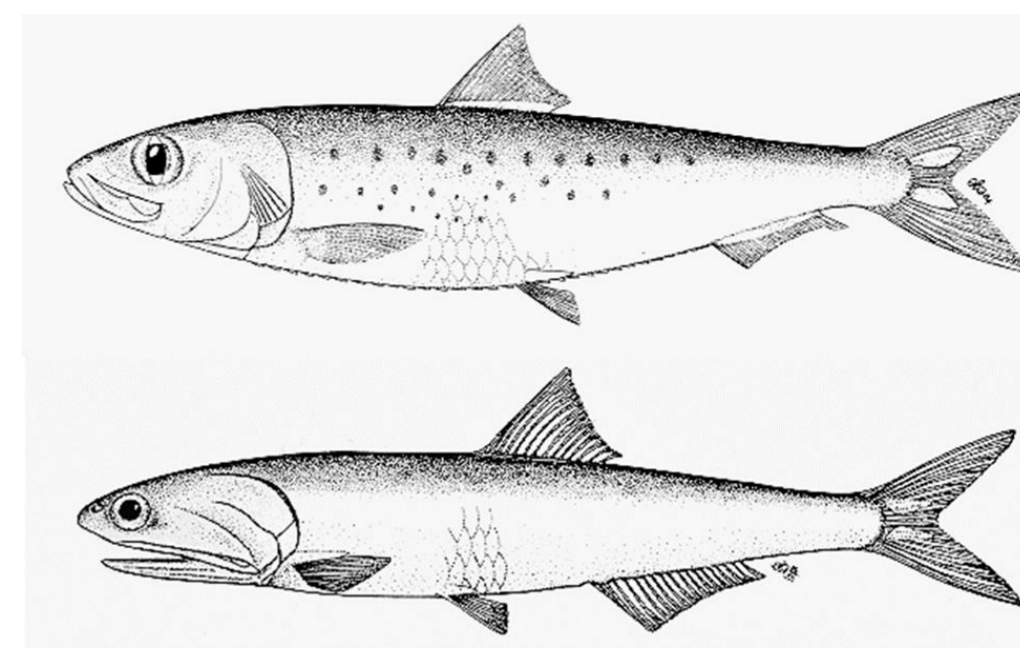




ASSESSMENT AND MANAGEMENT OF THE SOUTHERN STOCK OF *Sardinops sagax* AND THE CENTRAL STOCK OF *Engraulis mordax* ON THE WEST COAST OF THE BAJA CALIFORNIA PENINSULA, MEXICO.

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INTRODUCTION

With a catch exceeding one million tons, the small pelagic fishery is the most important fishery resource in Mexico, representing up to 50% of the national catch. The western coast of the Baja California Peninsula (Region "A"), where the Ensenada (ENS) and Bahía Magdalena (BM) fleets operate, contributes one-third, registering an average of around 350,000 tons per year: Pacific sardine (*Sardinops sagax*) accounts for 69%; anchovy (*Engraulis mordax*) for 21%; and the remaining 10% is comprised of other small pelagic species (*Scomber japonicus*, *Opisthonema spp.*, *Etrumeus acuminatus*, and *Cetengraulis mysticetus*). While the resource is considered to be fully sustainable, the inherent variability in its abundance remains a concern, making the adoption of appropriate management practices necessary to ensure its sustainability.

OBJETIVE

To evaluate the status, productivity, and management of the small pelagic fishery (*S. sagax* and *E. mordax*) on the western coast of the Baja California Peninsula, Mexico.

METHODOLOGY:

The study area comprises the western coast of the Baja California Peninsula (Region A), located on the northwestern coast of Mexico, where commercial fishing for small pelagic fish is carried out (Figure 1).

The status assessment of both stocks was conducted using data from 1989 to 2025 (Pacific sardine) and 2015 to 2025 (northern anchovy), including age-specific catch data, biological information, catch per unit effort (CPUE) derived from fishery data, and fishery-independent indicators (egg index and biomass estimation by hydroacoustics). Applying a Statistical Analysis of Catch by Age (SCA, Haddon 2011), allowed for the estimation of population biomass size and fishing mortality by age group and overall, and the generation of biological reference points for management (Table I, DOF 2023).

The Harvest Control Rule—Reference Catch (CR), Biologically Acceptable Catch (CBA), and Overexploitation Limit (LSE)—may vary depending on the nature of the fishery, management objectives, monitoring and evaluation capacities, and, above all, the available information. According to the current Management Plan:

- For Pacific sardine, active management is considered, where the FRACTION will be $FRACCION = 1 - e^{-F_{MSY}}$, and the BUFFER will be 0.95.
- For northern anchovy, passive management is considered, where the FRACTION will be $FRACCION = 0.8 * F_{MSY}$, and the BUFFER will be 0.80.

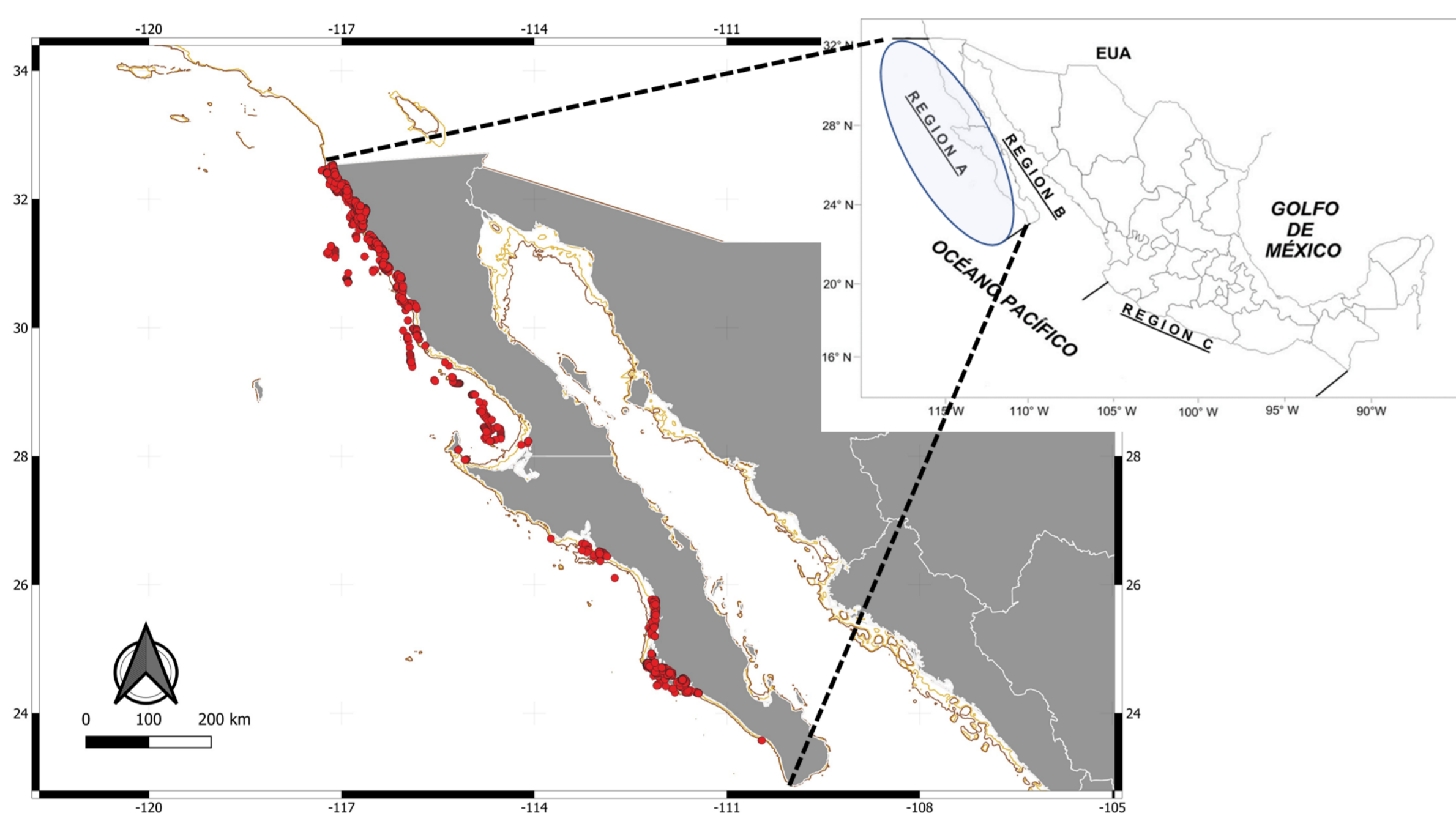
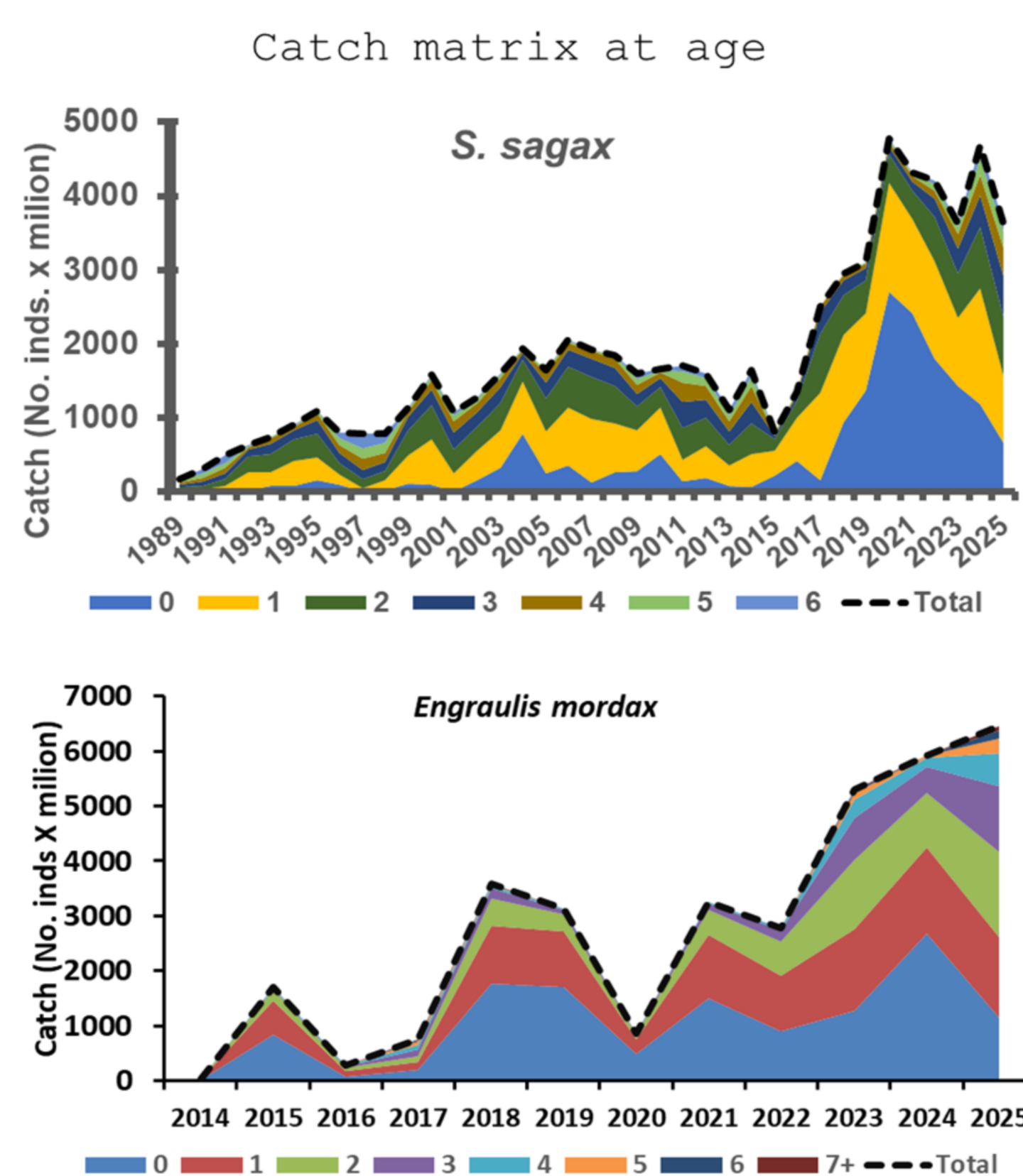
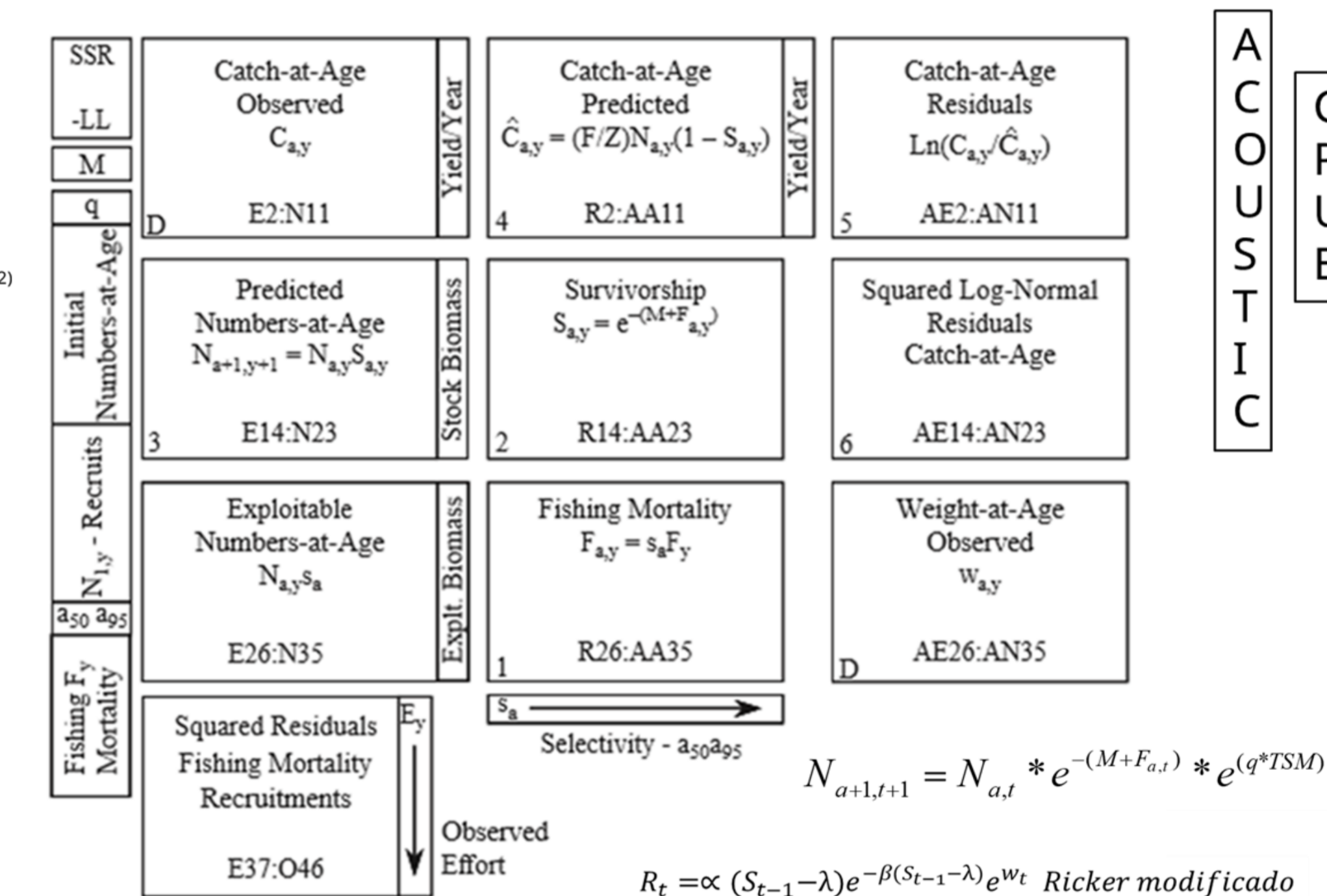


Figure 1.- Study area: western coast of the Baja California peninsula (Region A)



STATISTICAL CATCH-AT-AGE ANALYSIS (SCA, Haddon, 2011)



$$LL^T = LLC + LLF + LLR + LLacust + LLCPUE$$

RESULTS

Results: Although interannual variations in biomass were observed in both stocks, these fluctuations were not large: in *S. sagax*, total abundance (TTB) ranged from 1.255 to 3.286 million tons, with a similar trend in spawning biomass (SSB) between 0.633 and 1.854 million tons; for *E. mordax*, TTB ranged from 0.679 to 1.273 million tons and exploitable biomass (Bexp) from 0.594 to 1.110 million tons (Figure 2). According to the monitoring of the Harvest Control Rule (Biologically Acceptable Capture, CBA), both resources are being exploited to the maximum sustainable level (Figure 3), which confirms the high biomass status with the Kobe diagram (Figure 4).

Table I.- Harvest Control Rule formulation (DOF 2023)

HARVEST CONTROL RULE	FORMULATION
Reference Catch (CR)	$(Biomass - B_{min}) * FRACCION$
Biologically Acceptable Catch (CBA)	$Biomass * BUFFER * F_{MSY}$
Overexploitation Limit (LSE)	$Biomass * F_{MSY}$

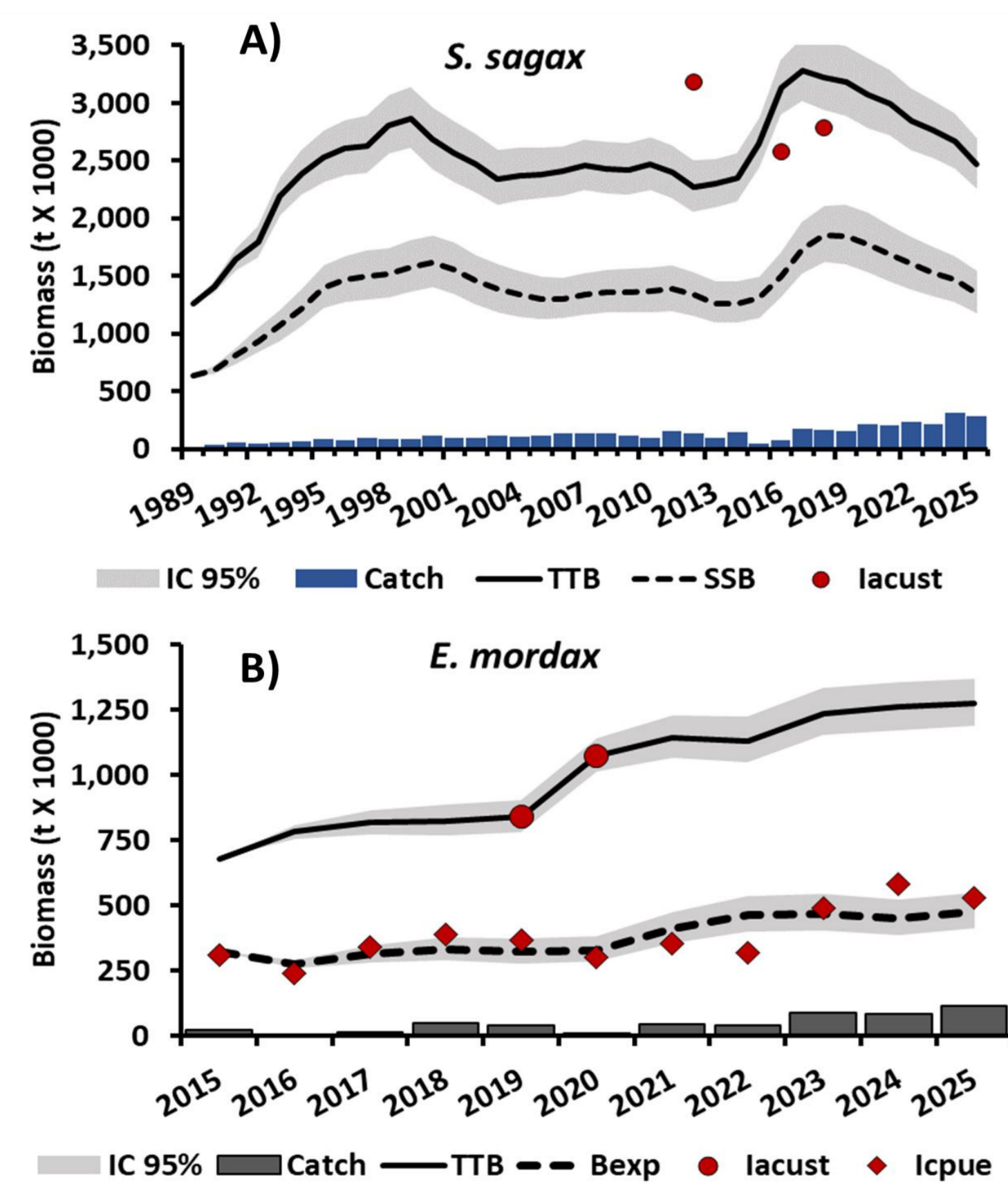


Figure 2.- Biomass level for *S. sagax* (A) and *E. mordax* (B).

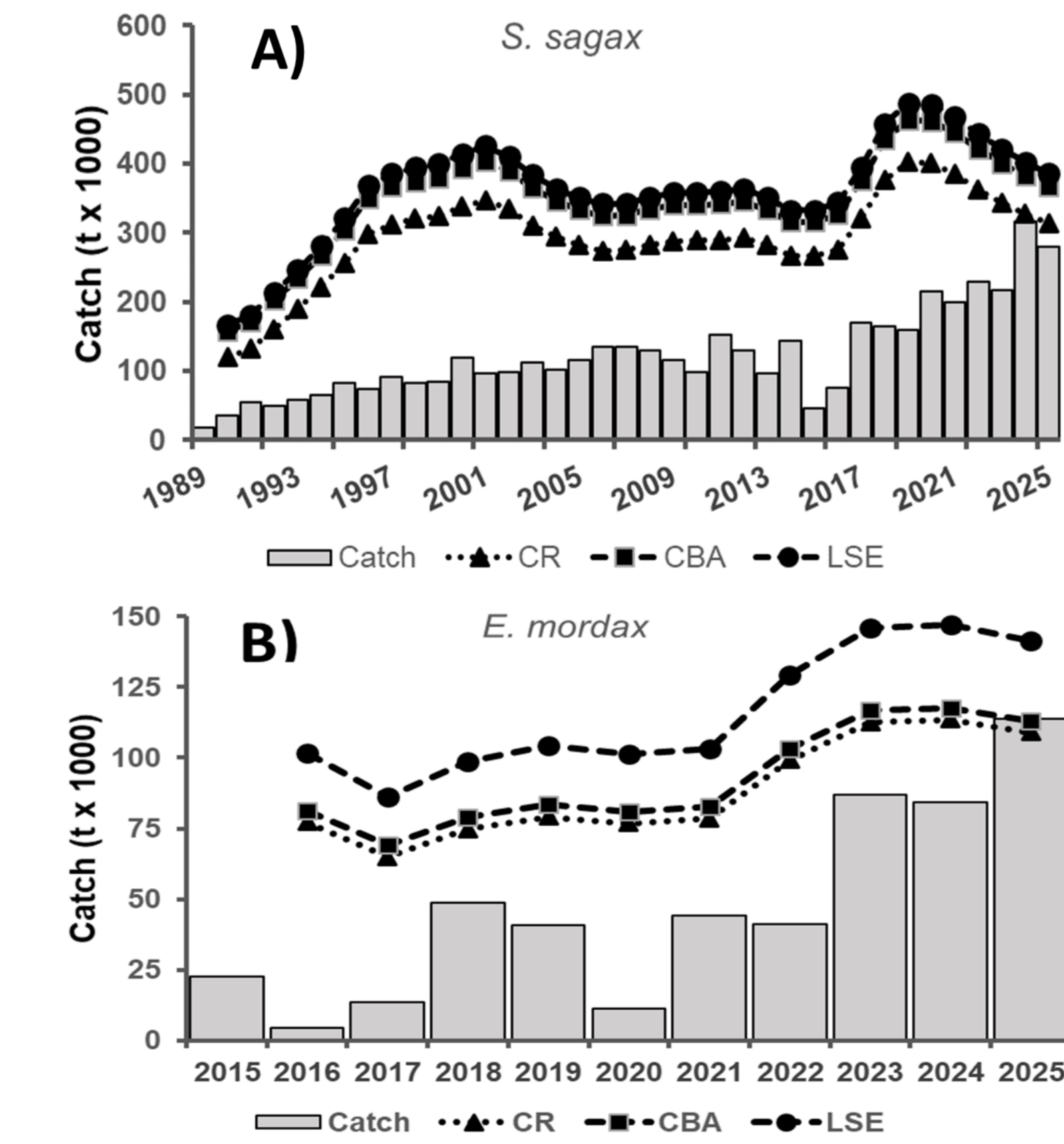


Figure 3.- Harvest Control Rule monitoring for *S. sagax* (A) and *E. mordax* (B).

CONCLUSION

Both resources are being exploited at maximum sustainable yield, with high biomass status; however, *S. sagax* is considered to be at a precautionary level, as it slightly exceeds the F/F_{MSY} reference point.

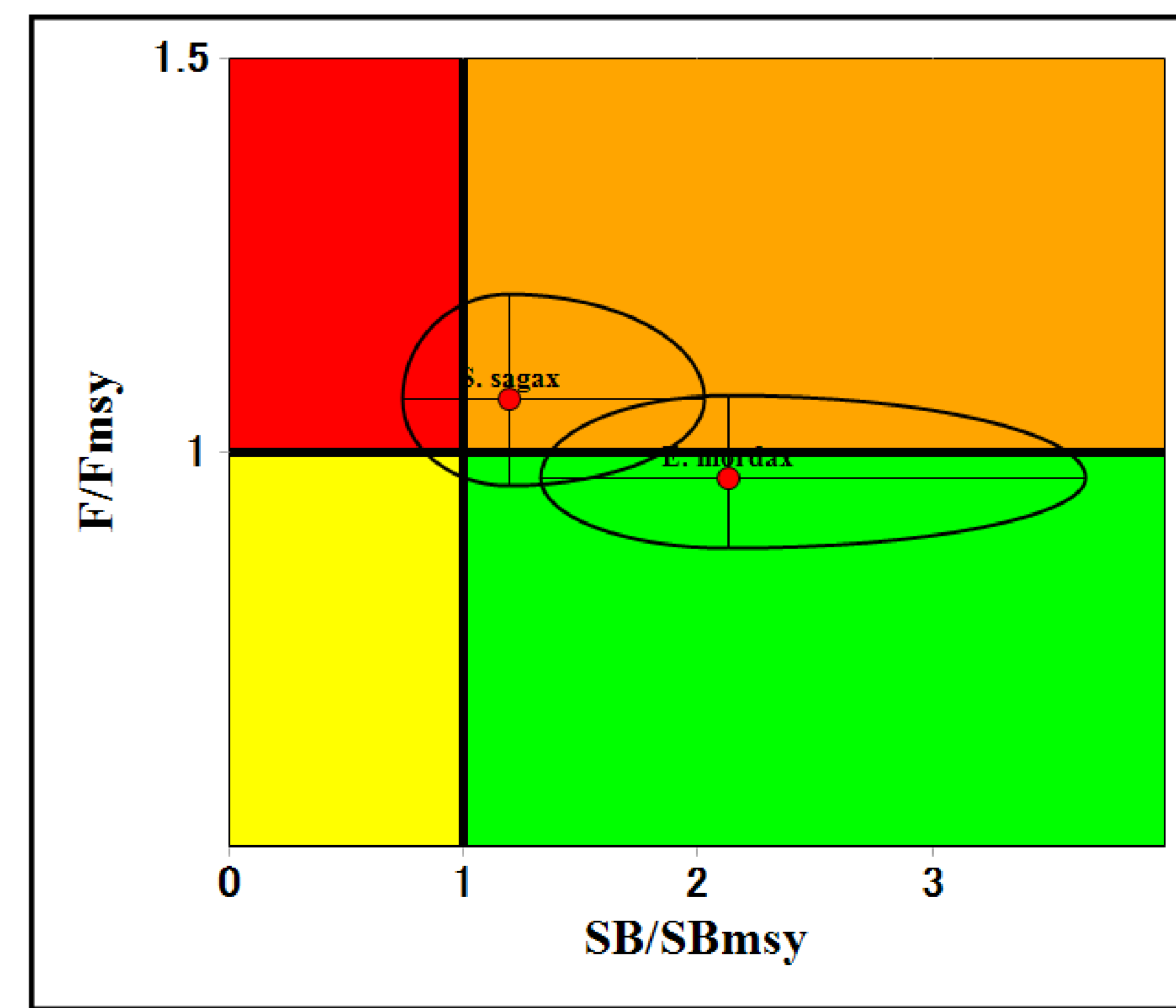


Figure 4.- Status for *S. sagax* and *E. mordax* on the western coast of the Baja California peninsula.

REFERENCES

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