Gulf sturgeon stock assessment efforts - Recent results and future plans

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- Thanks to NMFS, USFWS, and FWC for funding
- Gulf sturgeon researchers particularly Ken Sulak, Mike Randall, and Frank Parauka for data sharing and technical insight

Background

- NOAA & USFWS identified a need for a Gulf sturgeon stock assessment to update current population status and inform recovery criteria revisions

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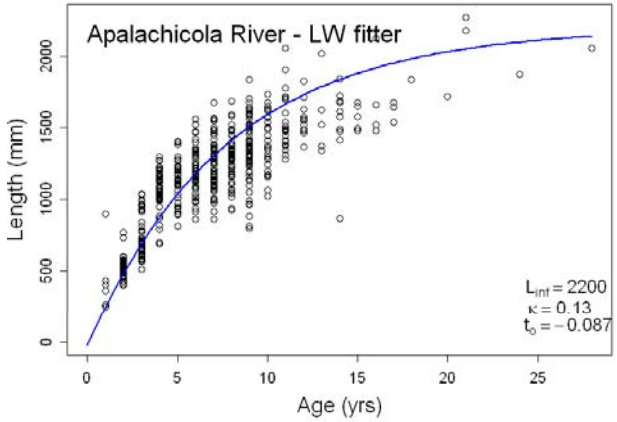
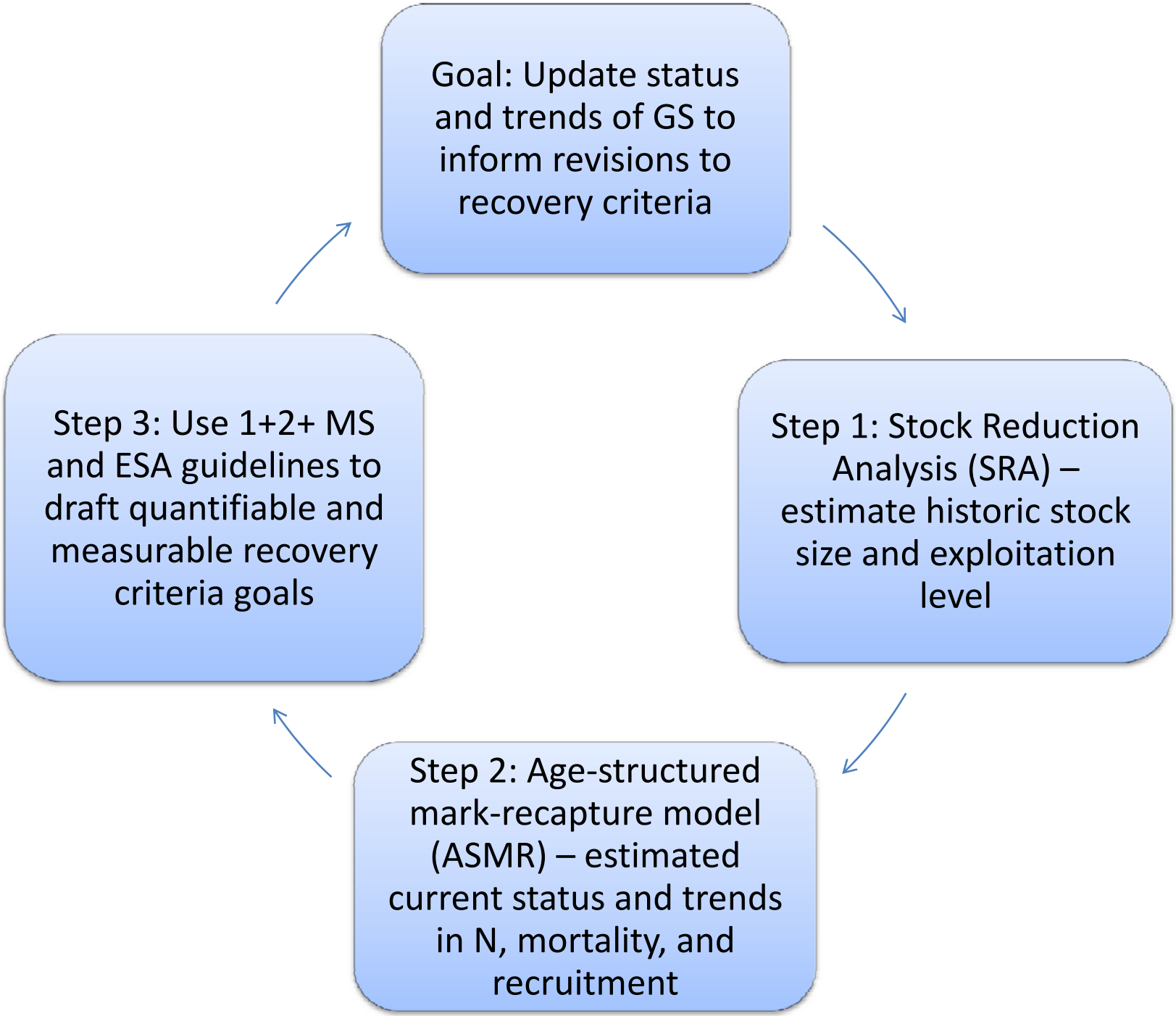
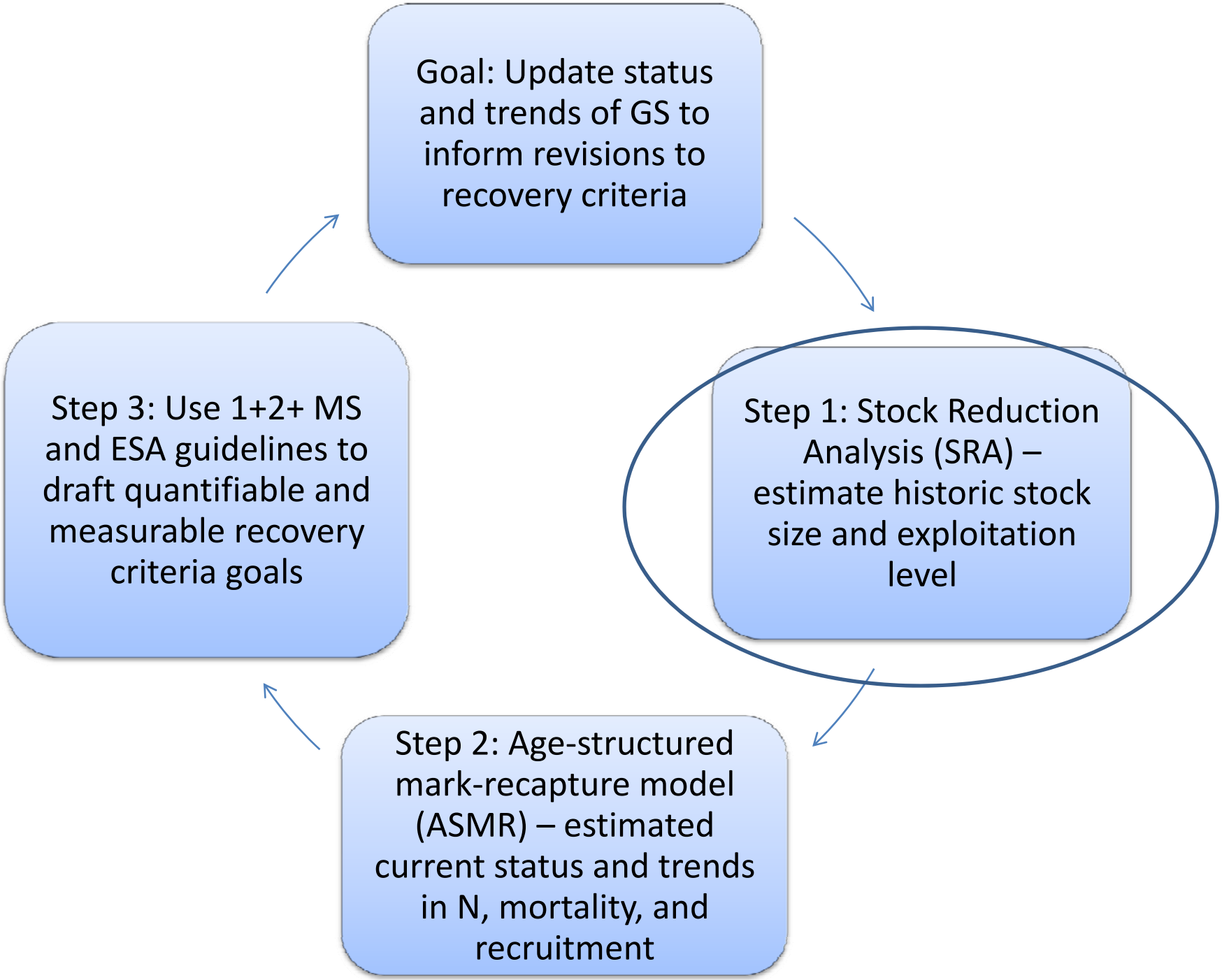
- NOAA & USFWS identified a need for a Gulf sturgeon stock assessment to update current population status and inform recovery criteria revisions
- Initiated the "**G**ulf sturgeon **D**ata **A**ssessment **R**eview" (G-DAR) modeled after the "SEDAR" process used by NOAA-SEFSC (and others) to assess status of exploited fish stocks

Background

- Data assessment workshop to compile and review available data
  - 15+ years of mark-recapture information in two rivers (Suwannee and Apalachicola Rivers, Florida)
  - <5 years of mark-recapture elsewhere
  - Age-growth information 1970's and early 1990's from 2-3 systems
  - Historic landings by river basin (1890's-1980's)




Goal: Update status and trends of GS to inform revisions to recovery criteria
Step 1: Stock Reduction Analysis (SRA) – estimate historic stock size and exploitation level
Step 2: Age-structured mark-recapture model (ASMR) – estimated current status and trends in N, mortality, and recruitment
Step 3: Use 1+2+ MS and ESA guidelines to draft quantifiable and measurable recovery criteria goals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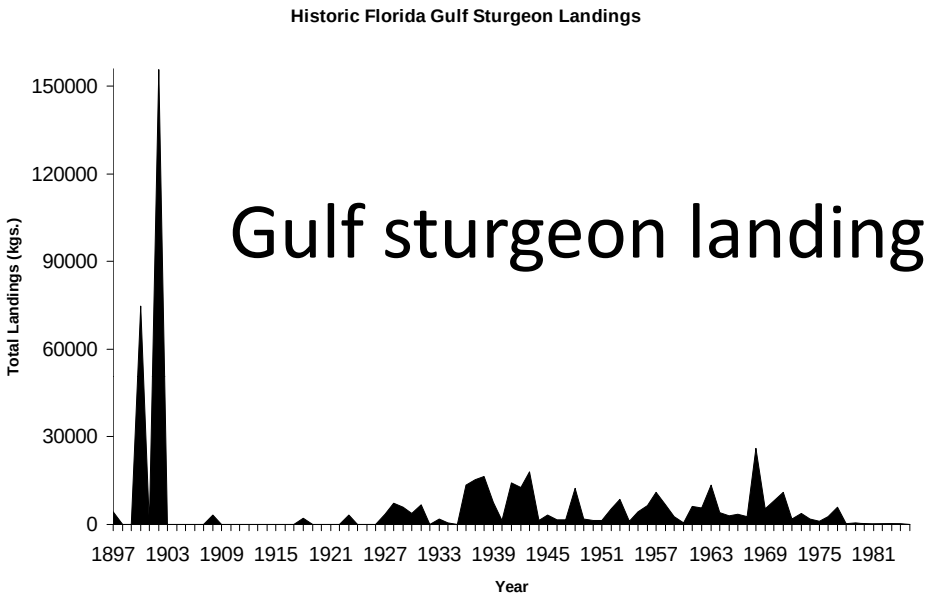
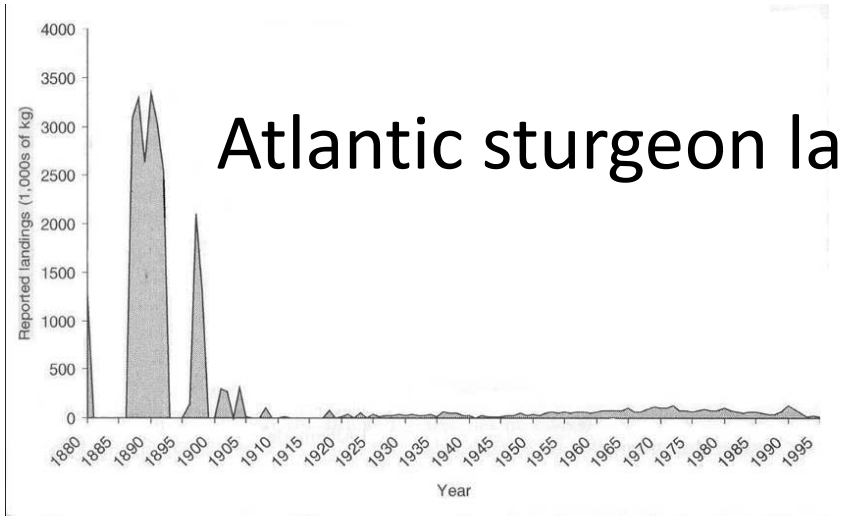
Stock reduction analysis (SRA)

- Standard fisheries age-structured population model (age-structure related to growth, survival and recruitment)
- Basic idea: given the life history characteristics of the population, fishery removals, and approximate current status (N or CPUE) what was the historic size?

Commercial landings



Gulf sturgeon landings

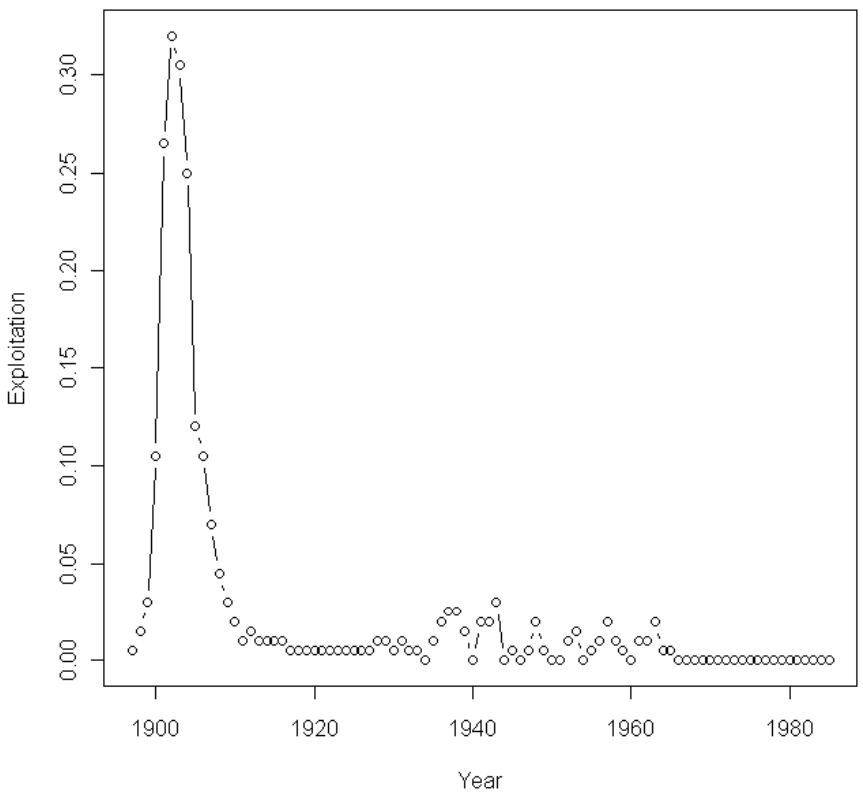


Atlantic sturgeon landings

Historic landings pattern temporally almost identical (Atlantic ~20x larger)

Both peaked ~1890-1900, crash, low sustained levels for 80+ years after

Key SRA Results

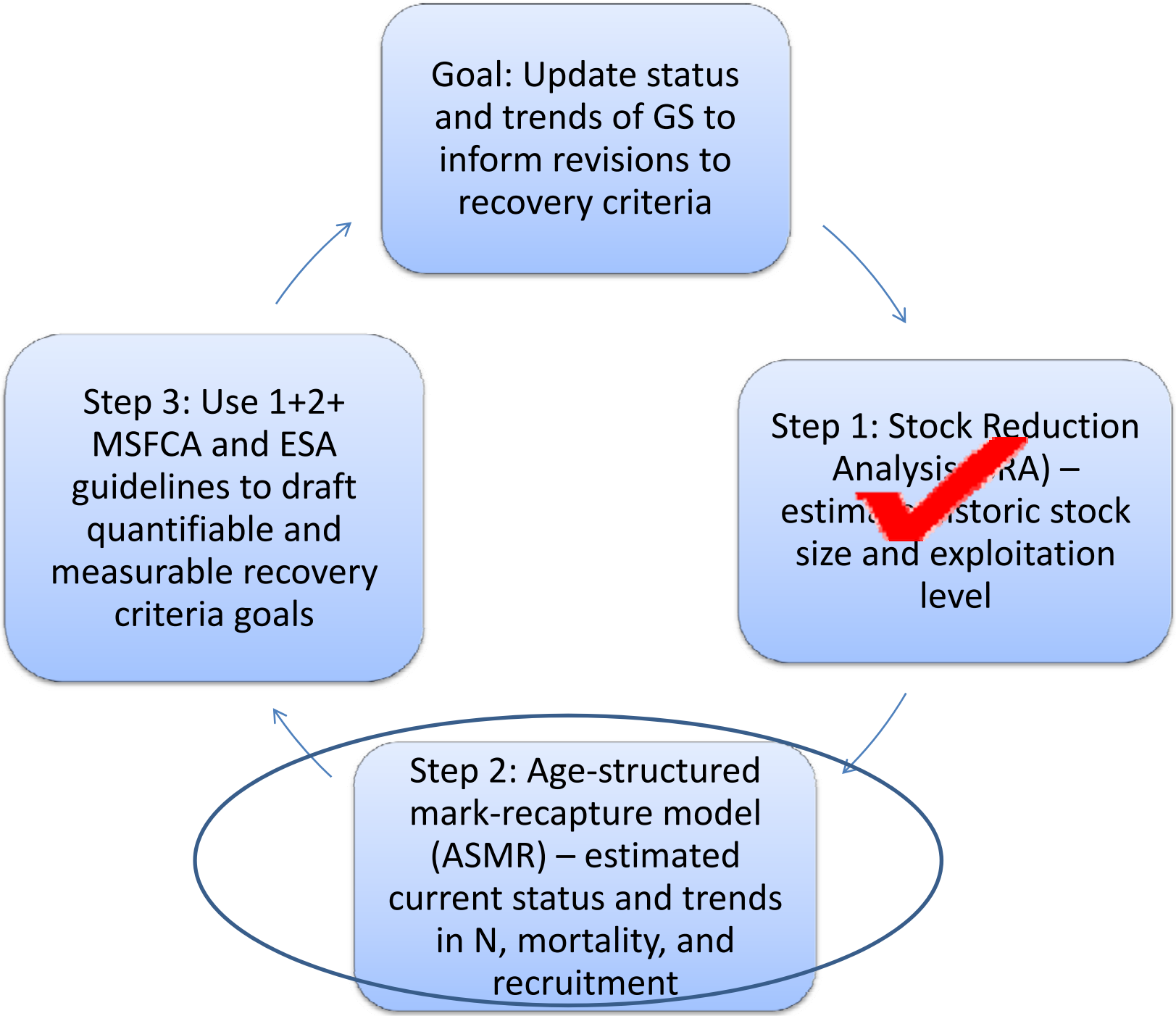


- Population biomass reduced by ~90% following peak harvest
- Currently ~20-30% historic levels and likely slowly rebuilding
- <u>Much longer time to rebuild population BIOMASS than NUM</u>BERS for a long lived slow growing species

Key SRA Results

- Provides an approximate potential reference point for “pre” exploitation biomass levels
- Forces assessment of life history parameters (growth, compensation, max age) and compilation of landings and current status indicies

Butchered and frozen Suwannee River sturgeon in a Crystal River fish house store room, awaiting shipment to Miami for smoking.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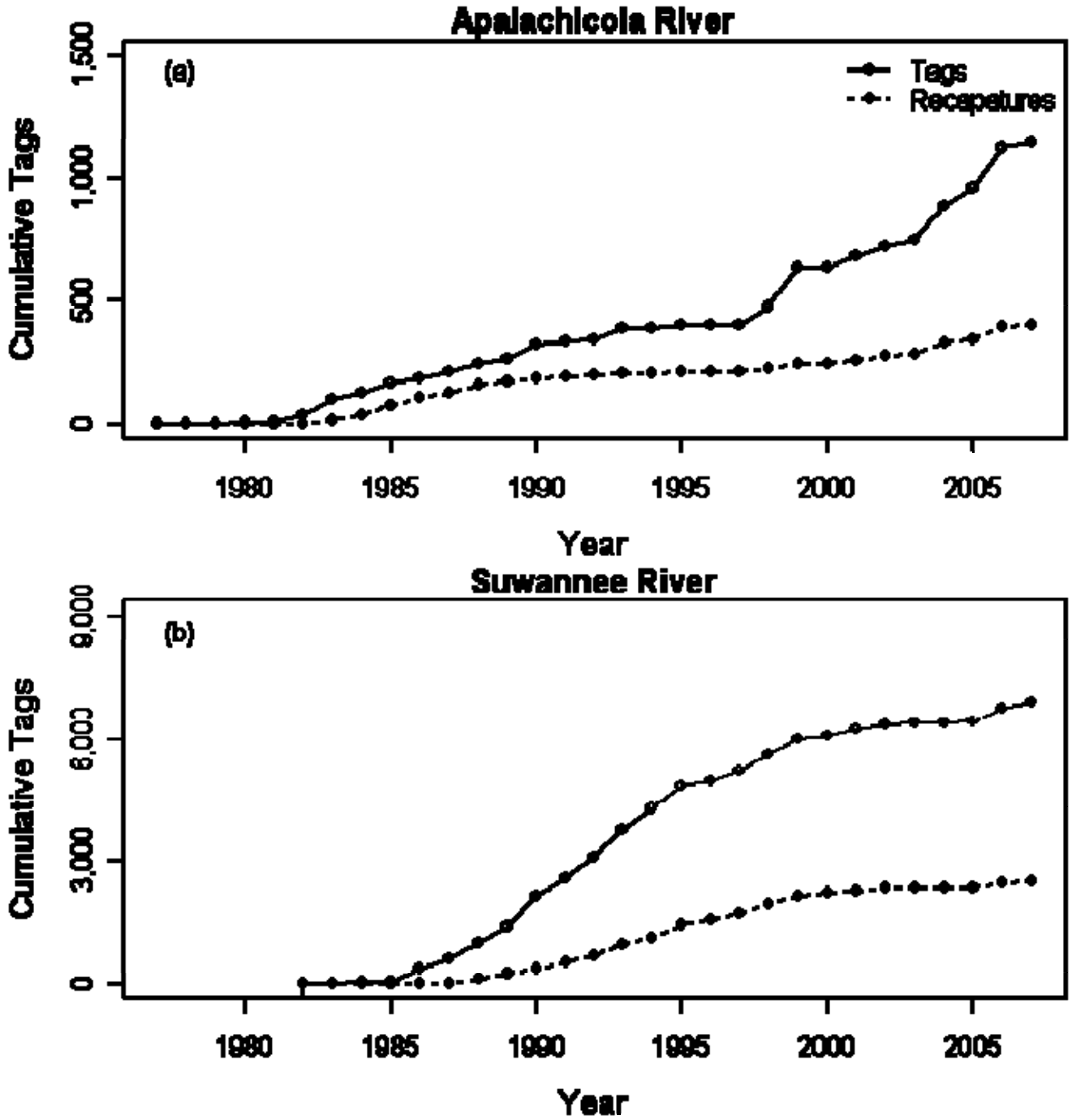
ASMR

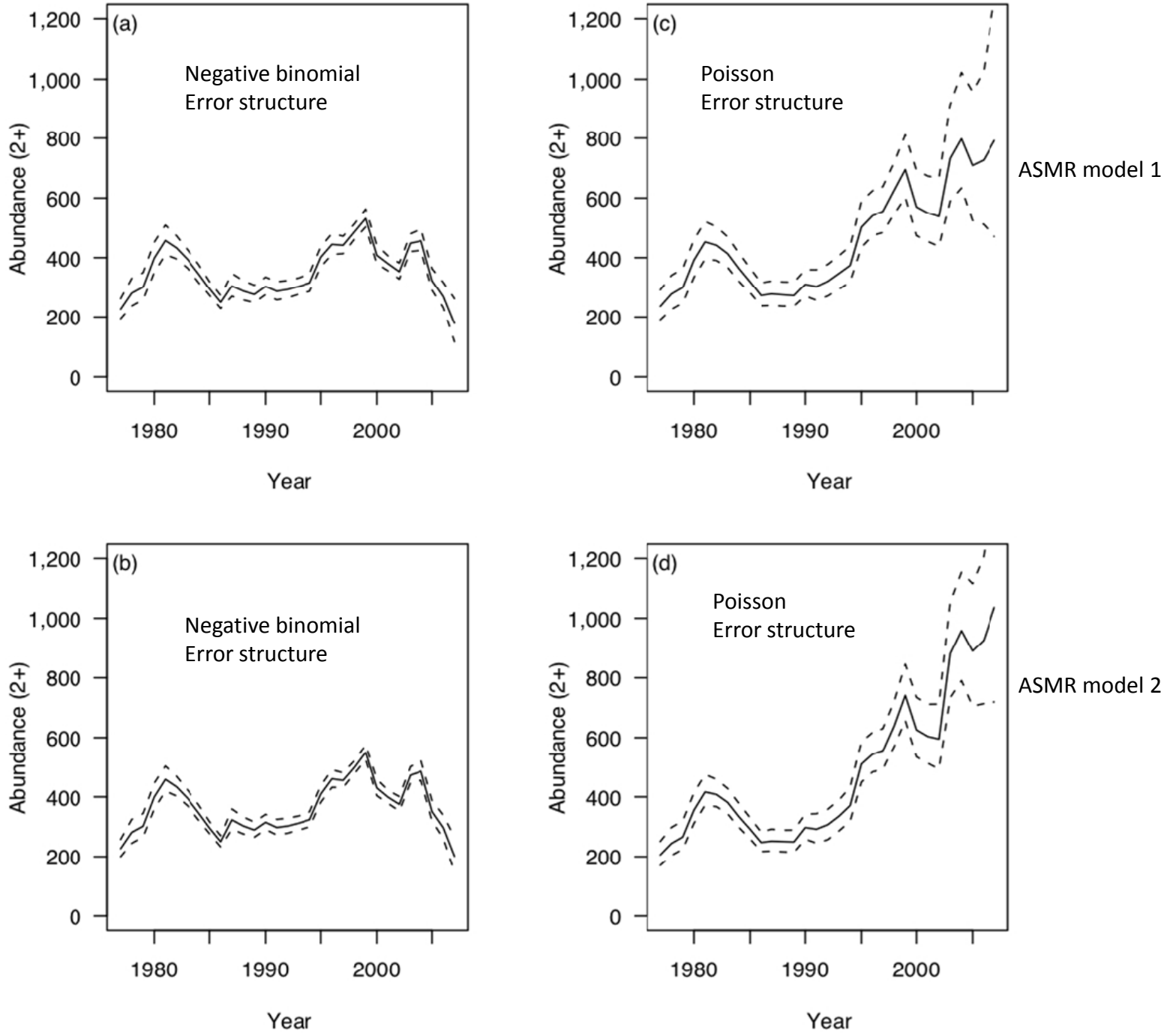
- Jolly-Seber type age-structured population model combined with a fisheries VPA model
- Estimates abundance by age, recruitment by birth year, and annual survival
- Key Inputs equal:
  - VB growth parameters (estimated from fin rays and tag-recaptures)
  - Matrices of marked and recaptured animals each year
  - Selectivity patterns
  - Max age and age at maturity

Example ASMR results

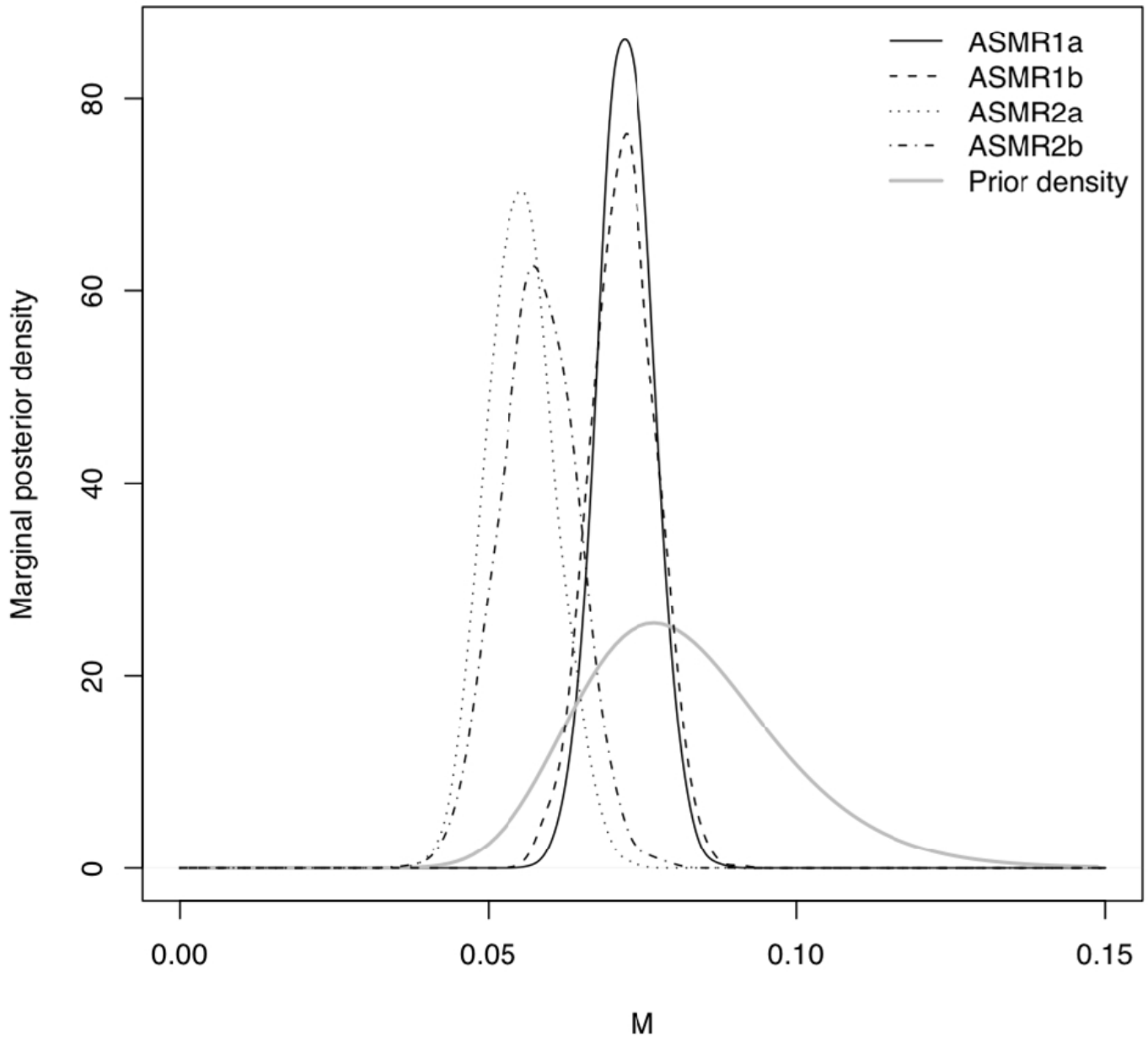
Note: G-DAR assessment provides detailed, transparent review of model and data uncertainty and alternative results under different model and data assumptions


Apalachicola River
(a)
Tags
Recaptures
Cumulative Tags
0
500
1,000
1,500
1980
1985
1990
1995
2000
2005
Year
Suwannee River
(b)
Cumulative Tags
0
3,000
6,000
9,000
1980
1985
1990
1995
2000
2005
Year

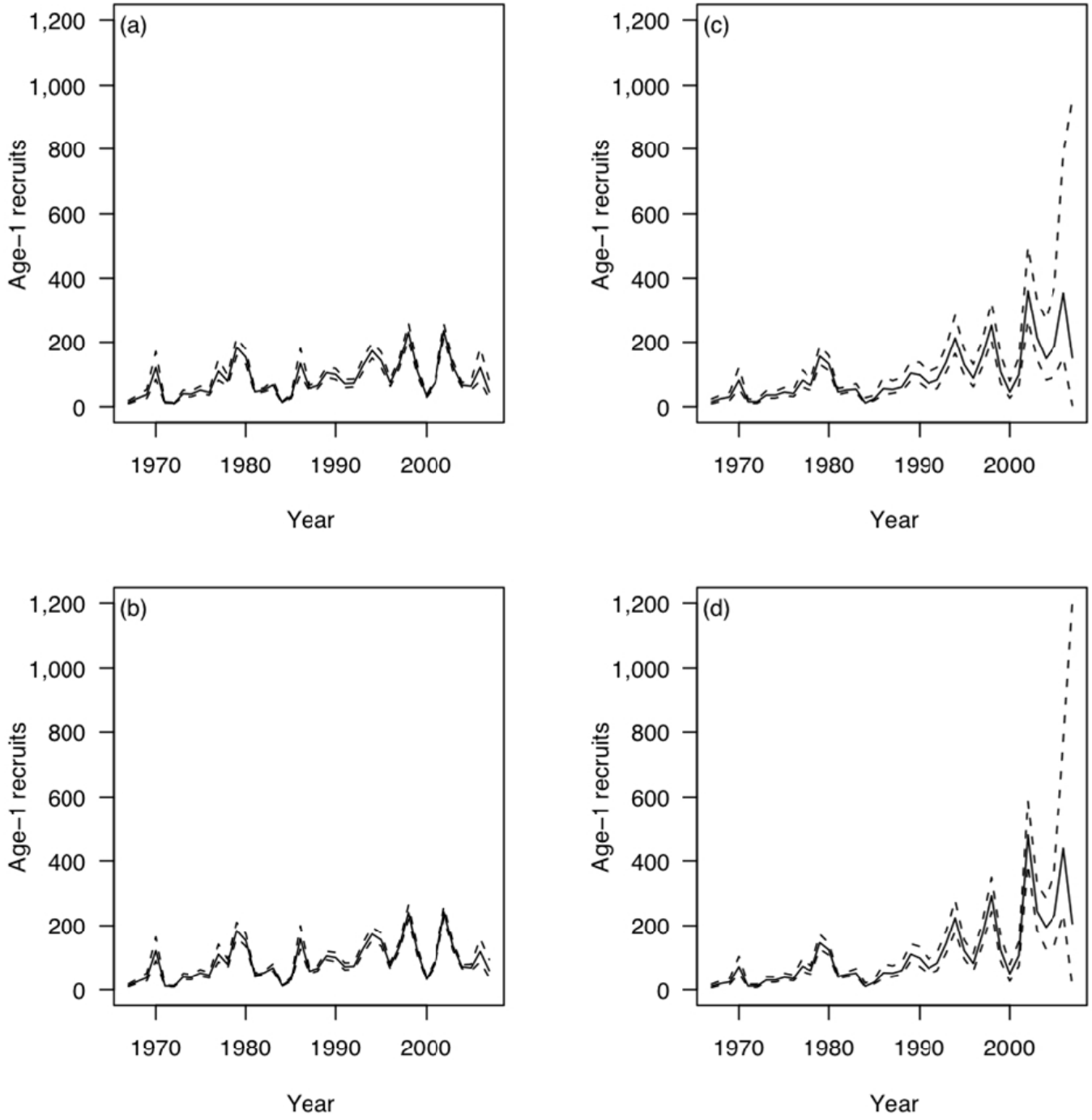
APALACHICOLA RIVER ABUNDANCE



APALACHICOLA RIVER NATURAL MORTALITY RATE



APALACHICOLA RIVER AGE-1 RECRUITS



Key ASMR findings

- Modeling approach is very promising for GS
- Apalachicola – Abundance low, but some evidence for s-l-o-w recovery, mortality estimates low and similar to life-history based estimates
- Suwannee – Abundance estimates variable in recent years, mortality estimates high (??)
- Capture probability low (5-15%), not uncommon in fisheries studies

Key ASMR findings

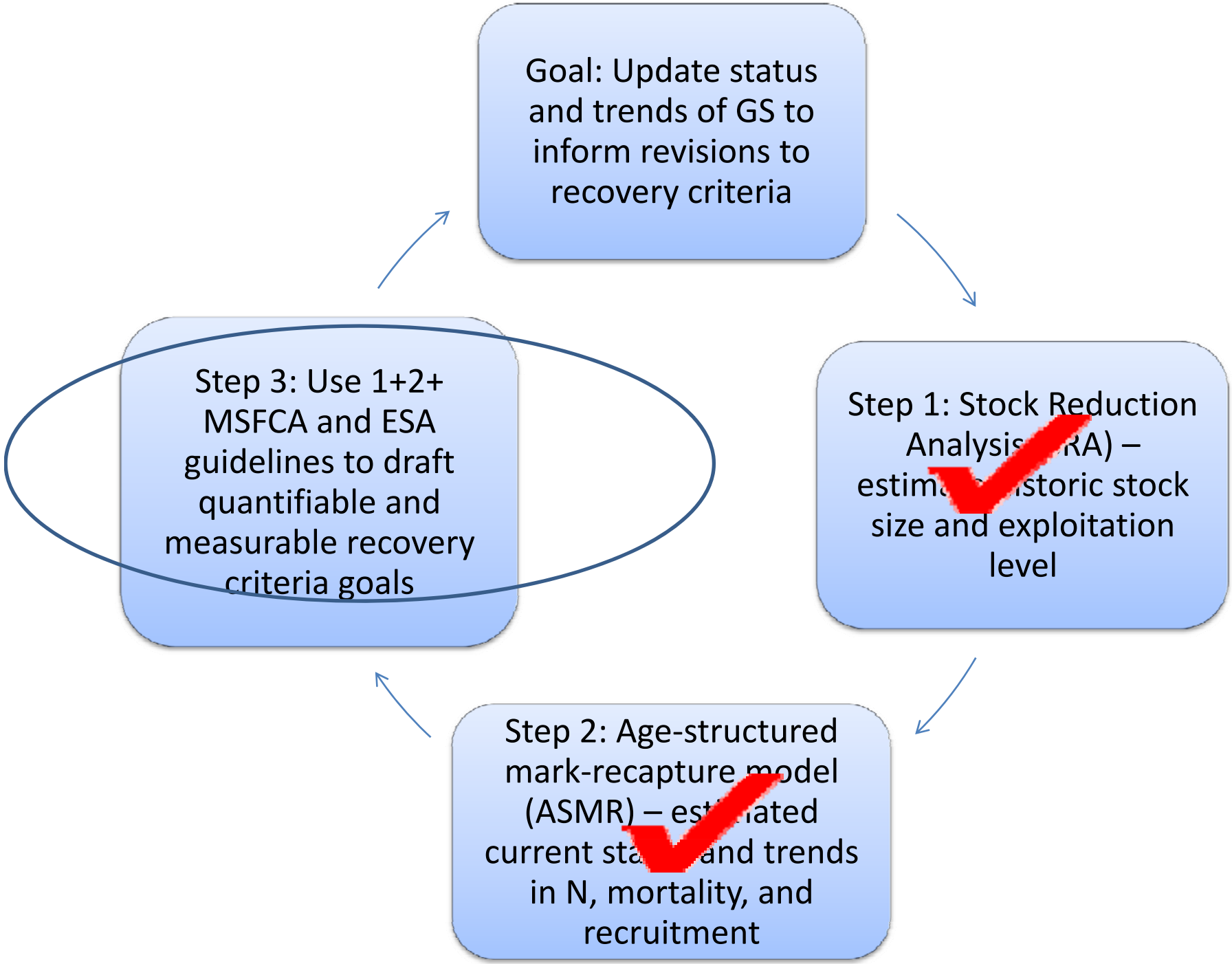
- Changes in monitoring programs (lack of sustained funding) adds complexity
- Difficult to separate mortality from low capture probability in given year (did you not catch a fish because it was dead or because it wasn’t there)

Key ASMR findings

- As with most stock assessments, independent estimates of natural mortality rate GREATLY improve ability to estimate abundance and recruitment
- G-DAR review panel recommended telemetry study to estimate M
  - NMFS/USFWS launched this study in 2010

Lessons

- SRA and ASMR provide jointly provide a good framework for assessing where we have been and where we are with Gulf sturgeon
- Require extensive tagging data…
- Alternative assessments possible for data poor systems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Next steps….

- Much can be learned from recovering and recovered exploited stocks
- Magnuson-Stevens provided a clearer definition of target abundance levels such as “recovered” and “recovery” than the ESA
- Use G-DAR assessment + lessons from other exploited stocks + Magnuson reference points = new recovery criteria guidelines (?)
- Great thesis project…

Thanks!!

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