

2024 Draft ADP Preliminary Rates

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Background

The purpose of this analysis is to preview the sampling rates and underlying assumptions for the designs that will be evaluated in the 2024 Annual Deployment Plan (ADP). Note that these results are preliminary and will vary from the 2024 Draft ADP that will be presented to the PCFMAC and the Council once data and assumptions are updated. The 2024 Draft ADP will include more comprehensive results of comparisons between different monitoring designs and the design evaluation and agency recommendations will focus on data quality metrics and the ability to meet monitoring goals rather than the expected sample rates for different strata.

In this document, we also present the expected number of trips that will be monitored for each stratum under each design being evaluated. The number of trips monitored will impact data gaps and quality of estimates, in particular variance estimates. A high sample rate for a smaller stratum could result in only a few monitored trips (and could lead to a high estimated variance) while a low rate in a larger stratum could result in a large sample size, and hence estimates with lower variance. These are among the reasons why coverage rate itself is not a consideration evaluated.

Fishing effort

The rates afforded under different monitoring designs presented in this analysis were generated using 2022 fishing effort data. In accordance with the typical ADP schedule, the Draft ADP analysis uses fishing effort from the prior calendar year and the Final ADP will incorporate changes to reflect anticipated changes to fishing effort, budgets, costs, and EM pool participation. This analysis uses the 2023 EM vessel participant lists. The Draft ADP will include anticipated changes to effort due to the Pacific Cod Trawl Cooperative (PCTC) and additional 2024 Trawl EFP vessels.

Monitoring Costs

Monitoring cost models were generated for all three monitoring methods: at-sea observers, at-sea fixed-gear EM, and trawl EM (including both compliance monitoring at-sea and shoreside sampling by observers). These models were built using the best available data and reflect known patterns of economy of scale and inflation and will be described in more detail in the 2024 Draft ADP. This analysis assumed a budget of \$4.5M dollars, which approximates the ex-vessel fee revenue from recent years. The Draft ADP will also examine designs at budgets above and below this amount (\$3.5M to represent a low market price scenario, and \$5.25M to represent a scenario with additional federal funds).

- **At-sea Observers:** Cost-per-observer day is a function of total sea days and travel costs; as total sea days increase, cost-per-day decreases. Although the current partial coverage observer contract

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concludes in mid-August, the cost structure was assumed to apply generally to the entire year. Additionally, because the new partial coverage contract will no longer have a single ‘guaranteed day’ minimum of 2,000 days, the cost model assumes the ability to purchase less than 2,000 days (at higher per-unit costs) .

- **At-sea Fixed-Gear EM:** Fixed-gear EM costs are a function of the number of vessels in the pool and how many trips are reviewed. Fixed costs are calculated as the number of fixed-gear EM vessels multiplied by the average yearly cost of each vessel (equipment install and maintenance costs), and review costs are calculated as the number of sampled trips multiplied by review costs. Costs assume that both fixed and recurring equipment costs will be fully funded by the PC ex-vessel monitoring fee in the future.
- **Trawl EM:** Fixed Trawl EM costs are a function of the number of GOA-only vessels expected to join the pool. GOA-only vessels are expected to have equipment installation and maintenance costs funded by the ex-vessel fee, whereas any vessels that fish in both the GOA and BS are assumed to pay for those costs. Review costs are assumed as the total number of GOA sea days multiplied by a per-day compliance review cost (note that review costs for BS trips will be paid through a separate fee). Shoreside observer costs for processors accepting deliveries from only the GOA are assumed as the expected number of shoreside observer days multiplied by the expected costs of each shoreside day. Costs assume that both fixed and recurring equipment costs by GOA-only vessels will be fully funded by the PC ex-vessel monitoring fee in the future. Again, the partial coverage observer contract which provides shoreside plant observers will conclude in August 2024, and costs of shoreside observers is expected to change in the newly awarded contract, but the extent is unknown.

It is important to note the total fixed costs of electronic monitoring (fixed-gear and trawl EM combined, consisting of new or replacement equipment costs and recurring equipment maintenance costs) **is approximately \$1.2M.** This amount is subtracted from the monitoring budget before any samples are allocated. As a result, the cost-per-unit of sampling with EM systems is greatly affected by the number of samples allocated to those monitoring tools (Figure 1). Allocating a large portion of the remaining budget to sample with EM systems (i.e., the *status quo* allocation method) results in a lower cost-per-unit for EM systems, but this in turn results in fewer samples allocated to at-sea observers and a relatively higher observer cost-per-day.

It is also important to consider the types of data collected by the various monitoring methods and the trade-offs of sample quantity, quality, and utility. The design evaluation in the 2024 Draft ADP will include several performance measures focused on different aspects of data quality, and will highlight the data quality trade-offs between designs.

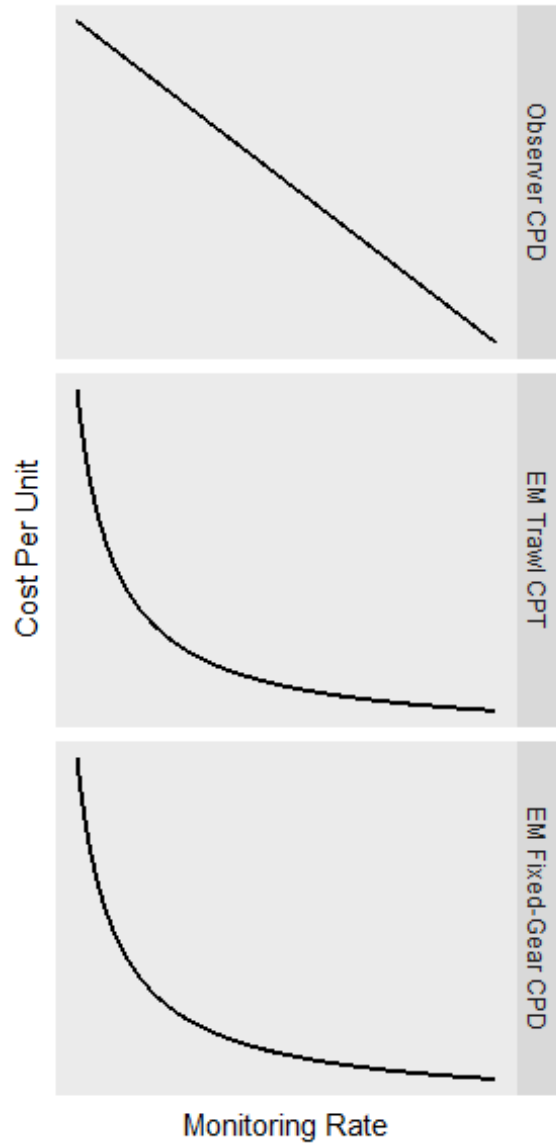


Figure 1. Relationships of cost-per-unit as a function of monitoring rate for each of the three monitoring methods. The y-axis units were obliterated to discourage comparisons. Observers do not have fixed costs but generally have higher per-day costs that gradually scale with volume. Trawl EM has high fixed costs dependent on the number of GOA-only vessels, cheap costs for compliance monitoring review, and moderate costs for shoreside sampling that scale with volume. Fixed-gear EM has very high fixed costs dependent on the number of wired vessels that enter the pool and low review costs.

Designs

Monitoring designs are a combination of stratification and allocation schemes.

- **Stratification:** Used to divide the population into sample units (trips/offloads). ODDS must be able to assign each trip to a stratum based on characteristics known before fishing occurs.

- **2023 Stratification (6 strata):**

- [Monitoring Method (Observer, EM Fixed Gear, EM Trawl)] x
- [Gear Type (HAL, POT, TRW)]

- **FMP (11 strata):**

- [Monitoring Method (Observer, EM Fixed Gear, EM Trawl)] x
- [Gear Type (HAL, POT, TRW)] x
- [FMP (BSAI, GOA)]

Further stratifying by FMP allows differential allocation that may reduce the likelihood of gaps in the BSAI

- **Fixed-FMP (7 strata):**

- [Monitoring Method (Observer, EM Fixed Gear, EM Trawl)] x
- [Gear Type (FIXED, TRW)] x
- [FMP (BSAI, GOA)]

Combining HAL and POT gear trips into a FIXED gear stratum simplifies the existing issue of deciding how to assign trips to a single stratum when the vessel fishes with multiple gear types.

- **Allocation Methods:** Used to decide how much to sample each stratum, given a pre-specified budget. Allocation methods differ based on the goals they are meant to achieve.

- **Equal Rates:** Useful for comparisons and when little is known about the population.

- **Status Quo:** The allocation method used in 2023, in part dictated by the policy decision to sample Fixed-gear EM at 30% and Trawl EM at 33.33%, with the remaining funds allocated to the Observer strata. Observer strata are allocated samples at equal rates until all the strata achieve a 95% probability of realizing 15% sample rate, at which point additional samples are allocated to reduce the combined variance of discarded, total groundfish, PSC Chinook, and PSC halibut.

- **Cost-weighted Boxes:** This design allocates more samples to strata with a higher proportion of boxes (based on the arrangement of trips in time and space) expected to not be near a neighboring sampled trip, and allocates more sampling to strata with a lower cost per trip.

- **Proximity:** This design allocates more samples to strata with a lower expected proportion of trips neighboring a sampled trip, and allocates more sampling to strata with fewer total trips to prevent small sample size issues.

Preliminary Rates

Table 1. Preliminary rates and sample sizes from all designs to be considered in the 2024 Draft Annual Deployment Plan. *Design* is a combination of the stratification and allocation schemes as defined above.

The alternative stratification schemes under consideration are identified as *2023*, *FMP*, *Fixed-FMP*, where strata are defined by a combination of monitoring method, gear type, and if applicable, FMP. *Method* refers to the monitoring method: *EM_FG* refers to EM on fixed gear vessels, *EM_TRW* refers to the GOA Trawl EM Program, and *OB* refers to at-sea observer monitoring. The allocation schemes under consideration are identified as *Equal* as equal rates, *SQ* as status quo, *CWB* as cost-weighted boxes, and *PROX* as proximity. For example, “2023 x Equal” refers to a monitoring design where strata are defined as specified in the 2023 ADP under equal rates Allocation.

N is the total number of trips in a stratum, *Sample %* is the preliminary sample rate given a \$4.5M budget, and *n* is the preliminary sample size (i.e., the expected number of monitored trips). It is important to note that in cases where the sample rate is high (e.g., the *FMP x Proximity* design for the BSAI EM_FG HAL stratum, 55%) the expected number of monitored trips is relatively small (18 trips).

Design	Method	FMP	Gear	<i>N</i>	Sample %	<i>n</i>
2023 x Equal	EM_FG		HAL	722	9.25	67
2023 x Equal	EM_FG		POT	353	9.25	33
2023 x Equal	EM_TRW		TRW	620	9.25	57
2023 x Equal	OB		HAL	1,352	9.25	125
2023 x Equal	OB		POT	1,086	9.25	100
2023 x Equal	OB		TRW	631	9.25	58
2023 x SQ	EM_FG		HAL	722	30.00	217
2023 x SQ	EM_FG		POT	353	30.00	106
2023 x SQ	EM_TRW		TRW	620	33.33	207
2023 x SQ	OB		HAL	1,352	6.76	91
2023 x SQ	OB		POT	1,086	6.76	73
2023 x SQ	OB		TRW	631	6.76	43
2023 x CWB	EM_FG		HAL	722	15.79	114
2023 x CWB	EM_FG		POT	353	17.56	62
2023 x CWB	EM_TRW		TRW	620	6.64	41
2023 x CWB	OB		HAL	1,352	10.00	135
2023 x CWB	OB		POT	1,086	8.17	89
2023 x CWB	OB		TRW	631	9.89	62
2023 x PROX	EM_FG		HAL	722	14.14	102
2023 x PROX	EM_FG		POT	353	23.99	85
2023 x PROX	EM_TRW		TRW	620	6.00	37
2023 x PROX	OB		HAL	1,352	8.97	121
2023 x PROX	OB		POT	1,086	10.03	109
2023 x PROX	OB		TRW	631	7.85	50

Design	Method	FMP	Gear	N	Sample %	n
FMP x Equal	EM_FG	BSAI	HAL	32	9.25	3
FMP x Equal	EM_FG	GOA	HAL	690	9.25	64
FMP x Equal	EM_FG	BSAI	POT	57	9.25	5
FMP x Equal	EM_FG	GOA	POT	296	9.25	27
FMP x Equal	EM_TRW	GOA	TRW	620	9.25	57
FMP x Equal	OB	BSAI	HAL	106	9.25	10
FMP x Equal	OB	GOA	HAL	1,246	9.25	115
FMP x Equal	OB	BSAI	POT	255	9.25	24
FMP x Equal	OB	GOA	POT	831	9.25	77
FMP x Equal	OB	BSAI	TRW	115	9.25	11
FMP x Equal	OB	GOA	TRW	516	9.25	48
FMP x SQ	EM_FG	BSAI	HAL	32	30.00	10
FMP x SQ	EM_FG	GOA	HAL	690	30.00	207
FMP x SQ	EM_FG	BSAI	POT	57	30.00	17
FMP x SQ	EM_FG	GOA	POT	296	30.00	89
FMP x SQ	EM_TRW	GOA	TRW	620	33.33	207
FMP x SQ	OB	BSAI	HAL	106	6.76	7
FMP x SQ	OB	GOA	HAL	1,246	6.76	84
FMP x SQ	OB	BSAI	POT	255	6.76	17
FMP x SQ	OB	GOA	POT	831	6.76	56
FMP x SQ	OB	BSAI	TRW	115	6.76	8
FMP x SQ	OB	GOA	TRW	516	6.76	35
FMP x CWB	EM_FG	BSAI	HAL	32	19.60	6
FMP x CWB	EM_FG	GOA	HAL	690	14.05	97
FMP x CWB	EM_FG	BSAI	POT	57	21.71	12
FMP x CWB	EM_FG	GOA	POT	296	18.13	54
FMP x CWB	EM_TRW	GOA	TRW	620	6.97	43
FMP x CWB	OB	BSAI	HAL	106	12.96	14
FMP x CWB	OB	GOA	HAL	1,246	8.36	104
FMP x CWB	OB	BSAI	POT	255	9.06	23
FMP x CWB	OB	GOA	POT	831	9.11	76
FMP x CWB	OB	BSAI	TRW	115	14.13	16
FMP x CWB	OB	GOA	TRW	516	9.61	50
FMP x PROX	EM_FG	BSAI	HAL	32	55.16	18
FMP x PROX	EM_FG	GOA	HAL	690	10.26	71
FMP x PROX	EM_FG	BSAI	POT	57	31.53	18
FMP x PROX	EM_FG	GOA	POT	296	20.05	59
FMP x PROX	EM_TRW	GOA	TRW	620	4.01	25
FMP x PROX	OB	BSAI	HAL	106	35.89	38
FMP x PROX	OB	GOA	HAL	1,246	6.09	76
FMP x PROX	OB	BSAI	POT	255	11.52	29
FMP x PROX	OB	GOA	POT	831	8.57	71
FMP x PROX	OB	BSAI	TRW	115	17.58	20
FMP x PROX	OB	GOA	TRW	516	5.78	30

Design	Method	FMP	Gear	<i>N</i>	Sample %	<i>n</i>
Fixed-FMP x Equal	EM_FG	BSAI	FIXED	89	9.25	8
Fixed-FMP x Equal	EM_FG	GOA	FIXED	986	9.25	91
Fixed-FMP x Equal	EM_TRW	GOA	TRW	620	9.25	57
Fixed-FMP x Equal	OB	BSAI	FIXED	361	9.25	33
Fixed-FMP x Equal	OB	GOA	FIXED	2,077	9.25	192
Fixed-FMP x Equal	OB	BSAI	TRW	115	9.25	11
Fixed-FMP x Equal	OB	GOA	TRW	516	9.25	48
Fixed-FMP x SQ	EM_FG	BSAI	FIXED	89	30.00	27
Fixed-FMP x SQ	EM_FG	GOA	FIXED	986	30.00	296
Fixed-FMP x SQ	EM_TRW	GOA	TRW	620	33.33	207
Fixed-FMP x SQ	OB	BSAI	FIXED	361	6.76	24
Fixed-FMP x SQ	OB	GOA	FIXED	2,077	6.76	140
Fixed-FMP x SQ	OB	BSAI	TRW	115	6.76	8
Fixed-FMP x SQ	OB	GOA	TRW	516	6.76	35
Fixed-FMP x CWB	EM_FG	BSAI	FIXED	89	23.29	21
Fixed-FMP x CWB	EM_FG	GOA	FIXED	986	12.56	124
Fixed-FMP x CWB	EM_TRW	GOA	TRW	620	8.88	55
Fixed-FMP x CWB	OB	BSAI	FIXED	361	14.00	51
Fixed-FMP x CWB	OB	GOA	FIXED	2,077	7.47	155
Fixed-FMP x CWB	OB	BSAI	TRW	115	16.28	19
Fixed-FMP x CWB	OB	GOA	TRW	516	11.07	57
Fixed-FMP x PROX	EM_FG	BSAI	FIXED	89	44.66	40
Fixed-FMP x PROX	EM_FG	GOA	FIXED	986	11.32	112
Fixed-FMP x PROX	EM_TRW	GOA	TRW	620	7.24	45
Fixed-FMP x PROX	OB	BSAI	FIXED	361	20.32	73
Fixed-FMP x PROX	OB	GOA	FIXED	2,077	5.88	122
Fixed-FMP x PROX	OB	BSAI	TRW	115	28.78	33
Fixed-FMP x PROX	OB	GOA	TRW	516	9.92	51

Analyst Notes

- A \$4.5M budget is not sufficient for the *status quo* allocation scheme to afford optimized days in the observed strata and two operational EM programs. Therefore, the *status quo* allocation method employs equal rates allocation to the at-sea Observer strata. For this same reason, the decision to apply the ‘minimum + optimized’ allocation method to all strata (not just observed strata) was not included in this analysis because it was equivalent to the ‘equal rates’ allocation scheme.
- The fixed costs of EM Trawl are likely to be higher than assumed in this analysis because the number of GOA-only trawl vessels is expected to be significantly greater than the count in 2022 (25 vessels in 2022 increasing to 39 in 2024). This change is expected to result in a relative decrease in the total number of monitored trips afforded.
- The removal of PCTC trips from fishing effort predictions is expected to result in a marginal increase in the total number of monitored trips afforded.