Draft 2024 Annual Deployment Plan and Partial Coverage Cost Efficiencies Analysis

Prepared for the Advisory Panel and North Pacific Fishery Management Council
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Jennifer Ferdinand

Alaska Fisheries Science Center; Fisheries Monitoring and Analysis Division

Preparers

The analyses and modeling in the Draft 2024 Annual Deployment Plan were prepared by Geoff Mayhew (NMFS AFSC), Dr. Craig Faunce (NMFS AFSC), Phil Ganz (NMFS AKR) and Jennifer Cahalan (PSMFC).

The following is a non-technical summary of the analysis, models evaluated, and NMFS recommendations.

NMFS Approach

- Design a monitoring program that collects credible, statistically rigorous scientific data
- Collect the best and most data under variable budgets using all the monitoring tools now available
- Collect data for a wide range of analytic needs (multi-objective program)

Council Priorities

- Efficiently distribute monitoring such that more monitoring is achieved for the available budget
- Increase monitoring on trawl-fisheries for PSC accounting
- Monitoring that has least impact on fishing operations
- A partial coverage program that isn't contentious

Challenges are to….

- Meet the data needs of users with a wide range of analytic and management objectives
- Collect data that reflects the full range of fishing activities: samples which represent the characteristics of the larger population

The ADP meets this challenge by…

- *Defines* the population: all fishing trips harvesting groundfish and halibut in federal fisheries
- *Divides* this population into selection pools, referred to as **stratification**
- *Distributes* monitoring resources to the strata, referred to as **allocation**

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Stratification

- How fishing trips are grouped for sampling
- Strata are defined by trip characteristics known *before* random selection
- Every sampling unit can only be in one stratum

Can be used to:

- Focus sampling on a particular objective
- Control costs

Can be defined by:

- Monitoring method
- Gear
- Fishery Management Plan (FMP) - Bering Sea, Aleutian Islands, and the Gulf of Alaska

Stratification Definitions Evaluated

Stratification	Number of Sampled Strata	Definition	Rationale
2023 (CURRENT)	6	Monitoring Method (Observer, EM Fixed Gear, EM Trawl) and Gear Type (HAL, POT, TRW)	Current stratification definition
FMP	11	Monitoring Method (Observer, EM Fixed Gear, EM Trawl) and Gear Type (HAL, POT, TRW) and FMP (BSAI, GOA)	Potential to reduce the likelihood of data gaps
Combined fixed gear - FMP (FIXED-FMP)	7	Monitoring Method (Observer, EM Fixed Gear, EM Trawl) and Gear Type (FIXED, TRW) and FMP (BSAI, GOA)	Maintains statistical integrity without creating small strata and allowing focused sampling

Allocation: Distributing sampling effort to strata

Equal Rates

Goal: Representative sample with equal burden of monitoring

Baseline 15% plus optimization (Status quo)

Goal: *Equal Rates* to 15% observed strata plus variance minimization with EM rates set by policy

EM integrated Baseline 15% plus optimization

Goal: *Equal Rates* to 15% for all strata plus variance minimization

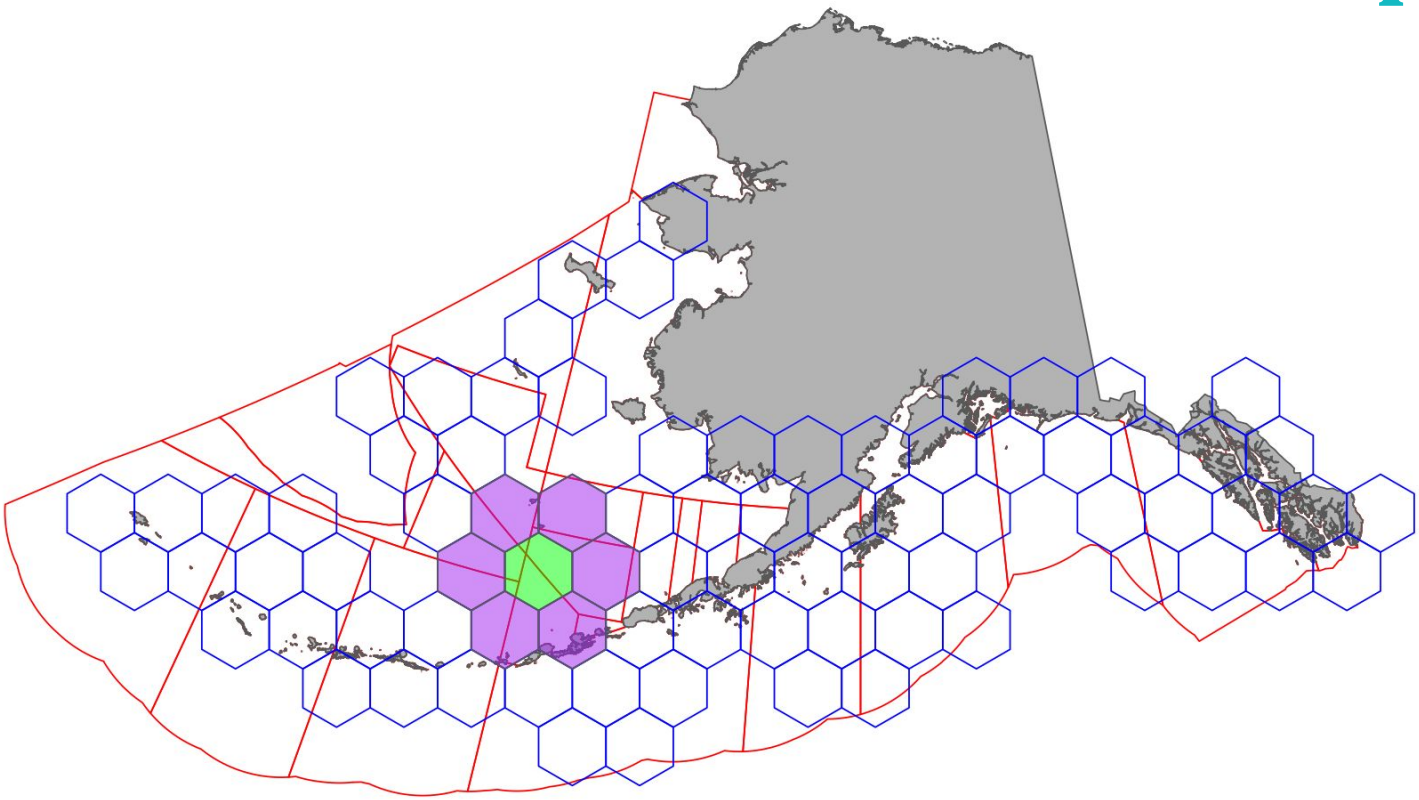
Cost-weighted boxes

Goal: maximize the proportion of "boxes" monitored (or near), decreasing allocation to strata with high monitoring costs

Proximity

Goal: maximize proportion of trips near monitored trips while guarding against low sample sizes

Allocation - “boxes” are **time** and **space**



Box definition:

200 km wide hexagon and 1 week period and adjacent neighboring hexagons and weeks

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Allocation Method	Objective	Rational	Benefits	Shortcomings
Equal Rates	Sample proportionally to the size of the stratum	Simple allocation relies on few assumptions	Few assumptions on data	At low sample size, can be prone to data gaps
Baseline 15% observed plus optimization; EM by policy (status quo)	• 30% coverage on FG EM • Baseline 15% observer rate • Minimize combined variance of discards of groundfish, halibut PSC, and Chinook PSC	Lower variance on estimates of halibut PSC and Chinook PSC	Baseline rate to decrease data gaps	• High EM rate results in low at-sea observer rates • Policy based EM rates • At low budgets, at-sea baseline rates not reached • Uses between-trip (not CAS) variance
EM integrated Baseline 15% plus optimization	• Baseline 15% rate • Minimize combined variance of discards of groundfish, halibut PSC, and Chinook PSC	Lower variance on estimates of halibut PSC and Chinook PSC	Baseline rate to decrease data gaps	• At low budgets, at-sea baseline rates not reached • Uses between-trip (not CAS) variance
Cost Weighted Boxes	• Decrease data gaps • Minimize overall costs	Collection of representative data at varied resolution and cost efficiency	• High data utility • Fewer data gaps • Limits sampling in high-cost strata	• Iterative process to set stratum weightings • Highly sensitive to costs in different strata
Proximity	• Decrease data gaps • Prevent low sample size	Collection of representative data at varied resolutions and sufficient sample size	• High data utility • Fewer data gaps • Fewer low-sample strata	Iterative process to allocate sample effort

Evaluation Metrics

- Data collection opportunities
  - Trips sampled (observers)
  - Trips monitored (observers or EM)
- Variance in *expenses*
- ~~Burden share~~
- Power to detect
  - Rare events (Short-tailed albatross, Steller sea lion)
  - Observer effects
- Data timeliness
- Variance between trips
  - Salmon PSC
  - Halibut PSC
  - Groundfish discards
  - Crab PSC
- Interspersion (monitored trips near unmonitored trips)

Evaluation Metrics

- Data collection opportunities
  - Trips sampled (observers)
  - Trips monitored (observers or EM)

} Output

- Variance in *expenses*
- Data timeliness
- Variance between trips
  - Halibut, Salmon, and Crab PSC
  - Groundfish discards

} Efficiency

- Power to detect
  - Rare events (STAL, SSL)
  - Monitoring effects
- Interspersion (monitored trips near unmonitored trips)

} Effectiveness

Evaluations of Designs - what we proposed

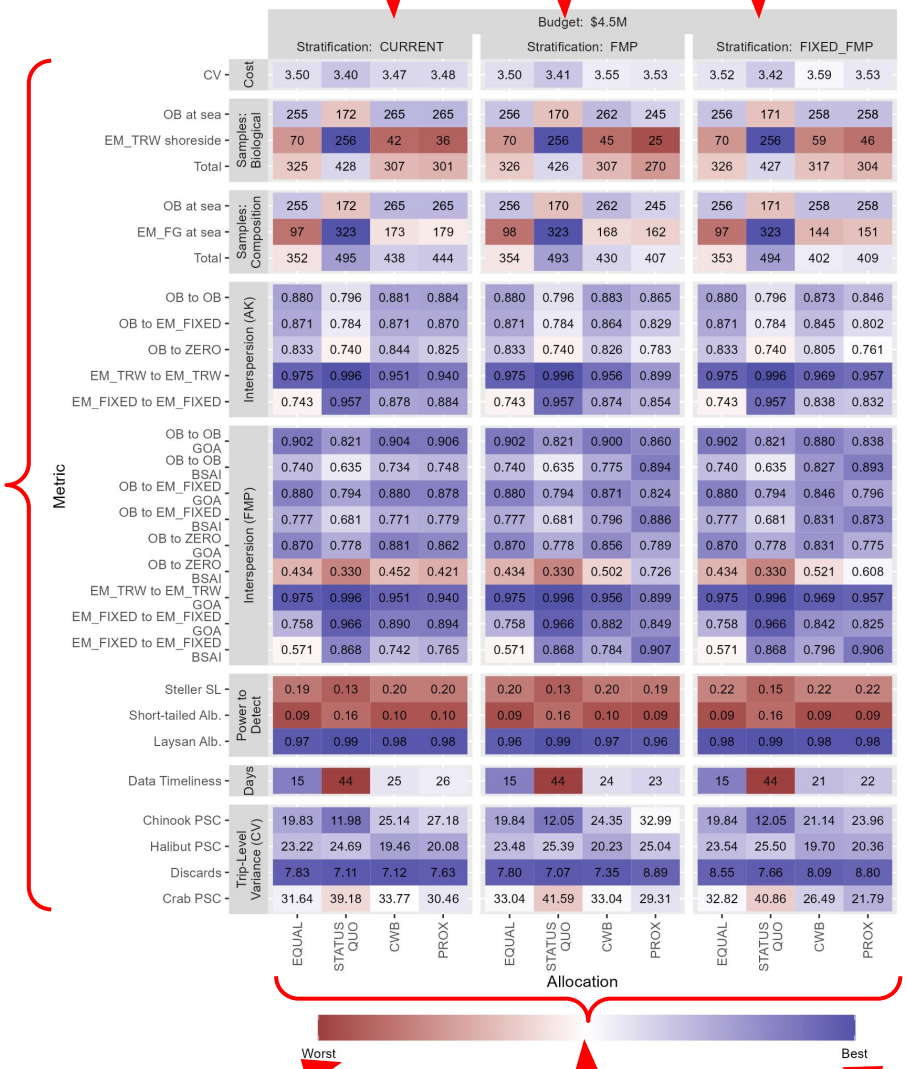
- It is unlikely that one design will be the best across all metrics
- Scores and rankings will change with different budgets
- We want the best design that will work on small and large budgets.

Metric	Design			
	A	B	C	D
Trips sampled (observers, all data)	**291**	126	221	237
Trips monitored (observers or EM)	**20**	37	60	43
Variance in expenses	**3115**	3028	3017	2979
Short-tailed albatross	**0.03**	0.07	0.25	0.15
Steller sea lion	**0.01**	0.04	0.04	0.01
Observer effects …	**0.45**	0.47	0.39	0.56
Burden share	**0.42**	0.85	1	0.49
Data timeliness	**164**	164	200	159
Salmon PSC (#)	**3940**	4444	3892	4602
Halibut PSC (t)	**60**	180	98	181
Crab PSC	**51**	111	70	38
Groundfish discards (t)	**651**	735	1198	338
Interspersion …	**0.16**	0.11	0.54	0.5

EXAMPLE

Evaluations of Designs

Stratifications



Metrics

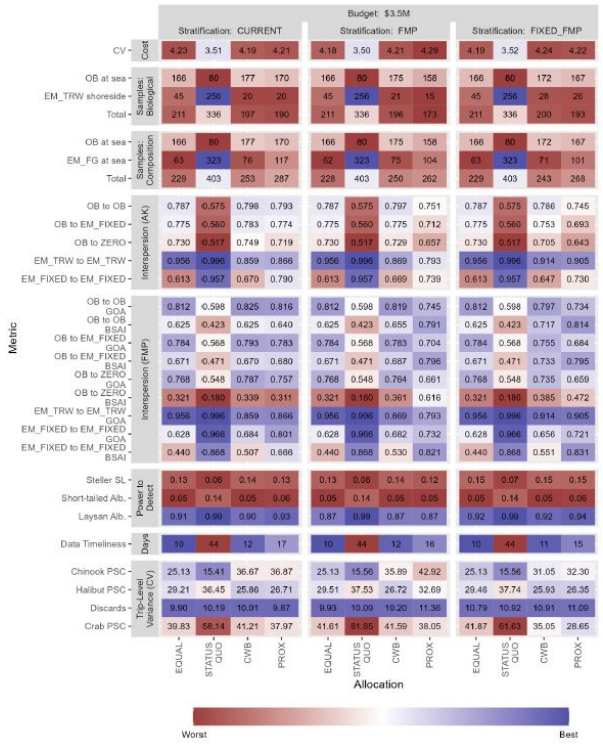
Worse performance

Allocations

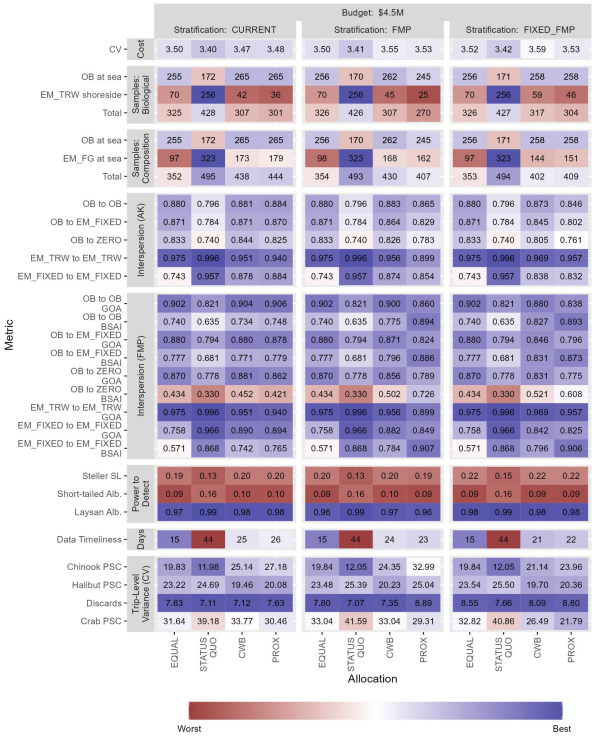
Better performance

Evaluations of Designs - Budgets

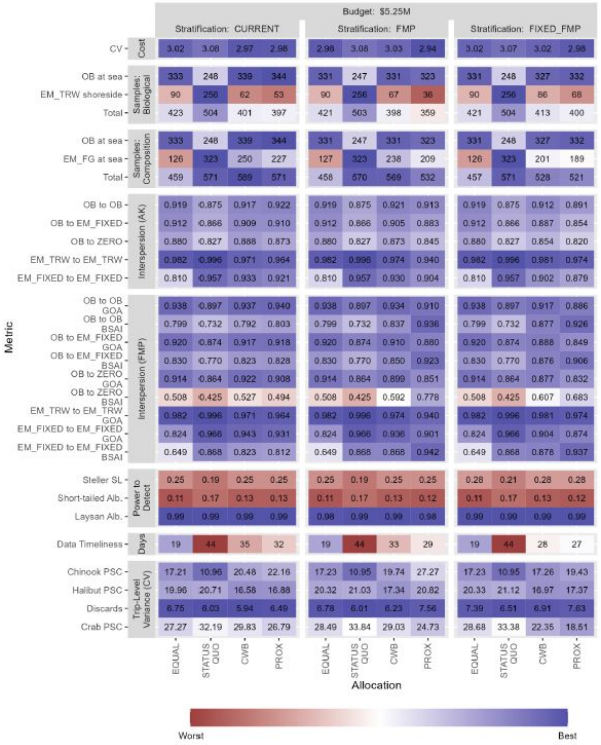
$3.5 M



$4.5 M



$5.25 M



Evaluations of Designs - Tradeoffs

Under budgets examined, *Current* Stratification and *Status quo* allocation resulted in much more EM sampling than observer sampling.

- 👍 Greatest cost efficiency
- 👍 Most samples (largely from Trawl EM - trip level)
- 👍 Lowest CV for between trip Chinook PSC

- 👎 Doesn't address multiple gear types on same trip
- 👎 Differences between FMP not detected
- 👎 Few at-sea observer biological measurements and tissue collections
- 👎 Low interspersion of observers to EM or observers to zero coverage
- 👎 Worst power to detect Steller Sea lion bycatch - relatively poor at Short tailed albatross in the BSAI.
- 👎 High between trip CV for Pacific halibut PSC and crab PSC.
- 👎 EM data too slow to be useful for quota management

Evaluations of Designs

- ***Fixed FMP* stratification for 2024.**
  - 👍 Facilitates multiple fixed gear types on the same trip.
  - 👍 Accounts for FMP differences without resulting in strata with too little effort.

- **When combined with either *CWB* or *Proximity* allocation:**
  - 👍 Greatly improves EM timeliness.
  - 👍 Uses cost / effort in its algorithm to avoid over/under sampling.
  - 👍 Relatively good interspersion, especially in the BSAI.
  - 👍 Relatively good power to detect albatross in the BSAI.
  - 👍 Decreased between trip CV of Pacific halibut and Crab PSC
  - 👎 Increased between trip CV of Chinook PSC when trawl EM was assumed to not operate under the EFP

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Other Cost Efficiency Considerations

Zero Selection

- Increasing the number of vessels in Zero Selection would increase the coverage rates in strata that remain available to monitoring
- We would expect this to decrease the **precision** of estimates
  - Data from a few vessels is likely to be more variable than data from many vessels.
- We don't know what affect this would have on the **accuracy** of estimates
  - It is generally best to get a sample from all segments of a population
  - The presence of a Zero Selection pool is known to decrease the accuracy of estimates (compared to having all vessels available to sampling), but it's a logistical concession that had to be made to accommodate vessels that are not capable of carrying an observer
  - As technology advances, it would increase the accuracy of estimates if affordable monitoring can be achieved on small vessels using EM
  - It is unknown whether monitoring effects disappear at coverage rates less than 100%

Hiring Observers as Federal Employees

At-Sea

- With 2 supervisors: $1,237 - $1,260 per day (11-13% less than most recent 3-year average of cost per day)
- With 4 supervisors: $1,276 - $1,319 per day (7-10% less than most recent 3-year average of cost per day)

Shoreside

- With 1 supervisor: ~$779 per day for 1,306 days (Kodiak only)
- Future contract (estimate): $500-$1,050 per day ($775 average)

Fixed-Gear EM Review Timeliness

- Pacific States currently has 3 staff who review video from fixed-gear trips in Alaska
- During much of the year, this number of video reviewers is sufficient to produce a 1-week turnaround time on video review from the time the hard drive is received
- However, there are times of the year when 6-10 video reviewers would be needed to maintain a 1-week review time
- Therefore, an additional 3 reviewers (for a total of 6) would be needed to achieve a 1-week review time for **most** of the year
- This all assumes no backlog of trips to review from the prior year
- The estimated cost of 3 additional reviewers annually is 3 x $100,000 = $300,000, a 30% increase in the current EM budget of ~$1,000,000

Multi-Provider / Voucher Program to Procure Observers

- Vessels would procure observer coverage directly from providers
- NMFS would then reimburse vessels for coverage with money from the landing fee
- In 2017, the Observer Advisory Committee reviewed a discussion paper (NPFMC 2017; section 3.5) that evaluated this approach
  - The paper outlined legal issues, explained the complication of setting a voucher amount that is equitable, and discussed ways that it could introduce bias
- In 2022, the PCFMAC discussed this approach again and decided it did not want to divert NMFS staff resources to evaluate it
  - The committee recommended that if the Council were to initiated by the Council, it be developed by Council staff and considered separately from the 2024 ADP and Cost Efficiencies Analysis

Have Observers Review EM Video

- Under this approach, deployed observers would review video during their down time in port
- NMFS did a preliminary analysis and did not find evidence of sufficient observer down time that could be dedicated to video review
- Additionally, this approach would have logistical difficulties
  - Field computers that are sufficient for video review
  - Training observers on video review software
  - Observers tracking hard drives in between going to sea
- NMFS did not consider this approach further

Structure of Partial Coverage Contract

- In August 2024, a new partial coverage contract will begin. The structure of the Request for Proposals includes several components designed to improve efficiency and reduce costs:
  - Guaranteed days have been set to the maximum realistic amount in order to get the maximum price per day as low as possible
  - Plant days to support EM on trawl vessels are incorporated, which reduces travel costs and may add flexibility for the provider to reduce lodging costs
  - Moved from half-day to hourly billing
  - Comparative costs of observer deployment from recent past programs will be provided by all bidders
  - Contract is not solely evaluated on the cost of observer deployment

Biological Data Collection

- Use fishery-independent longline survey data for weights to inform fixed-gear EM? Stock assessment authors were consulted and they raised several concerns:
  - This is problematic for the growing EM sablefish pot fishery because of gear selectivity differences
  - Average weights in the fishery may be higher than survey because the fishery is targeting larger fish at ideal depths
  - Weight data is only one component of observer data used in assessments
  - If full retention requirements for sablefish were to be removed, the assessment would have no data to understand discard information

Biological Data Collection

- Opportunistically deploy idle observers for focused collection of biological data?
  - Opportunistic deployments do not add value to a statistically rigorous sampling plan
  - Sea days are more expensive than idle days
  - Predicting where and when observers will be idle is challenging
  - NMFS is not planning to evaluate this further

Biological Data Collection

- Specify differing observer sampling protocols regionally or temporally based on data needs?
  - The highest quality data come from standardized sampling protocols
  - It is most efficient to have observers with skills that are interchangeable
  - NMFS is not planning to evaluate this further

Reduce Flexibility for Fishery Participants

- Although the following ideas may result in cost savings, the PCFMAC did not support moving any of them forward due to the impact on fishery participants:
  - Requiring vessels to pick up observers in specific ports
  - Multi-trip or vessel selection
  - Extending notification before a trip

Preliminary Budget for 2024

Funds already in place:

- Carryover funds from Year 4 into Year 5 on AIS contract: $1,365,291
- FY23 fee funds obligated for Year 5 AIS contract (Aug 2023 - Aug 2024): $3,084,915
- FY23 federal funds obligated for Year 5 AIS contract (Aug 2023 - Aug 2024): $827,192
- FY23 fee funds for fixed gear EM implementation July 2023 - June 2024: $1,019,314

Additionally, we can expect the following funding to be available for the new observer contract (deployments starting after August 2024) and to provide support for recurring EM operational costs:

- 2022 fee funds carrying forward: $1,687,988
- 2023 fee funds assessed to date: $3,260,000
  - Note that the AKR is projecting $4.71M total fee assessment in 2023
- FY24 federal funds: $700,000
- Industry is applying for funding to finish the final year of the trawl EM EFP as well

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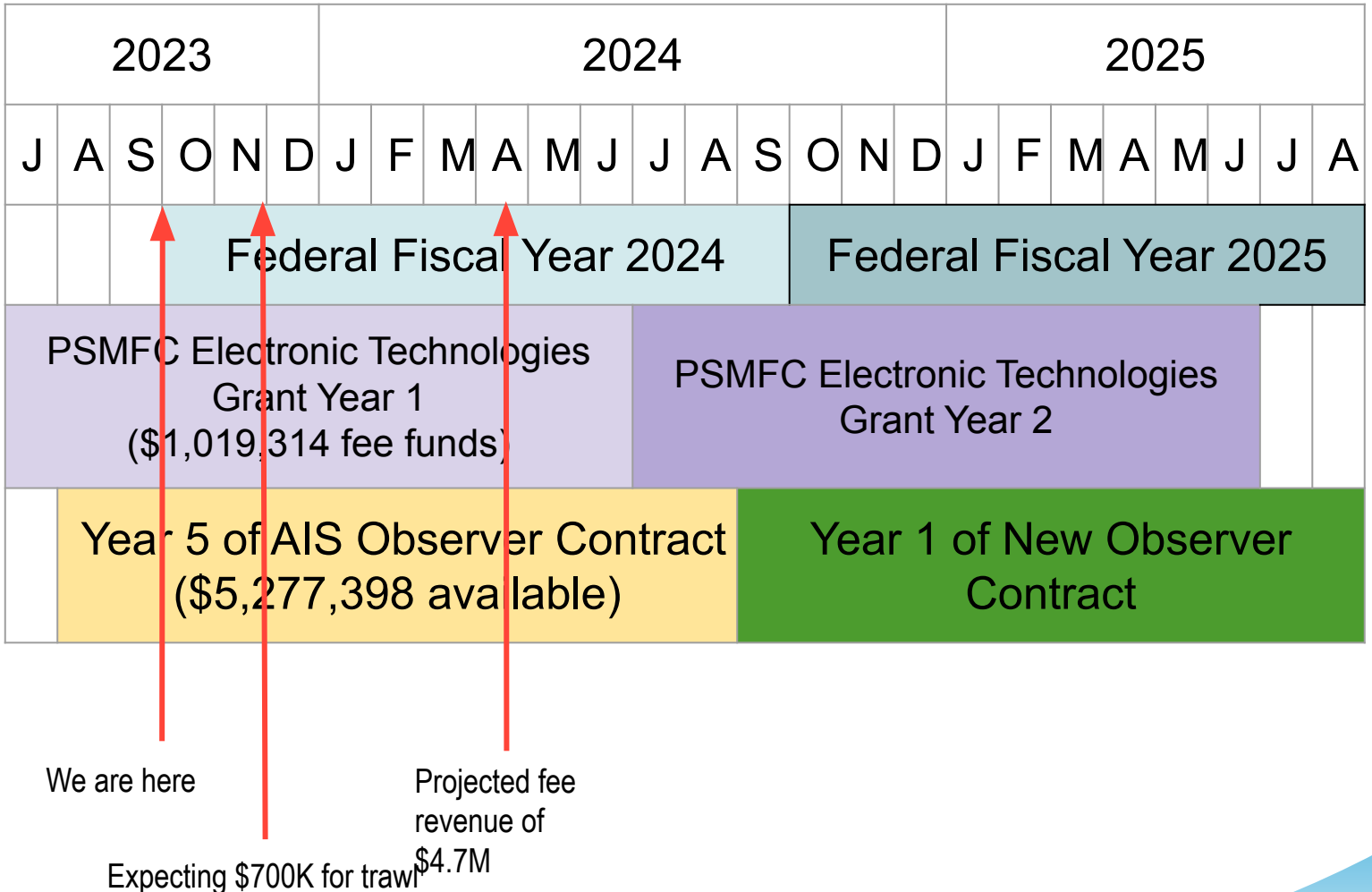
Fishing Year, Fiscal Year, Grant Year, and Contract Year



NMFS Recommendations

NMFS Recommendations: Deployment Design

FIXED / FMP stratification, based on monitoring method (Observer, EM Fixed Gear, EM Trawl), FMP (BSAI, GOA), and gear (Fixed, Trawl).

The 7 recommended sampled strata for 2024 are:

1. Observed fixed gear trips in GOA (OB_FIXED - GOA)
2. Observed fixed gear trips in BSAI (OB_FIXED - BSAI)
3. Observed trawl gear trips in GOA (OB_TRW - GOA)
4. Observed trawl gear trips in BSAI (OB_TRW - BSAI)
5. EM fixed gear trips in GOA (EM_FIXED GOA)
6. EM fixed gear trips in BSAI EM_FIXED (EM_FIXED - BSAI)
7. EM trawl gear deliveries in the GOA (EM_TRW - GOA [EFP])

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NMFS Recommendations: Deployment Design

Proximity allocation method

- Exception of the pelagic trawl EM EFP

- CWB and Proximity allocations provide the most effective data from both EM and observers and collect it most efficiently at the variable budget levels
  - CWB is very sensitive to cost assumptions
  - PCFMAC recommended that NMFS revisit EM cost assumptions
  - Cost uncertainties associated with the rebid of the observer contract
  - Cost uncertainties with the transition of trawl EM from an EFP to a regulated program supported by fees

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NMFS Recommendations: Trawl EM EFP

Status quo sampling rate for the Trawl EM strata

- Maintain the status quo sampling rate of EM deliveries by shoreside fishery observers at 33%;
- NMFS supports a combination of federal funds and NFWF grant funding, which will cover associated costs;
- This approach provides a better idea of the number of boats and trips to project when using an allocation method with the regulated program in 2025.

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Estimated Deployment Rates and Sample Sizes

Estimated budget of $5.819M that **excludes** the Trawl EM EFP, under the FIXED-FMP stratification and *proximity* allocation method, with transformed 2022 fishing effort (trips, *N*), affords the following sample rates (*N*/number of sampled trips, or *n*). Fishing effort from 2022 was used as an expectation for fishing effort in 2024, accounting for the removal of trips due the PCTC and updated vessel participant lists for the Trawl EM EFP.

Stratum	*N*	Sample Rate (%)	*n*
OB_FIXED - GOA	2,077	11	229
OB_FIXED - BSAI	361	39	143
OB_TRW - GOA	368	30	112
OB_TRW - BSAI	21	85	18
EM_FIXED - GOA	986	21	204
EM_FIXED - BSAI	89	71	63
EM_TRW - GOA (EFP)	768	33	256

Note that these coverage rates are preliminary estimates and will differ from rates determined in the final ADP.

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NMFS Recommendations: Fixed Gear EM

- Continue to work with operators who have made improvements to adhere to their Vessel Monitoring Plans (VMPs) to prevent data loss
- Proposes to remove vessels that have not utilized their EM systems for three or more years
  - Vessels 50 ft and under which have not utilized their EM systems will be placed in zero coverage
  - Vessels over 50 ft which have not used their EM systems will be placed in the observer pool
  - Reevaluate after 1 year to determine if this approach creates data gaps, cost inefficiencies
- Prioritize placement in the EM selection pool based on vessel size, fishing effort, minimizing data gaps, and cost efficiency
- EM selection pool in 2024 would not exceed the Council's recommendation of 200 fixed-gear EM vessels.

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NMFS Recommendations: ODDS

- Changes to Observer Declare and Deploy System (ODDS) to address issues with full coverage:
  - Incorporate PCTC into ODDS to alert vessels that they are in full coverage

- Changes to ODDS to address issues with partial coverage:
  - Ask operators of vessels to declare fishing FMP
  - Modify ODDS to ask operators of vessels to declare gear type as fixed gear or trawl gear.

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NMFS Recommendations: EM Development

- Collaborate with industry partners on the following EM development and cost efficiency projects:
  - Testing EM on trawl catcher vessels participating in the CGOA rockfish program to increase utility of trawl EM systems and decrease EM infrastructure costs supported by the partial coverage observer fee
  - Continued testing of electronic logbook data collection and reporting in fixed and trawl fisheries, testing integration of elog data into NMFS databases, and exploring a potential EFP to exempt participating vessels from maintaining a physical printed copy of logbooks.
  - Evaluate alternative catch handling protocols for single pot gear in the EM program in order to identify strategies to improve overall program efficiency while still providing necessary data.
  - Test the use of EM to monitor the sorting line for salmon in shoreside processing plants to enable more efficient use of observer time for biological sampling and improve assurance of Chinook PSC accountability at shoreside processing plants, allowing eLandings to be used for Chinook PSC information.

Acknowledgments

- Thank you to the AFSC, AKR, and PSMFC staff who have developed new deployment models to evaluate for 2024
- Thank you to the members of the Fisheries Monitoring Science Committee, the Joint Plan Team, FMAC, PCFMAC, and Trawl EM Committee for their input, feedback, and dedication to sustainable fisheries management
- Thank you to the observers, observer providers, captains, crew members, EM providers, video reviewers, and agency staff who make fishery-dependent data collection possible

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