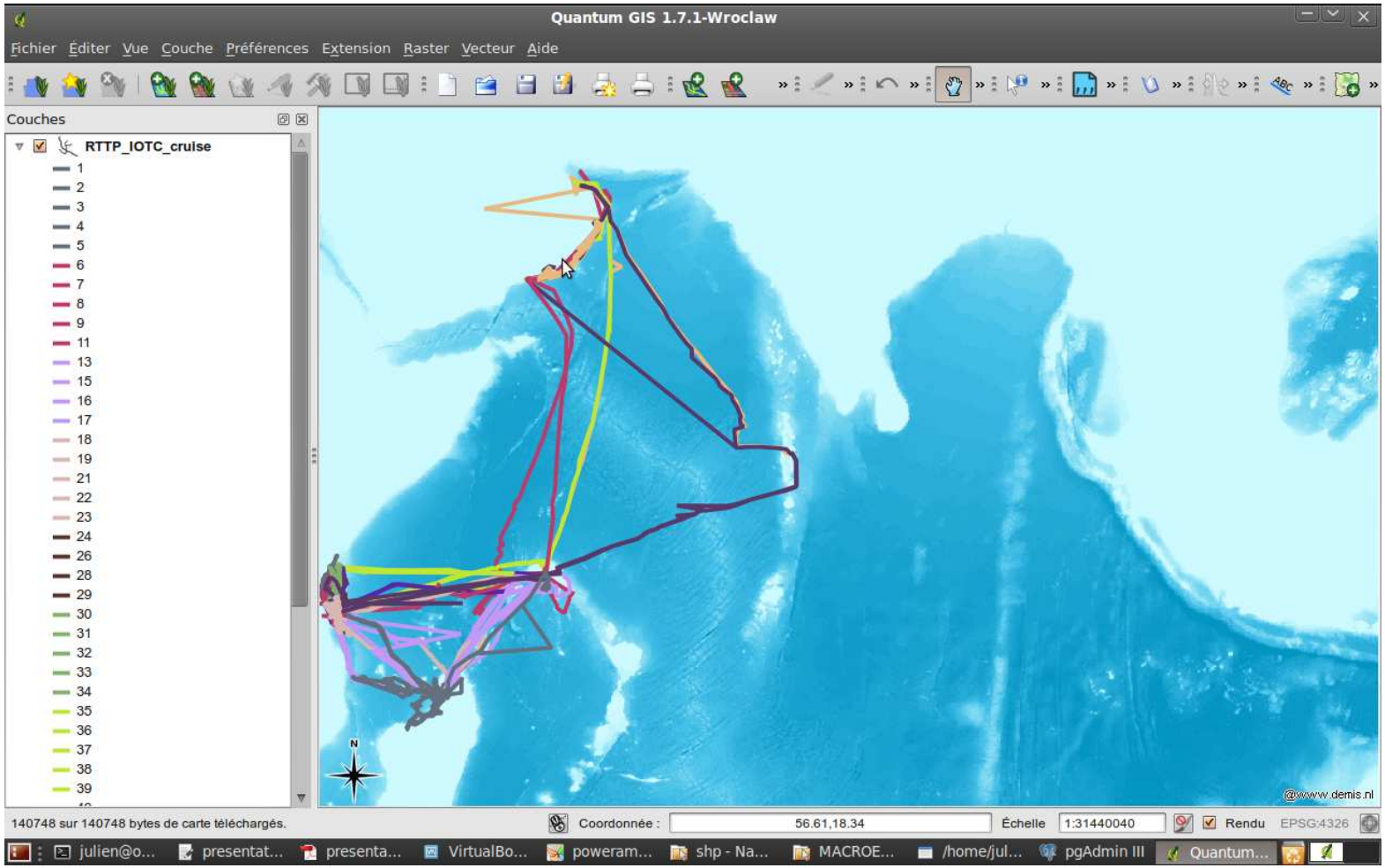


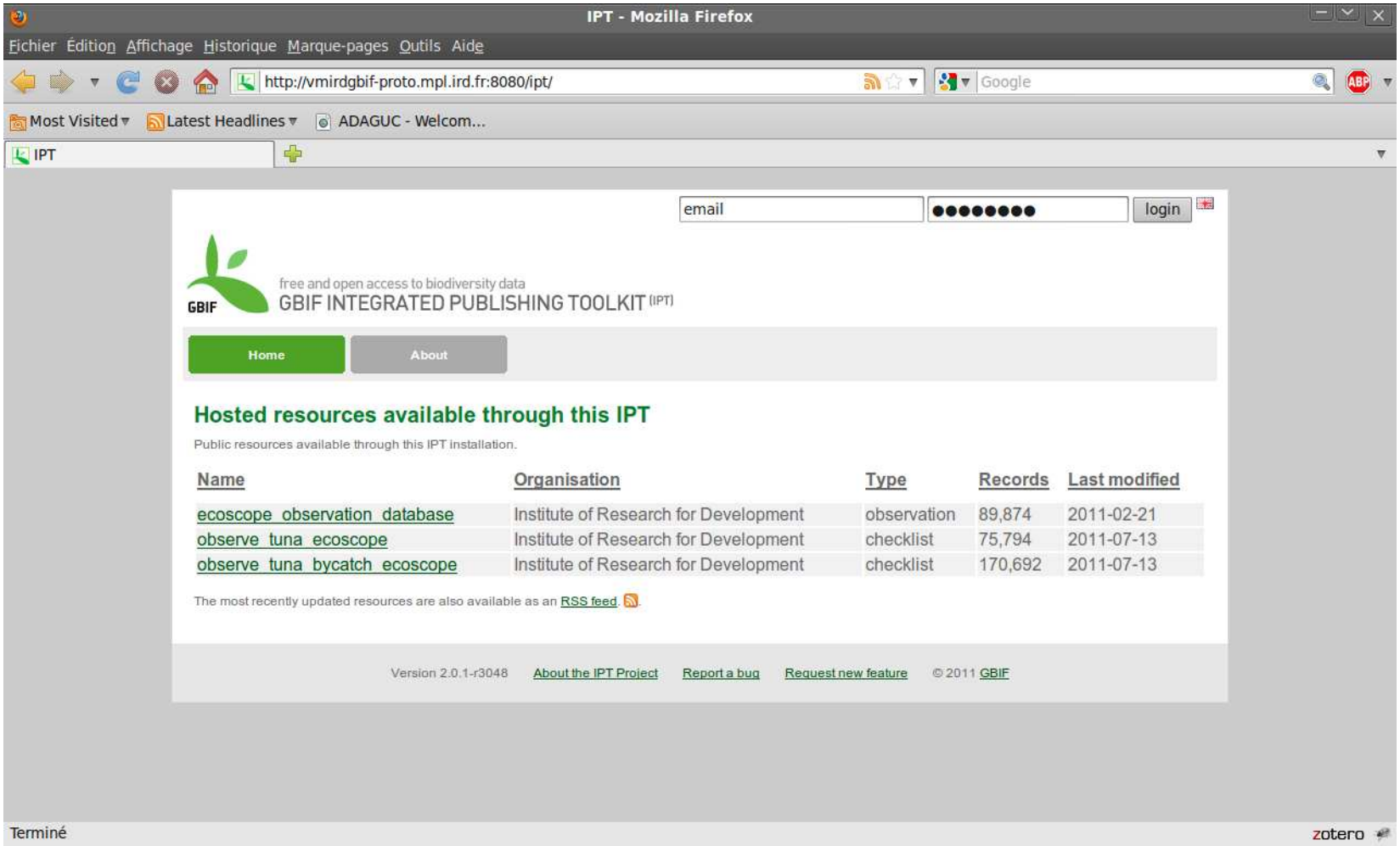
Data interoperability (step 3)

Data in this database are served with different standards according to the communities of users:

- Fisheries: Fishframe (for EU member states: DCF),
- Biodiversity: TDWG / GBIF,
- Spatial information with OGC standards (INSPIRE in Europe):
  - spatial databases enable to manage more than points: polygons, polylines... (real need for tagging data),
  - Postgis 2.0 enables to query usual RDMS data with environmental parameters managed in raster data formats (netCDF, geoTiff...).
  - same operations are possible with Web Services.
- Statistical data: SDMX,
- Web / Linked Open data: W3C,
- ...and others to come.

Interoperability results (step 3) for the generic database

GBIF (IPT server of IRD in Montpellier)



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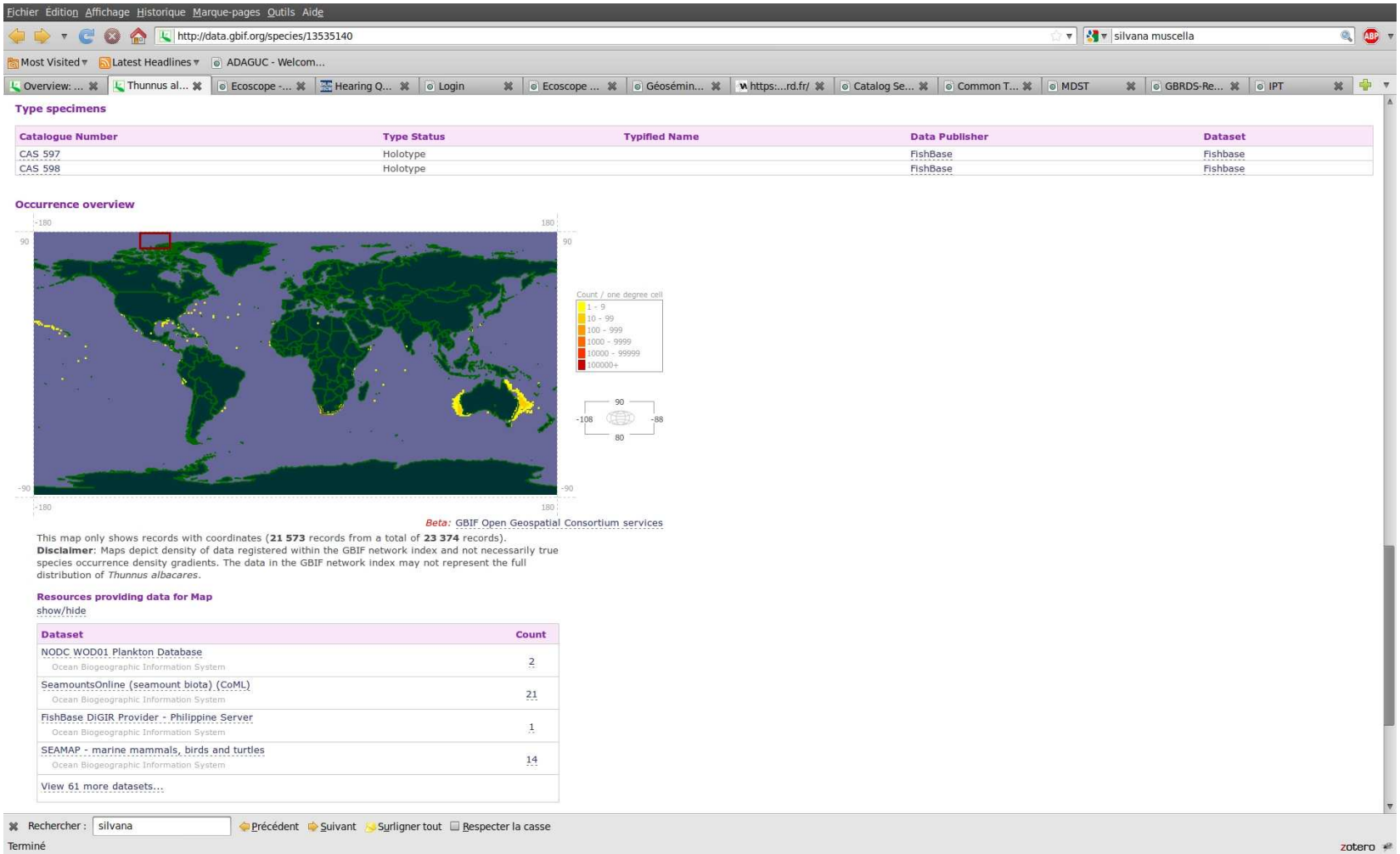

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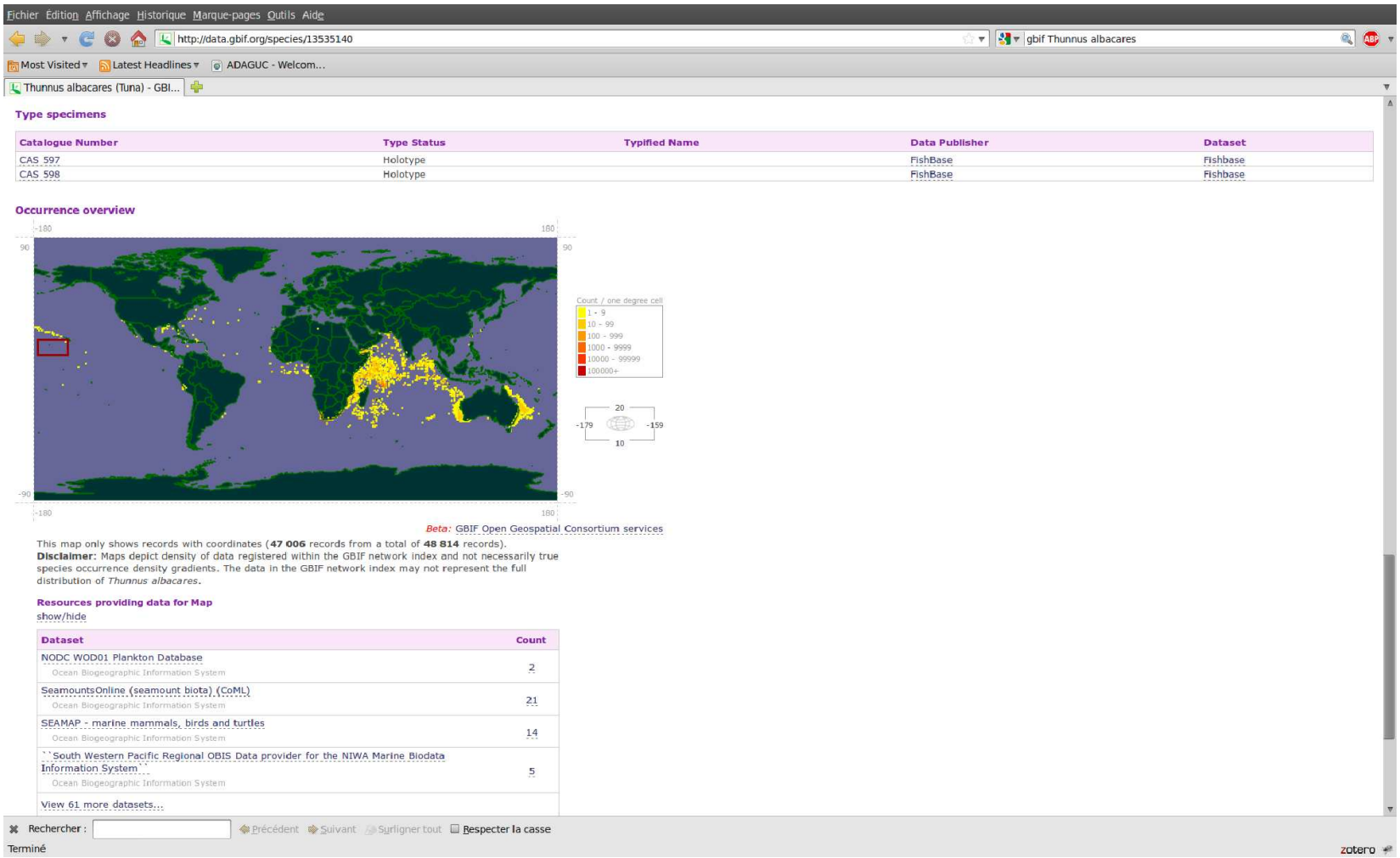

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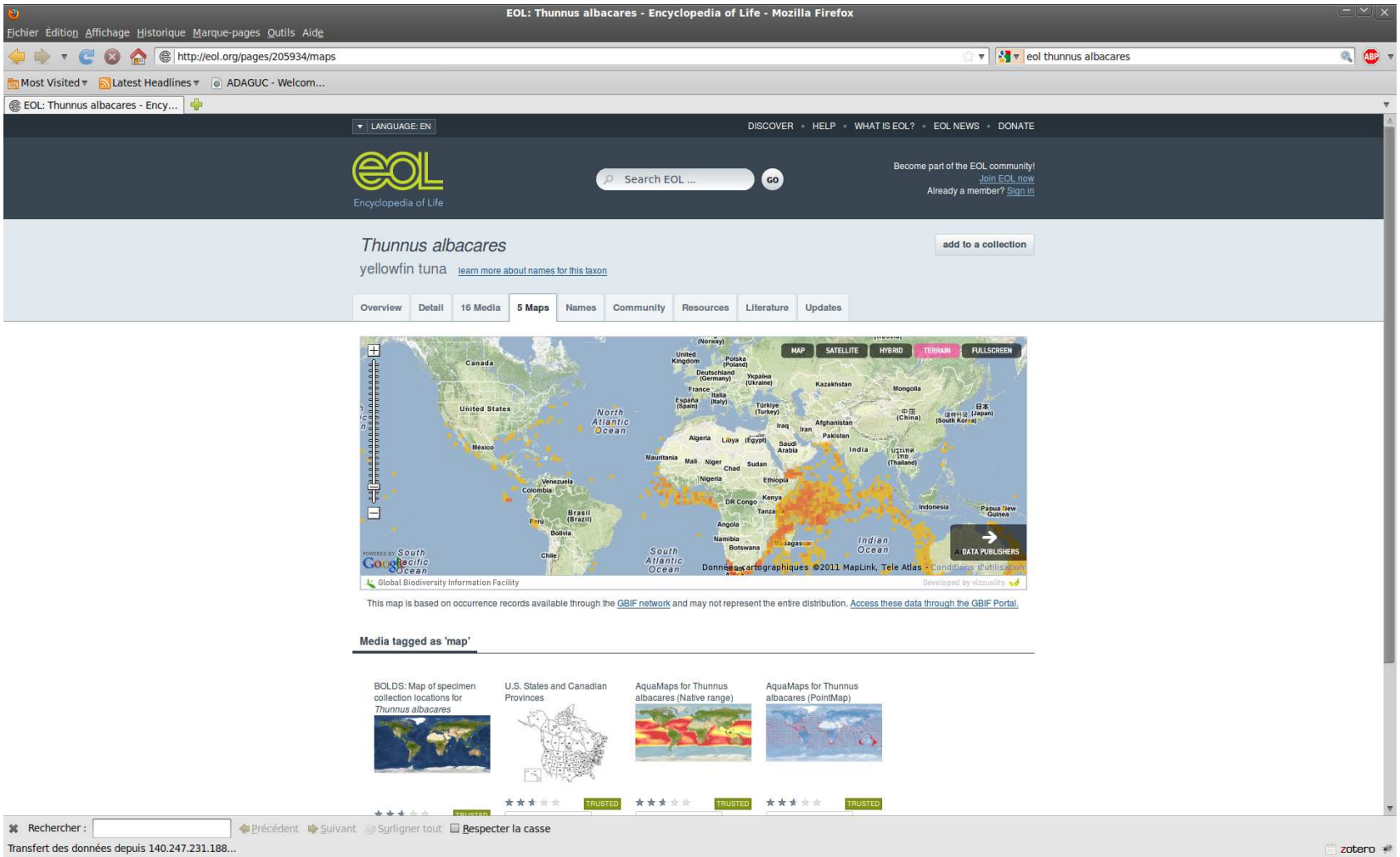
Web portals via GBIF (EOL, OBIS. . .)



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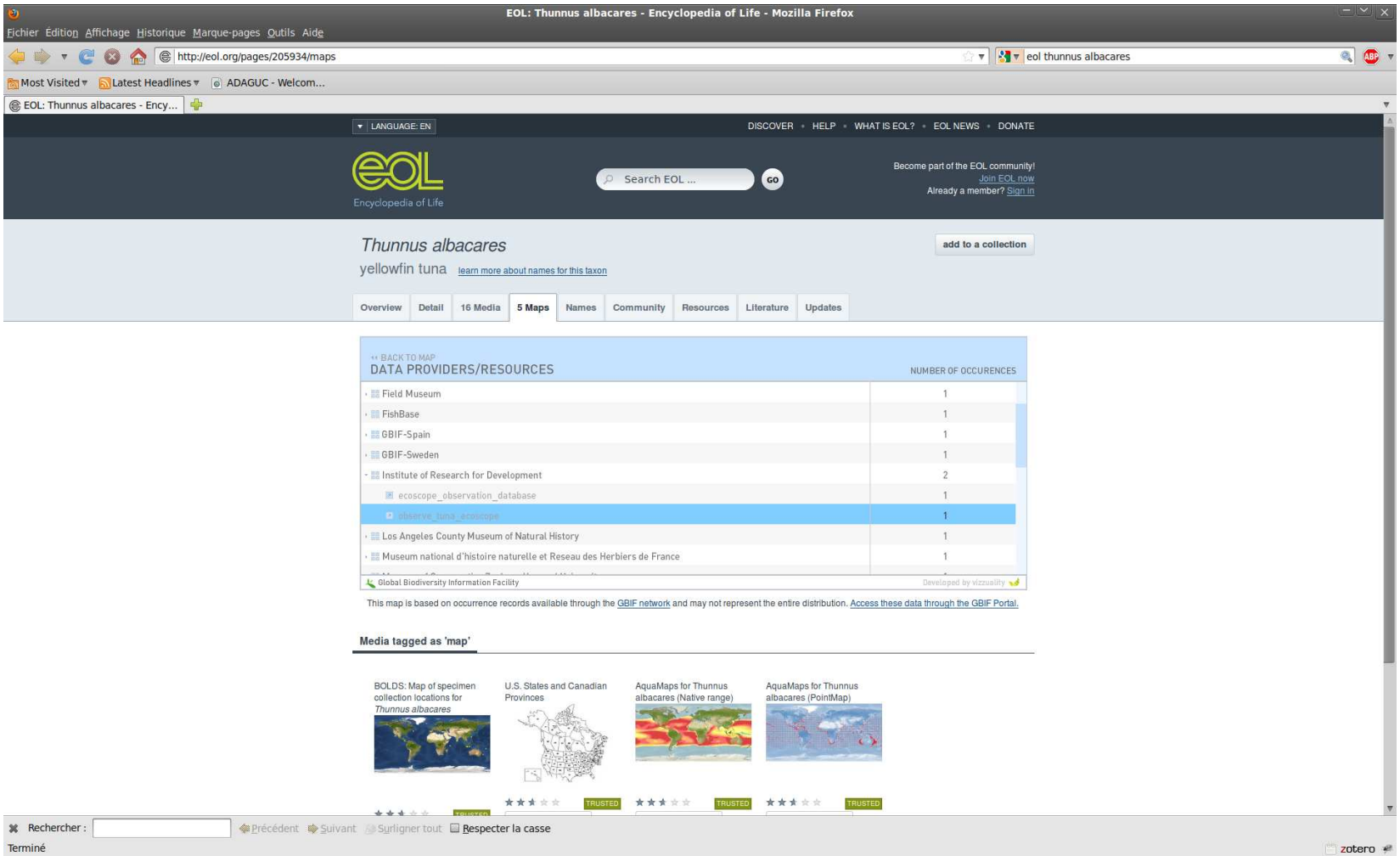

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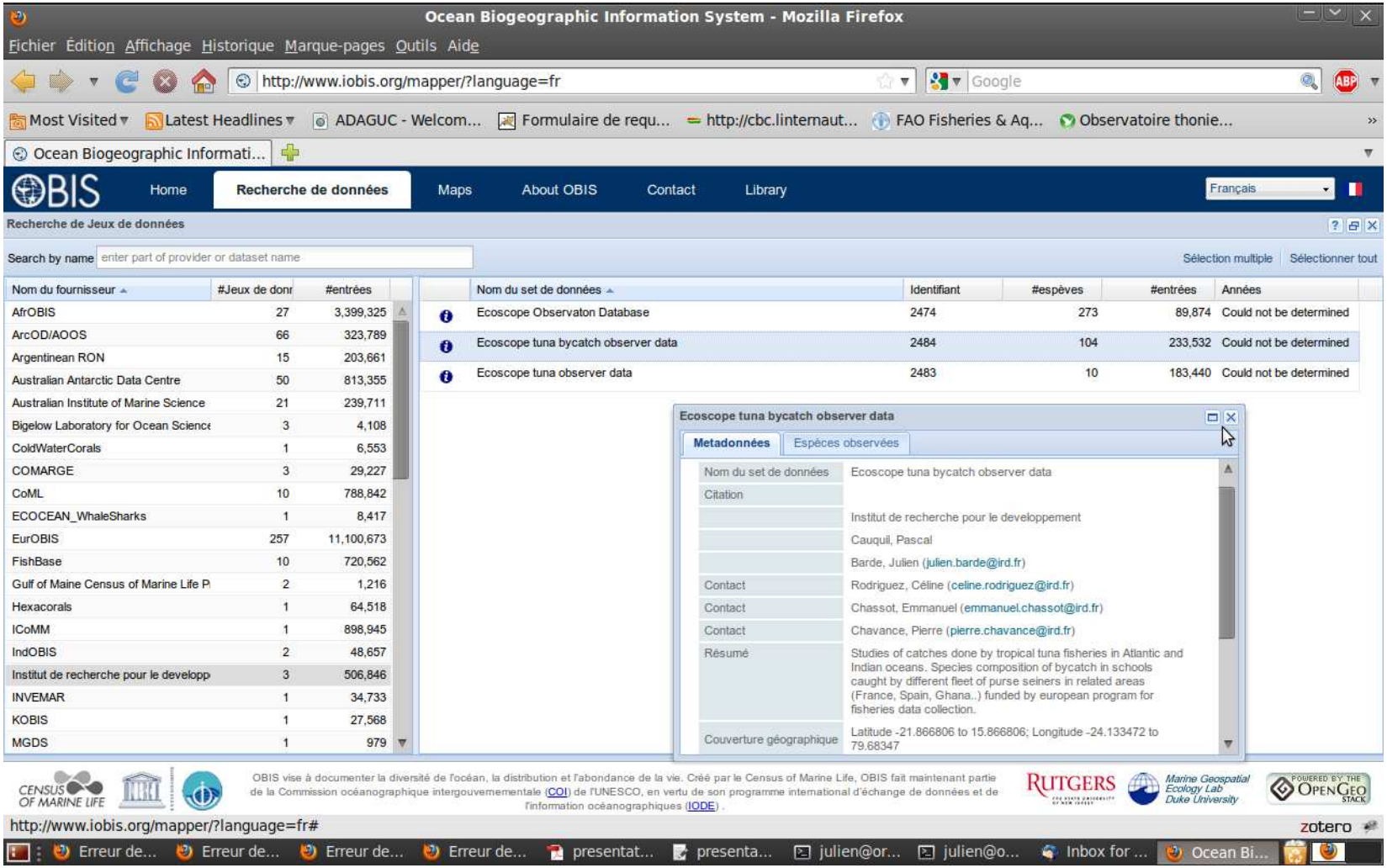

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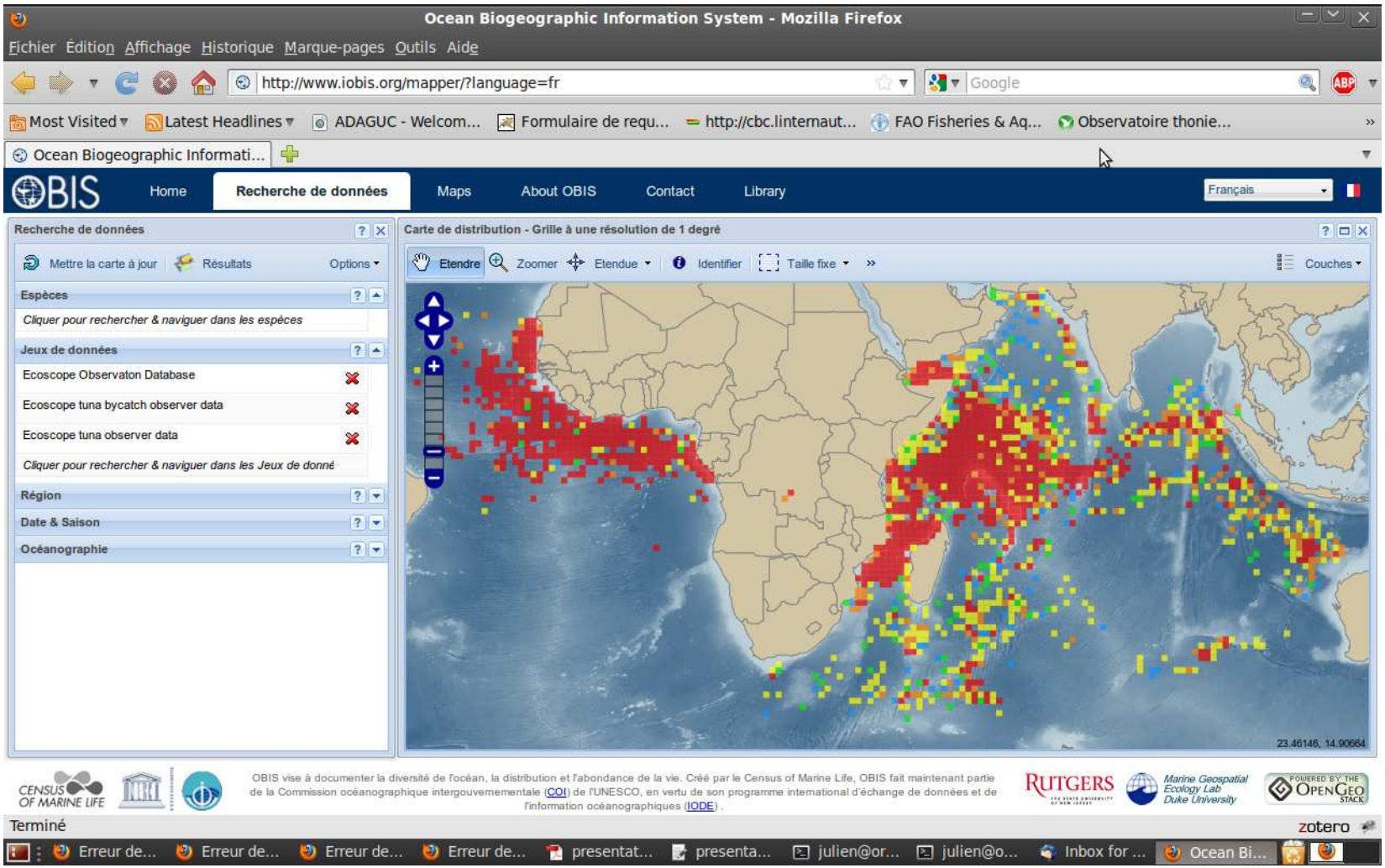
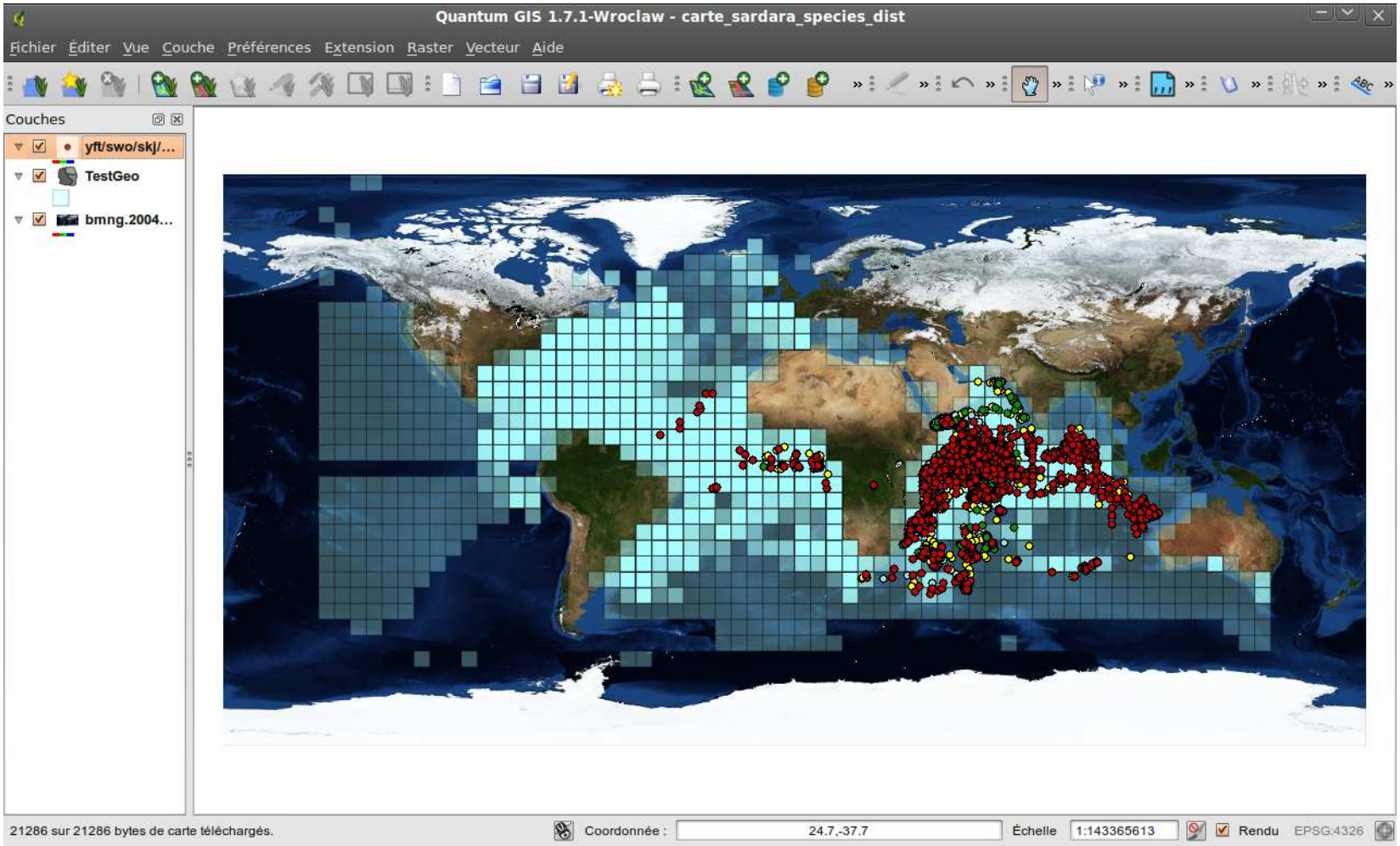


Interoperability results (step 3) for the generic database

GIS (via OGC standards / INSPIRE): Qgis, GvSig through Web Services



Summary

Achievements

Work done so far:

- new version of the database model to manage replicated observations,
- first steps of data migration and access OK:
  - tagging data and EAF data can be stored together,
  - data can be made available in different ways with a Web portal (MDST) through standards for data formats and access protocols,
  - can be blended with environmental data (Postgis + OGC).
- data can be connected to other infrastructures (GBIF, INSPIRE, ...) through standards / interoperability.

Next steps

Still a lot of work:

- to improve the model of the database,
- to separate raw data from estimated data . . .
- . . . by embedding libraries of processing in the database:
  - flag the quality of data,
  - location of the recovery with set of points (min, max. . .),
  - time at liberty. . . ,
  - density. . . ,
- loading of similar datasets: MAC (atlantic). . . ,
- administration interfaces for the database,
- publication of RTTP CTOI data on INSPIRE, GBIF, OBIS...with MDST ? Not plugged for now.

Additional information