Leveraging the power of Big Data at FAO

Applications in Fisheries and Aquaculture

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Contents

1. Introduction
   • FAO presentation
   • Statistics at FAO
   • Sustainable development goals (SDGs)

2. Applications of Big Data for Fisheries and Aquaculture at FAO
   • Why Big Data: what do we have to gain?
   • A review of applications
   • Limitations

3. Conclusion
FAO

- **194 Member Countries**, two associate members and one member Organization
- Headquarters in **Rome**, Italy
- Presence in more than **130 countries**

- FAO supports governments and their stakeholders in areas of development, in the design of adequate policies, programmes and legal frameworks to **promote food security and nutrition**
Our priorities

1. Eradicate hunger and malnutrition
2. Make agriculture, forestry and fisheries more productive and sustainable
3. Reduce rural poverty
4. Enable inclusive and efficient agricultural and food systems
5. Increase the resilience of livelihoods from disasters
Importance of statistics at FAO

Role of FAO:

- Collect, analyze, interpret and disseminate food & agriculture statistics
- Develop and implement methodologies, standards to help generate sound data
- Support for member countries: collection, dissemination, and uptake of data

Reliable, relevant statistics (agriculture, forestry, fishery)
Support decision making, policies & investment
Better progress monitoring
Tackle key food and agriculture issues
Big Data in Fisheries and Aquaculture

Advantages – Limitations – Scope – Perspectives
FAO’s Fisheries and Aquaculture Statistics

• Fisheries and Aquaculture as important source of food, nutrition, income and livelihoods
  • Marine and inland ecosystems and their resources under growing threat
  • Sustainability only possible with cautious and effective management
  • FAO is the only global source of fisheries and aquaculture statistics

• Our main databases:
  • Global capture and aquaculture production
  • Global trade of fisheries and aquaculture commodities
  • Consumption of Fish and Fishery Products
  • …
Why Big Data in Fisheries and Aquaculture?

• Source of new data
• Alternative source to validate, complement, enhance existing datasets
Application 1 - species distribution

**Goal**
predicting future distribution of marine species

**Data sources**
species occurrence data, marine environmental parameters (e.g. depth, temperature, salinity), habitat preferences

**Analysis type**
ML niche modelling to compute future range under climate change scenarios
Application 1 - species distribution

Results

- Silver-cheeked toadfish (*Lagocephalus sceleratus*)
- From Red Sea to Mediterranean Sea
- Without intervention, spread will continue and impact on fisheries will worsen

Limitations

- Uncertainty of predictions unclear
Application 2 – AIS for fisheries monitoring

Goal
identify fishing effort location to understand impacts on environment and resources; improve fleet data

Data sources
global Automatic Identification System (AIS) data (60k vessels in 2017)

Analysis type
machine learning to identify fishing gear based on movement
Application 2 – AIS for fisheries monitoring

Results

example of output, west Africa (2017)

Trawling activity

Longlining activity

(Fishing hours/km2)
### Application 2 – AIS for fisheries monitoring

#### Limitations

<table>
<thead>
<tr>
<th>AIS coverage</th>
<th>number of vessels using AIS limited (mostly larger boats, richer countries, distant water fleet)</th>
</tr>
</thead>
<tbody>
<tr>
<td>AIS reception</td>
<td>constrained by presence of satellites/antennae, heavy vessel traffic areas</td>
</tr>
<tr>
<td>AIS algorithm</td>
<td>some fishing techniques are less predictable and therefore harder to identify than others (e.g. gillnets, pole and line)</td>
</tr>
</tbody>
</table>
Application 3 – detection of aquaculture sites

Goal

detection and mapping of aquaculture sites for improved information insights and production capacity analysis, spatial planning and potential disaster assessments

Data sources

satellite imagery (Sentinel II)

Analysis type

image classification algorithms

Limitations

imagery resolution (the better the more expensive), type of aquaculture, complex production calculation

Result

eexample in South-East China
Application 4 – SmartForms mobile app

Goal
decentralized collection of important but sparse data (e.g. bycatch, recreational catch, marine litter)

Data sources
customizable forms designed to collect standardized data

Analysis type
visualization of key data collection statistics

Limitations
control over accuracy of data collection

Result
currently in beta version, release within months
Application 4 – SmartForms mobile app

Choose form

- **Catch of the day**
  Monitoring recreational fisheries in the Caribbean (Billfish project)

- **SoFiRe**
  A test data collection App for Somali Fisheries Reporting

- **ByCatch-ABNJDeepSea**
  ABNJ Deep-seas Project

ByCatch-ABNJDeepSea

- **Date**
  2019-10-07

- **Use current location**

- **Latitude**
  41,90

- **Longitude**
  12,50

By-catch ABNJ Deep-seas Project

- **Observer name**
  Aureliano Gentile

- **Vessel name**
  Popeye

- **IMO Ship Identification Number**
  5758908543

- **Trip Number**
  546fg

- **Trip ID**
  Ylg467i

- **Tow number**
  2

- **Sharks**
  Gulper shark

Data Overview

- **Total number of forms submitted for Fisheries and Aquaculture**

Graph showing the total number of forms submitted for Fisheries and Aquaculture.
Implementation in FAO Fisheries and Aquaculture

- Strategy on the use of Big Data under development
- Range of experimental projects
- Promising applications but no routine use of Big Data yet
Conclusion

• Very promising technology, but limitations exist
• Does not replace data collection by national statistical offices, but can be a very good complement
• Technology constantly improves, creating more and more opportunities (e.g. AIS use, satellite imagery resolution, machine learning algorithms)
• The future of fisheries and aquaculture will include these technologies and FAO is getting prepared to leverage them fully
شکرا
谢谢
Merci
Thank You
Благодарю
¡Muchas Gracias!

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Contributed to the contents of this presentation: 

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Annex – List of relevant publications and websites

• **Advances in geographic information systems and remote sensing for fisheries and aquaculture**
  - [http://www.fao.org/3/i3254e/i3254e.pdf](http://www.fao.org/3/i3254e/i3254e.pdf)

• **E-agriculture in Action: Big Data for Agriculture**

• **Forecasting the ongoing invasion of Lagocephalus sceleratus in the Mediterranean Sea**

• Upcoming: **Atlas of Fishing Activity using AIS data**
Annex – List of relevant publications and websites

• Global Fishing Watch website: https://globalfishingwatch.org/