Deployment Performance Review of the 2016 North Pacific Observer Program

2016 Observer Science Committee

Presented by
Fishery Monitoring and Analysis Division, Alaska Fisheries Science Center, Seattle

North Pacific Fishery Management Council
Advisory Panel
June, 2017
Seattle, WA

The Analytical Team

Analyses were performed by the Fisheries Monitoring and Analysis Division in consultation with experts with practical knowledge of observer data. The Division convenes its Observer Science Committee annually. This years members included:

- Craig Faunce (AFSC/FMA)
- Jane Sullivan (Alaska Sea Grant Fellow, AKRO/SF)
- Steve Barbeaux (AFSC/REFM)
- Jennifer Cahalan (PSMFC)
- Jason Gasper (AKRO/SF)
- Sandra Lowe (AFSC/REFM)
- Ray Webster (IPHC)

This review is intended to inform the Council and the public of how well various aspects of the program are working and lead to recommendations for improvement (based on the data). OSC recommendations do not need to equate to official NMFS recommendations or actions for future ADPs.

Efficiency

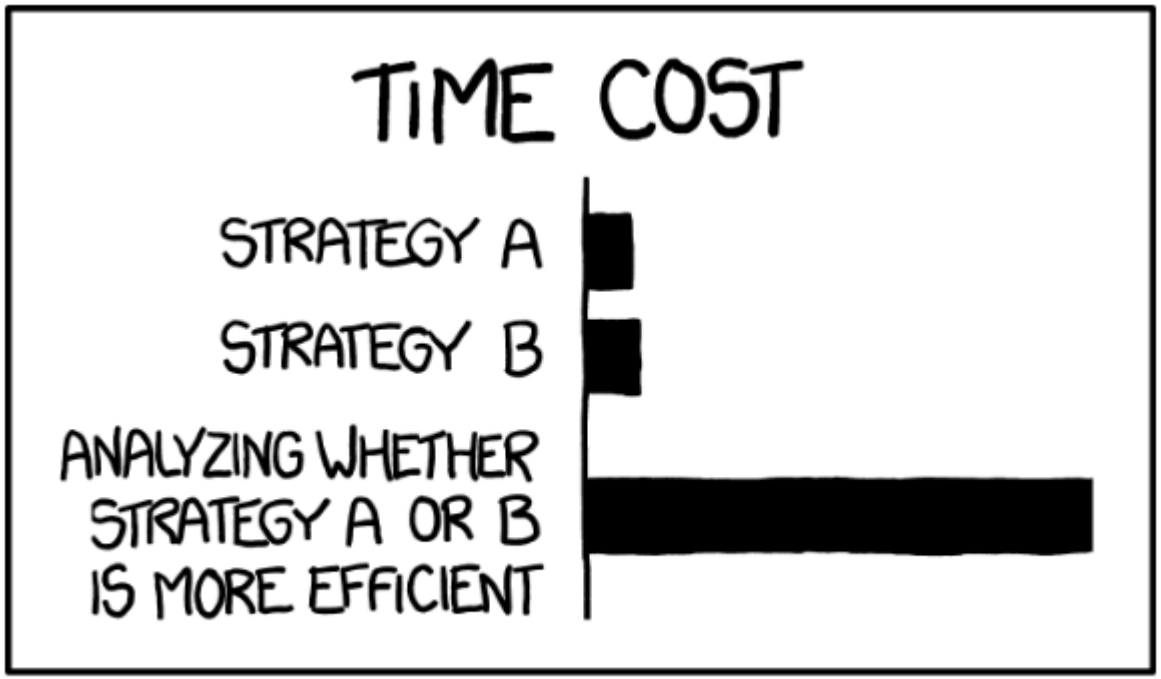
is focused on inputs:
how well is a task performed?

Effectiveness

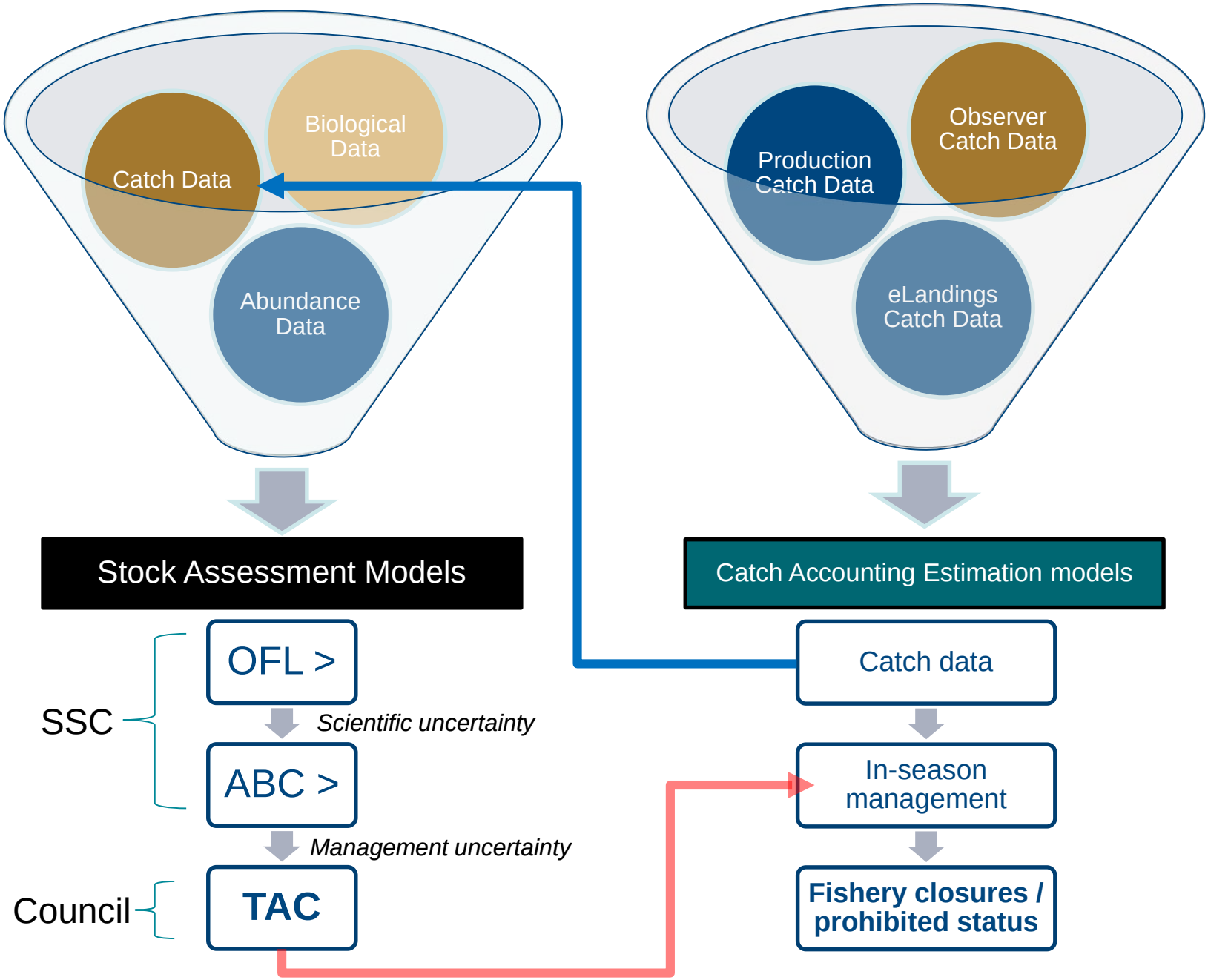
is focused on outputs:
How meaningful is the product?

> Efficiency is doing things right.
>
> Effectiveness is doing the right things!
>
> – Peter Drucker

http://bitbar.com/effective-mobile-devops-strategy-and-typical-goals/
https://blog.versionone.com/words-mean-things-efficient-and-effective/



https://imgs.xkcd.com/comics/efficiency.png


Catch Data
Biological Data
Abundance Data
Production Catch Data
Observer Catch Data
eLandings Catch Data
Stock Assessment Models
Catch Accounting Estimation models
SSC
OFL >
Scientific uncertainty
ABC >
Management uncertainty
Council
TAC
Catch data
In-season management
Fishery closures / prohibited status

Good fisheries monitoring data is important because it affects TAC setting, the accuracy of the Stock Assessment, and how well the quotas are managed.

Observer Deployment 2016

Evaluating Observer Program in 2016

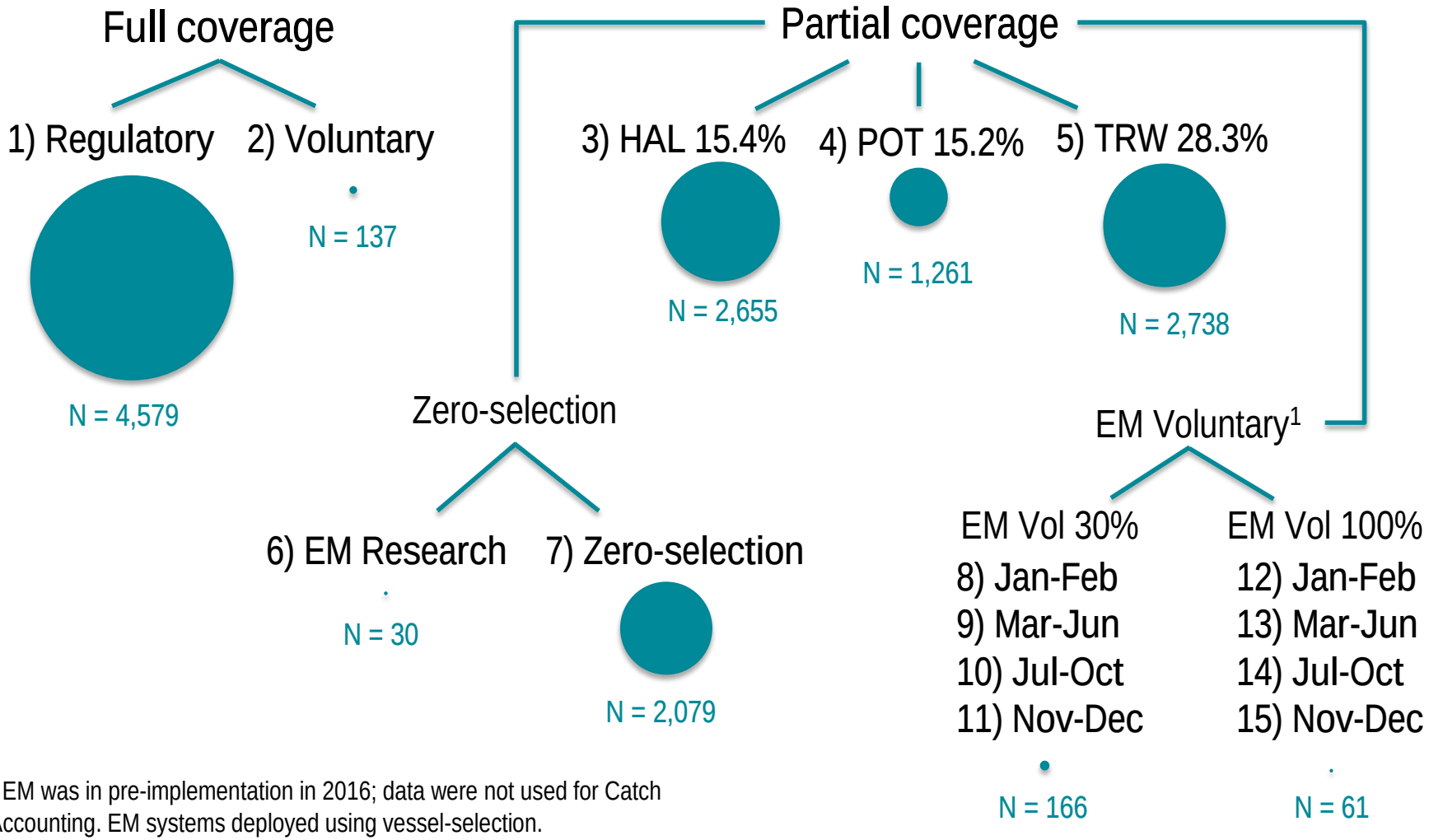
1) Did we meet expectations for deployment rates in each stratum?
    - Trip- and vessel-selection
2) Were our samples representative?
    - Dockside monitoring of salmon
    - Temporal and spatial bias
    - Observer & tendering effects
3) Was our sample size adequate?

Changes in Methods:

- NEW! Trip definitions for full coverage reverted back to 2013 & 2014 methods.
    - (Trip definitions from quota monitoring and do not accurately reflect fishing trips). Not comparable to 2015 values.
- Updated spatial coverage maps
- Visual summaries of vessel-selection strata (Electronic Monitoring)
- Development of Annual Report in a fully reproducible research project in R Markdown
    - Increase efficiency
    - Reduce errors

15 strata to evaluate in 2016

N = Total number of trips



[1] EM was in pre-implementation in 2016; data were not used for Catch Accounting. EM systems deployed using vessel-selection.

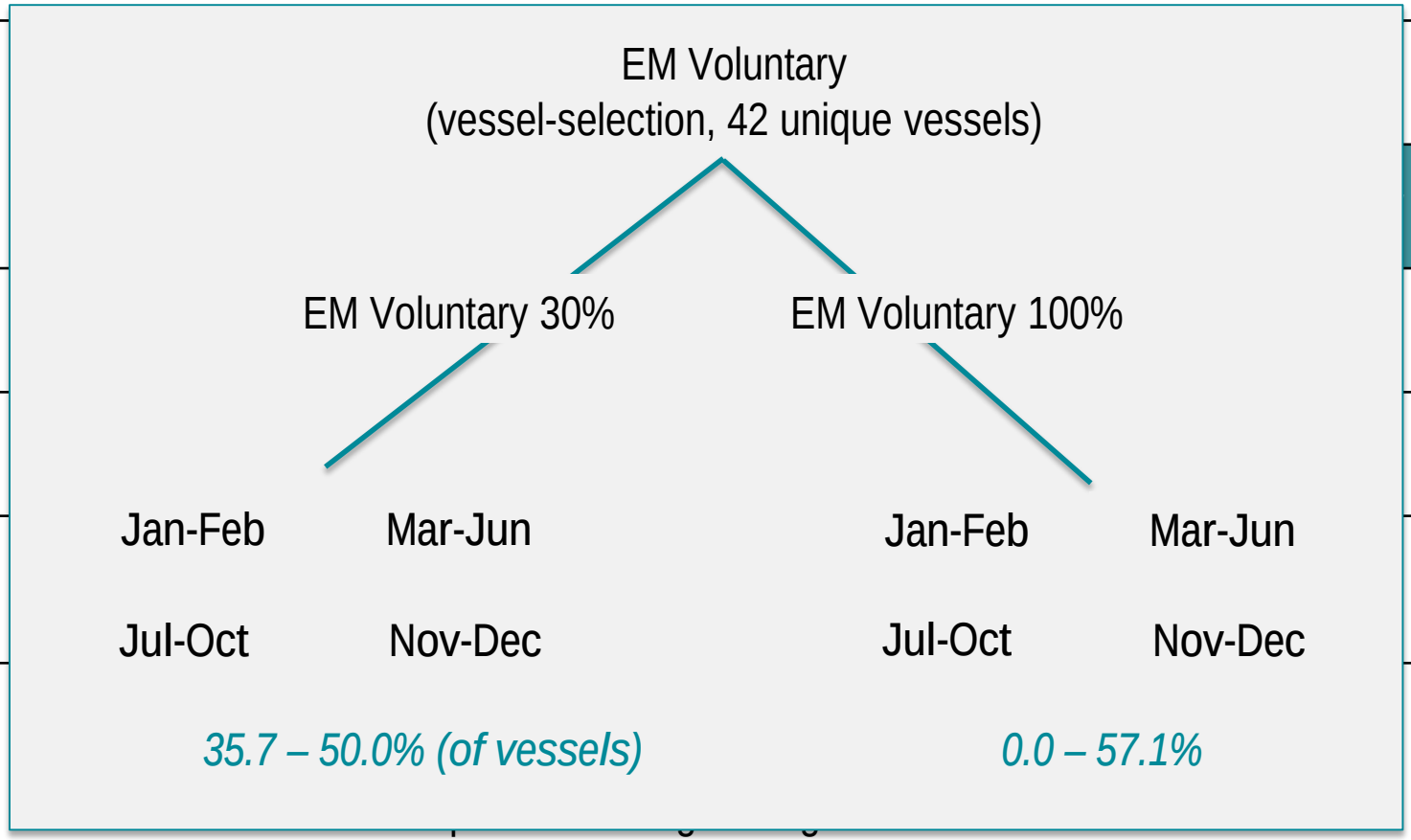
Partial Coverage Two Year Comparison: Coverage Rates

	2015				2016					
	t	T	Zero	All	Zero	HAL	POT	TRW	EM	All
% Observed	**11.2**	**23.4**	**0.0**	**15.0**	**0.0**	**15.0**	**14.7**	**28.0**	**33.4**	**15.9**[1]
% Expected	**12.0**	**24.0**	**0.0**		0.0	15.4	15.2	28.3		
Meets Expectations?	**Yes**	**Yes**	**Yes**		**Yes**	**Yes**	**Yes**	**Yes**	**Yes & No**	

[1] The *% Observed* for all partial coverage categories would be 15.0% if EM is excluded.

Section 3.6.1, Table 3-5

Partial Coverage Two Year Comparison: Coverage Rates



	EM	All
	33.4	15.9[1]
	Yes & No	

would be 15.0% if EM is excluded.

Section 3.6.1, Table 3-5

Partial Coverage Two Year Comparison: Coverage Rates

	2015				2016					
	t	T	Zero	All	Zero	HAL	POT	TRW	EM	All
% Observed	**11.2**	**23.4**	**0.0**	**15.0**	**0.0**	**15.0**	**14.7**	**28.0**	**33.4**	**15.9**[1]
% Expected	**12.0**	**24.0**	**0.0**		0.0	15.4	15.2	28.3		
Meets Expectations?	**Yes**	**Yes**	**Yes**		**Yes**	**Yes**	**Yes**	**Yes**	**Yes & No**	

[1] The *% Observed* for all partial coverage categories would be 15.0% if EM is excluded.

Section 3.6.1, Table 3-5

Evaluation of EM Vessel-selection: Anticipating Effort

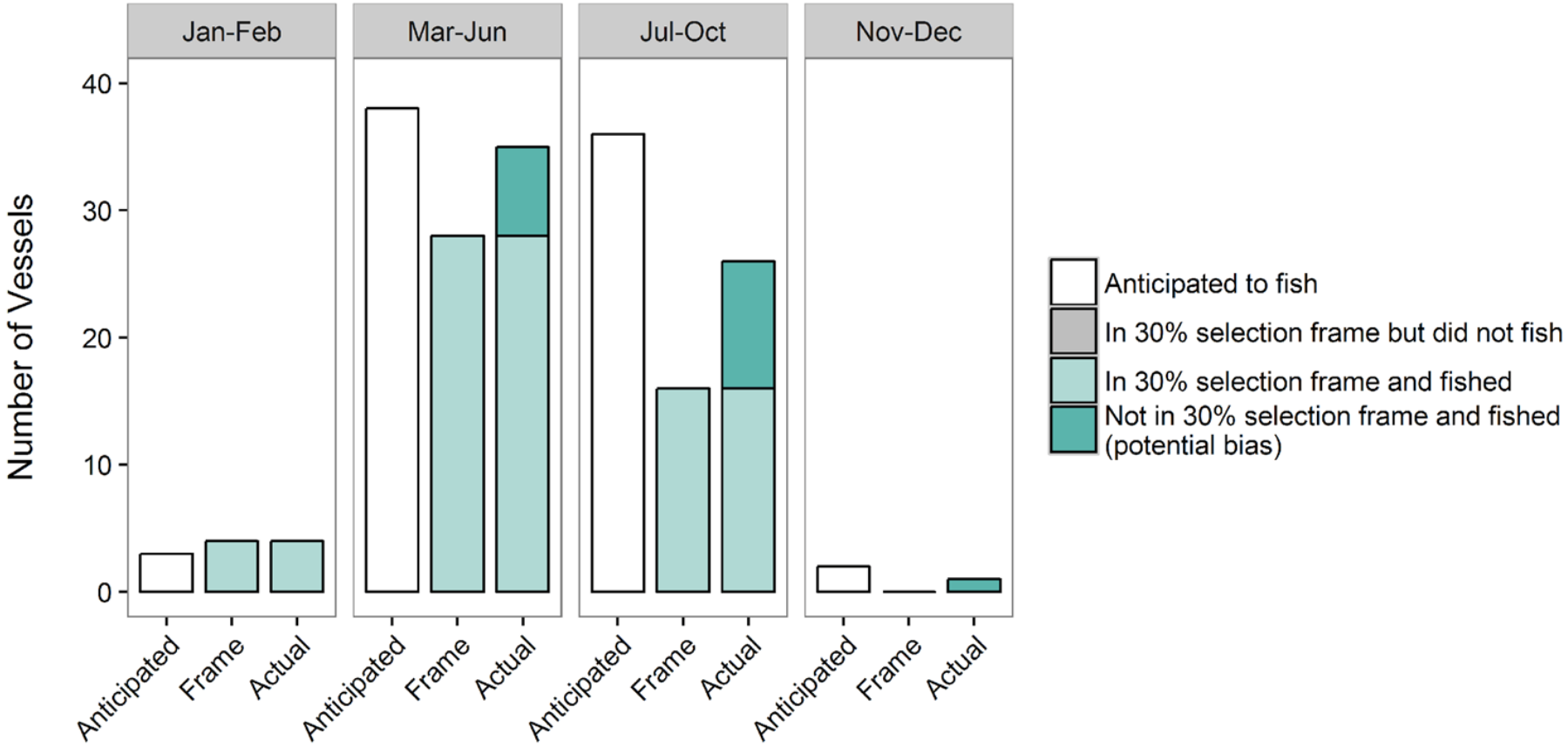


Figure 3-3

Evaluation of EM Vessel-selection: Coverage Rates

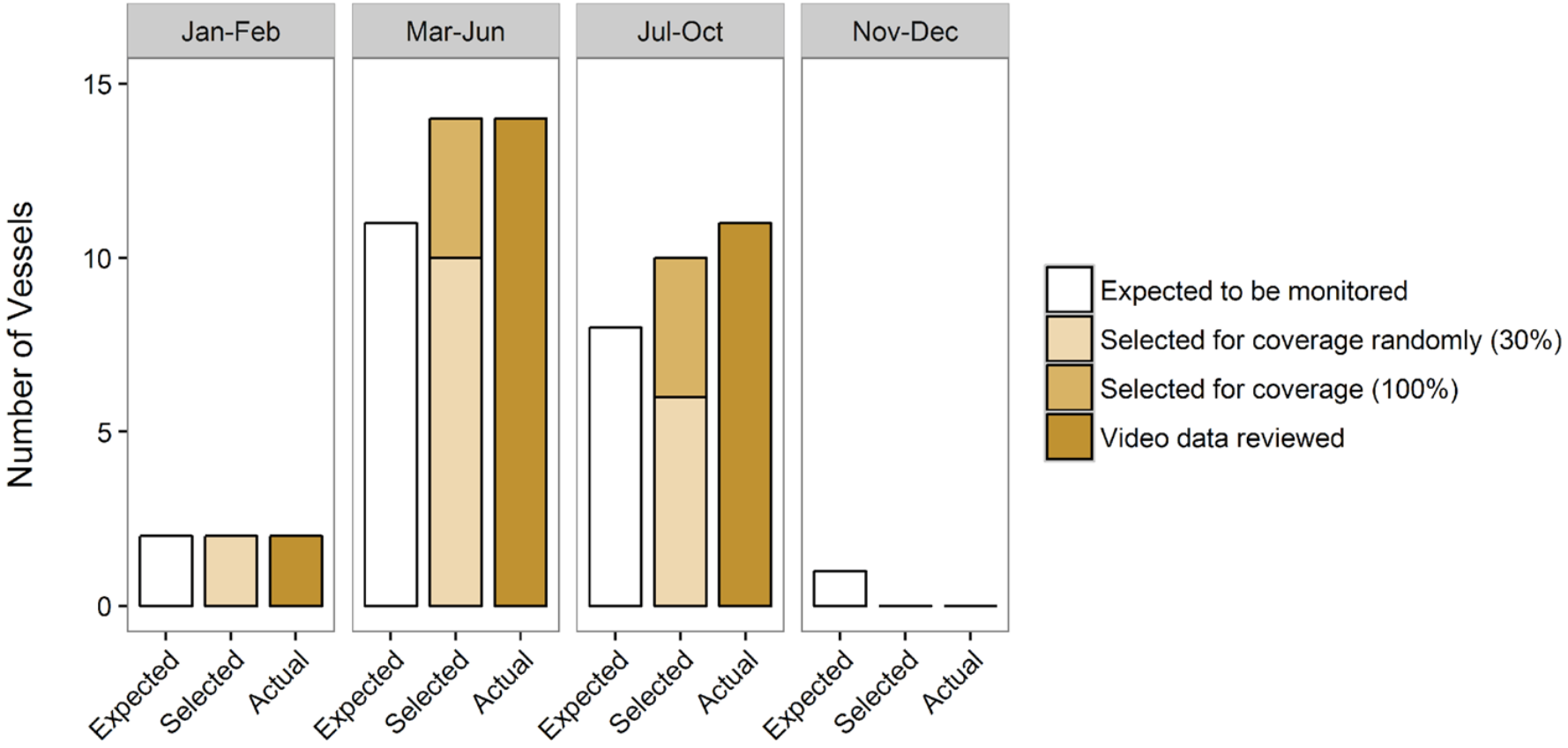


Figure 3-4

Partial Coverage: Trip-selection and Evaluation of ODDS

	2016		
	HAL (15.4%)	**POT (15.3%)**	**TRW (28.3%)**
Total trips logged	2,846	1,331	2,825
Initial Selection Rate[1]	15.9	14.3	28.4
Final Selection Rate[2]	17.7	14.4	29.6
User cancellation % (Selected Trips)	23.9	25.3	15.8
Final selection rate as programmed?	No	Yes	Yes
Are initial and final selection rates similar over time?	No	No	No

[1] Random number only.
[2] Includes cancellations, waivers, and inherits.

Tables 3-2 to 3-4, Fig. 3-2

Partial Coverage Two Year comparison: Dockside monitoring

- Pollock delivered by observed catcher vessels are monitored for salmon. Tender deliveries not monitored.
- Did we achieve a random sample of trawl pollock deliveries in partial coverage at the desired rate?

	2015		2016		
	t	T	HAL	POT	TRW
Dockside monitoring as expected? Table 3-7	No (King Cove)				No (King Cove)

Tendering continues to affect genetic sampling and salmon bycatch estimation within the pollock trawl fleet.

Partial Coverage Two Year comparison: Temporal and Spatial Bias

	2015		2016		
	t	**T**	**HAL**	**POT**	**TRW**
Temporal observation rates as expected? Fig. 3-5	Yes (0%)	Yes (0.6%)	Yes (0%)	Yes (0%)	Yes (0.06%)
	Trip-selection + higher coverage reduced temporal bias				
Spatial observation rates as expected? Figs. 3-6 to 3-12	No	Maybe	Yes	Yes	Yes
	Higher coverage reduced gaps				

Partial Coverage: Testing for observer and tendering effects

Tables 3-8 to 3-15

All trips

1. *Observer effect?*

TRW: Yes
HAL: Yes
POT: No

2. *Tendering effect?*

TRW: Yes
HAL: *omit*
POT: Yes

3. *Observer effect within tenders?*

TRW: Yes
HAL: *omit*
POT: No*

4. *Observer effect within non-tenders?*

TRW: Yes
HAL: Yes
POT: No

Partial Coverage: Testing for observer and tendering effects

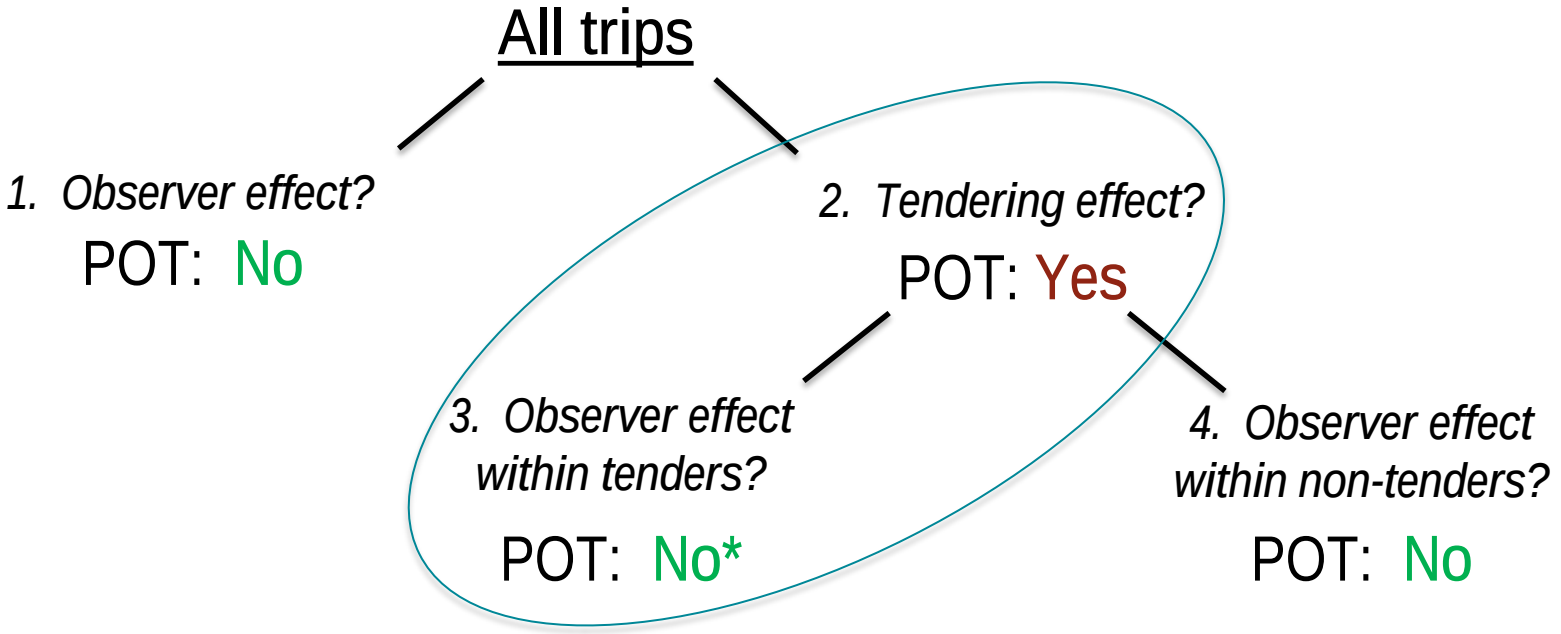
TRW: Both observer and tendering effects at 28% coverage

HAL: Observer effect (too few tender trips to examine) at 15% coverage

POT: No observer effect but tendering effect at 15% coverage (potential sample size issue? SSC)

Detecting tendering effects in POT when sample size is low

- Consistent tendering effect in POT in 2015 and 2016. Potentially unable to detect observer effect within tenders because of low sample size (only 14 of tendered 118 trips were observed, 11%).
- Concern about declining power with declining coverage rates.



Adequacy of sample size

Goal: Apply discard rates from observed trips to unobserved trips with similar traits. Important that each NMFS Area has at the very least one observed trip.

We evaluate the likelihood of "missing" an area. This likelihood goes down as you:

- Increase the number of trips in an area
- Increase the sampling rate

Areas and gears with low amounts of effort activity will require higher selection rates to observe than areas and gears with large amounts of effort.

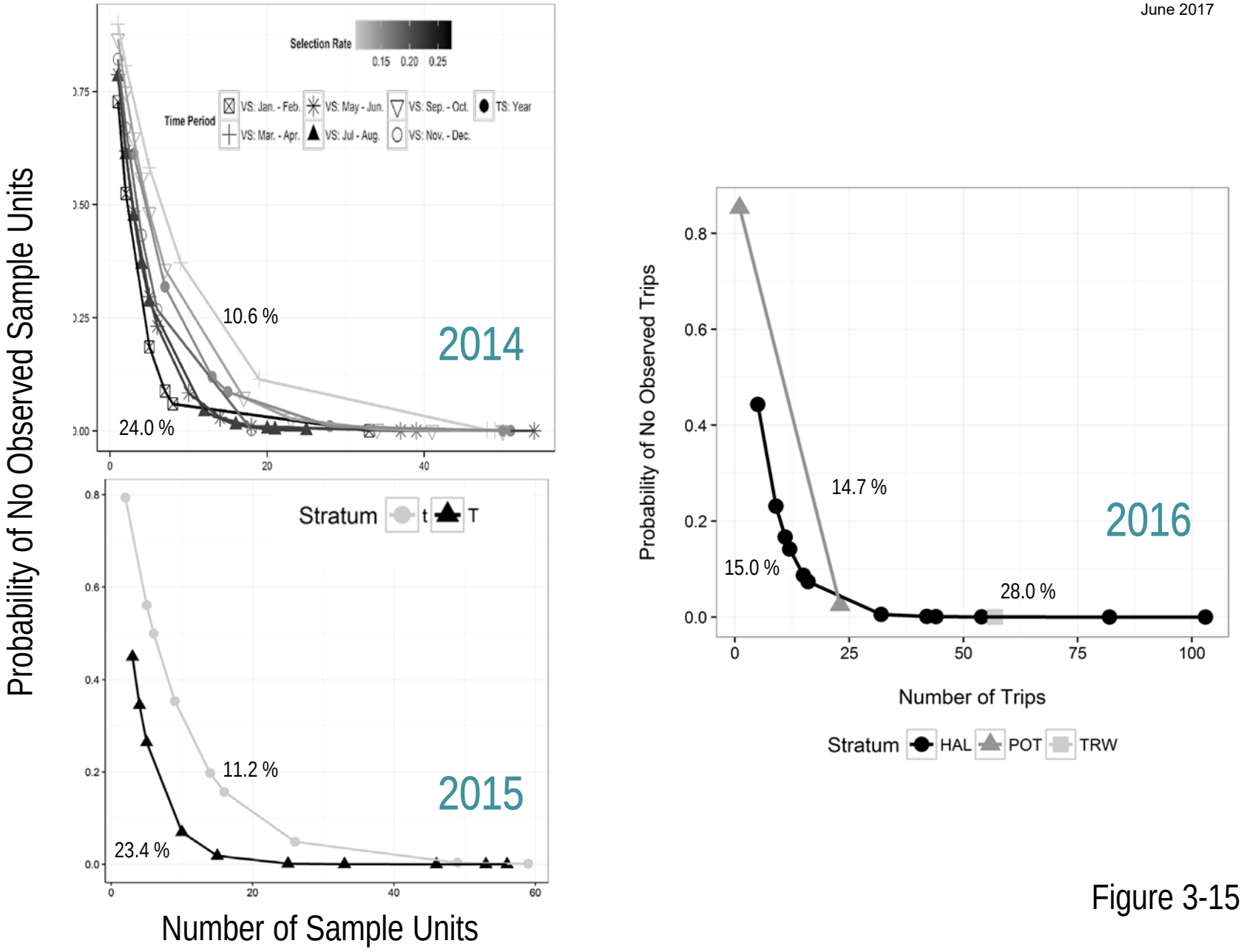

Probability of No Observed Sample Units
Selection Rate
0.15 0.20 0.25
Time Period
VS: Jan. - Feb.
VS: Mar. - Apr.
VS: May - Jun.
VS: Jul - Aug.
VS: Sep. - Oct.
VS: Nov. - Dec.
TS: Year
10.6 %
2014
24.0 %
Stratum
t
T
11.2 %
2015
23.4 %
Number of Sample Units
Probability of No Observed Trips
14.7 %
2016
15.0 %
28.0 %
Number of Trips
Stratum
HAL
POT
TRW

Figure 3-15

OSC Recommendations

OSC Recommendations 2016

Improve the linkages between ODDS and eLandings.

ODDS	eLandings
Planned trips	Actual trips
Coverage expectation	Fishery designation

Linkages are needed to facilitate movement to design-based estimation and improve tools for fishermen such as the ability to see their own data and trip history in ODDS.

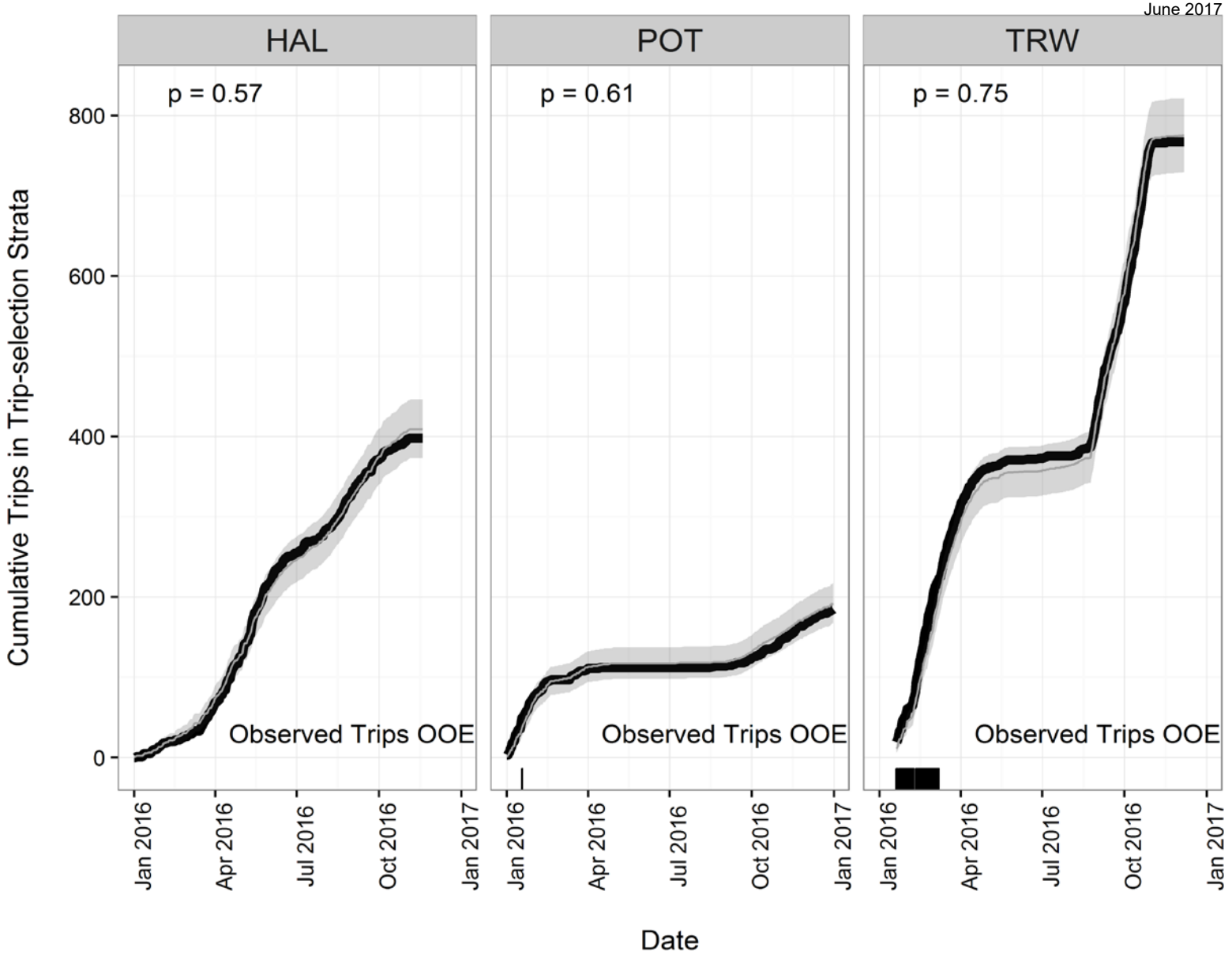
OSC Recommendations 2016

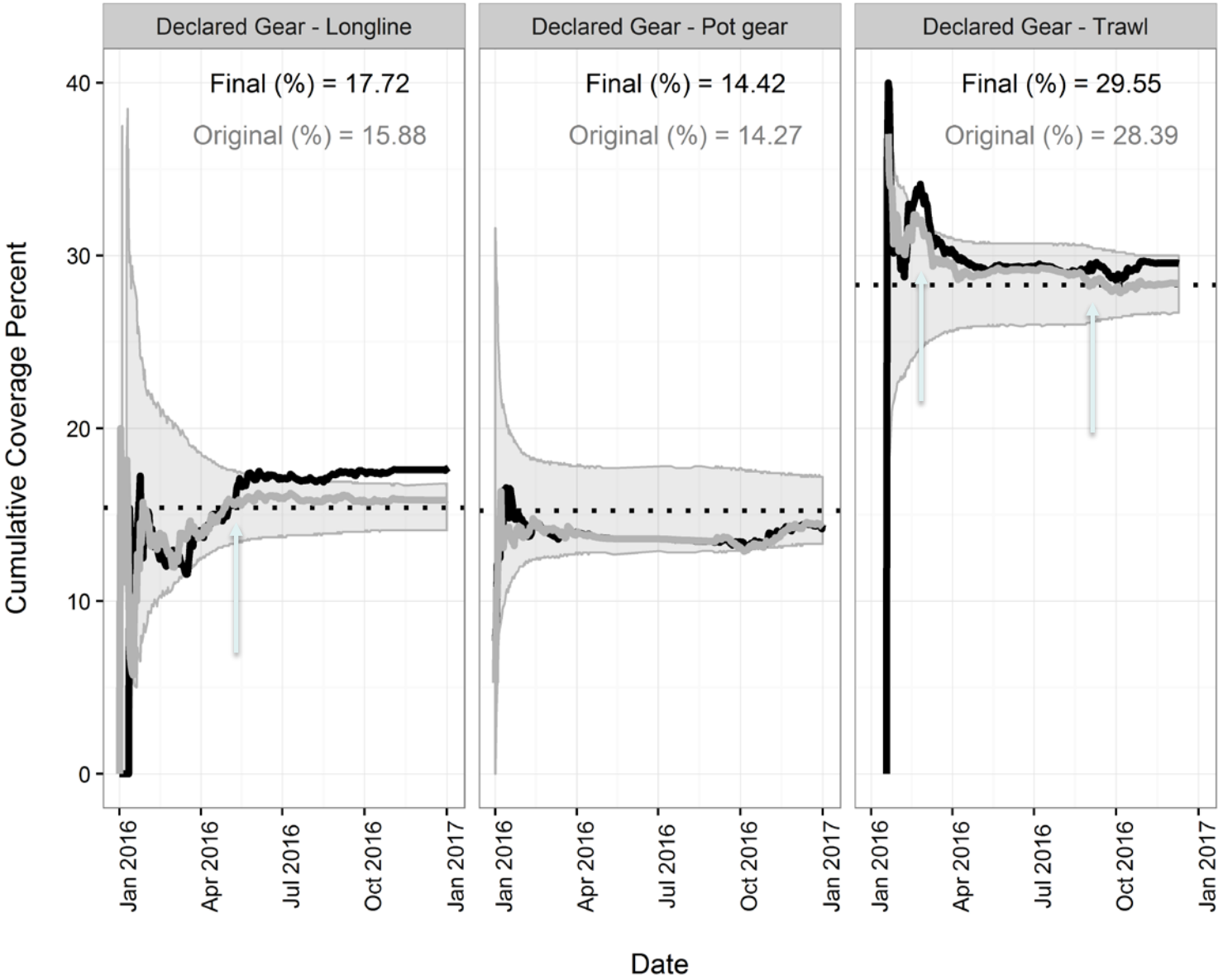
Reduce the impact of cancellations on the number of trips selected for observer coverage in the ODDS.

Trip date changes are already facilitated.

Multiple trips are already facilitated.

Why the need to cancel trips?


HAL
POT
TRW
p = 0.57
p = 0.61
p = 0.75
Observed Trips OOE
Observed Trips OOE
Observed Trips OOE
Cumulative Trips in Trip-selection Strata
0
200
400
600
800
Jan 2016
Apr 2016
Jul 2016
Oct 2016
Jan 2017
Date


Declared Gear - Longline
Declared Gear - Pot gear
Declared Gear - Trawl
Final (%) = 17.72
Original (%) = 15.88
Final (%) = 14.42
Original (%) = 14.27
Final (%) = 29.55
Original (%) = 28.39
Cumulative Coverage Percent
0
10
20
30
40
Jan 2016
Apr 2016
Jul 2016
Oct 2016
Jan 2017
Date

OSC Recommendations 2016

Alternative ways to monitor salmon bycatch should be explored.

Offload monitoring **2016**

The observer program monitors fishing activity among participants by randomly deploying into trips based on qualities known before fishing begins.

With one exception....

The observer program attempts to monitor separately the salmon caught as bycatch in the trawl pollock fishery.

Offload monitoring **2016**

Salmon bycatch is a rare event in this fishery.

(Rare events do not necessarily equate to small magnitudes)

Salmon bycatch quotas are constraining the fleet.

- Incentivizes bycatch avoidance (good)
- Incentivizes bycatch monitoring avoidance (not so good)

Offload monitoring **2016**

Objective of observer program was to monitor trawl pollock offloads.

Supports bycatch estimation by increasing likelihood of encountering rare species (less zeros) and reduces the likelihood of rare, but really large values that can result from estimation routines using at-sea observer sample data.

Supports genetic research since the individual fish can be used as the sampling unit for collecting tissues.

Offload monitoring **2016**

Method has been used successfully in the past, but does not work for tendered deliveries.

- Which salmon came from which catcher vessel?
- How much weight per haul for unobserved vessels?

Offload monitoring **2016**

If tendering was a random process, might still be fine.
(could extrapolate results from observed to unobserved fleet)

It is not a random process.

Offload monitoring **2016**

Evaluation of dockside monitoring for salmon needs to be done at the level of the offload since it is these that are monitored by the observer program and fishery designation is specific to offloads, not trips.

Offload monitoring **2016**

Complications arise from the fact that multiple offloads can be within a single ODDS trip

Offload monitoring **2016**

So what is the expected rate of coverage among deliveries?

Should be equal to the trip deployment rate where tendering does not occur.

Offload monitoring **2016**

Want to test whether the rate of offload monitoring in this fishery is equal to the expected rate of observer deployment.

First perform test for all deliveries...

....then perform the test for just non-tendered.

If tendering is a small portion of the fleet activity, both tests should pass.

If tendering is a greater portion of fleet activity, only the second test should pass.

In no case do we expect both tests to fail.

Offload monitoring **2016**

Both tests failed.

Nearly all deliveries out of King Cove were tendered and no deliveries were observed.

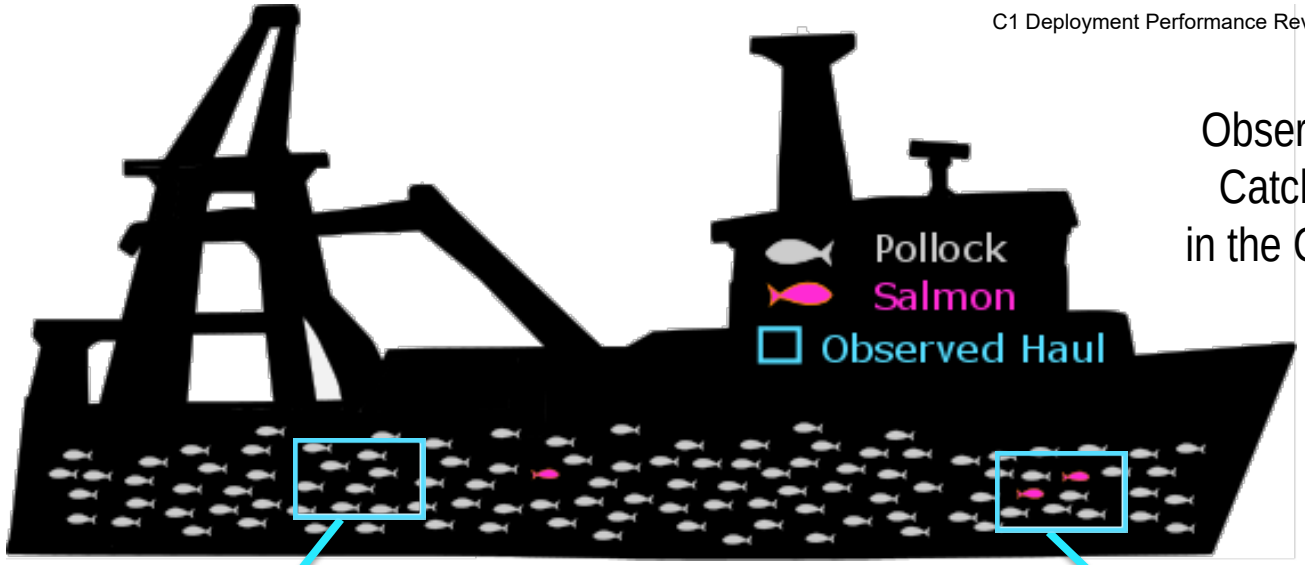
Coverage rates from Sand Point were lower than in the past from non-tendered deliveries.

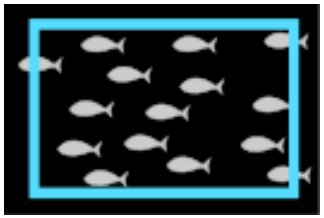
Offload monitoring **2016**

It is likely we are not getting a good estimate of salmon bycatch from high tendering ports.

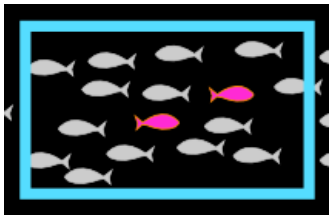
Observer statements.

Observed Pollock Catcher Vessels in the Gulf of Alaska





Change in behavior due to observed salmon creates potential for bias.



Deliver to tender.
Offload not monitored.

Zero salmon count extrapolated to trip & fleet.

Deliver dockside.
Entire offload monitored.

Entire salmon count from trip extrapolated to fleet.

Offload monitoring **2016**

"bias is unavoidable, but its influence can be lessened".

Observer program lacks the firepower to lessen this effect, and cannot afford to continue to chase this goal of monitoring salmon bycatch with precision through the partial coverage contract.

OSC Recommendations 2016

Alternative ways to monitor salmon bycatch should be explored.

OSC Recommendations 2016

Our recommendation is that future ADPs allocate coverage equally among gear types (proportional to effort) up to 15%.

Any remaining observer days in excess of this coverage may be allocated according to alternative optimized designs.

Observe all fisheries first **2016**

At present our coverage rates in some fisheries are at levels that can result in a biased/inaccurate estimate of the catch taken by unobserved vessels.

This in turn means that we can get an inaccurate bycatch estimate from your fleet, quota management suffers, possibly resulting in earlier than normal fishery closures.

Observe all fisheries first **2016**

Our risk of getting biased data is reduced when we allocate coverage proportional to effort -- at least 15% at-sea coverage across all fisheries.

This is a better approach than allocating limited resources to optimize coverage rates in a single fishery.

For example if we tweak our coverage rates to primarily deal with the bycatch of salmon in the pollock fishery, we do so at the harm of our stock assessments for groundfish and we do so at the harm of marine mammal estimation.

Observe all fisheries first **2016**

We at the AFSC and the NMFS are obligated to conduct the best available science and provide these estimates under the MSA, the MMPA, and the ESA to the AKRO and the Council.

Working in partnership with the Council and the industry, we have been able to meet this requirement.

As a result, Alaska serves as a model for successful fisheries management.

Observe all fisheries first **2016**

Going forward we need to ensure that we have at least 15% across gear groups to generate good estimates of catch and bycatch in all our fisheries.

To quote history- Perfect is the enemy of good. We should not pursue optimization in future ADPs without first ensuring we have enough coverage to provide meaningful picture of our fisheries catch and bycatch.

OSC Recommendations 2016

Future ADPs allocate coverage equally among gear types (proportional to effort) up to 15%.

Any remaining observer days in excess of this coverage may be allocated according to alternative optimized designs.

See More At: https://alaskafisheries.noaa.gov/fisheries/observer-program

How long is an unobserved tendered trip?

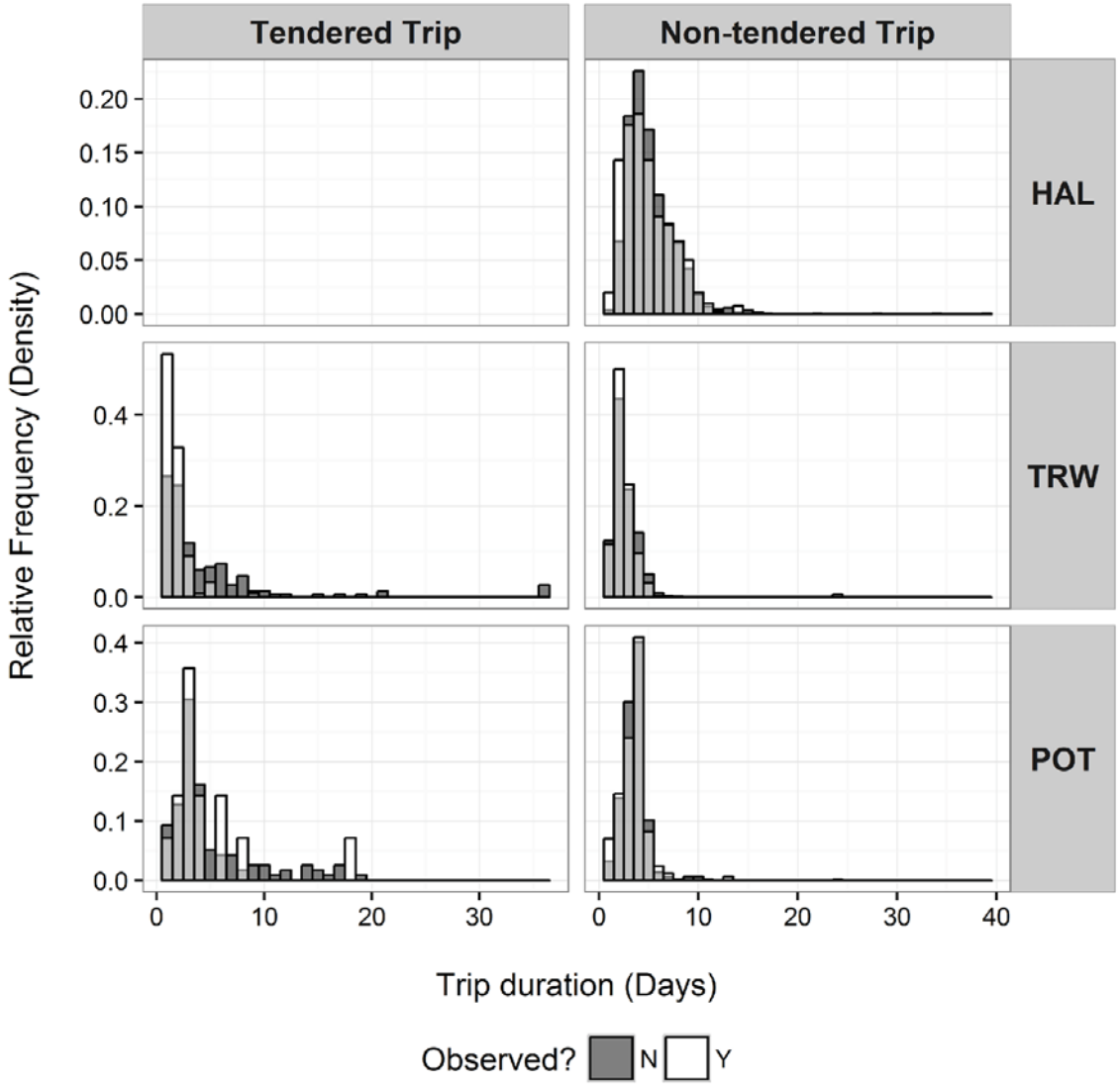


Figure 3-14

Offload monitoring 2016

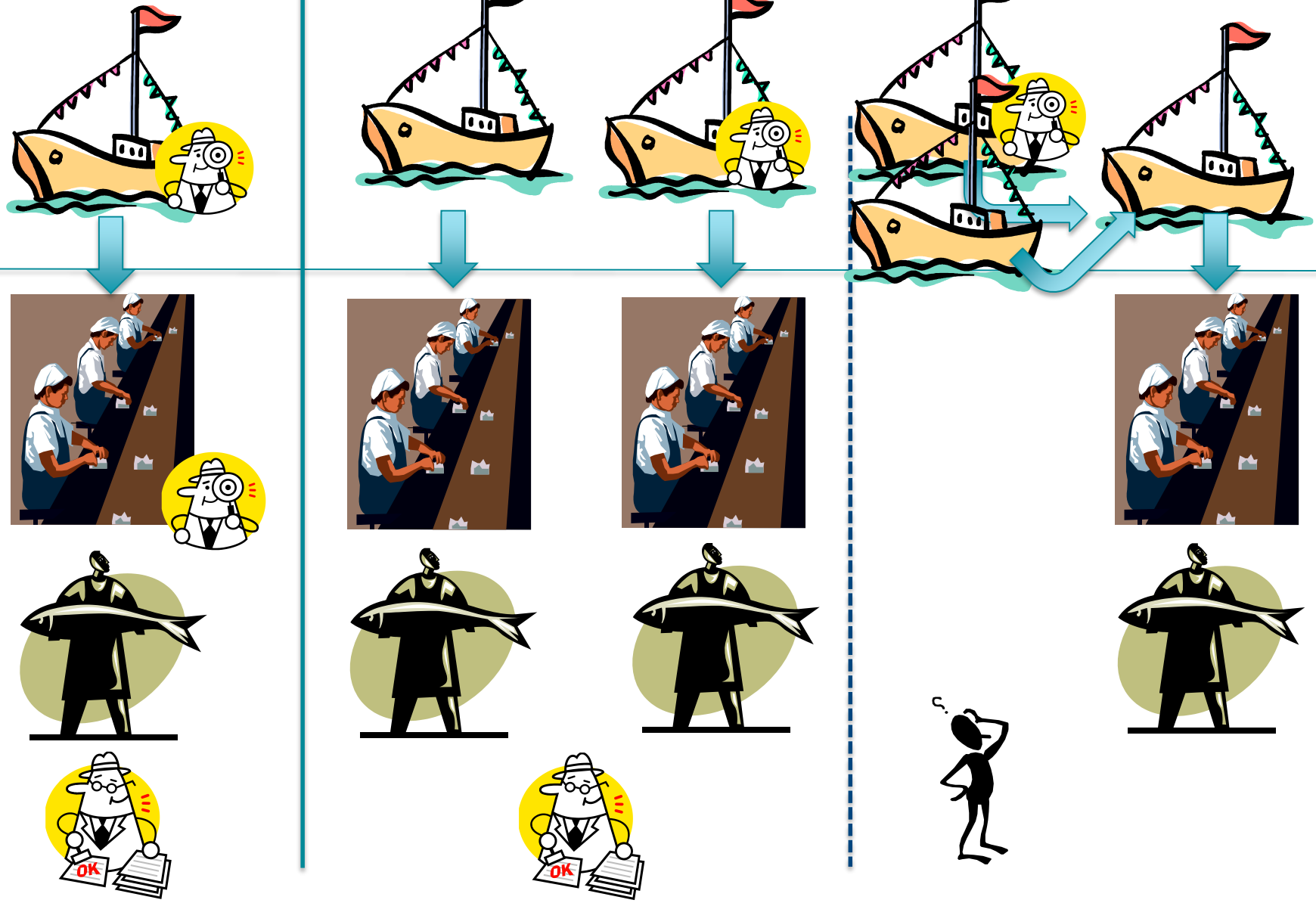
Table 3–7. -- The number of pollock deliveries by observation and tendering status. The '% Observed' column is the percent of all deliveries observed (including tendered deliveries), while the '% Observed Non-tendered' is the percent of non-tendered deliveries observed. For partial coverage, the p-values for 'Deliveries Observed' and 'Deliveries Observed Non-tendered' show the probability that the achieved rates came from random deployment at the expected rate (28%). IFP: Inshore Floating Processor, Hbr: Harbor.

FMP	Coverage category	Port	Total deliveries (*N*)	Observed deliveries (*n*)	% Observed	p-value deliveries observed	% Tender deliveries	% Observed non-tendered	p-value deliveries observed non-tendered
Bering Sea	Full	Akutan	751	751	100.0		0.0	100.0	
Bering Sea	Full	Dutch Hbr.	806	806	100.0		0.0	100.0	
Bering Sea	Full	IFP	339	339	100.0		0.0	100.0	
Bering Sea	Full	King Cove	79	79	100.0		0.0	100.0	
Bering Sea	Full	Sand Point	5	5	100.0		0.0	100.0	
Total	Full		1,980	1,980	100.0		0.0	100.0	
Gulf of Alaska	Partial	Akutan	158	47	29.7		1.9	30.3	
Gulf of Alaska	Partial	Dutch Hbr.	7	4	57.1		0.0	57.1	
Gulf of Alaska	Partial	IFP	29	2	6.9		0.0	6.9	
Gulf of Alaska	Partial	King Cove	322	0	0.0		97.5	0.0	
Gulf of Alaska	Partial	Kodiak	1,097	315	28.7		0.0	28.7	
Gulf of Alaska	Partial	Sand Point	560	58	10.4		21.2	12.9	
Total	Partial		2,173	426	19.6	< 0.001	20.1	24.5	< 0.001

Full census (BSAI A91)

Random sampling catcher vessels

Random sampling catcher vessels tendering



OK if random sample

Might be ok if rare or random event

Offload monitoring 2016

Complications arise from the fact that multiple offloads can be within a single ODDS trip

1 trip
1 offload

1 trip
0 offloads

3 tlandings,
1 offload

The changes in the Observer Program sampling strata, selection pools, and observer coverage categories in each year from 1990 to the present. The observer coverage rates set through the Annual Deployment Plan are noted in black and the realized coverage rates evaluated in the Annual Report are noted in green. CP = catcher/processor vessel; CV = catcher vessel; H&L = hook-and-line gear; LOA = vessel length overall

Year	Full Observer Coverage Category[1]	Partial Observer Coverage Category[2]							
	Full Selection Pool Observer coverage required on all trips	Trip Selection Pool Observer coverage required on all randomly selected trips						Vessel Selection Pool Randomly selected vessels required to carry an observer for all trips in a time period	No Selection Pool Observer coverage not required	
2017	Regulatory full ≥ 100%	Trawl: 18%	Trawl Tender: 14%	H & L: 11%	H & L Tender: 25%	Pot: 4%	Pot Tender: 4%			Voluntary EM ~90 vessels
2016		Trawl: 28% (28)		H & L: 15% (15)		Pot: 15% (14.7)		N/A	Vessels <40' LOA and Jig gear	Voluntary EM 42 vessels (24 observed[4])
2015	Regulatory full	Large Vessel: 24% (23.4) • Trawl CVs • Small CPs • H&L/Pot CVs ≥ 57.5'		Small Vessel: 12% (11.2) • H&L/Pot CVs >40' and <57.5'						Voluntary EM 13 vessels (1 observed)
2014	Opt-in Full	All Trawl CVs and H&L/Pot vessels ≥ 57.5': 16% (15.1)						H&L/Pot CVs >40' and <57.5': 12% (15.6)		Voluntary EM
2013		All Trawl CVs and H&L/Pot vessels ≥ 57.5': 14.5% (14.8)						H&L/Pot CVs >40' and <57.5': 11% (10.6)	Vessels <40' LOA and Jig gear	
1990 - 2012[3]	• CPs participating in AFA, A80, RFP & Atka fisheries • Motherships • CVs >125' LOA • Pollock Processing Plants	Self-selected coverage for a minimum 30% of fishing days by gear/quarter and at least one trip per fishery. • CVs ≥ 60' and < 125' LOA targeting groundfish • Other CPs and processing plants when not required 100%.								

[1] Vessels in the full observer coverage category are defined in regulations at § 679.51(a)(2) and include: all CPs (with few limited exceptions); all Motherships; BSAI pollock processing plants; and CVs while participating in AFA or CDQ pollock, CDQ groundfish fisheries, and Central Gulf of Alaska Rockfish Program

[2] Vessels in the partial observer coverage category are defined in regulations at § 679.51(a)(1)

[3] Coverage requirements are generalized based on requirements implemented prior to 2013.

[4] Defined as EM data received.