

NOAA
FISHERIES

2016 *Draft* Annual Deployment Plan

for observers in the Groundfish and Halibut fisheries off Alaska:

Appendix B:

**An Initial analysis of alternative sample designs
for the deployment of observers in Alaska**

September - October, 2015

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Why

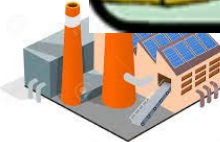
- Observer deployment into the partial coverage fleet is funded through a 1.25% fee that is expected to be re-evaluated in 2018.
- Observer deployment in partial coverage under intense scrutiny since 2013. NMFS recommended improvements be explored (June 2015).
- Efficiency can be achieved through the sampling design, which is comprised of 1) how you divide the population of interest and 2) how you allocate your samples. The first is called **stratification**, the second is called **allocation**.

Allocation strategies

“where to put those samples you bought”

- A. You can set all rates = (proportional allocation)
- B. You can allocate to reduce overall variance (Neyman allocation)
- C. You can do B. but for multiple metrics, or
- D. You can select along a large range of possibilities by what feels good, sounds good, is popular, etc.





Here alternative designs are compared.

Which one you think is best is a matter of opinion,
and challenging that is the hard part.

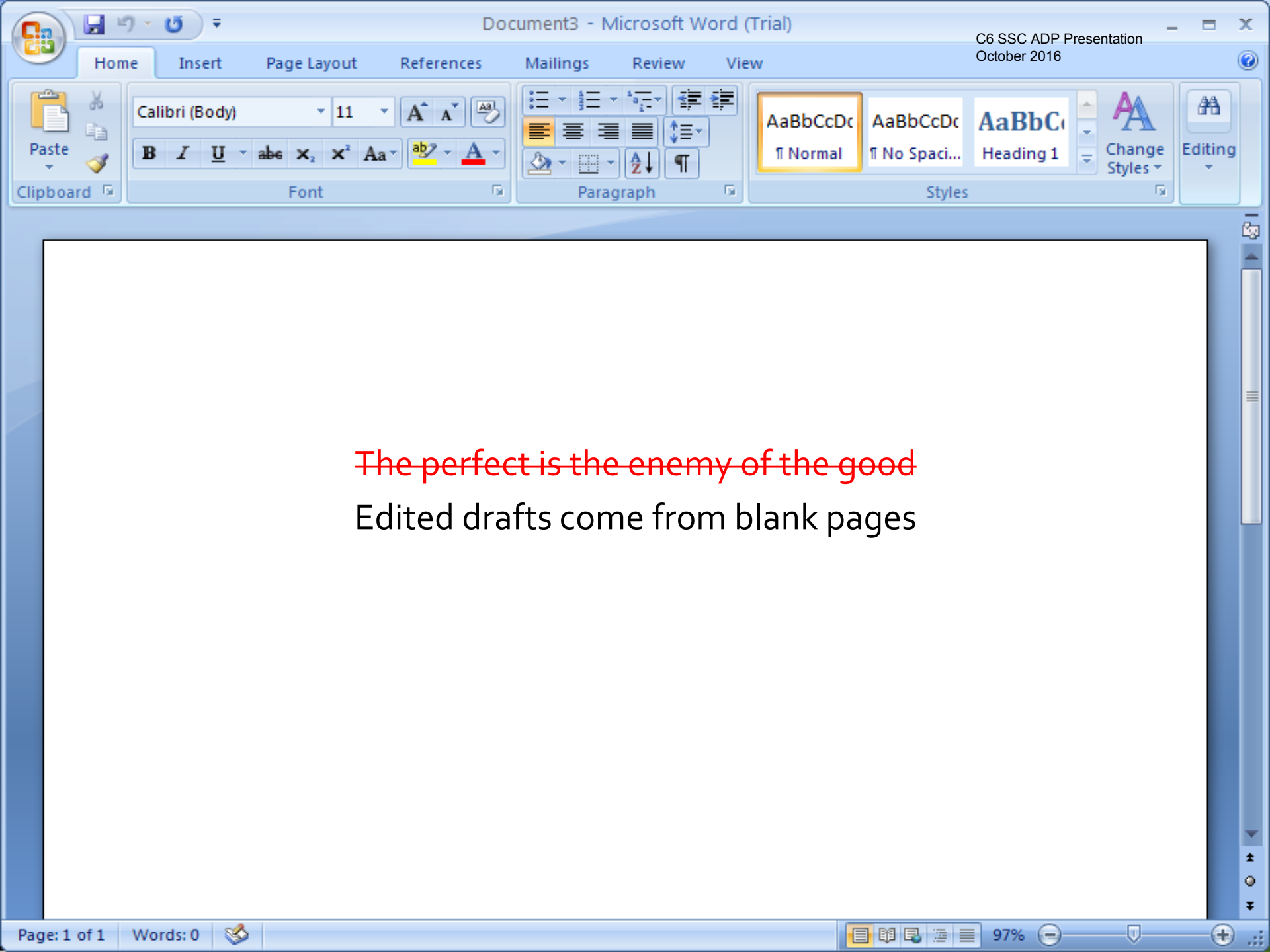
Picasso or Van Gogh?



"Starry Night over the Rhone"



*Femme Assise dans un Fauteuil
(Woman Sitting in a Chair),*



~~The perfect is the enemy of the good~~
Edited drafts come from blank pages

How

Simple Assumptions

- All groundfish are of equal importance
- All discards of groundfish species (including halibut PSC) are of equal importance
- We have perfect knowledge of the fishing outcomes
- There are no observer effects (deployment is without error)
- All trips have same length (for converting days to trips to expected rates).

What

- 6 stratification schemes

1. The original 2010 CART (5 strata) Trawl, HAL+POT big T, HAL + POT little t .
2. The 2013 – 2015 design: (2 strata) T and t
3. The 2016 design: (2 strata) T, t with some tweaks
 - 9 CPs formally in full coverage moved into partial coverage (Council action)
 - 56 EM vessels removed from partial coverage (EM workgroup)*
 - Voluntary full-coverage AFA non-pollock CVs in 2014 assumed to be full-coverage for 2016.
4. Gear only (3 strata)
5. 2 FMPs and 3 gears (6 strata)
6. Contract friendly: (5 strata) Trawl, HAL+POT first half of year, HAL+POT second half of year
- ~~7. 3 FMPs and 3 gears (9 strata)~~ Discontinued – some strata not sampled



Draft 2016 Electronic Monitoring Pre-Implementation Plan

EM Workgroup Recommendation, 9/16/2015

Year	Fieldwork / Pre-implementation (Pre-Imp)	Council process, regulations	Observer Program/ Annual Deployment Plan (ADP)
2014	<i>Fieldwork</i>	<i>EMWG develops 2015 Cooperative Research Plan (CRP), discusses alternatives for analysis</i>	<i>Oct – 2015 ADP places 10 vessels that are participating in EM research into the no selection pool</i>
2015	<i>Feb – SSC reviews CRP Jan-Jul – operational and stereo camera field research</i>	<i>Feb – SSC, Council review CRP Oct – propose a 2016 Pre-Implementation plan to Council</i>	<i>Oct – 2016 ADP proposes all EM Pre-Imp vessels in no selection pool</i>
2016	<i>Jan-Dec – Pre-implementation on 60 longline vessels 40-57.5'. Jan-Jul – EM field research on stereo cameras, pot vessels.</i>	<i>Oct – initial review for EM analysis to integrate EM into obs program. Dec – final action on EM analysis</i>	<i>Oct – 2017 ADP proposes all EM Pre-Imp vessels in no selection pool</i>
2017	<i>Jan-Dec – Second pre-implementation year for longline vessels 40-57.5'. Potentially expand to include other fixed gear vessels or other technology.</i>	<i>Jan-Dec – Develop regulations for integrating EM</i>	<i>June – Annual Report provides prelim analysis on allocating observer fee between observer and EM deployment Oct – 2018 ADP allocates funding to observers and EM deployment</i>
2018	Integrated observer/EM monitoring program		

What

For each stratification scheme:

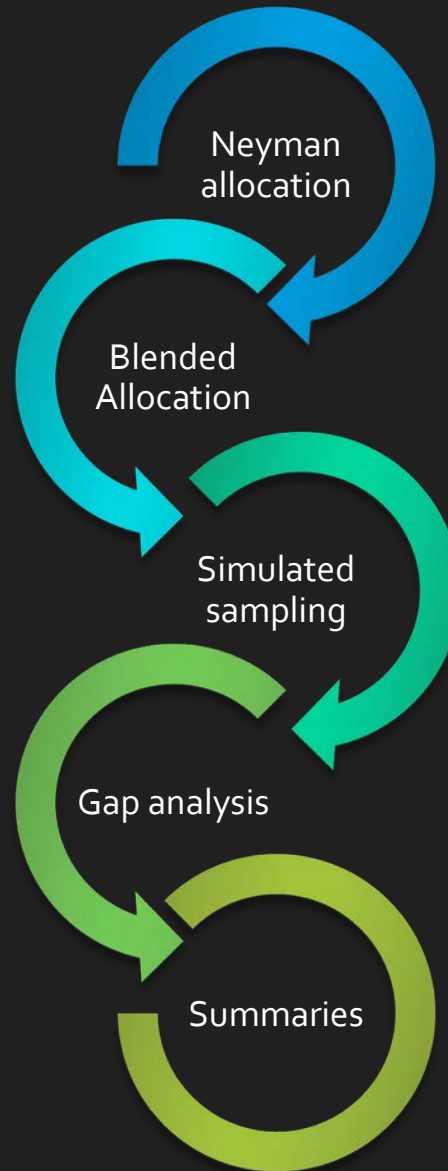
- 2 evaluation metrics:
 1. All groundfish retained,
 2. All groundfish discarded (including halibut PSC)
- 2 allocation strategies:
 1. proportional to N ,
 2. proportional to NS (optimized)

Analysis Process

2014 data

- For each Scheme (6), there are 2 methods :
 - proportional
 - Blended optimal weights (m_h)

- Use n expected in 2016
- Hypergeometric
- Gear: Area: Target
- Chance > 50% of >3 observed
- PASS / FAIL



- For each Metric (2) & Stratification scheme (6)
 - n_h

- Iterations , method, scheme, metric:
- n_{initial} = 2000
 - Estimates
 - % error
 - SE

- Ellipse plot
- Means plot
- Gaps rank plot
- Distance plot
- **DRAFT** expected coverage rates

2013 & 2014 combined data



The blended ranking system

Three **relative** components

Uncertainty

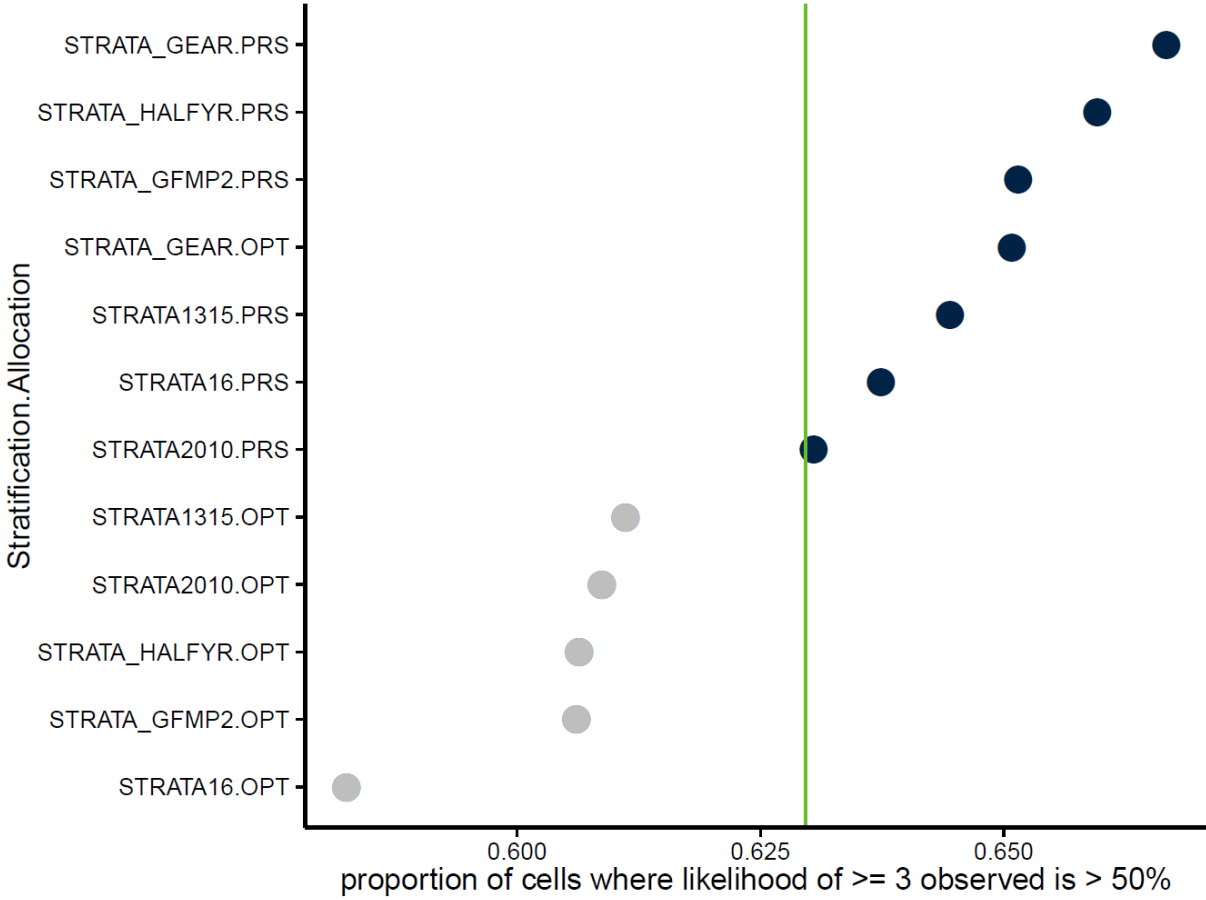
Accuracy

Gap analyses

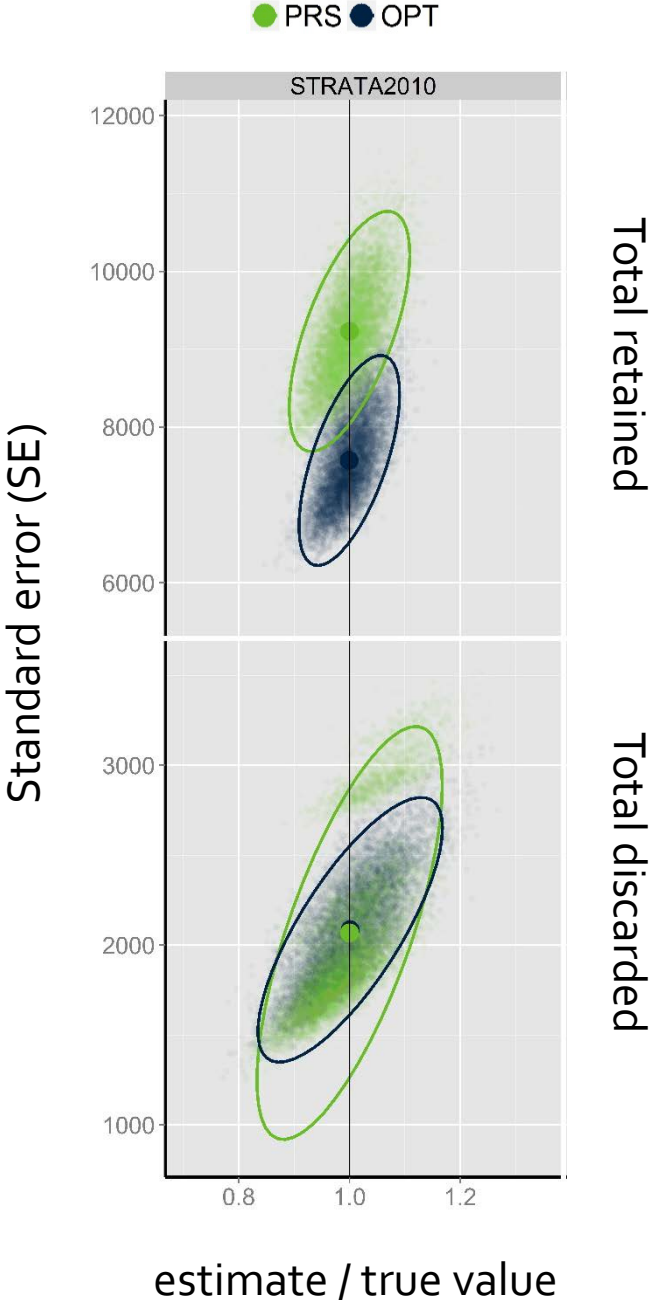
Euclidian Distance on these components

Disregard stratifications and allocations where metric 3 is below average.

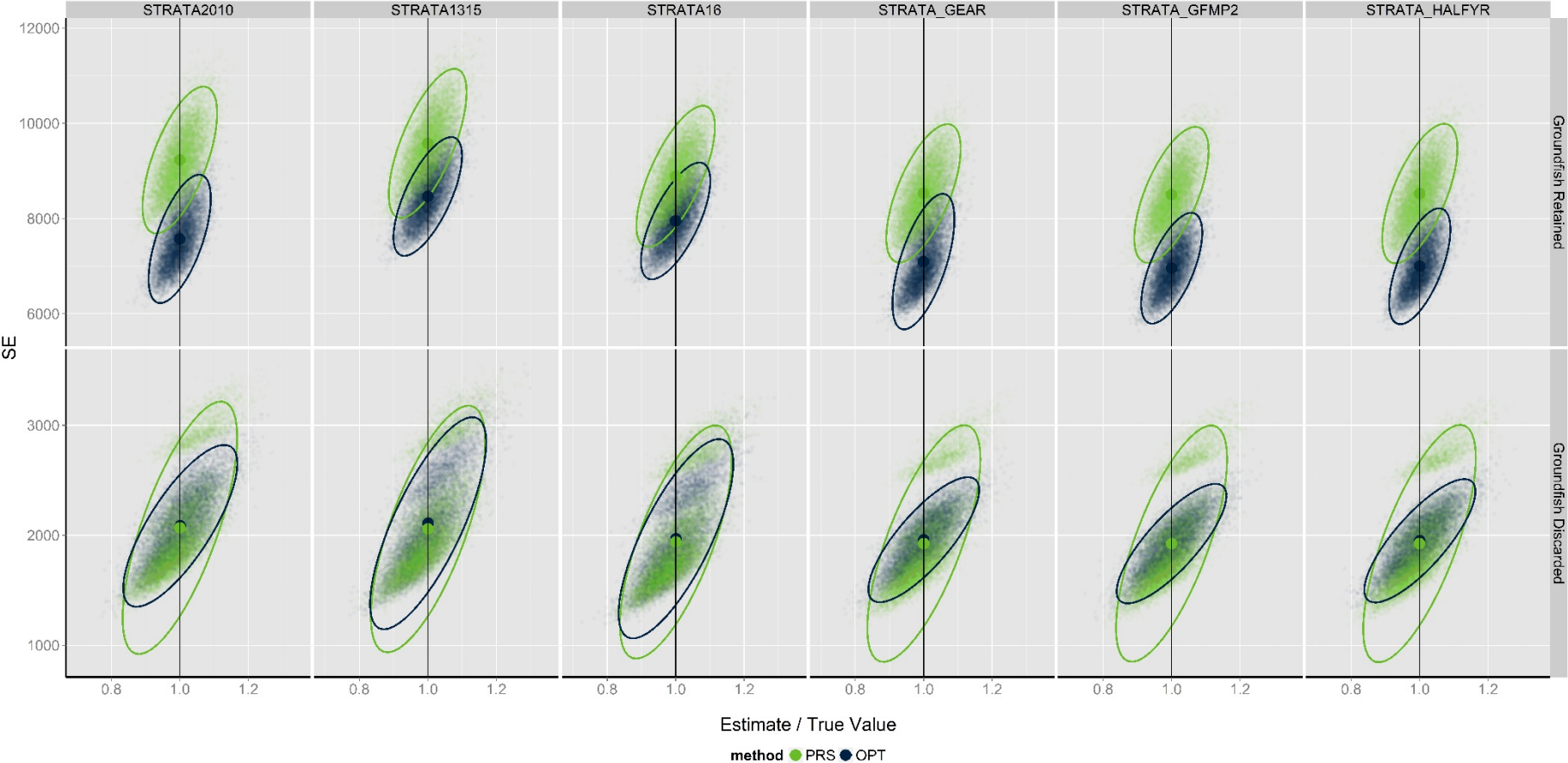
Gap Analysis



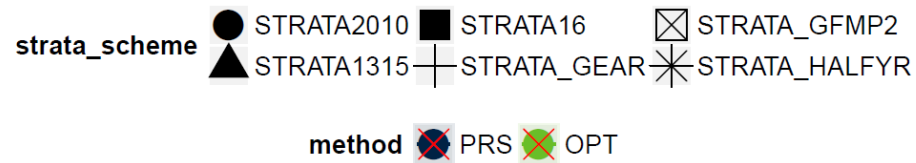
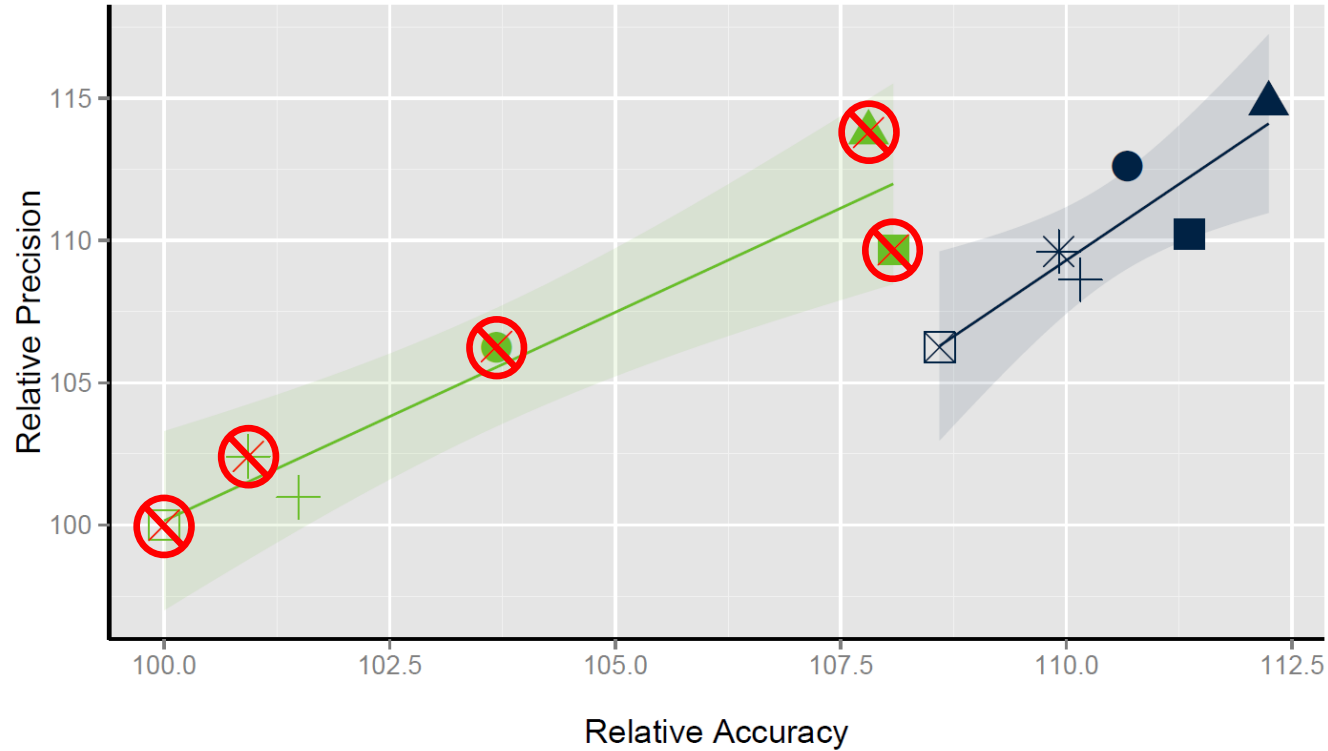
Example



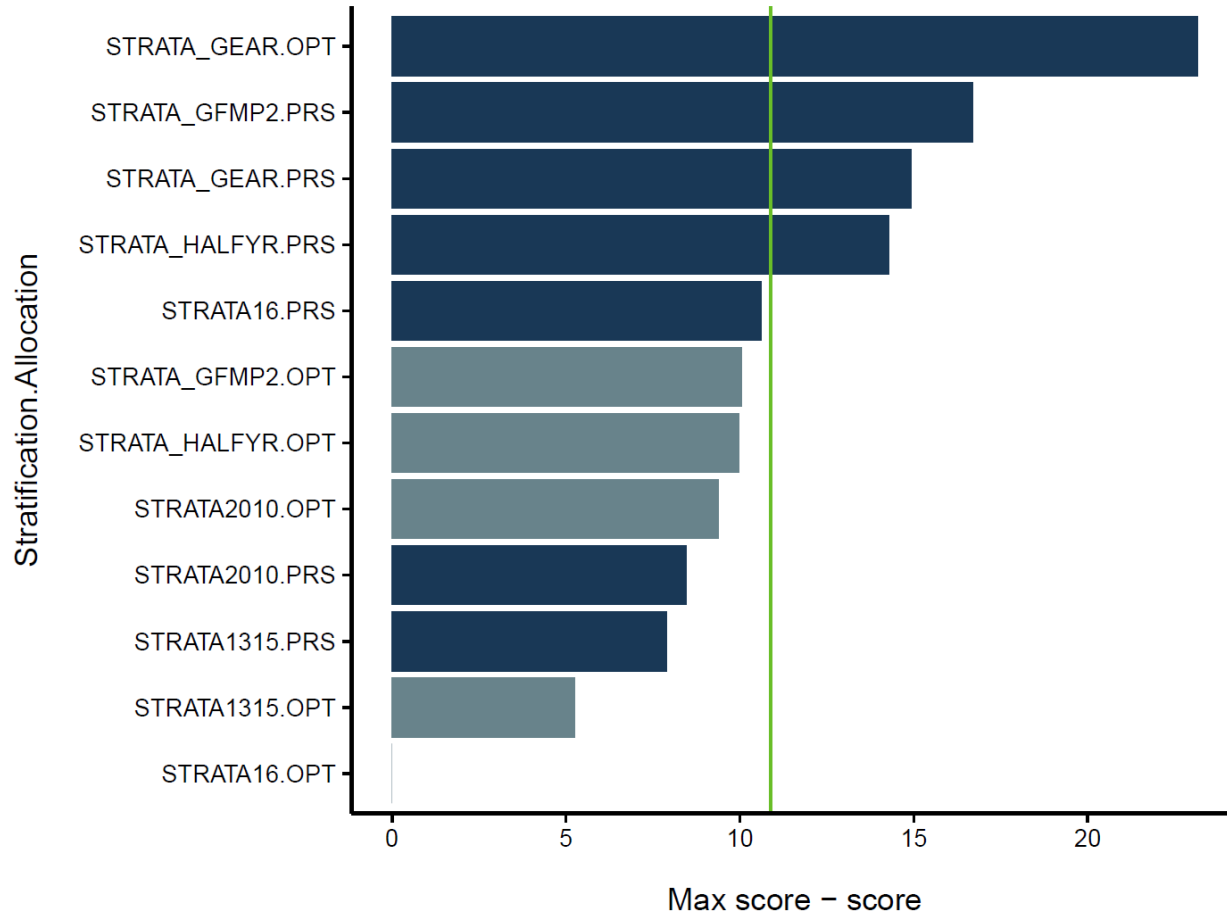
Ellipse Plot



Mean plot



Distance plot



Summary:

We can make the following generalizations for the deployment of observers in the 2016 *remaining* partial coverage (> 0% selection) fleet:

- We can improve on 2013-2015
- Among viable sampling plans, Trawl > Fixed, GOA > BSAI, First half > Second half.
- Proportional allocation better than optimal for filling gaps; borrowing data can lead to poor inference.
- Optimal now \neq optimal later; depends on metrics and stability of past data.
- Blended ranking is just that – weights relative performance of designs equally in terms of accuracy, precision, and gaps. **Metric 3 driving overall D' score.**
- Two of the four viable sampling plans has strata defined by gear type.

Table 1. Sampling designs with above average gap analysis results and above average distance values recommended for consideration in the 2016 ADP. Sampling designs are defined by their stratification schemes and sampling allocations (OPT = optimal, PRS = proportional). Gear stratum abbreviations are HAL = Hook and Line, POT = Pot, and TRW = Trawl. FMP stratum abbreviations are: BSAI = Bering Sea and Aleutian Islands, GOA = Gulf of Alaska. The total number of trips in each stratum, their relative proportion (Proportion N), and relative allocation under compromised optimal allocation (Relative mh) are also provided for comparison. The number of samples afforded in each stratum (nh) is the product of the number of samples afforded total (n) and either the PRS weighted allocation (Wh) for proportional allocation or the OPT weighted allocation (mh) for compromised optimal allocation. The weighted allocation used in each rate calculation is depicted in bold. The anticipated preliminary coverage rate (Rate) is nh divided by Nh.

Sampling Design (Strata Scheme. Allocation)	Stratum (h)	Trips (N _h)	PRS weighted allocation (W _h)	OPT weighted allocation (m _h)	n _h	Rate*
GEAR.OPT	HAL	2775	0.522	0.339	419	0.151
GEAR.OPT	POT	1253	0.190	0.152	187	0.149
GEAR.OPT	TRW	1992	0.288	0.510	630	0.316
GEAR.PRS	HAL	2775	0.522	0.339	646	0.233
GEAR.PRS	POT	1253	0.190	0.152	235	0.188
GEAR.PRS	TRW	1992	0.288	0.510	357	0.179
FMP.PRS	HAL_BSAI	323	0.067	0.032	83	0.257
FMP.PRS	HAL_GOA	2452	0.454	0.311	562	0.229
FMP.PRS	POT_BSAI	546	0.082	0.089	101	0.185
FMP.PRS	POT_GOA	707	0.108	0.052	134	0.190
FMP.PRS	TRW_BSAI	119	0.021	0.025	26	0.218
FMP.PRS	TRW_GOA	1873	0.267	0.491	331	0.177
HALFYR.PRS	HAL_First	1665	0.302	0.183	373	0.224
HALFYR.PRS	HAL_Second	1110	0.220	0.154	272	0.245
HALFYR.PRS	POT_First	650	0.106	0.099	131	0.202
HALFYR.PRS	POT_Second	603	0.084	0.049	104	0.172
HALFYR.PRS	TRW	1992	0.288	0.515	357	0.179

Table 2. Comparison of observer coverage rates* for the STRATA GEAR stratification scheme that result from proportional allocation and compromised optimal allocation (Relative m_h ; OPT). Also depicted is how the OPT coverage rates differ from those that would have resulted from either the Neyman allocation based on total groundfish discarded (Discarded) or total groundfish retained (Retained). The sampling design GEAR.OPT was the only design with OPT allocation with above average gap analysis scores and above average distance scores.

Rates					
Stratification Scheme	Stratum (h)	Proportional (PRS)	Relative m_h (OPT)	Neyman allocation (Discarded)	Neyman allocation (Retained)
GEAR	HAL	0.233	0.151	0.231	0.071
GEAR	POT	0.188	0.149	0.049	0.251
GEAR	TRW	0.179	0.316	0.269	0.363

2016 *Draft* ADP

NMFS recommends **GEAR stratification with OPT allocation**.
Preliminary coverage rates (%) expected to be:

No selection – 0

Trawl – 29

Hook and line – 14

Pot – 14

GOA and BSAI genetic sampling protocols - **No change**



Thomas Eakins (1881) Shad Fishing at Gloucester on the Delaware River. Oil on canvas.