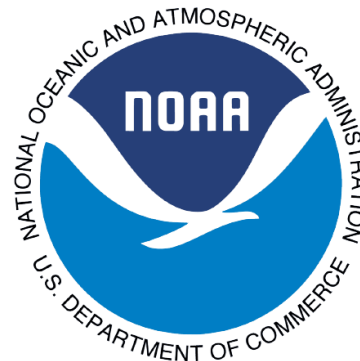


# Fish community change in South Slough from 1987 to 2017

Shon Schooler<sup>1</sup>, Colleen Walker<sup>1</sup>, Bree Yednock<sup>1</sup>, Dan Bottom<sup>2</sup>

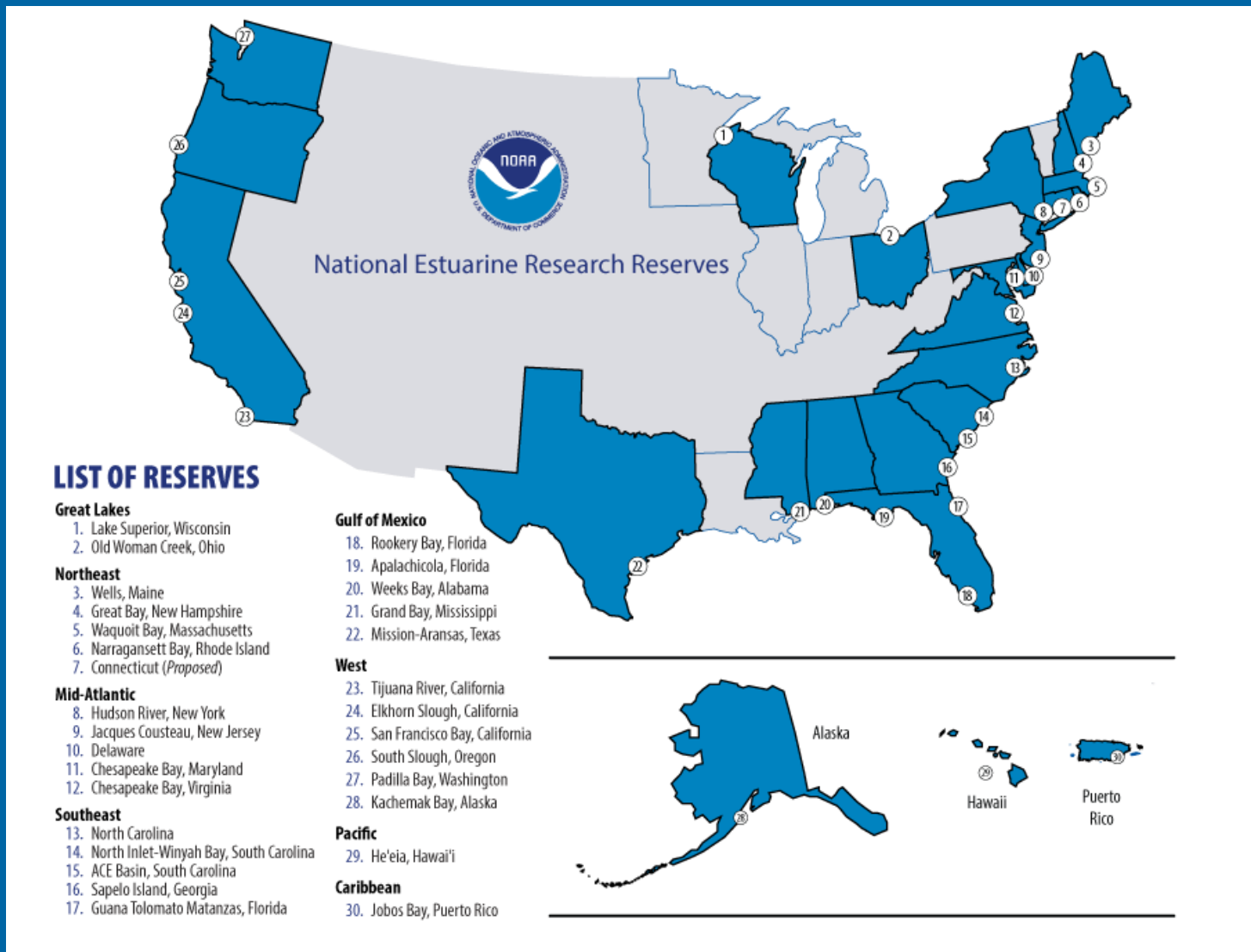
<sup>1</sup>South Slough National Estuarine Research Reserve

<sup>2</sup>Oregon Department of Fish and Wildlife



# National Estuarine Research Reserve System

Partnership: NOAA and Oregon Department of State Lands (DSL)

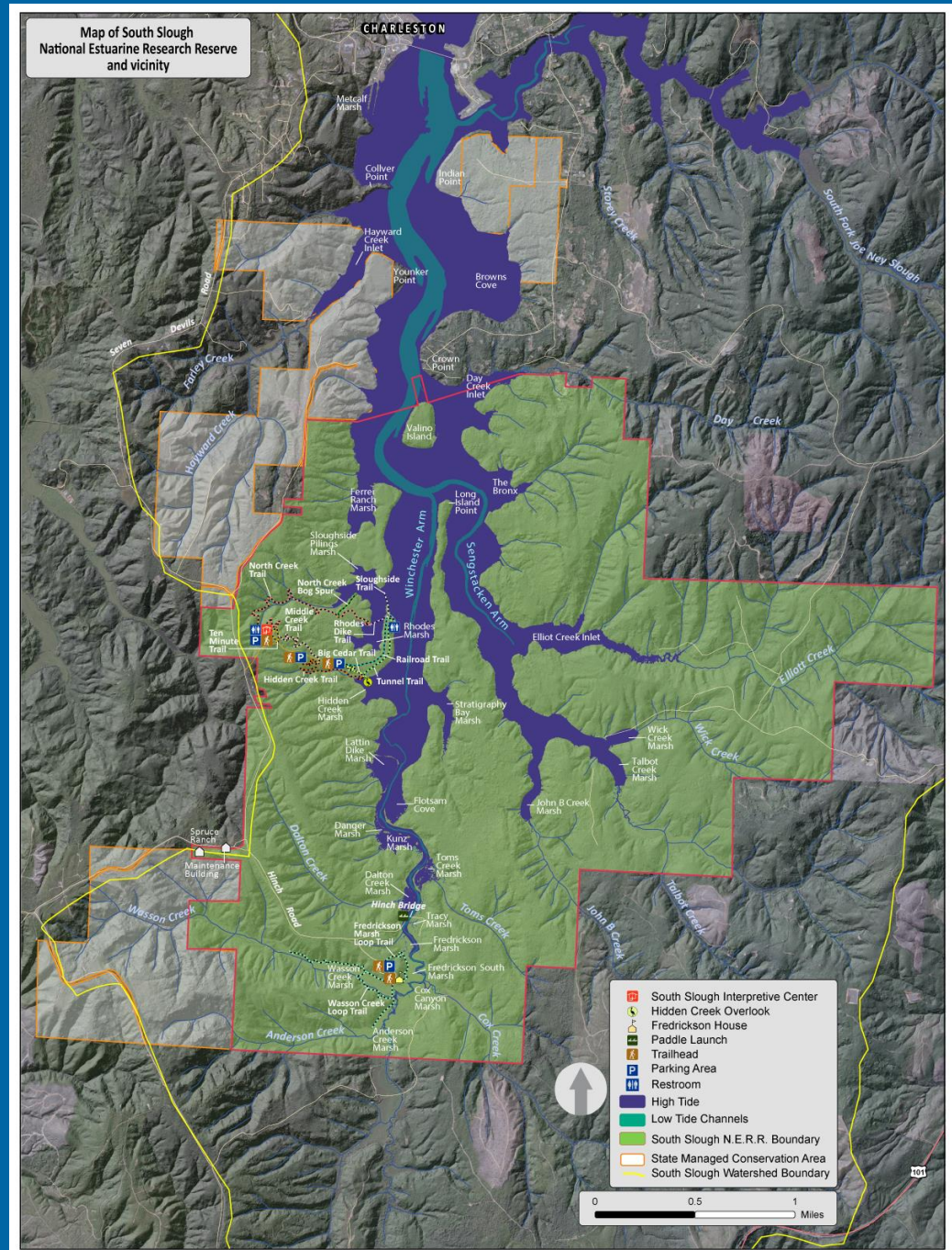


# South Slough National Estuarine Research Reserve (50th anniversary!)

6,000 acre protected area for:

- Research
- Stewardship
- Education
- Recreation

*Improve the understanding and stewardship of Pacific Northwest estuaries and coastal watersheds*



# South Slough is a dynamic system

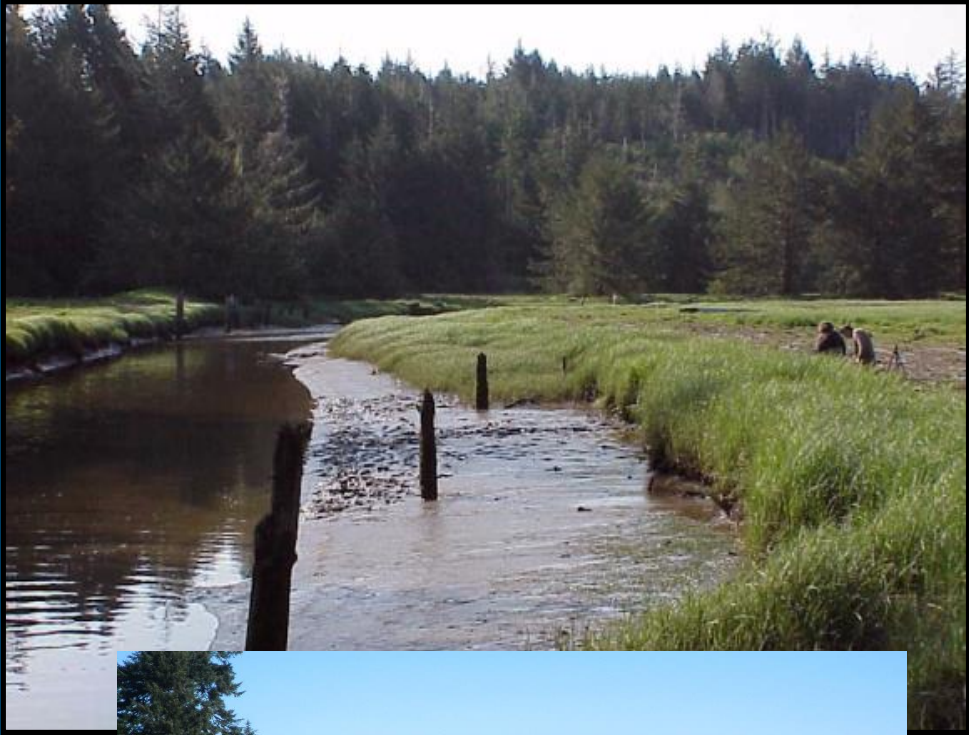
High tide



Low tide



# South Slough has diverse habitats



# Question: How has the fish community changed over time?

NOAA TECHNICAL REPORT SERIES OCRM/SPD

FISH COMMUNITY STRUCTURE, STANDING CROP, AND PRODUCTION  
IN UPPER SOUTH SLOUGH (COOS BAY), OREGON

by

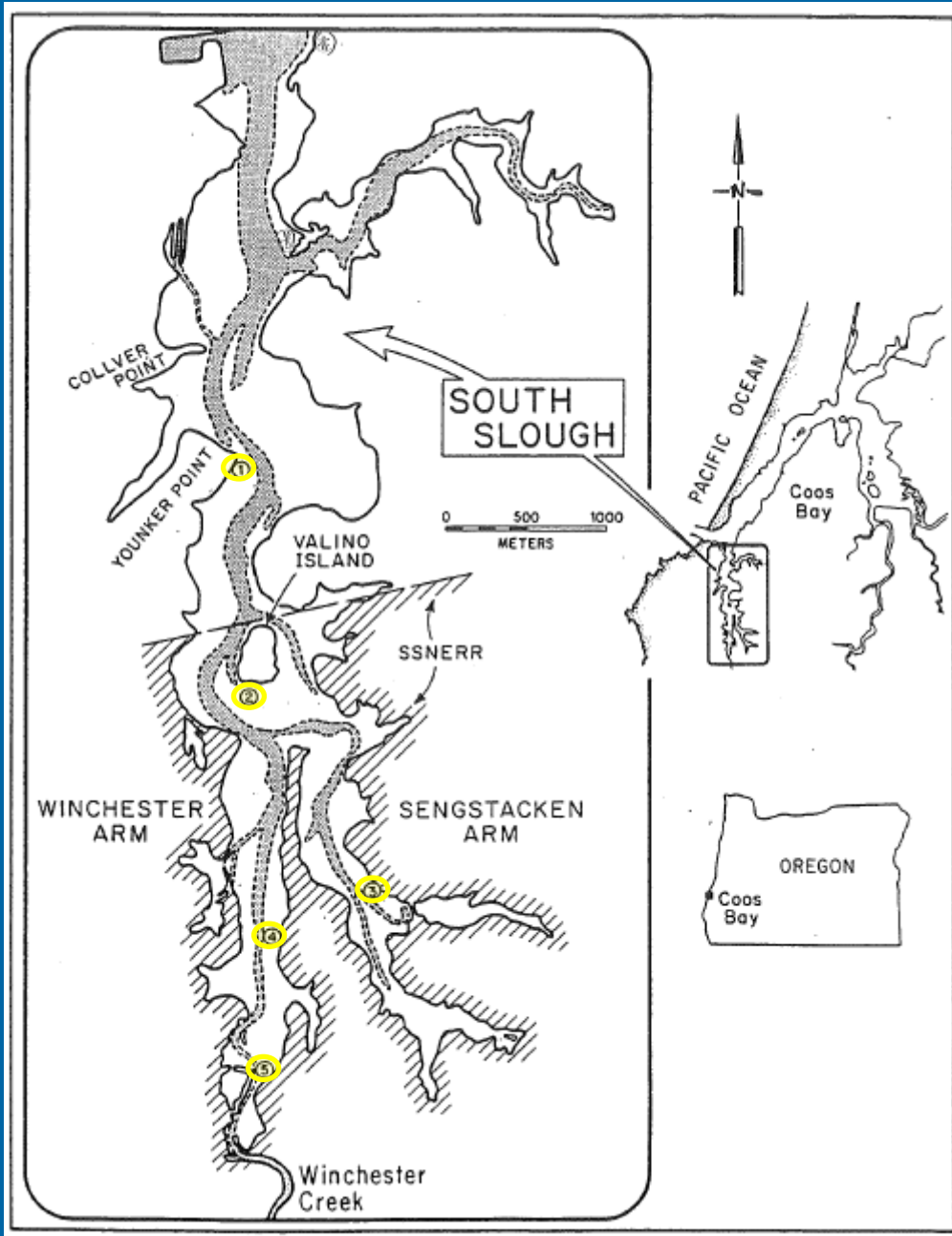
DANIEL L. BOTTOM  
KIM K. JONES  
JEFFREY D. RODGERS

OREGON DEPARTMENT OF FISH AND WILDLIFE  
506 SW MILL STREET  
P.O. BOX 59  
PORTLAND, OREGON 97207

Report from 1987

# Fish Community Structure, Standing Crop and Production in Upper South Slough

Daniel L. Bottom  
Kim K. Jones  
Jeffrey D. Rodgers

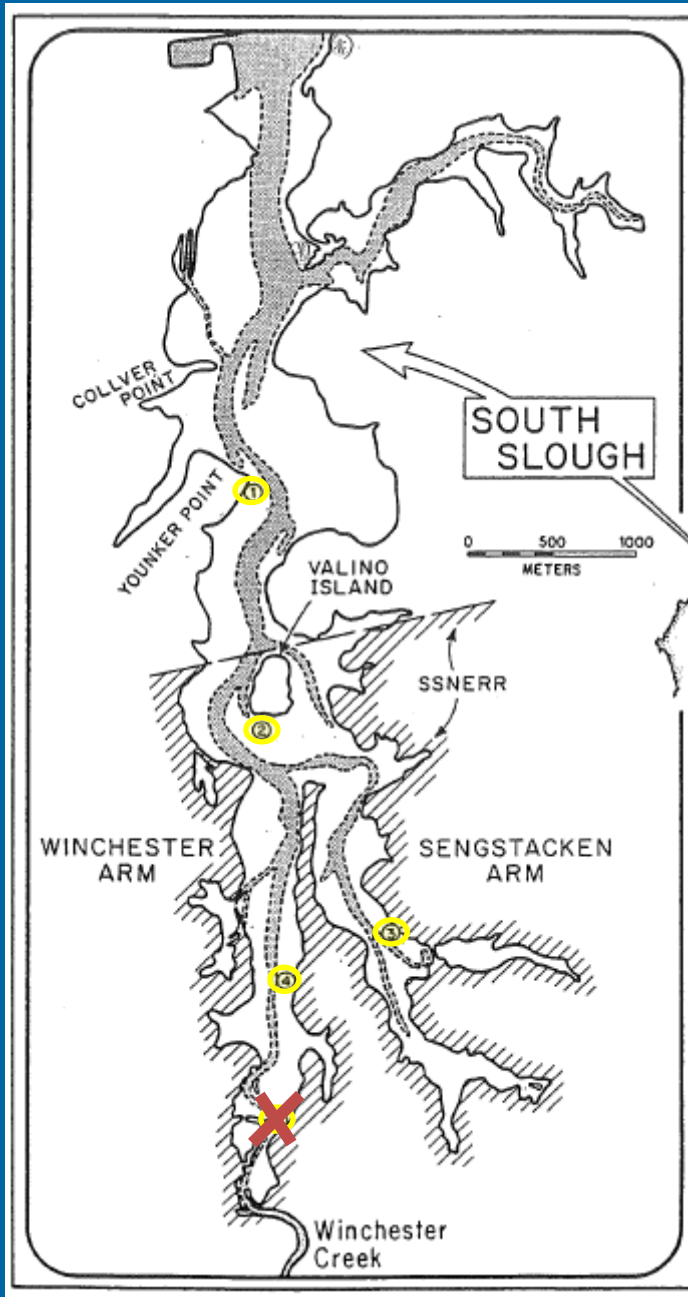


5 sites, sampled 4 times in 1987  
*April, June, July, October*

33 Species documented

# Replicated methods at same sites using same gear in 2016-2017

- Seine net (constructed to same specifications)
- Deployed by boat
- Four sites (same locations, couldn't sample one)
- Same time of year (April-May through October)
- Same measurements (species, abundance, size, weight)
- Acquired original 1987 hard data and entered it into database (from Dan Bottom)



# Sites sampled

| Site                  | Tides sampled | Lat.   | Long.    | Description   |
|-----------------------|---------------|--------|----------|---|
| Valino Island (VI)    | H, L          | 43.31  | -124.321 | Mid estuary: Sandbars, eelgrass, emergent wetlands.   |
| Yunker Point (YP)     | H, L          | 43.323 | -124.323 | Low estuary: Mudflats, sandbars, rooted algae.        |
| Winchester North (WN) | H             | 43.297 | -123.319 | Upper estuary: Mudflats, eelgrass, emergent wetlands. |
| Sengstacken (S)       | H             | 43.297 | -124.311 | Upper estuary: Mudflats, eelgrass, emergent wetlands. |







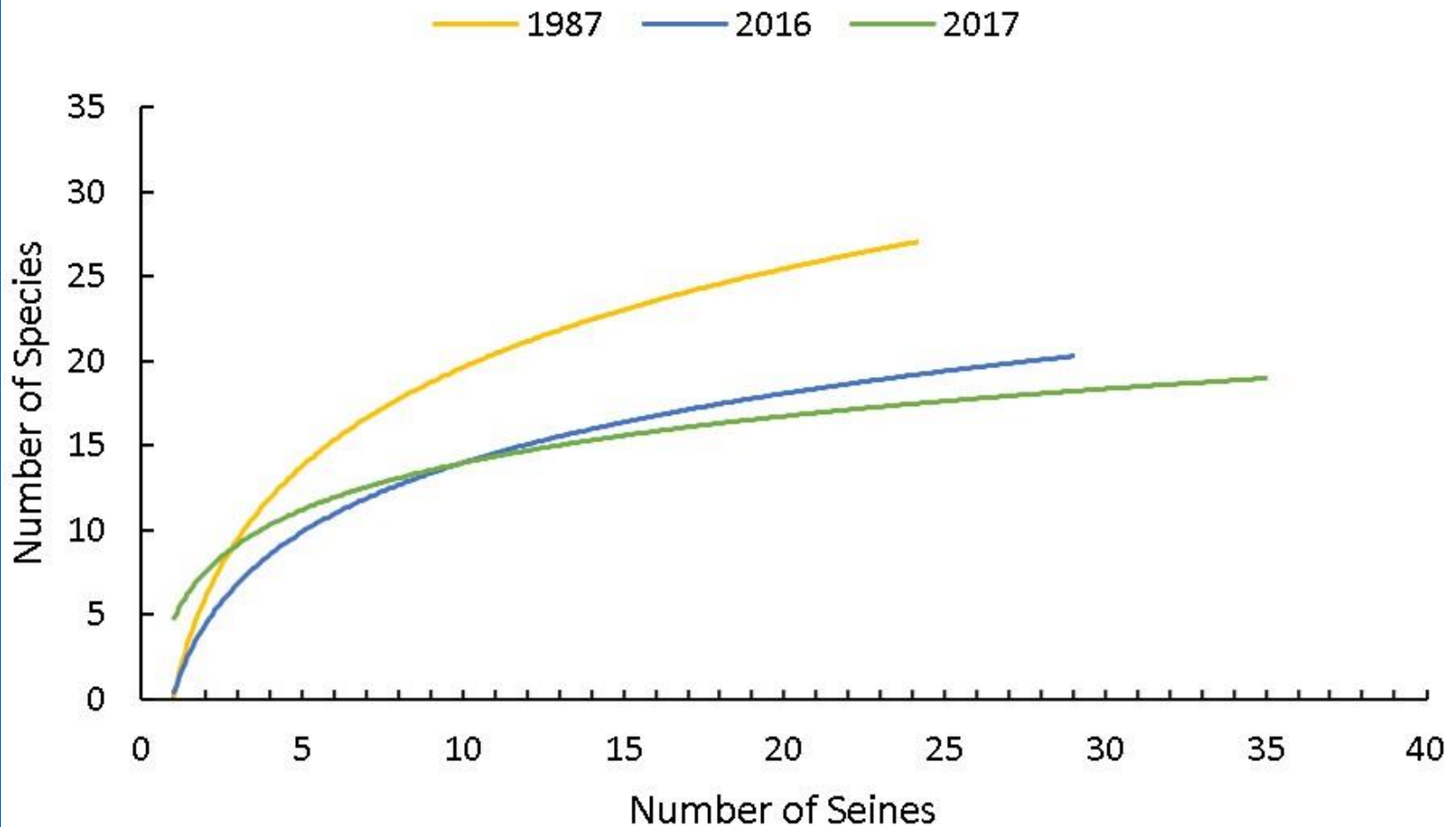


# Results

## Description of fish community sampling (based on directly comparable data):

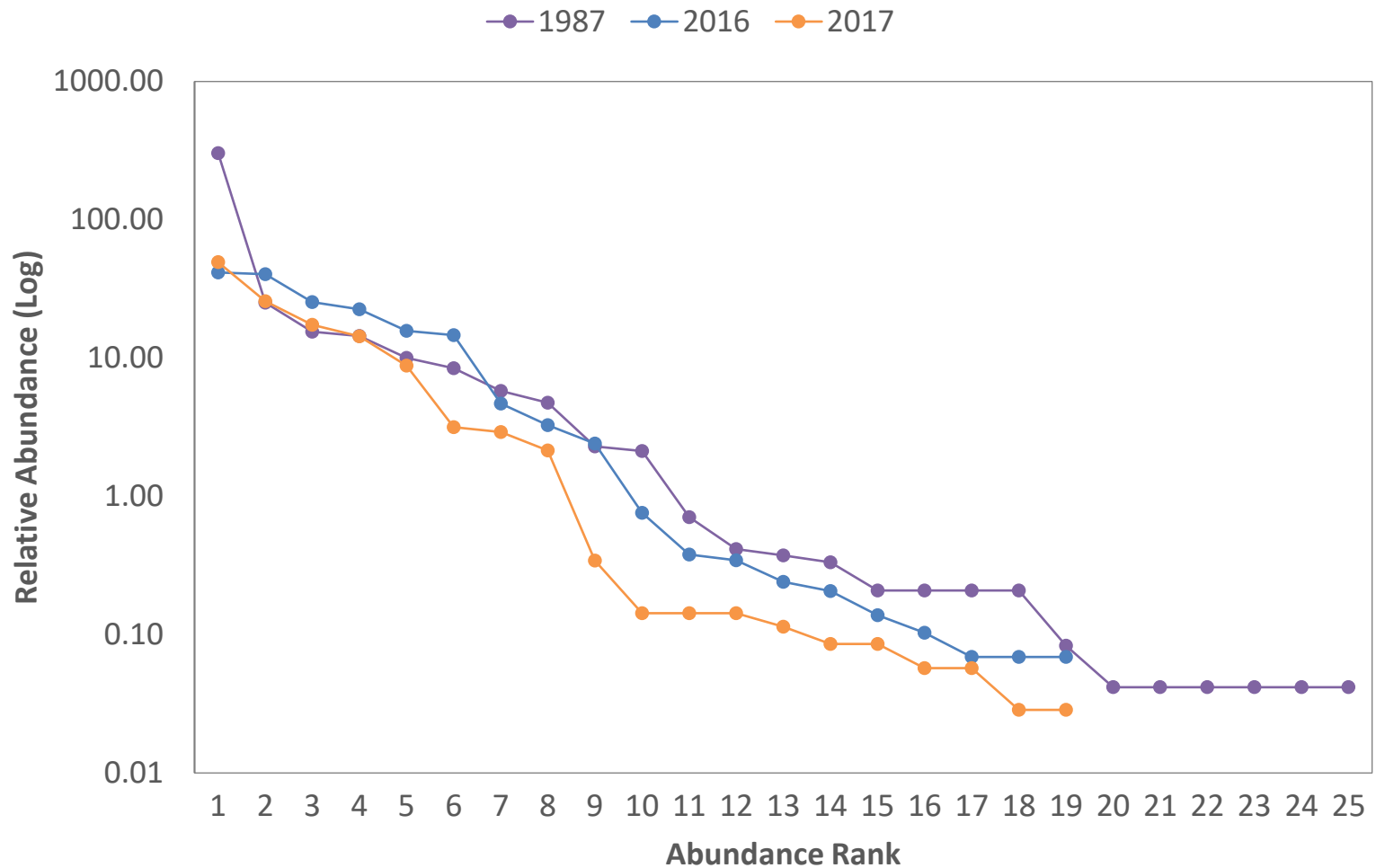
|                              | 1987                        | 2016                        | 2017                        |
|------------------------------|-----------------------------|-----------------------------|-----------------------------|
| <b>Number sites</b>          | 4 (S,WN,VI,YP)              | 4 (S,WN,VI,YP)              | 4 (S,WN,VI,YP)              |
| <b># Seines (total)</b>      | 24                          | 29                          | 35                          |
| <b>Months</b>                | 4,6,7,10                    | 5,6,7,8,9,10                | 5,6,7,8,9,10                |
| <b>Tides</b>                 | H, L (WN and S = High only) | H, L (WN and S = High only) | H, L (WN and S = High only) |
| <b># Fish species</b>        | 25                          | 19                          | 19                          |
| <b>Fish abundance</b>        | 9,987                       | 6,614                       | 4,384                       |
| <b>Estimated biomass (g)</b> | 182,171                     | 85,607                      | 15,395                      |

# Species richness



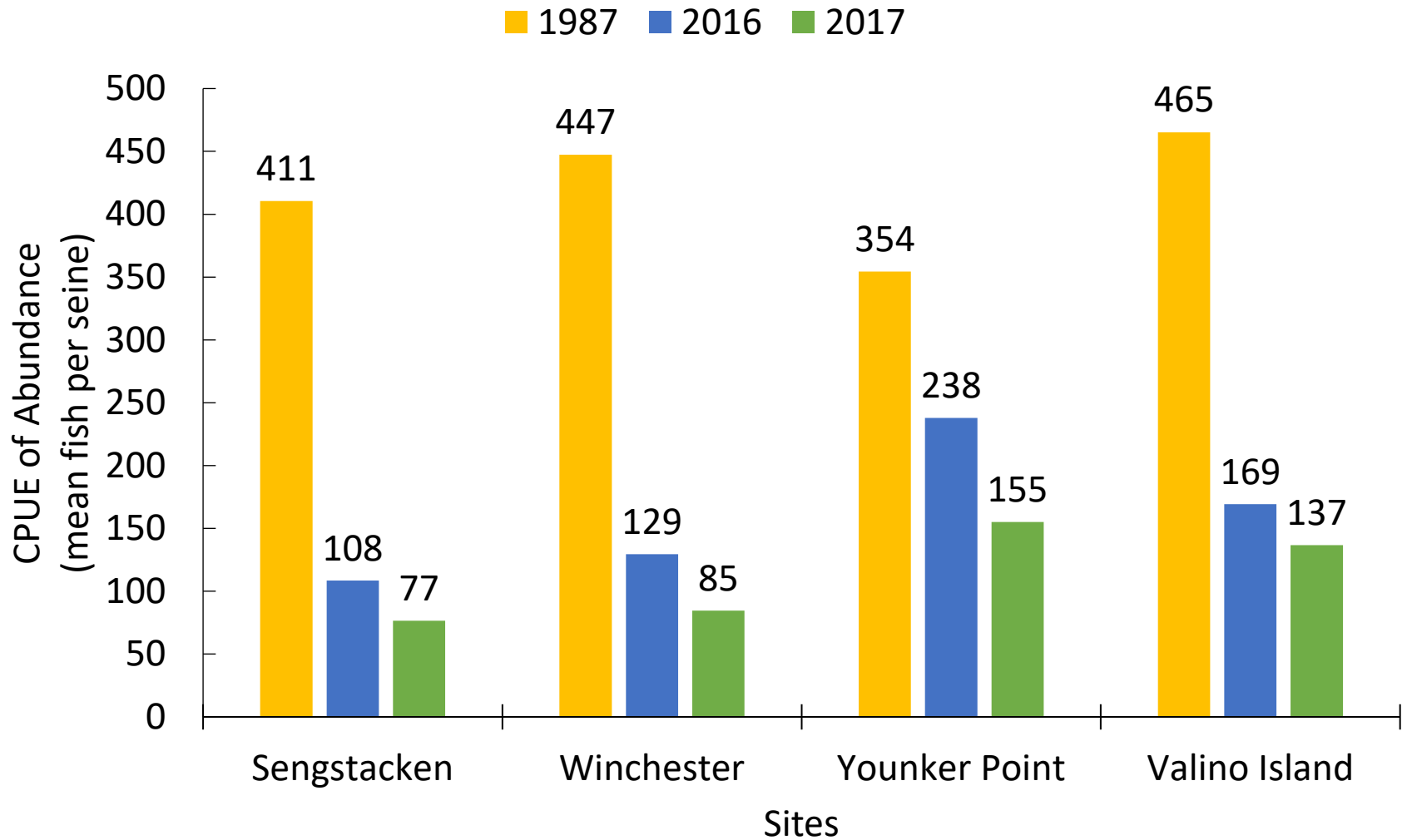
Species accumulation curves

# Community structure

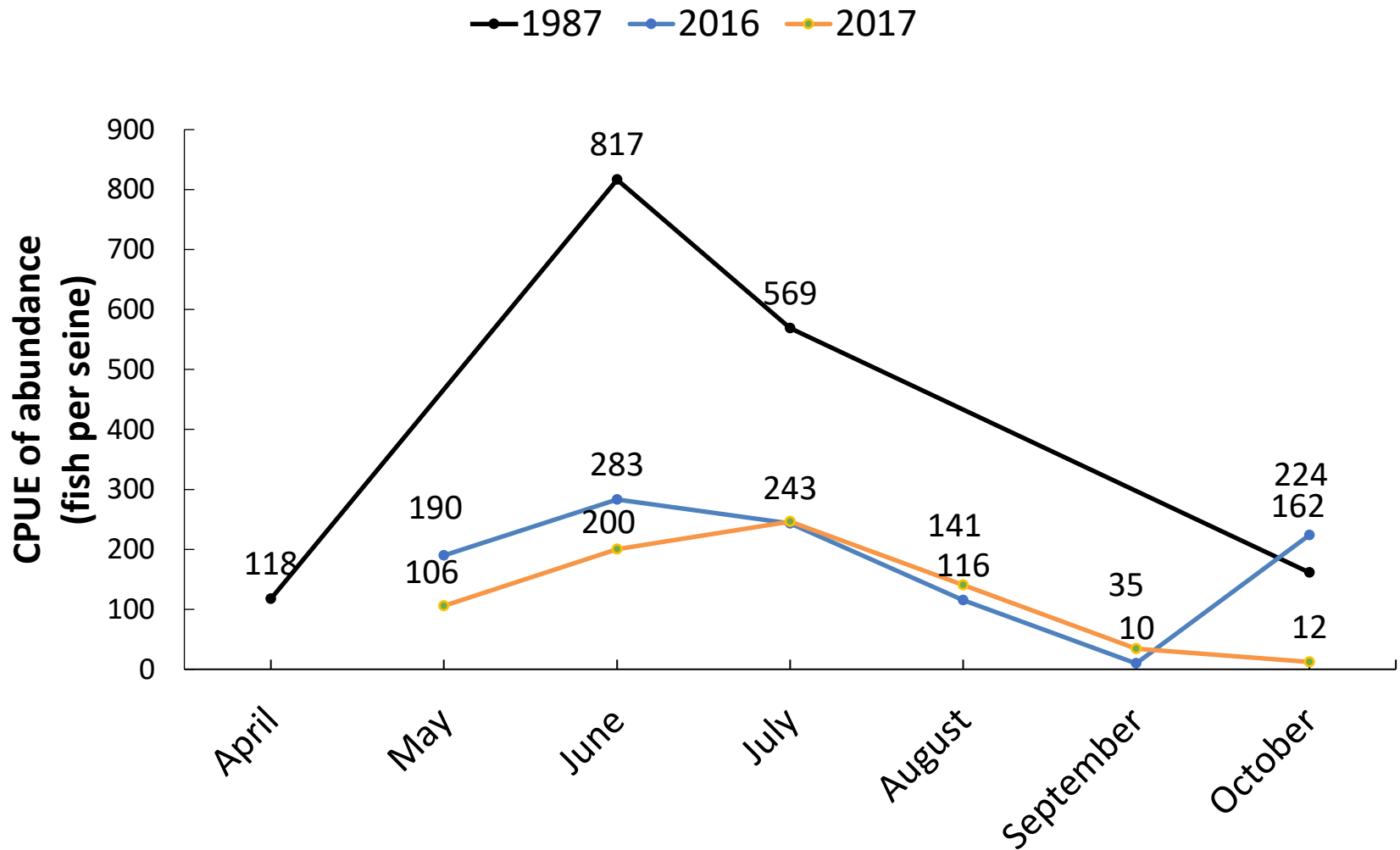


Rank abundance curves

# Abundance by site



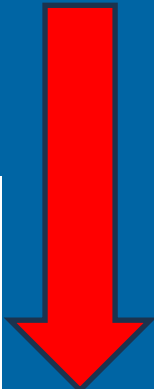
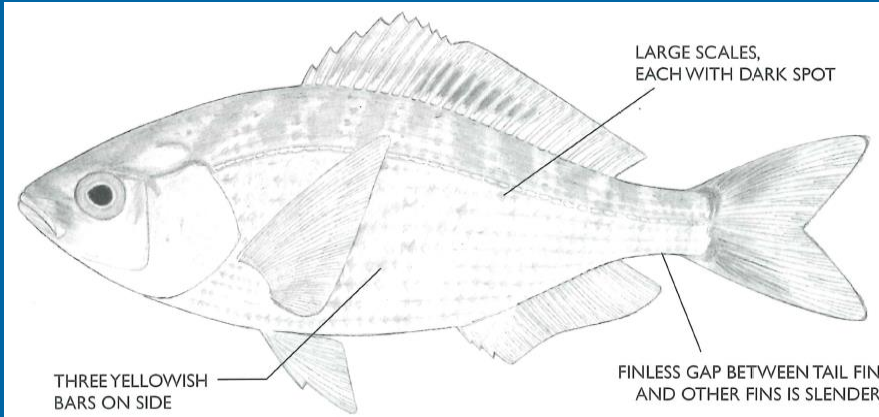
# Abundance over seasons



# Change in abundance

| Fish species             | 1987 CPUE   | 2016-2017 Mean CPUE | Change       |
|--------------------------|-------------|---------------------|--------------|
| Shiner perch             | 303.92      | 8.91                | -295.00      |
| White seaperch           | 14.42       | 0.26                | -14.16       |
| Walleye surfperch        | 8.46        | 0.00                | -8.46        |
| Pacific staghorn sculpin | 30.67       | 24.18               | -6.49        |
| Pile perch               | 2.29        | 0.03                | -2.26        |
| Saddleback gunnel        | 2.13        | 0.00                | -2.13        |
| Surfsmelt                | 4.75        | 3.42                | -1.33        |
| Topsmelt                 | 25.21       | 24.64               | -0.57        |
| Striped seaperch         | 0.42        | 0.00                | -0.42        |
| Kelp greenling           | 0.21        | 0.00                | -0.21        |
| <b>Starry flounder</b>   | <b>0.71</b> | <b>0.55</b>         | <b>-0.16</b> |
| Bay pipefish             | 0.21        | 0.10                | -0.11        |
| Lingcod                  | 0.08        | 0.00                | -0.08        |
| Chum Salmon              | 0.04        | 0.00                | -0.04        |
| Pacific sand lance       | 0.04        | 0.00                | -0.04        |
| Penpoint gunnel          | 0.04        | 0.00                | -0.04        |
| Speckled sanddab         | 0.21        | 0.19                | -0.02        |
| American shad            | 0.21        | 0.19                | -0.02        |
| Green sturgeon           | 0.04        | 0.03                | -0.01        |
| Steelhead                | 0.04        | 0.04                | 0.00         |
| Cabezon                  | 0.00        | 0.01                | 0.01         |
| Buffalo sculpin          | 0.00        | 0.03                | 0.03         |
| Bay goby                 | 0.00        | 0.09                | 0.09         |
| Coho salmon              | 0.04        | 0.15                | 0.10         |
| Coastal cutthroat trout  | 0.00        | 0.12                | 0.12         |
| Pacific sardine          | 0.00        | 1.64                | 1.64         |
| Chinook salmon           | 0.38        | 2.66                | 2.29         |
| Pacific herring          | 15.50       | 32.55               | 17.05        |
| Northern anchovy         | 0.33        | 21.42               | 21.09        |
| English sole             | 5.79        | 27.98               | 22.19        |

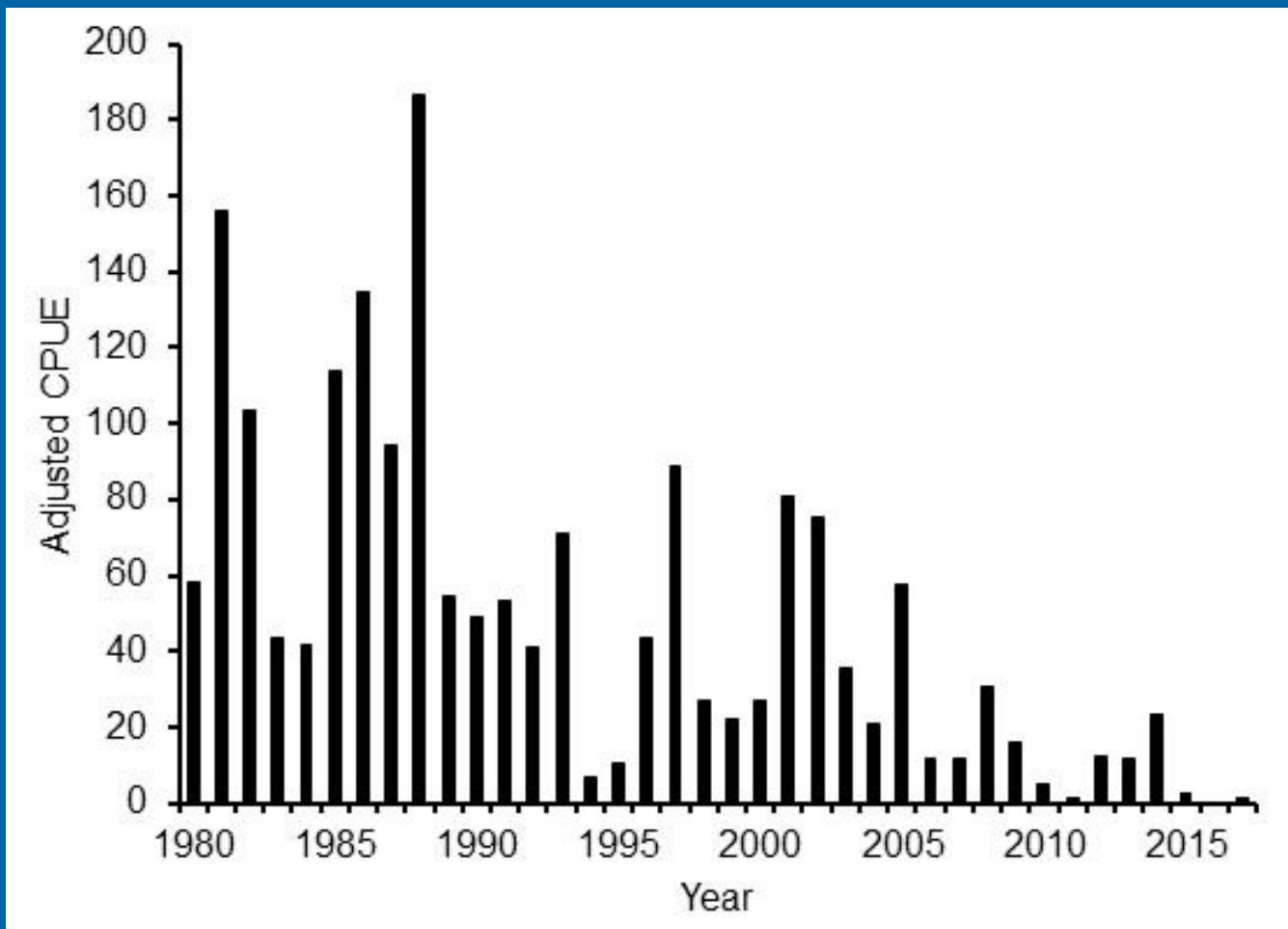
# Shiner Perch – *Cymatogaster aggregata*



Male in winter and spring

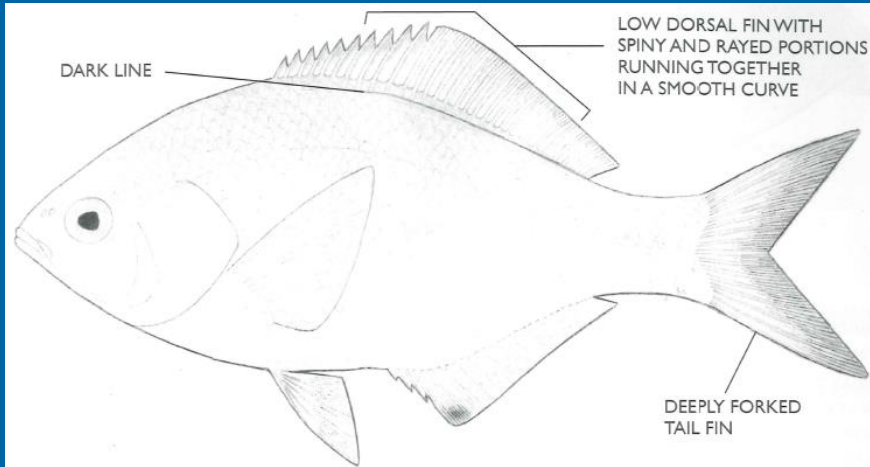
**Characteristics** – vertical light yellow bars on sides of body, crossing faint horizontal stripes; anal fin with 3 spines; males are nearly black in winter and spring  
**Size:** up to 8 inches  
Favor eelgrass habitat.





**Figure 1-4.** Shiner perch abundance indices from the Interagency Ecological Program San Francisco Bay Study: 1980 to 2017 (CDFW Bay Study 2019)

# White Seaperch— *Phanerodon furcatus*

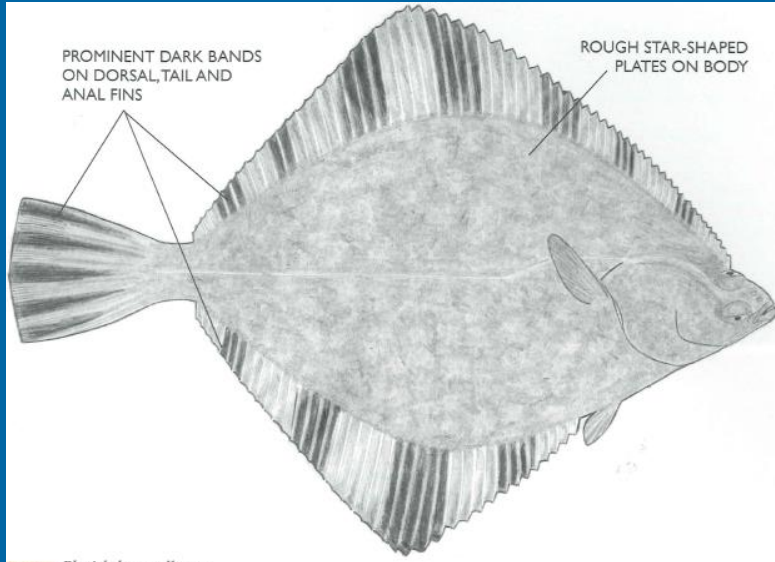


**Characteristics** – anal fin with three spines; body oval in shape, low dorsal fin with spiny and rayed portion running together in a smooth curve, there is a black line along the base of the soft dorsal, deeply forked tail. Silvery white along dorsal surface and sides, yellow at base of pelvic and anal fins. Both sexes may appear deep gray in color during the winter months.

**Size:** up to a foot



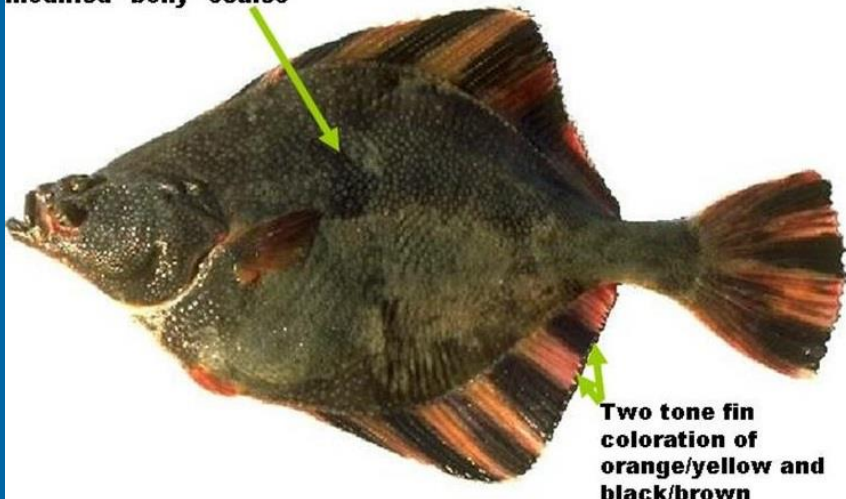
# Starry Flounder — *Platichthys stellatus*



**Characteristics** – fins striped with black; orange to whitish between colored bands in dorsal, anal, and caudal fins

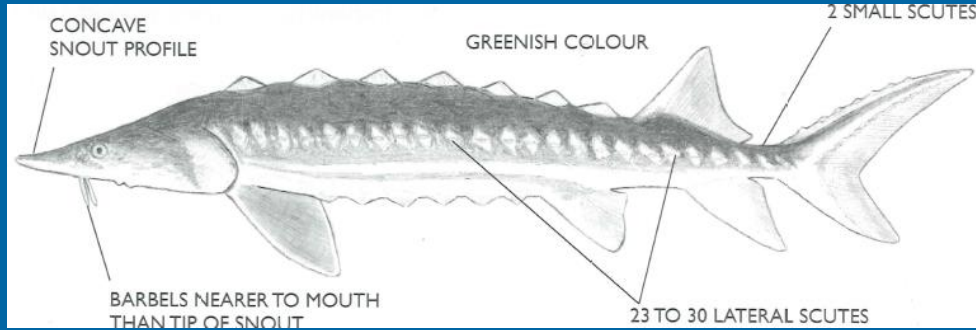
**Size:** up to 3 feet

**Eyed side covered with modified “bony” scales**



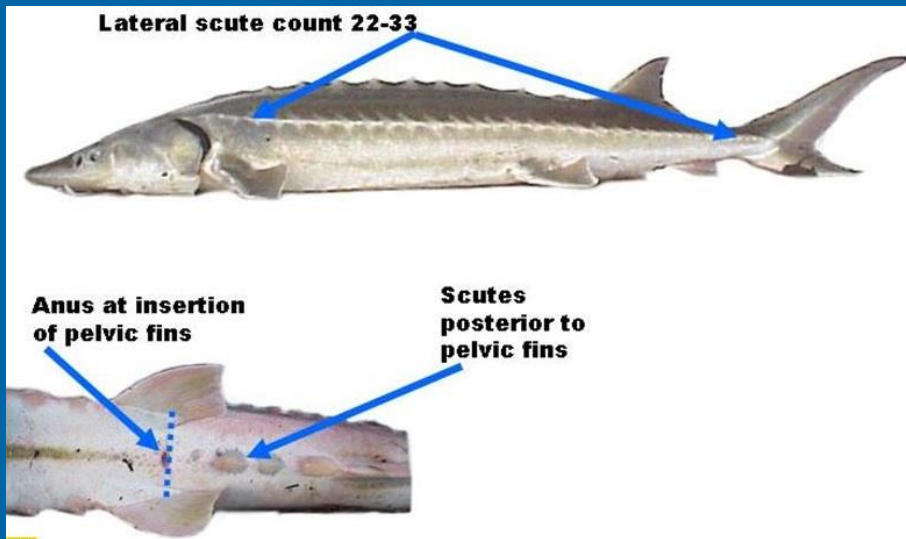
# Green Sturgeon— *Acipenser medirostris*

=

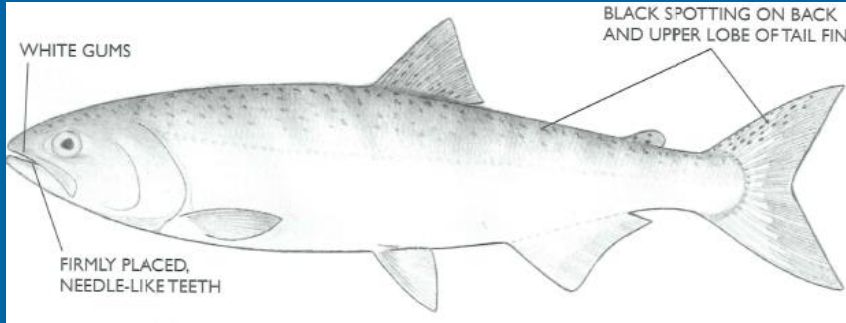


**Characteristics** – long snout with four underlying barbels placed nearer the mouth than the tip of the snout; 23 to 30 sharp bony scutes in main row on each side of body; green stripe running down the middle of the ventral surface. blotched olive green on dorsal surfaces, silvery sides

**Size:** up to 7 feet

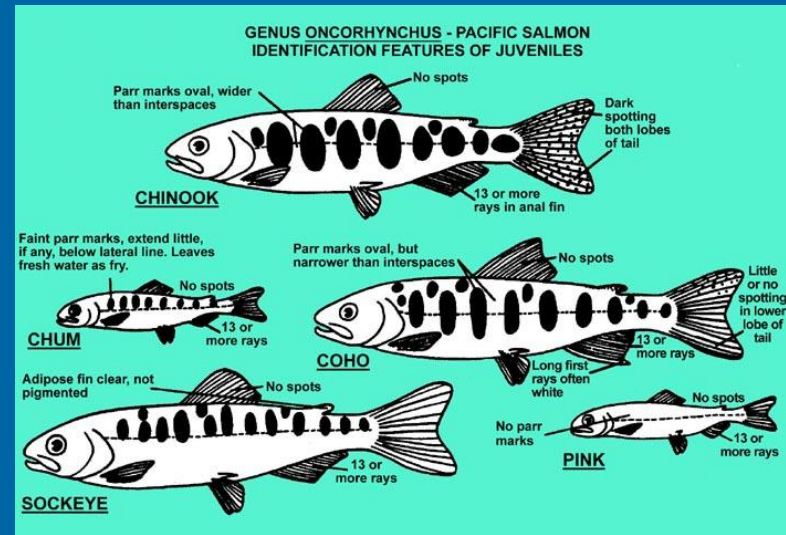


# Coho Salmon – *Oncorhynchus kisutch*

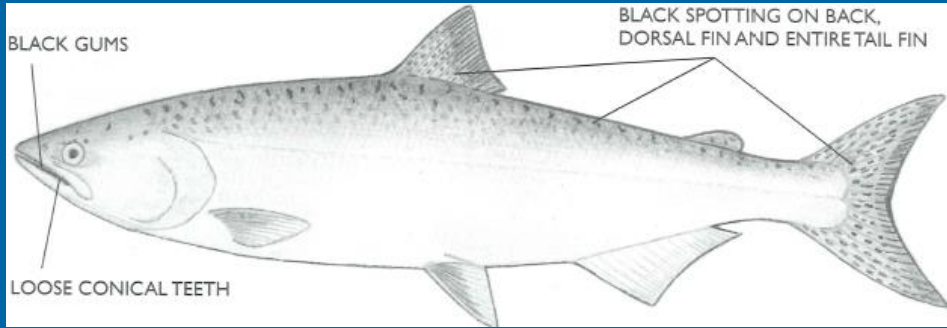


**Characteristics** – may have pale orange fins, parr marks (8-12) that are narrower than the spaces in between them, dorsal and anal fins with the leading edge white followed by black ; leading edge of anal fin when folded against body ends after the half way point; ; if spots are present on the caudal fin they will be on only the top lobe.

**Size:** up to 3 feet



# Chinook Salmon— *Oncorhynchus tshawytscha*

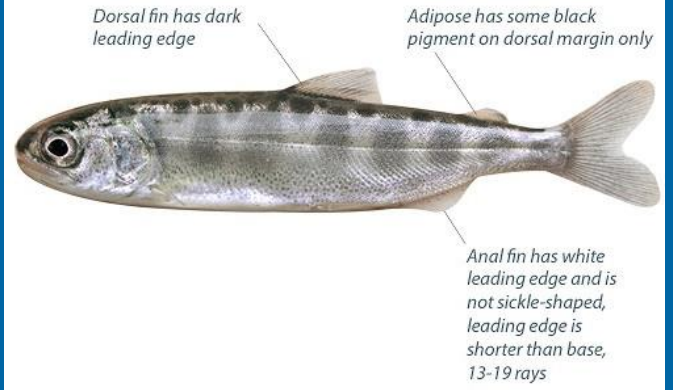


**Characteristics** – parr marks (6-12) on sides are wider than the spaces in between them, a dorsal fin that usually has a dark leading (anterior) edge; leading edge of anal fin when folded against body ends slightly before the half way point; if spots are present on the caudal fin they will be on both the top and lower lobes

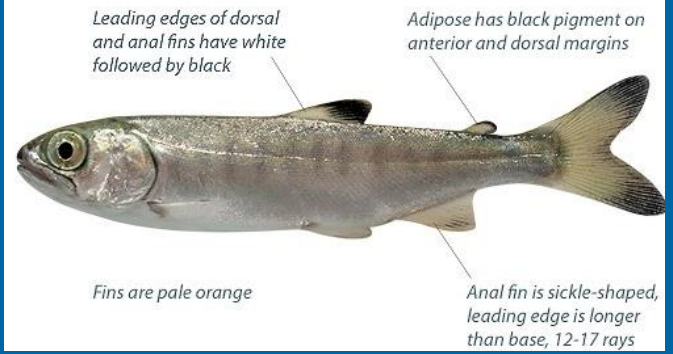
**Size:** up to 3 feet



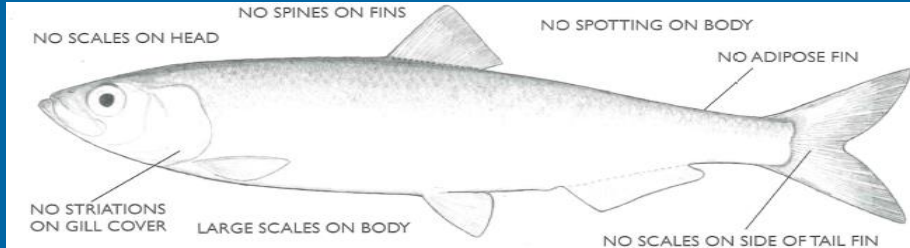
# Chinook (*Oncorhynchus tshawytscha*)



# Coho (*Oncorhynchus kisutch*)



# Pacific Herring – *Clupea harengus pallasii*



Larva ( 22mm)



Young of the year ( 35 - 50 mm)



Juvenile ( 85 mm)

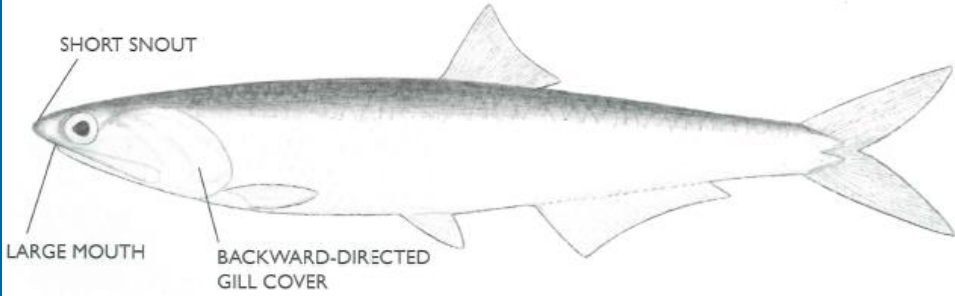


**Characteristics** – easily removed scales, bluish green on back, silvery on sides and bottom but no stripe like topsmelt, **no black spots on upper sides**; , migrate into bays to spawn in winter – enormous numbers of adhesive eggs are laid on rocks, eelgrass, sea weed and pilings. Foremost baitfish

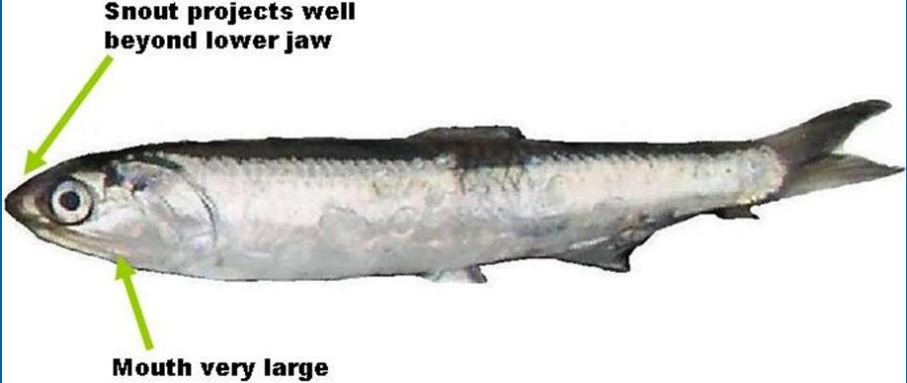
**Size:** up to 18 inches



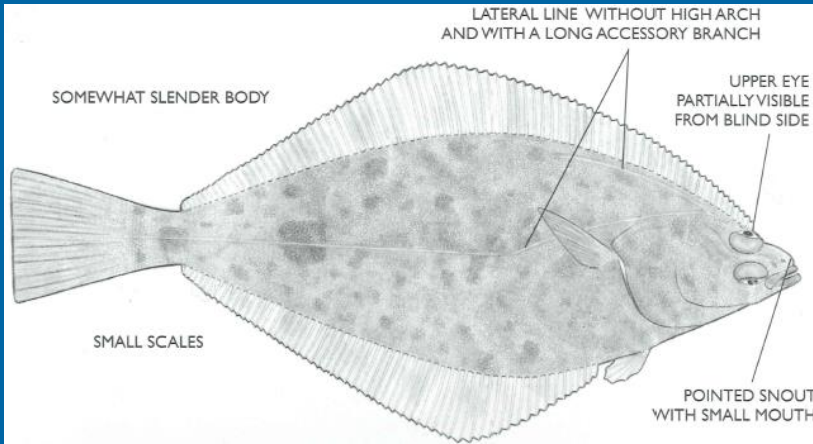
# Northern Anchovy – *Engraulis mordax*



**Characteristics** – Large mouth with gill rakers inside; projecting snout; large forward eye; metallic bluish or greenish on dorsal surface, silvery on sides  
**Size:** up to 9 inches

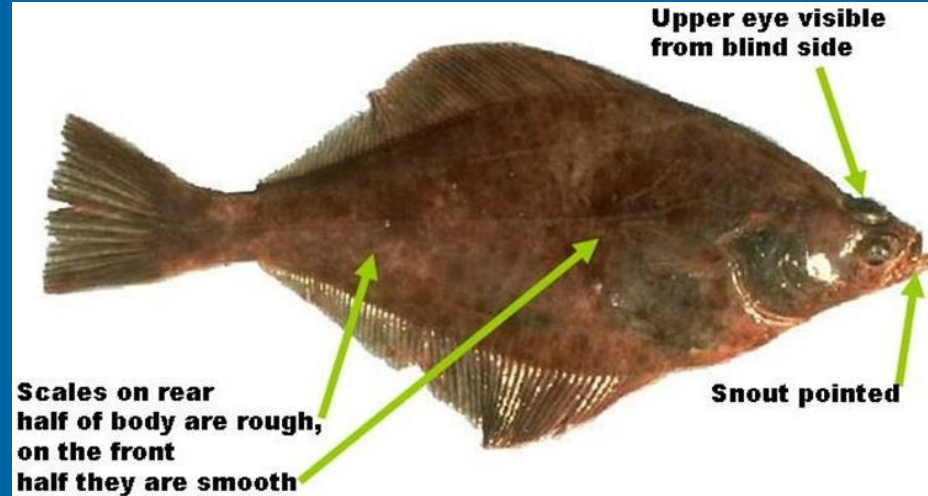


# English Sole — *Parophrys vetulus*



**Characteristics** –right-eyed flounder; pointed head with a small mouth, dorsal fin extends forward to middle of eye, lateral line nearly straight with a long accessory dorsal branch, **high narrow bridge between eyes**. Yellowish brown on eyed side, white to cream color on blind side. Young are abundant in estuaries, but adults are rarely found there.

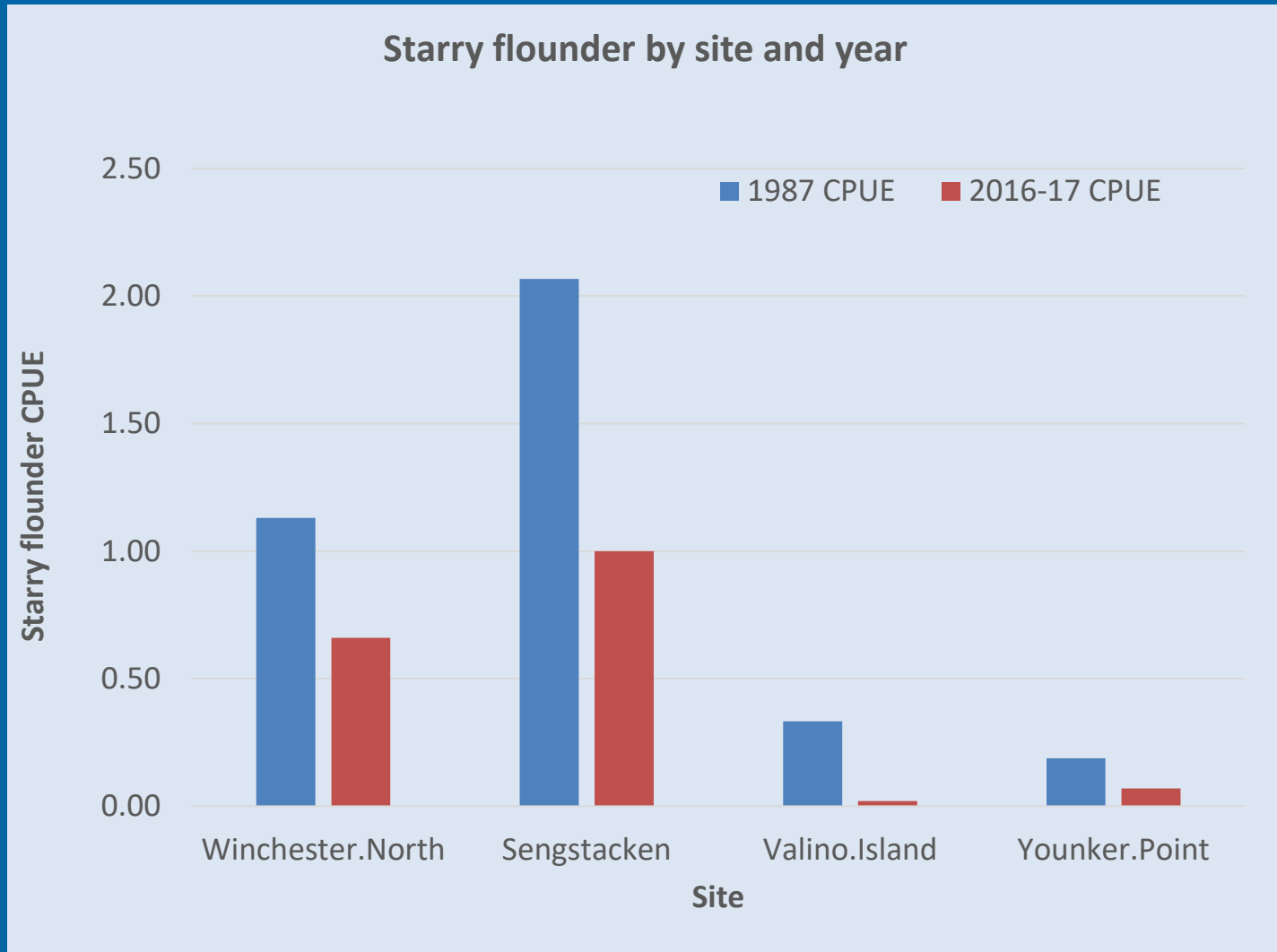
**Size:** up to 2 feet



Juvenile

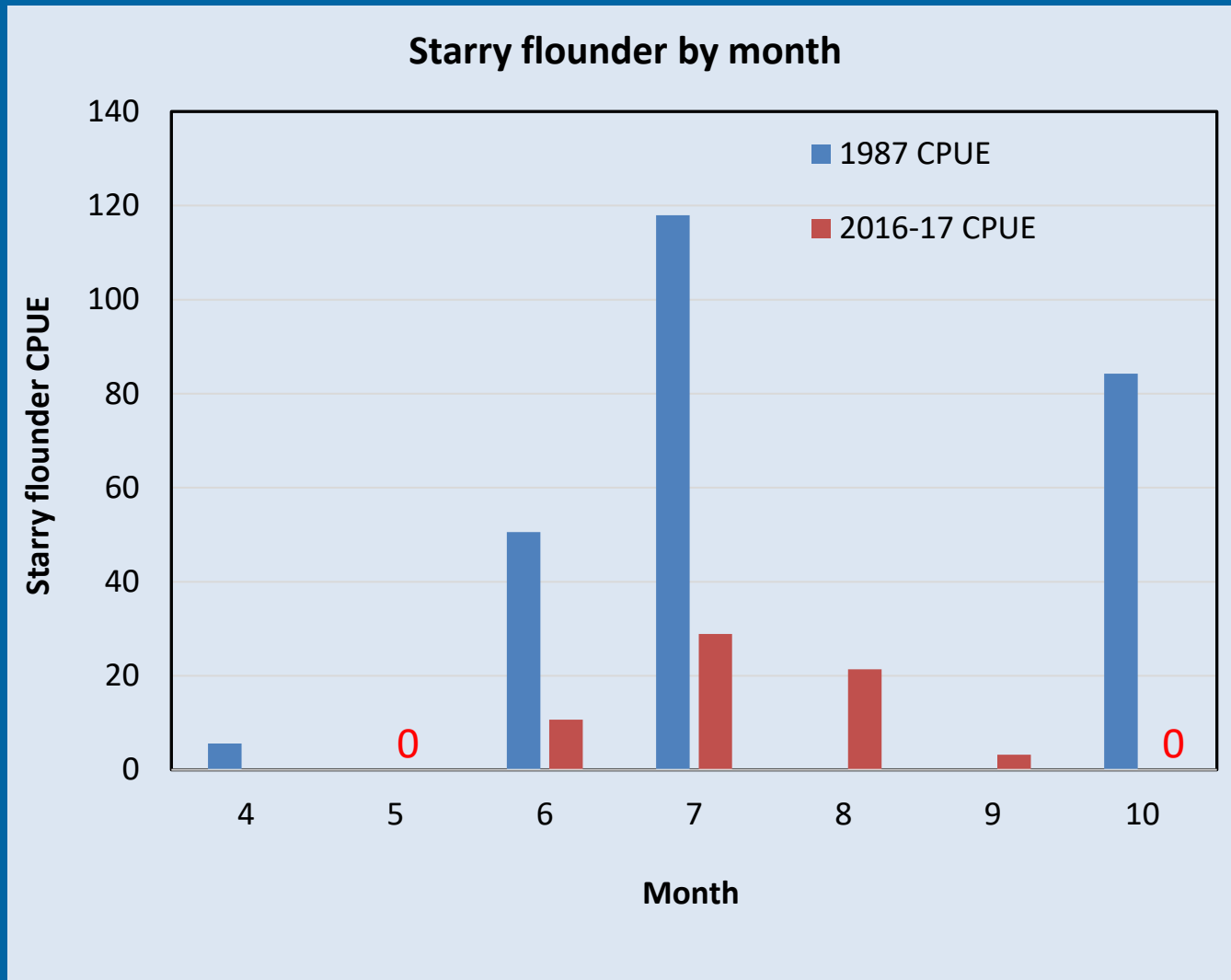


# Where were starry flounder caught?





# Where were starry flounder caught?



# Conclusions

## Summary

- Fish species richness, abundance, and biomass have decreased in South Slough over the 30 years from 1987-2017.
- However, abundance of some species have decreased, some have increased, and some have stayed about the same.
- Starry flounder abundance decreased slightly.
- Starry flounder were caught at every site.
- Starry flounder were caught from April through October in 1987 and from June through September in 2016-2017.

# Conclusions

## Future research

- We don't know the causes for the observed changes, could they be natural variability or a long-term trend?
- Study was completed 7 years ago. What is the status now?
- Is this local, regional, or a general trend along the coast?

# Questions?



**Thanks to all the staff and volunteers who made this possible, and to NOAA and PMEP for funding!**



# When were starry flounder caught? (abundance-CPUE)

| Common Name              | April       |          | May      |             | June         |              | July          |              | August   |              | September |             | October      |             |
|--------------------------|-------------|----------|----------|-------------|--------------|--------------|---------------|--------------|----------|--------------|-----------|-------------|--------------|-------------|
|                          | 1987        | 2016-17  | 1987     | 2016-17     | 1987         | 2016-17      | 1987          | 2016-17      | 1987     | 2016-17      | 1987      | 2016-17     | 1987         | 2016-17     |
| American shad            | 0.00        | -        | -        | 12.45       | 0.00         | 0.00         | 0.00          | 7.47         | -        | 24.90        | -         | 0.00        | 4.07         | 0.00        |
| Bay goby                 | 0.00        | -        | -        | 0.00        | 0.00         | 0.00         | 0.00          | 1.56         | -        | 0.00         | -         | 0.00        | 0.00         | 0.00        |
| Bay pipefish             | 0.00        | -        | -        | 0.00        | 2.83         | 0.80         | 0.00          | 2.88         | -        | 0.00         | -         | 0.00        | 0.00         | 0.00        |
| Buffalo sculpin          | 0.00        | -        | -        | 0.00        | 0.00         | 0.00         | 0.00          | 0.00         | -        | 0.00         | -         | 0.00        | 0.00         | 0.00        |
| Cabezon                  | 0.00        | -        | -        | 0.00        | 0.00         | 0.00         | 0.00          | 0.00         | -        | 0.00         | -         | 0.00        | 0.00         | 0.00        |
| Chinook salmon           | 0.00        | -        | -        | 0.00        | 4.09         | 76.73        | 8.18          | 52.04        | -        | 83.40        | -         | 36.03       | 24.54        | 0.00        |
| Chum Salmon              | 0.17        | -        | -        | 0.00        | 0.00         | 0.00         | 0.00          | 0.00         | -        | 0.00         | -         | 0.00        | 0.00         | 0.00        |
| Coastal cutthroat trout  | 0.00        | -        | -        | 0.00        | 0.00         | 26.53        | 0.00          | 0.00         | -        | 0.00         | -         | 15.92       | 0.00         | 0.00        |
| Coho salmon              | 0.59        | -        | -        | 11.63       | 0.00         | 5.82         | 0.00          | 0.00         | -        | 0.00         | -         | 0.00        | 0.00         | 0.00        |
| English sole             | 4.41        | -        | -        | 96.04       | 23.25        | 98.65        | 40.04         | 224.25       | -        | 9.77         | -         | 1.56        | 0.00         | 0.00        |
| Green sturgeon           | 0.00        | -        | -        | 0.00        | 0.00         | 0.00         | 0.00          | 0.00         | -        | 0.00         | -         | 0.00        | 0.00         | 0.00        |
| Kelp greenling           | 0.00        | -        | -        | 0.00        | 3.64         | 0.00         | 0.91          | 0.00         | -        | 0.00         | -         | 0.00        | 0.00         | 0.00        |
| Lingcod                  | 0.06        | -        | -        | 0.00        | 0.00         | 0.00         | 0.34          | 0.00         | -        | 0.00         | -         | 0.00        | 0.00         | 0.00        |
| Northern anchovy         | 0.00        | -        | -        | 116.70      | 6.64         | 219.17       | 0.00          | 7.40         | -        | 3.32         | -         | 5.12        | 0.00         | 0.00        |
| Pacific herring          | 0.70        | -        | -        | 14.85       | 245.58       | 106.86       | 98.23         | 0.70         | -        | 10.77        | -         | 0.00        | 172.61       | 0.00        |
| Pacific sand lance       | 0.00        | -        | -        | 0.00        | 0.53         | 0.00         | 0.00          | 0.00         | -        | 0.00         | -         | 0.00        | 0.00         | 0.00        |
| Pacific sardine          | 0.00        | -        | -        | 0.00        | 0.00         | 275.14       | 0.00          | 0.00         | -        | 218.03       | -         | 0.00        | 0.00         | 0.00        |
| Pacific staghorn sculpin | 57.15       | -        | -        | 147.86      | 238.60       | 150.91       | 290.16        | 157.31       | -        | 39.63        | -         | 15.55       | 16.79        | 100.61      |
| Penpoint gunnel          | 0.00        | -        | -        | 0.00        | 0.00         | 0.00         | 0.18          | 0.00         | -        | 0.00         | -         | 0.00        | 0.00         | 0.00        |
| Pile perch               | 0.00        | -        | -        | 0.00        | 0.00         | 0.00         | 0.00          | 3.20         | -        | 0.00         | -         | 0.00        | 0.00         | 0.00        |
| Saddleback gunnel        | 0.00        | -        | -        | 0.00        | 17.45        | 0.00         | 20.62         | 0.00         | -        | 0.00         | -         | 0.00        | 2.38         | 0.00        |
| Shiner perch             | 53.78       | -        | -        | 10.46       | 6096.28      | 106.71       | 3740.50       | 278.70       | -        | 95.20        | -         | 0.00        | 539.81       | 0.00        |
| Speckled sanddab         | 0.00        | -        | -        | 0.00        | 3.77         | 4.97         | 0.00          | 2.56         | -        | 0.00         | -         | 0.00        | 0.00         | 0.00        |
| <b>Starry flounder</b>   | <b>5.62</b> | <b>-</b> | <b>-</b> | <b>0.00</b> | <b>50.56</b> | <b>10.70</b> | <b>117.96</b> | <b>28.89</b> | <b>-</b> | <b>21.40</b> | <b>-</b>  | <b>3.21</b> | <b>84.26</b> | <b>0.00</b> |
| Steelhead                | 0.00        | -        | -        | 0.00        | 0.00         | 0.00         | 0.00          | 0.00         | -        | 0.00         | -         | 0.00        | 0.00         | 0.00        |
| Striped seaperch         | 0.00        | -        | -        | 0.00        | 1.18         | 0.00         | 10.65         | 0.00         | -        | 0.00         | -         | 0.00        | 0.00         | 0.00        |
| Surfsmelt                | 1.87        | -        | -        | 182.84      | 21.90        | 50.02        | 0.97          | 0.00         | -        | 0.00         | -         | 2.07        | 21.41        | 0.00        |
| Topsmelt                 | 242.91      | -        | -        | 2246.27     | 1282.55      | 1407.53      | 198.21        | 2186.49      | -        | 3817.69      | -         | 80.98       | 4115.81      | 11684.4     |
| Walleye surfperch        | 0.00        | -        | -        | 0.00        | 449.59       | 0.00         | 3549.41       | 0.00         | -        | 0.00         | -         | 0.00        | 804.53       | 0.00        |
| White seaperch           | 21.73       | -        | -        | 0.00        | 1806.91      | 0.00         | 4247.18       | 6.12         | -        | 0.00         | -         | 0.00        | 260.79       | 0.00        |