



Fisheries Indicators for the Maryland
Coastal Bays
6/02/10

- The report card website (<http://www.mdcoastalbays.org/content/docs/Report%20Card.pdf>) lists the following undeveloped fisheries indicators:
 - finfish
 - blue crab
 - oysters

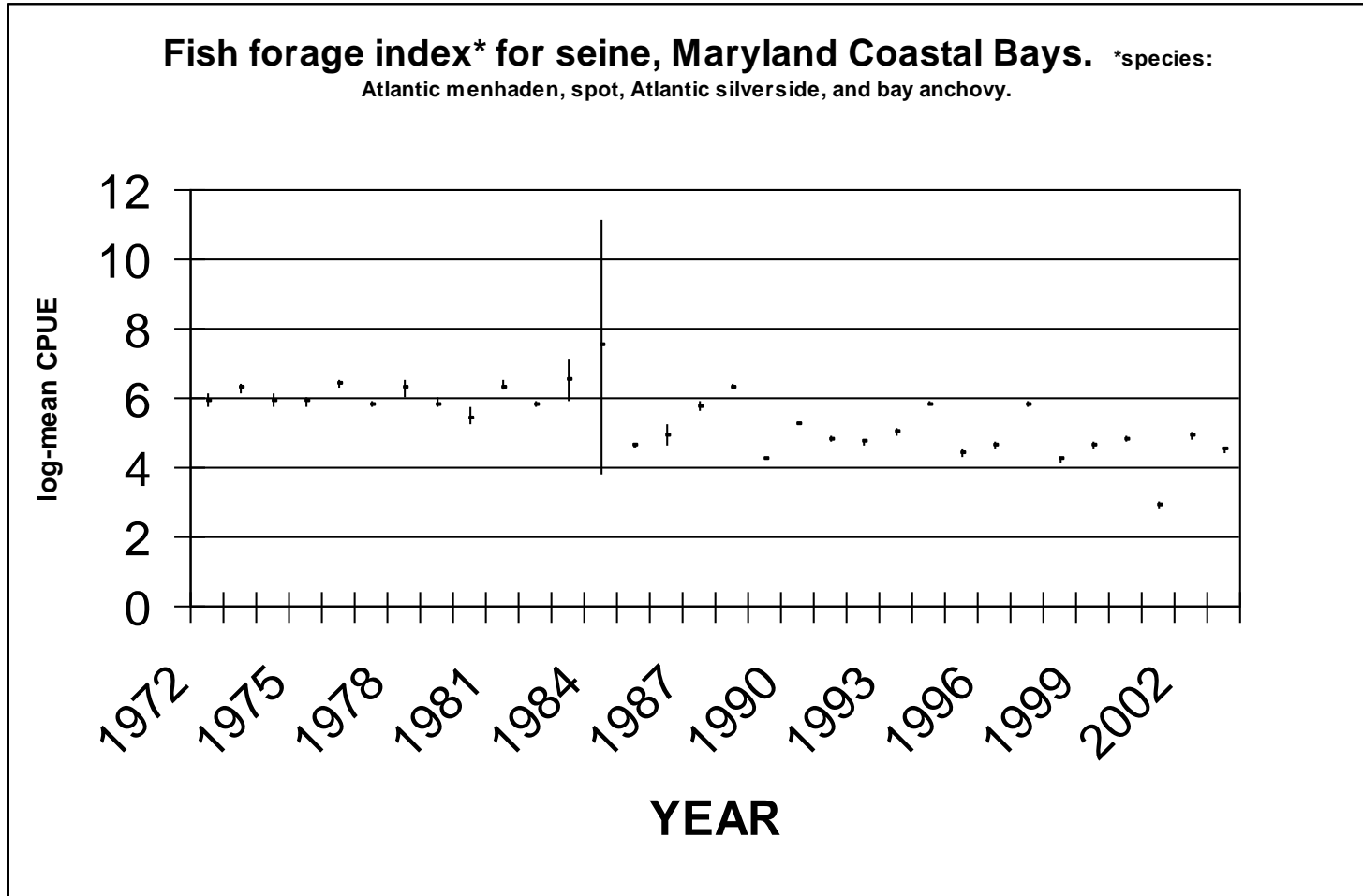
Coastal Bays Fish Index For Report Card

Fisheries Coastal Program has been asked to provide an index of fisheries resources that can be used as an indicator to grade the Coastal Bays.

1. Forage Index
2. Flounder Index
3. Indices suggested in the literature

- Abundance of forage species was examined using a forage index.
 - Log mean CPUE of four forage species (Atlantic menhaden, spot, Atlantic silverside and bay anchovy).
 - These species are forage for both juvenile and adult game fish and may serve as indicators of habitat changes.

Coastal Bays Fish Index For Report Card



Coastal Bays Fish Index For Report Card

Forage Index not used in report card because:

- Driven by spot abundance.
- Atlantic silversides and Atlantic menhaden prefer shallower water while bay anchovy and spot prefer deeper water. The index was either a seine or trawl index, missing one or the other abundance component.
- Spot tend to be very cyclical in abundance.
- Bay anchovy, Atlantic menhaden, and Atlantic silverside recruitment processes are little understood. We don't know how variable the recruitment of these species are.
- Distribution of these species is variable throughout the bays.

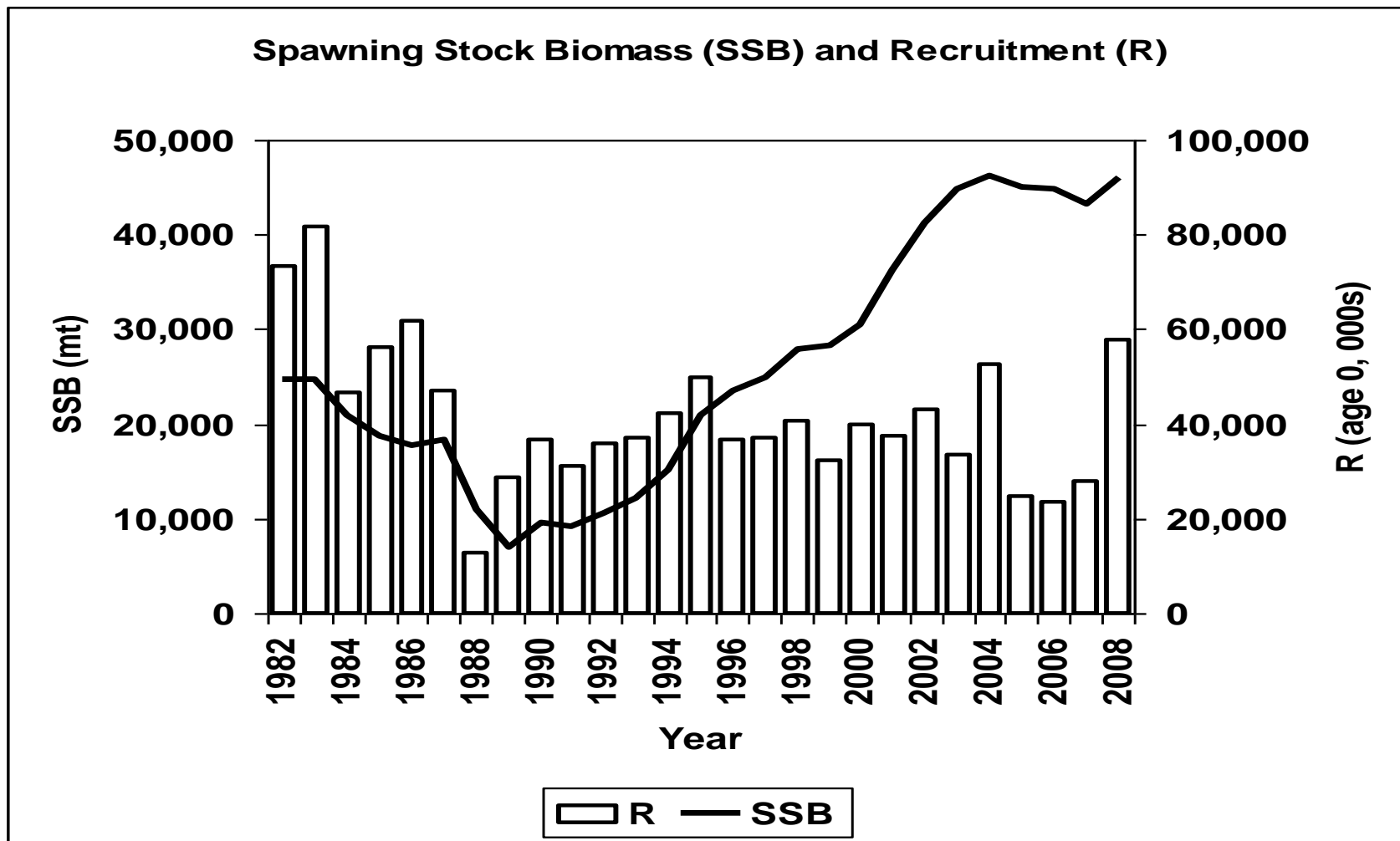


Summer Flounder as an Indicator

Coastal Bays Fish Index For Report Card

Reasons for Using Summer Flounder as an Indicator Species

- Summer flounder are caught at most sites and most months of the year. They have one of the most even distributions of the Coastal Bays of any species we study.
- Summer flounder are a widely recognized species and have commercial and recreational value to the users of the coastal bays resources. Summer flounder make a great 'Poster Child' for an indicator species.
- Recruitment on a coastal scale is the most consistent of any species we study. It varies less from year to year than any other species we have studied. We know a lot about the recruitment variability of this species.
- We are central in the range of the species and they are abundant in the Coastal Bays.
- A good index value will often translate into good fishing several years down the road, making the value in the index something that people can actually see measurable results from.



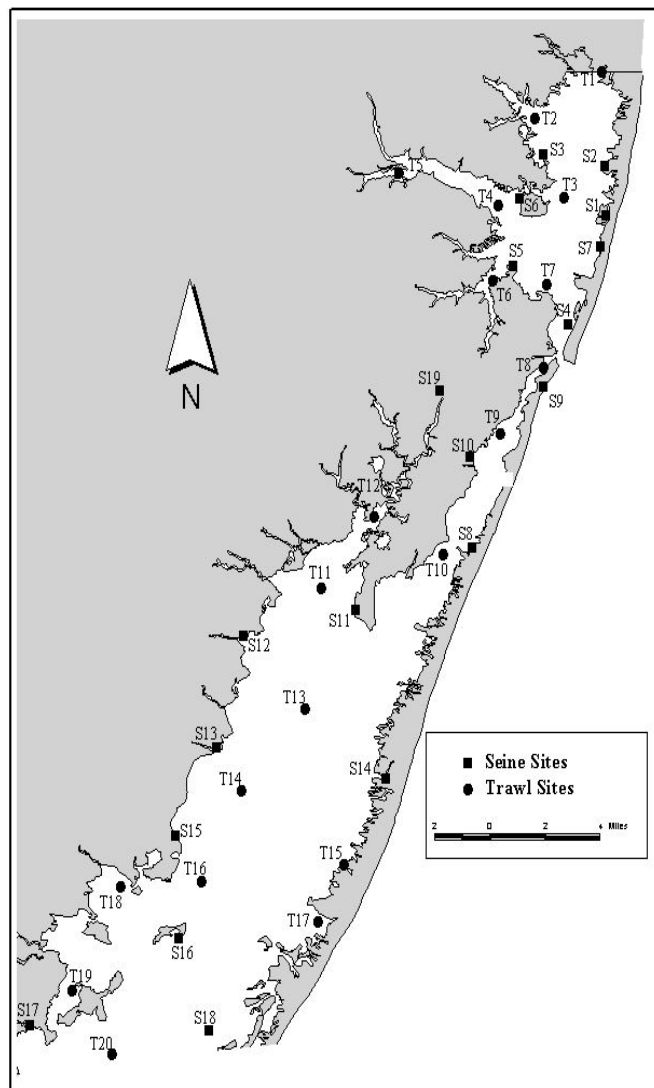
Coastal Bays Fish Index For Report Card

Reasons to Use Percentage of Sites with Summer Flounder as Index

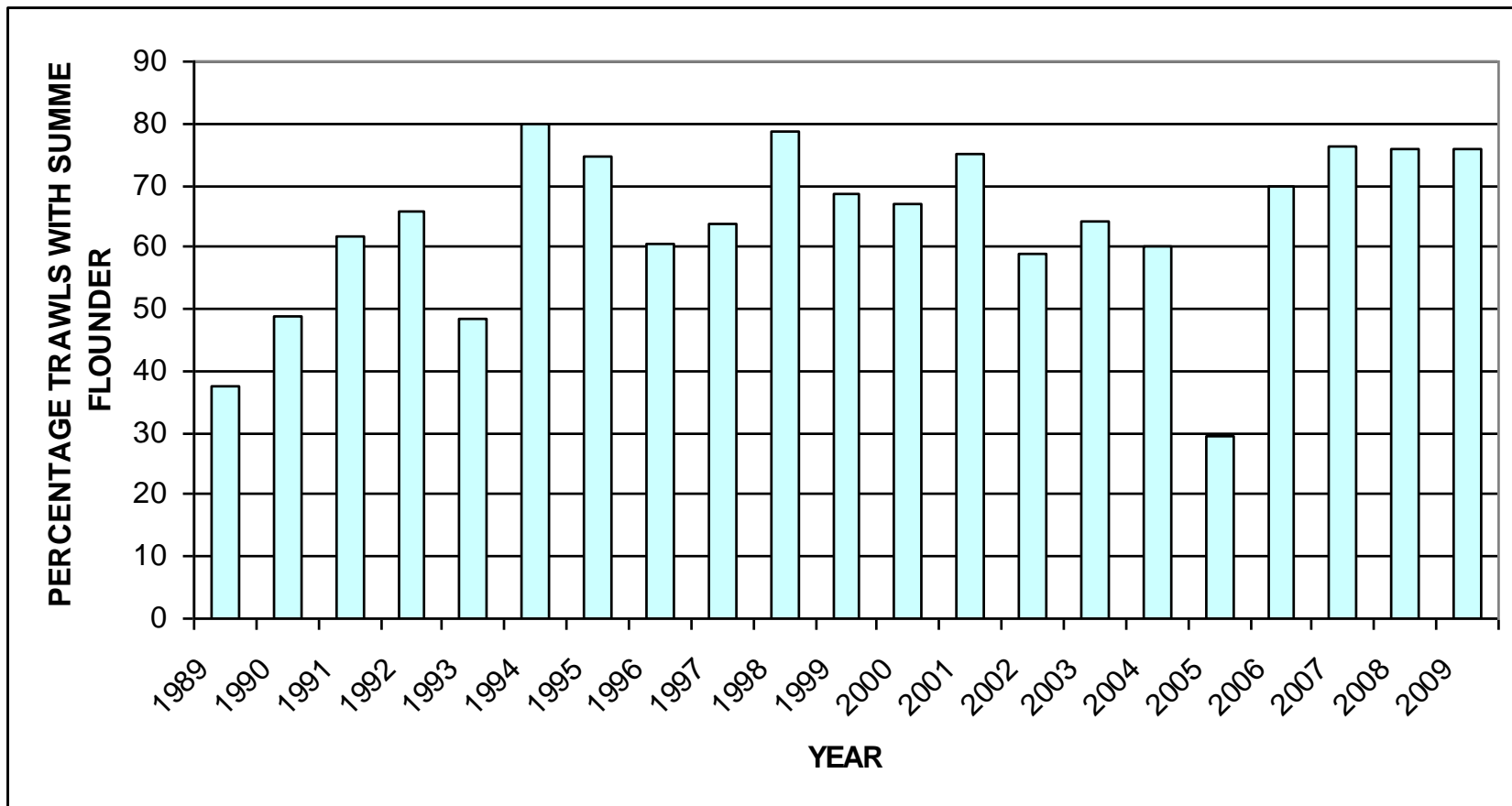
- Summer flounder will avoid a site if habitat quality is compromised at that location, reducing the index value.
- A healthy population will result in a wide dispersion of juvenile summer flounder in the bays and a high index value.
- Better indicator of habitat quality than just an abundance index. While sensitive to fluctuations in the stock status, it is less sensitive than a pure abundance estimate
- Retrospective analysis of recent data indicates that while the stock has continued to improve (SSB) the index plateaus.
- It reflects the coastal stock abundance which is critical to local health of the population. Closes the loop in the association of local fish populations to coastal stocks.
- Easy to understand and translate to the general public.

MARYLAND DEPARTMENT OF NATURAL RESOURCES

Coastal Bays Fish Index For Report Card



Coastal Bays Fish Index For Report Card



Coastal Bays Report Card Summer Flounder Index

- The Maryland Coast Bays Finfish Study does 20 trawls per month at fixed sites, every month April through October for a total of 140 sites per year.
- The index is the percentage of sites that summer flounder are found in a given year.
- A grade would be applied based on the percentage of sites that summer flounder were captured.

70 and above = A

60-69.9 = B

50-50.9 = C

40-40.9 = D

Below 40 = F

Another Index option:

- Index of Biotic Integrity (IBI)
 - Consistent with the Chesapeake Bay Report Card and other components of the Coastal Bays Report Card.

Linder, Cecelia C., James Casey, and Stephen J. Jordan. 1996 Ecological Integrity of Maryland's coastal bays: effects of water quality, physical habitat, and land use characteristics.

– Objectives:

- Develop an IBI for the coastal bays.
- Apply the database to examine long term changes in ecosystem integrity (since 1972) and how these changes may relate to anthropogenic factors.

Linder, Cecelia C., James Casey, and Stephen J. Jordan

- Objective: Apply the database, IBI, and habitat assessments to map and interpret ecosystem integrity for the coastal bays in context of impacts from urbanization, water quality degradation, and habitat disturbance and destruction.

Coastal Bays Fish Index For Report Card

Linder, Cecelia C., James Casey, and Stephen J. Jordan

•IBI Metrics

- Total number of species,
- number of species representing 90% of catch,
- proportion of planktivores,
- proportion of benthivores,
- proportion of carnivores,
- abundance of estuarine spawners,
- abundance of marine spawners,
- total number of fish less menhaden catch,
- total number of blue crabs

Linder, Cecelia C., James Casey, and
Stephen J. Jordan

- Analyses

- Calculated IBI per site, per month
- Correlations of IBI to: chlorophyll *a*, total dissolved nitrogen, total dissolved phosphorus, bottom type.
- Cluster analysis used to describe certain profiles of mean metric values and to rank clusters according to levels of biological integrity.

Linder, Cecelia C., James Casey, and
Stephen J. Jordan

- Outcomes

- At the time, correlation analysis between IBI score and anthropogenic impacts limited by lack of water quality and habitat data.
- More work was needed on the fish habitat assessment, such as distance from shore and amount of structure.

Linder, Cecelia C., James Casey, and
Stephen J. Jordan

- Outcomes

- No significant decrease in IBI score, but CPUE was declining.
- Some species poorly sampled by trawl or beach seine.

Deegan, Linda A., et al. 1997. Development and validation of an Estuarine Biotic Integrity Index. Estuaries 20, No. 3: 601-617.

- Objective: test hypothesis on how estuarine fish assemblages respond to habitat degradation & integrated those responses into an overall index.

Deegan, Linda A., et al.

- EBI Metrics – 15 tested & selected 8:
 - total # of species
 - Dominance
 - fish abundance
 - # of nursery species
 - # of estuarine spawning species
 - # of resident species
 - proportion of benthic-associated fishes
 - proportion abnormal or diseased

Deegan, Linda A., et al.

- Outcomes

- Anthropogenic stress severely alters the function of SAV as habitat for higher trophic levels long before the plants disappear.
- High diversity & abundance of fish in estuarine ecosystems are due to the physical structure of vascular plants that protect YOY from predation, the abundance of food, and a suitable chemical environment. These attributes are three important indicators of the quality of estuarine conditions for fish.

Deegan, Linda A., et al.

- Outcomes

- EBI is a useful indicator of estuarine ecosystem status because it reflects the relationship between anthropogenic alterations in estuarine ecosystems and the status of higher trophic levels.

Other Fisheries Components for the Coastal Bays Report Card

Blue Crabs – An index similar to the one proposed by Steve could be worked on.

Oysters – Not a suitable indicator because of disease.

Coastal Bays Fish Index For Report Card

- Forage Index is not suitable for use in the report card
- Summer Flounder Index would be clear, understandable, and relatable.
- Other, more complicated options exist
 - Would need immediate guidance from STAC to have product by 2011
- What is the timeline for index to be complete?