

Biomass indicators of potential use for allocation of the Total Allowable Catch in the Indian Ocean

15th meeting of the Technical Committee on Allocation Criteria

Charles T T Edwards

14-17 July, 2025

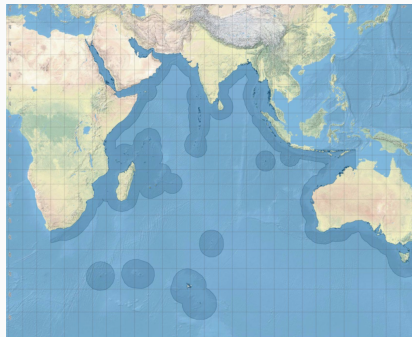
Background

Problem statement

How to partition the biomass between EEZs and between coastal and high seas regions.

Interpretation of the available data and biological information could partition the biomass in different ways:

1. Between EEZs;
2. Between coastal and high seas regions;
3. Between EEZs and the high seas.



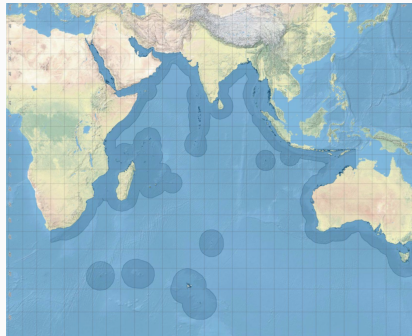
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Structure of presentation:

- Spatial area proxies;
- Biological principles;
- Uses of empirical data;
- What can and can't be achieved.

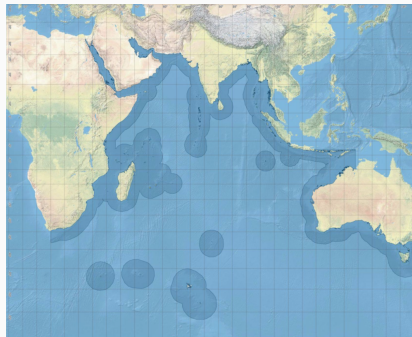


Spatial area proxies

Can the EEZ size be used as a proxy for the proportion of the biomass it contains?

EEZ size:

- Does not account for the different productivity of different regions;
- Could be “weighted” using an understanding of the biomass distribution.



Biological principles

Can we use our understanding of species biology combined with the physical environment to distribute the biomass?

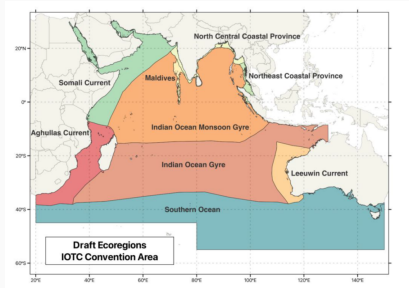


Figure 1: Juan-Jorda et al. (2022) IOTC-2022-WPEB18-22

Bioregions:

1. Designed for spatial management;
2. Do not provide direct information on the relative biomass;
3. But do provide partitions that may be useful for interpretation of empirical data.

Empirical approaches

As part of the IOTC's stock assessment cycle, statistical models of the commercial catch rate data are used to extract a temporal or spatio-temporal index of abundance.

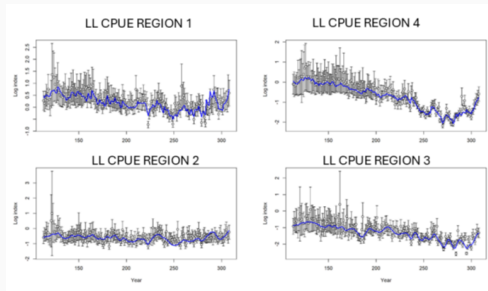


Figure 2: Urtizberea et al. (2024) IOTC-2024-WPTT26-11

Could these methods also be used to provide information on the distribution of the biomass in support of a TAC allocation procedure?

Empirical approaches

Statistical models are used to estimate the abundance from commercial catch rate data for all the major commercial species (ALB, BET, SKJ, SWD & YFT).

- Quality of the model outputs is dependent on the quality of the data inputs;
- Models are limited to commercial data, due to the quality of artisanal catch records;
- Spatial resolution:
 - purse seine data are aggregated per $1^{\circ} \times 1^{\circ}$ cell;
 - longline data are aggregated per $5^{\circ} \times 5^{\circ}$ cell;
- The spatial resolution of reporting, combined with spatial extent of the fleets, will determine the spatial properties of the abundance estimate.

Purse seine catch-effort data:

- primarily targets SKJ;
- aggregated per $1^\circ \times 1^\circ$ cell;
- high enough resolution to be assigned to individual EEZs;
- limited spatial coverage.

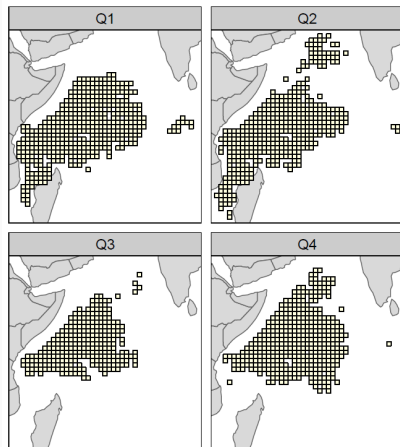


Figure 3: Kaplan et al. (2023) IOTC-2023-WPTT25-08

Empirical approaches

Longline catch-effort data:

- targets ALB, BET, SWD & YFT;
- aggregated per $5^\circ \times 5^\circ$ cell;
- cannot be assigned to individual EEZs;
- wide spatial coverage.

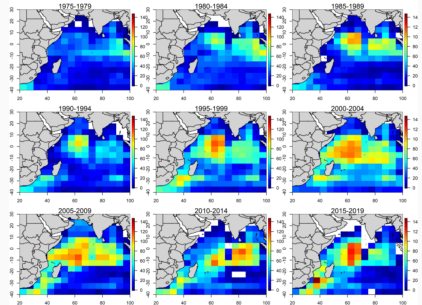


Figure 4: Langley (2024) IOTC-2024-WPM15-INF01

Empirical approaches

How can longline data be used?

- Spatio-temporal modelling of the relative biomass;
- Cannot reliably predict at the level of the EEZ;
- Could potentially be used to predict relative biomass in wider regions.

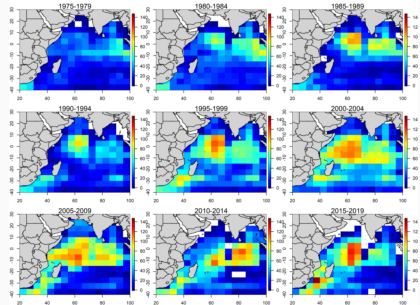


Figure 5: Langley (2024) IOTC-2024-WPM15-INF01

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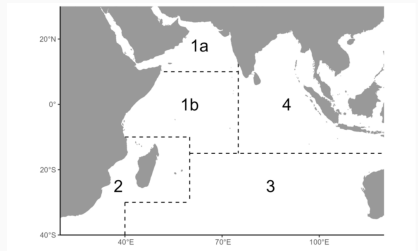


Figure 6: Urtizberea et al. (2024) IOTC-2024-WPTT26-11

Empirical approaches

Stock assessments:

- Can use catch rate data to predict "regional scaling factors" for large areas;
- These are used to partition the biomass;
- Reviewed as part of the stock assessment cycle;
- Represent out "best estimate" of the species distribution;
- Currently only ALB, YFT & BET.

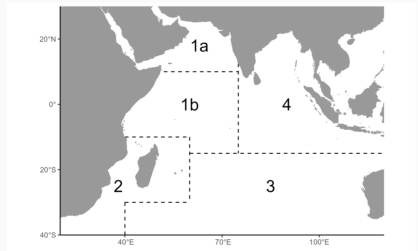


Figure 7: Urtizberea et al. (2024) IOTC-2024-WPTT26-11

What questions can we not answer:

- Due to limitations in the data, it is unlikely that a model can predict relative biomass at the level of the EEZ, or partition the biomass between coastal and high seas regions;

What questions we could potentially answer:

- It is more likely that a model can predict the relative biomass at larger regions, with each region containing multiple EEZs.

If an allocation for coastal states existed, then models of the biomass distribution could potentially be helpful for distribution of that allocation between coastal states (e.g., weighting of the EEZ size).

Construction of a biomass model that may be useful for partition of the biomass between coastal states would require:

- Regional definitions;
- A reference period for the data used;
- Agreement on the data used and the model structure;
- Likely only feasible for species fished with longline data;
- Initially adopted as part of the allocation criteria in the WCPFC (but currently not used).

Acknowledgements

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