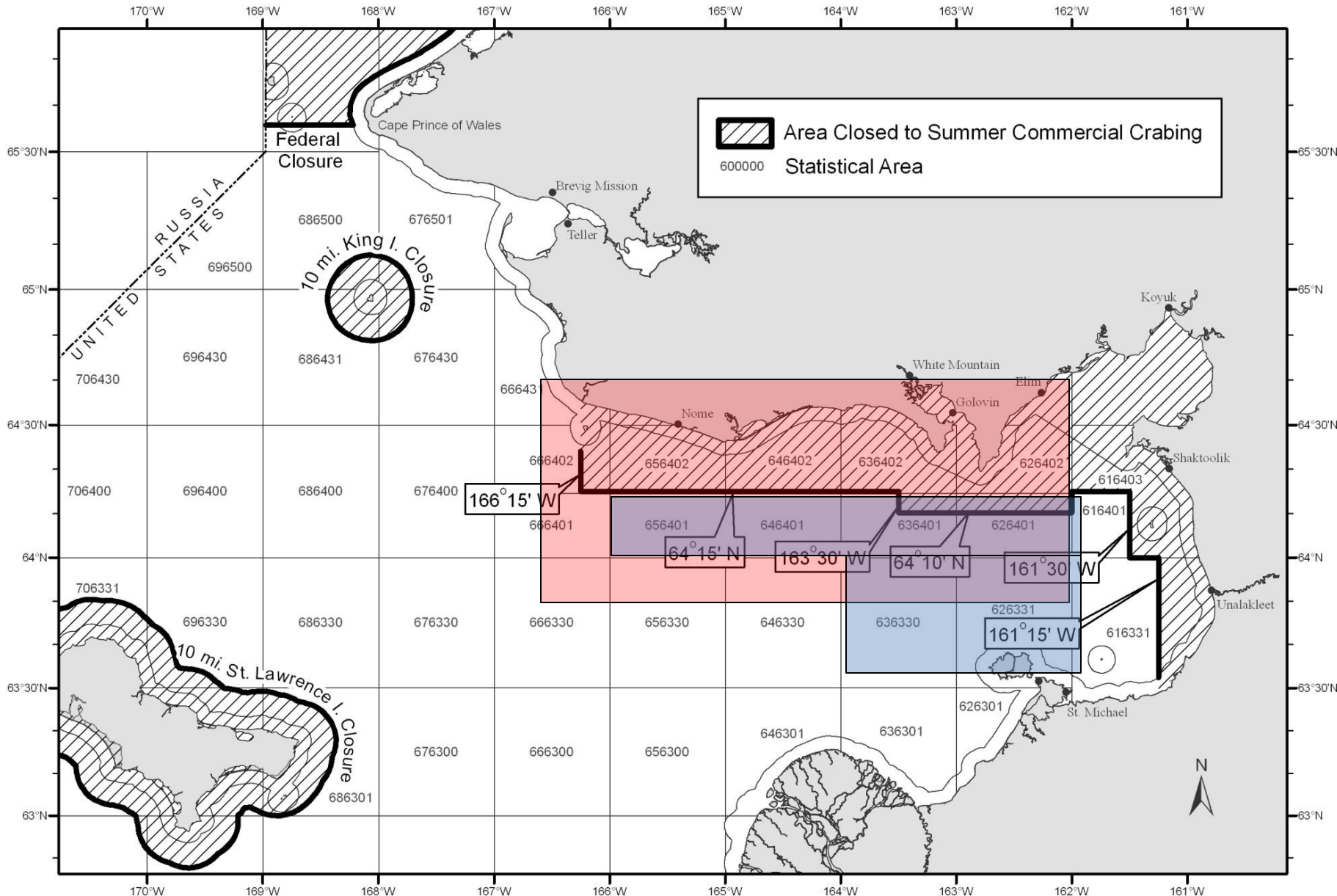


Norton Sound Red King Crab Stock
Assessment 2014/2015
Progress report

Sept 17 2014

Toshihide “Hamachan” Hamazaki,
Jie Zheng
Alaska Department of Fish & Game
Division of Commercial Fisheries

Fishery District



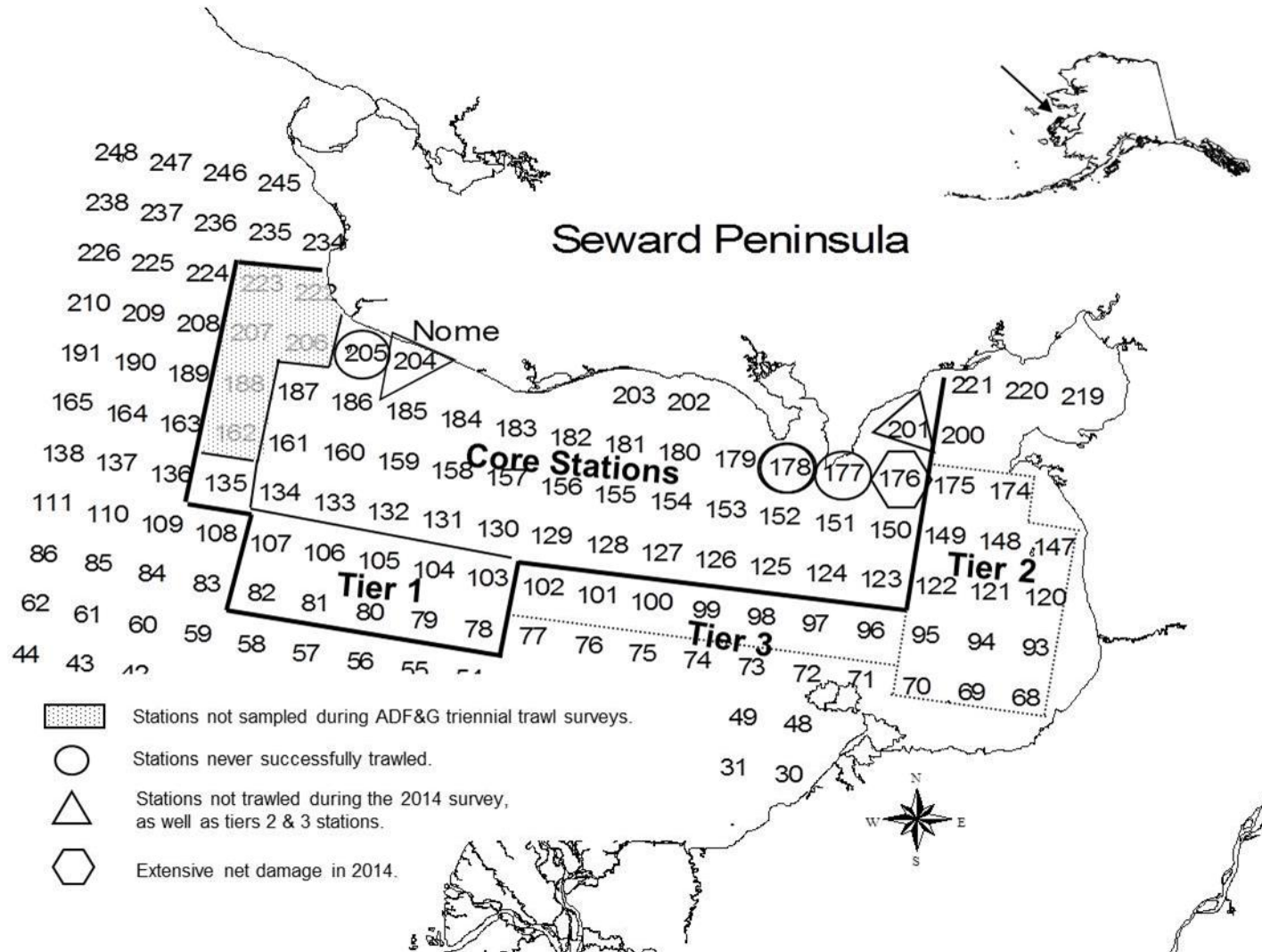
Data update

- 2014 trawl survey abundance estimate
 - 5.4816 million (CV 48%) crab
 - 2X higher than 2011 (2.7017 mil. CV 13%).
 - The highest estimate ever recorded (Table 1)
 - 50% of estimate came from one station (Figure 1, Table 3)
- 2014 Summer commercial fishery (6/25-8/15)
 - 129,956 legal crab harvested (Table 4)
 - CPUE (1.23) higher than 2013 (0.72), but similar to 2004-2013 average (1.27) (Table 4)
 - Discards data: just received.
 - Tag recovery data: waiting

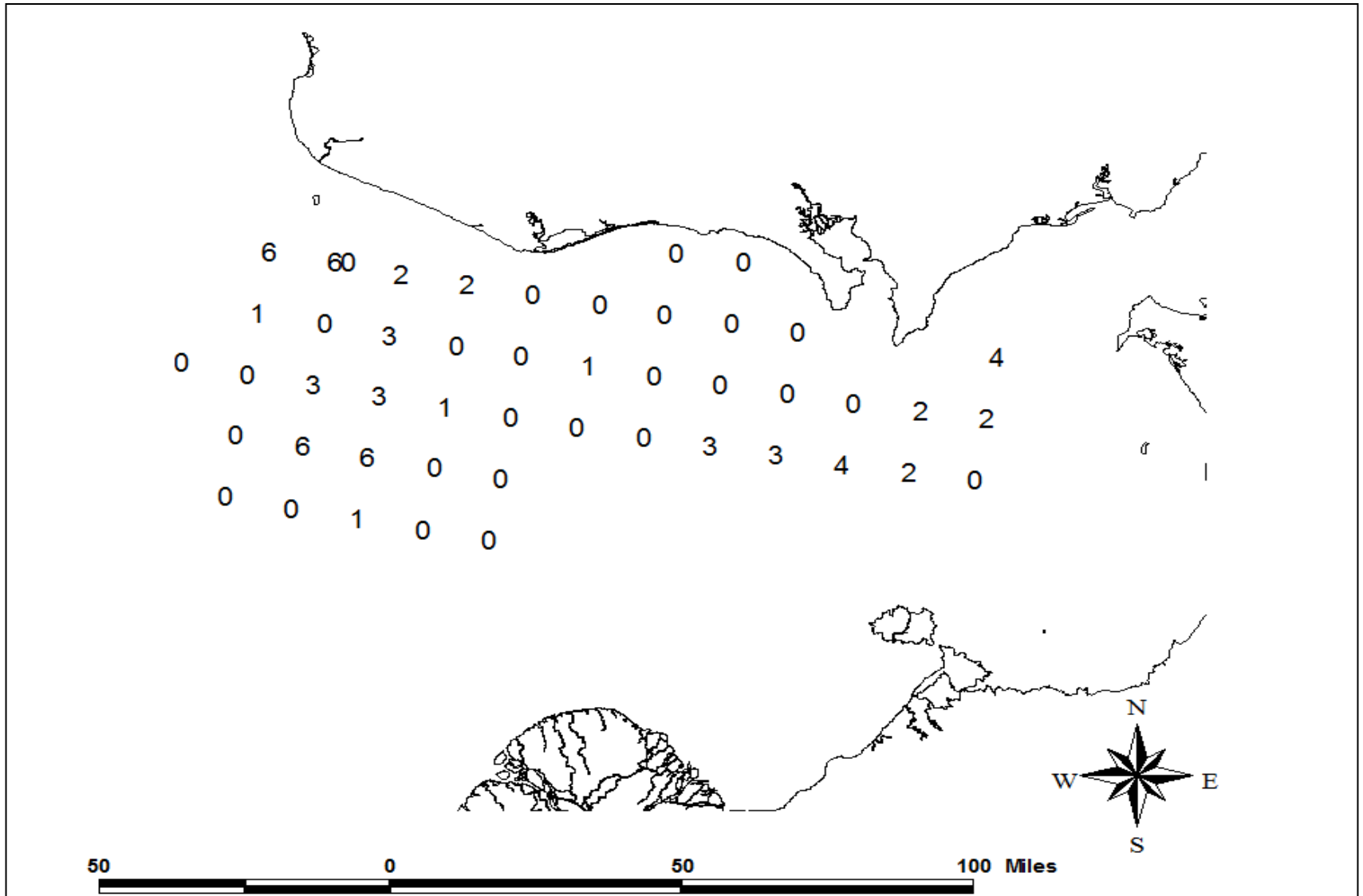
2014 Trawl survey details

- Survey date: 7/18-7/30
 - Bad weather: no survey on 7/19, 21, 27
 - Survey coverage: 47 stations: Core and tire 1
 - The lowest coverage
 - No retows (protocol: retow when > 5 crabs are caught).

Trawl survey stations

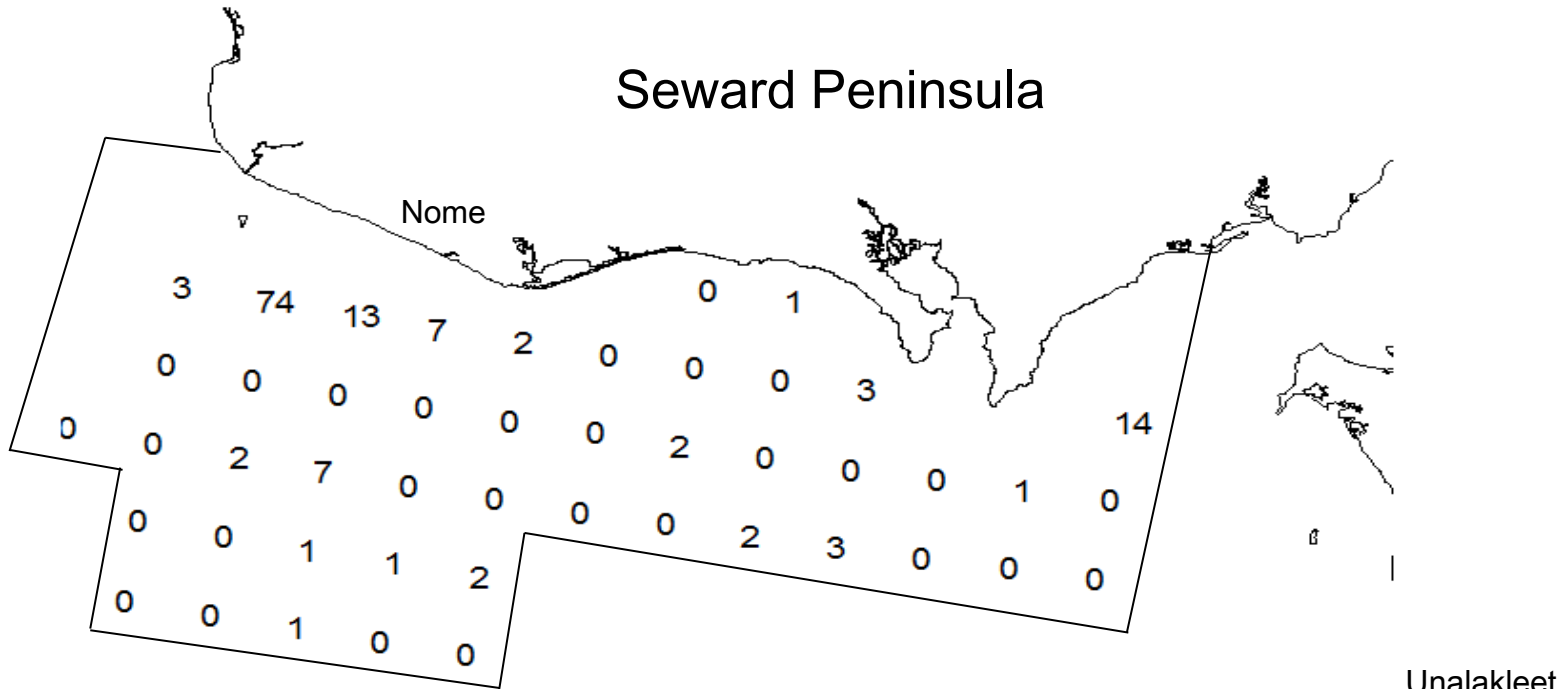


Legal male(CW > 121mm)

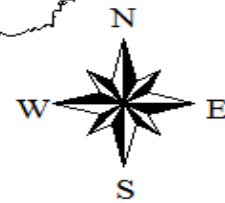


Pre-recruit 1(CL 90-104mm)

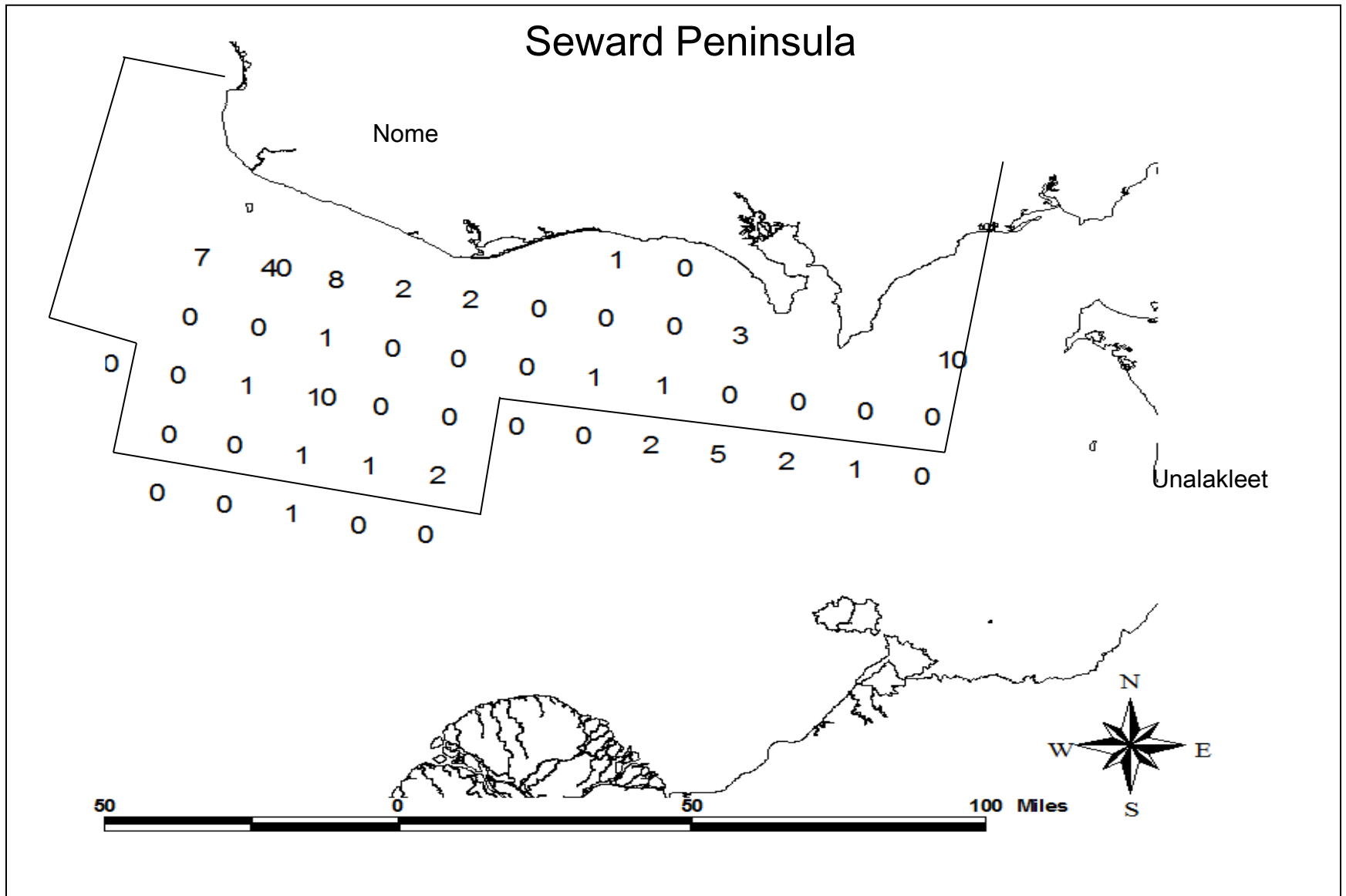
Seward Peninsula



Unalakleet



Pre-recruit 2 (CL 76-89mm)



Major changes in assessment model

- Changes in modeling schedule
 - Previous: July 1st - June 30th
 - Model projection fishery year: 2015 summer and 2015/6 winter fisheries
 - Revised: Feb 1st – Jan 31st
 - Model projection fishery year: 2014/5 winter and 2015 summer fisheries

NSRKC Stock Assessment Length based model

Previous Modeling and Assessment

Calendar Year

Summer
Fishery

Jul /2014

Winter
Fishery

Feb /2015

CPT
Assessment

May /2015

Summer
Fishery OFL

Jul/2015

Winter
Fishery OFL

Feb/2016

Jul /2014

Feb /2014

May /2014

Jul /2015

Feb /2015

Model Year

Revised Modeling and Assessment

Calendar Year

Summer
Fishery

Jul /2014

CPT
Assessment

Jan /2015

Winter
Fishery

Feb /2015

Summer
Fishery OFL

Jul /2015

Jul /2014

Jan /2014

Feb /2015

Jul /2015

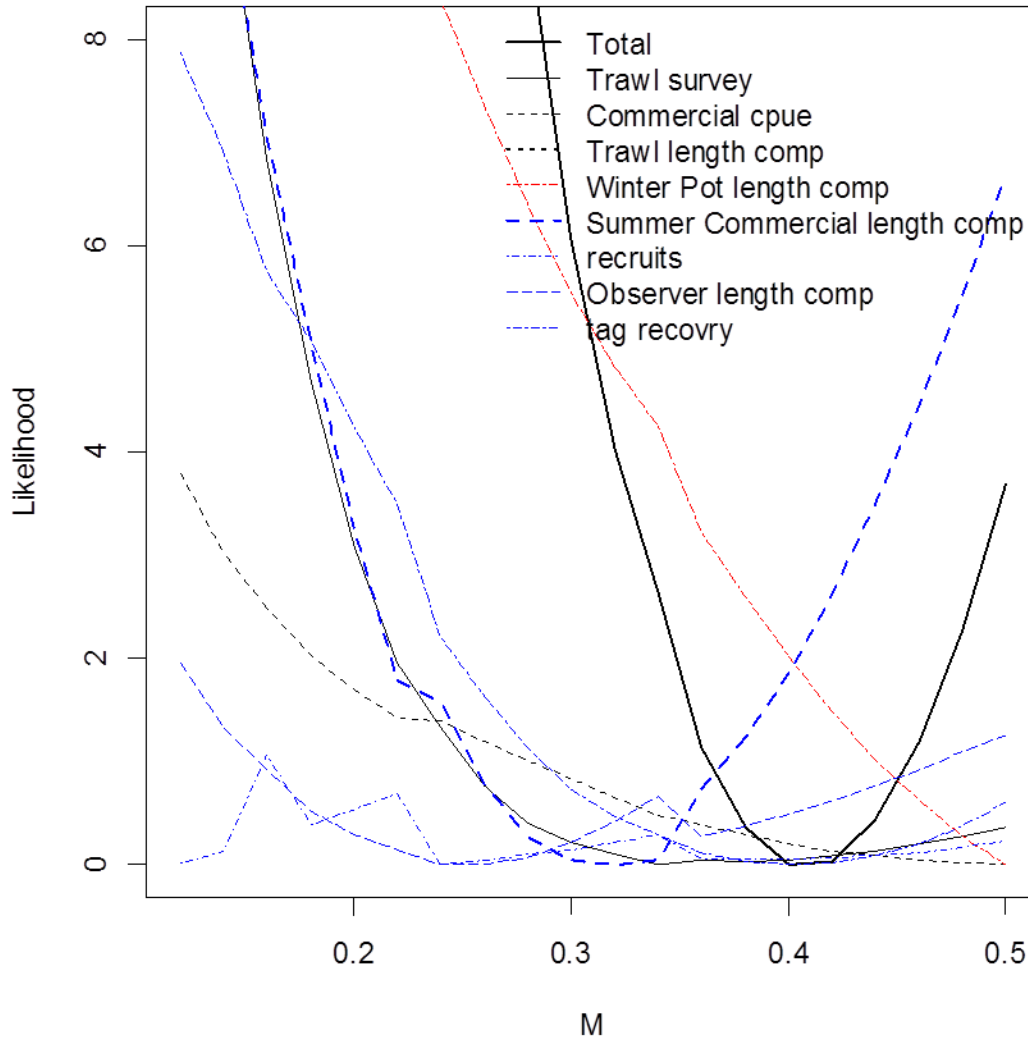
Model Year

Responses to CPT/SSC

- Likelihood profile (with growth matrix estimated...)
 - Single M for all size classes
 - M differs between the last size class and other size classes.
- Explore different weighting for tag recovery data
- Model parsimony: combine or separating trawl survey selectivity.

Likelihood Profile for single M

Total negative log likelihood



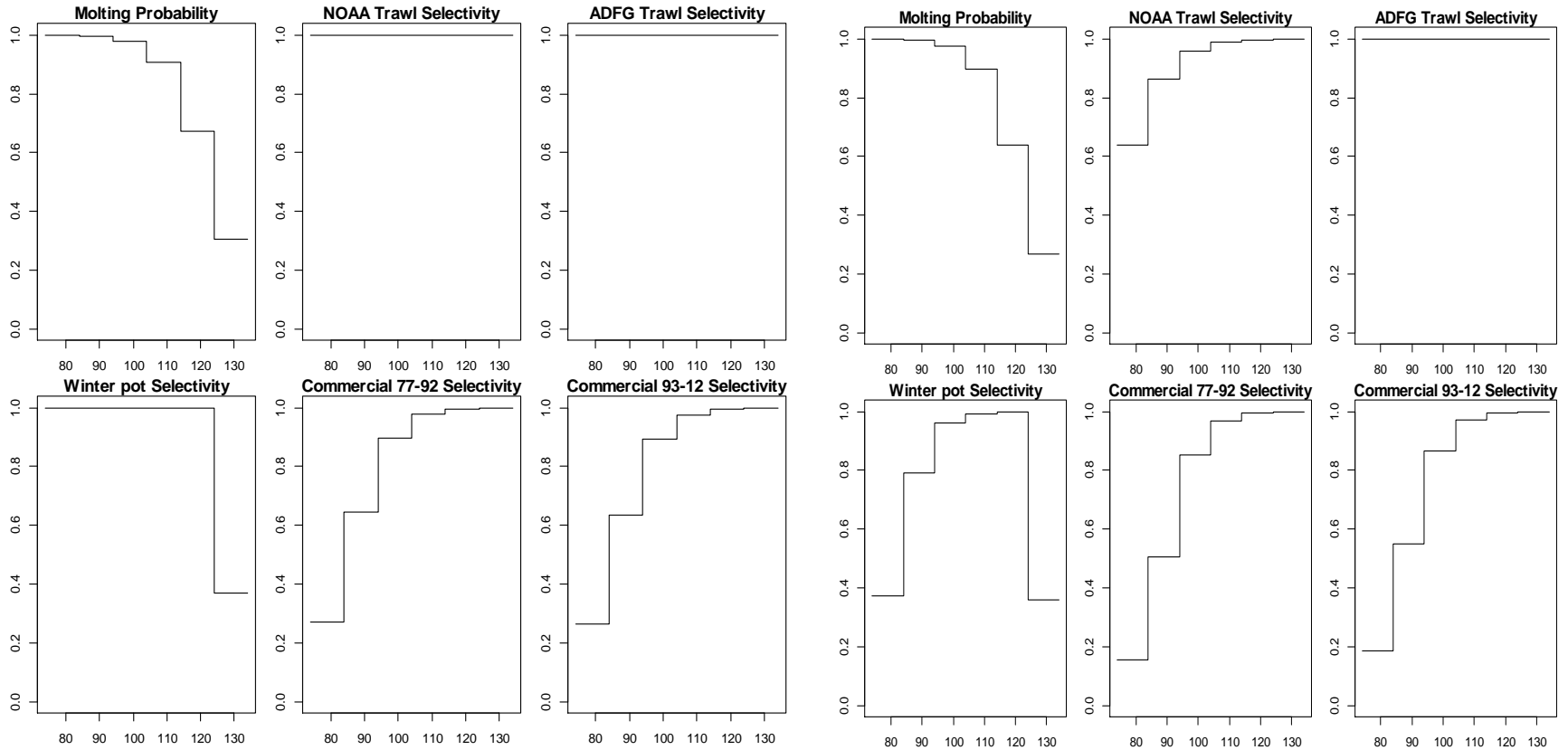
M = 0.4 seems the lowest

Expected. Similar to the results of SAFE 2013. At single M, higher M shows better model fit.

Likelihood Profile for single M

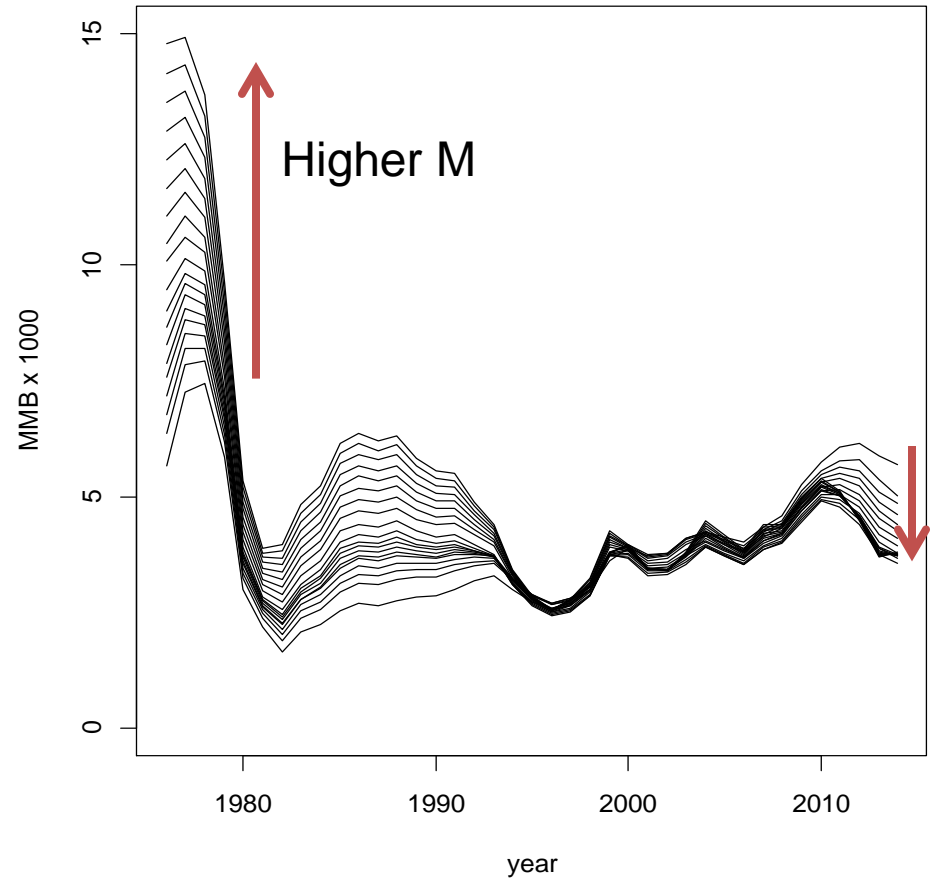
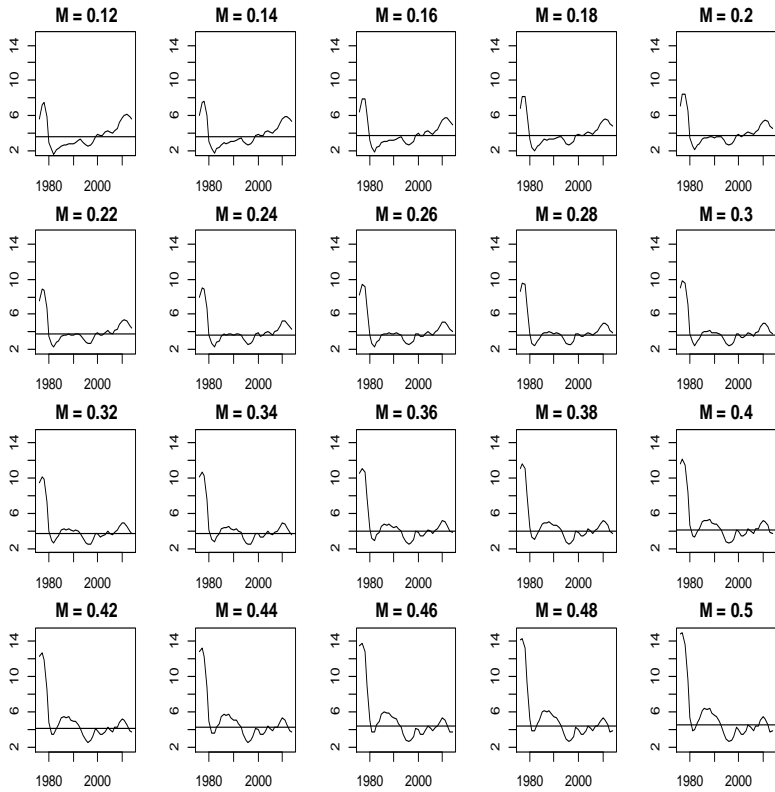
2014 model

$M = 0.4$



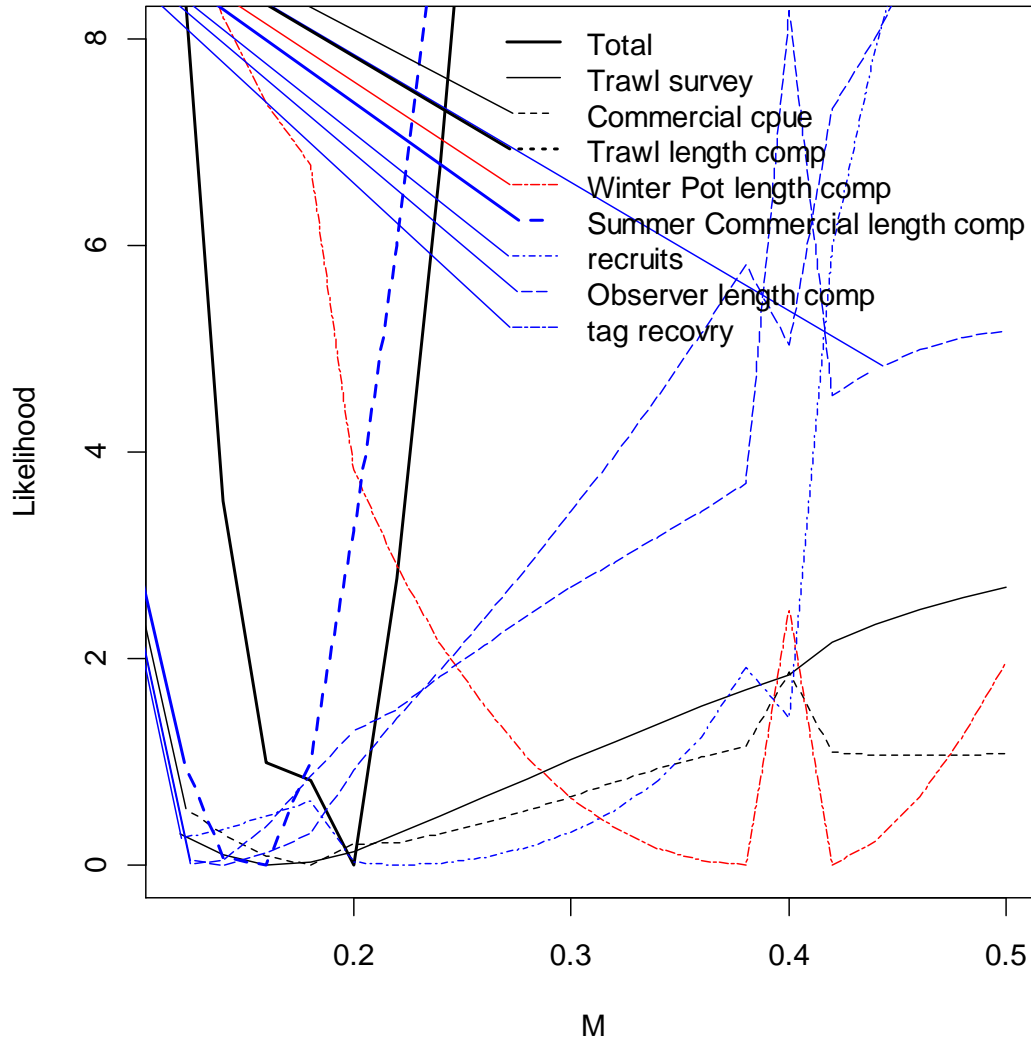
Winter pot survey selectivity became estimable
Trawl selectivity is different between NOAA and ADF&G

MMB projection for single M



Likelihood Profile for separate M

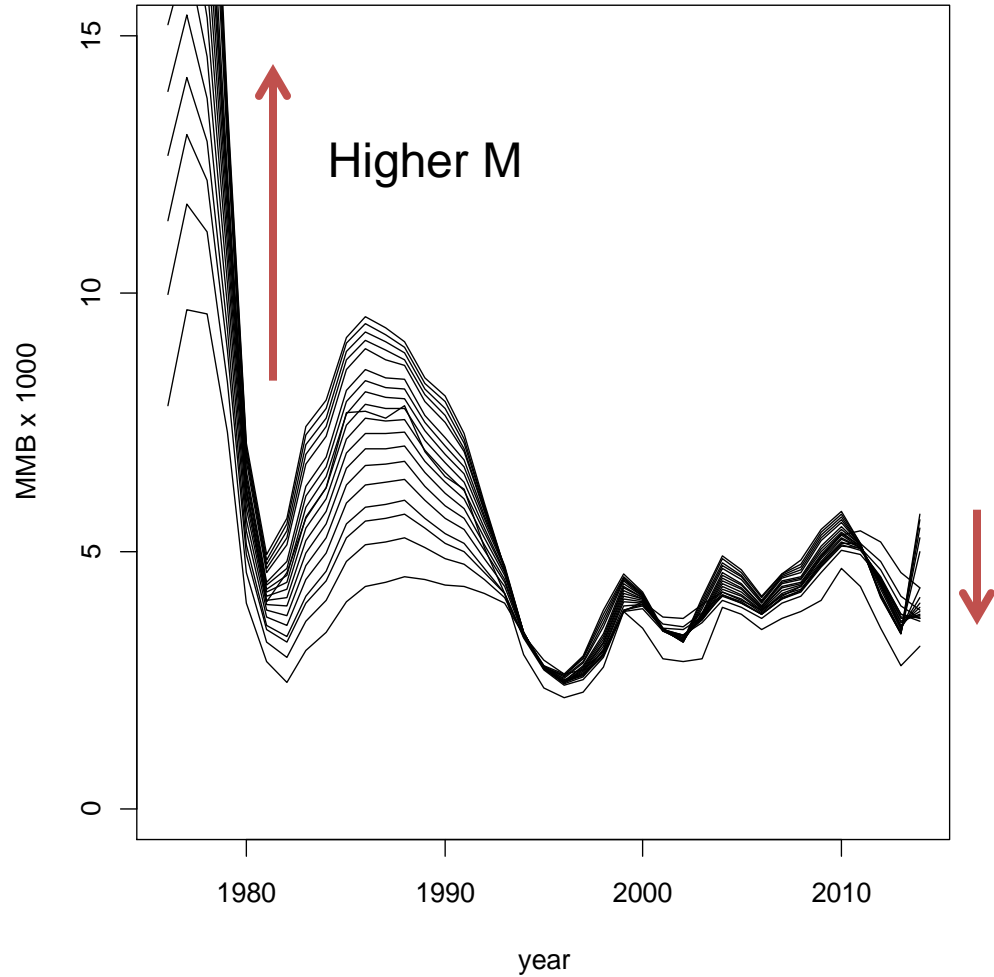
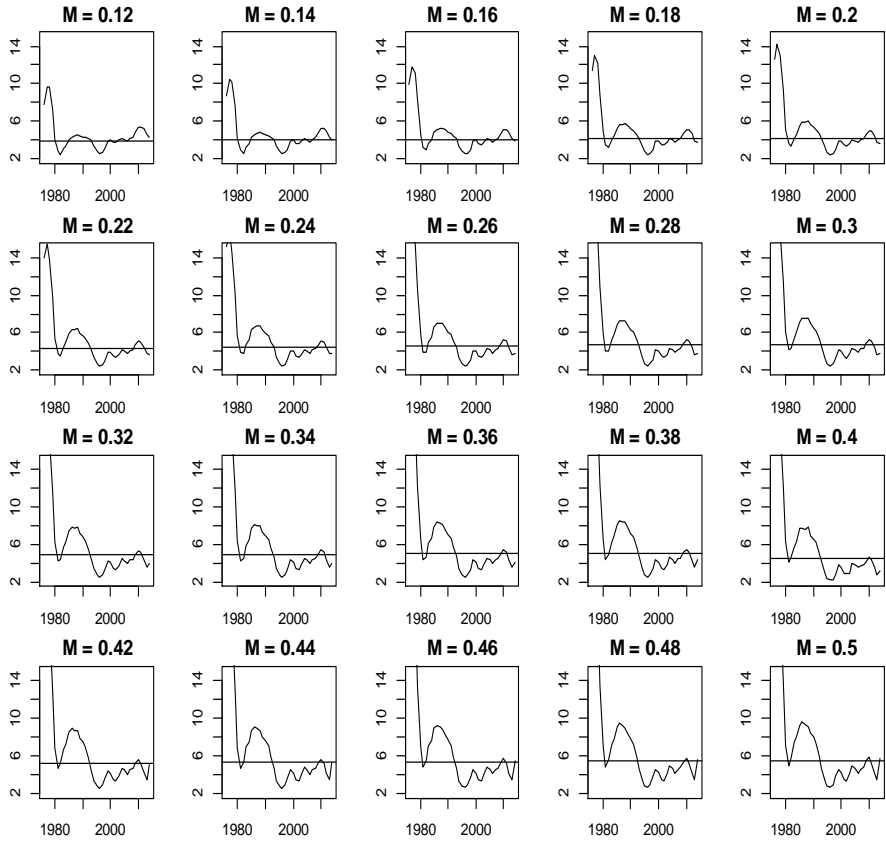
Total negative log likelihood



Lowest at $M = 0.2$

Expected because
the increase of M for
the last length class
was selected to
make likelihood the
lowest at $M = 0.18$
(SAFE 2012)

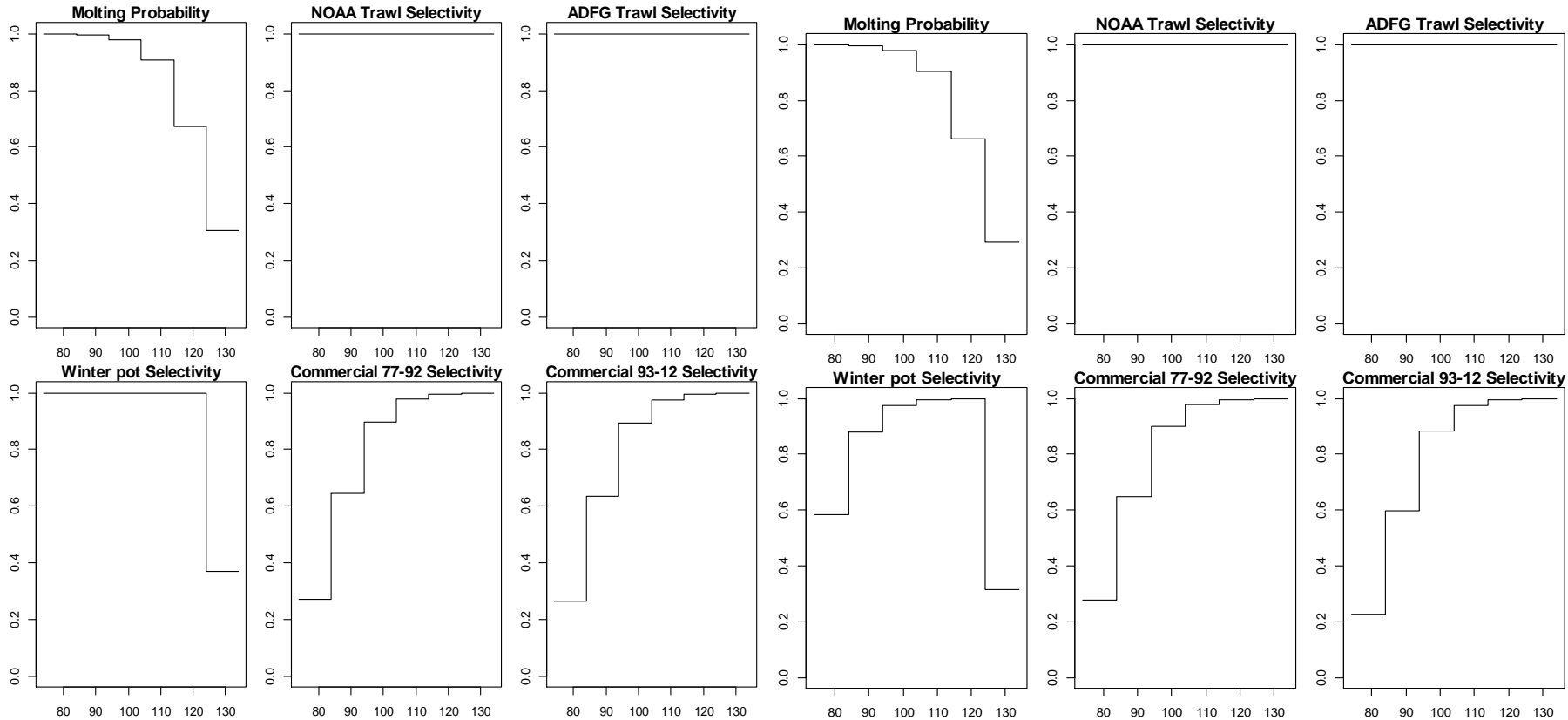
MMB projection for separate M



Likelihood Profile for single M

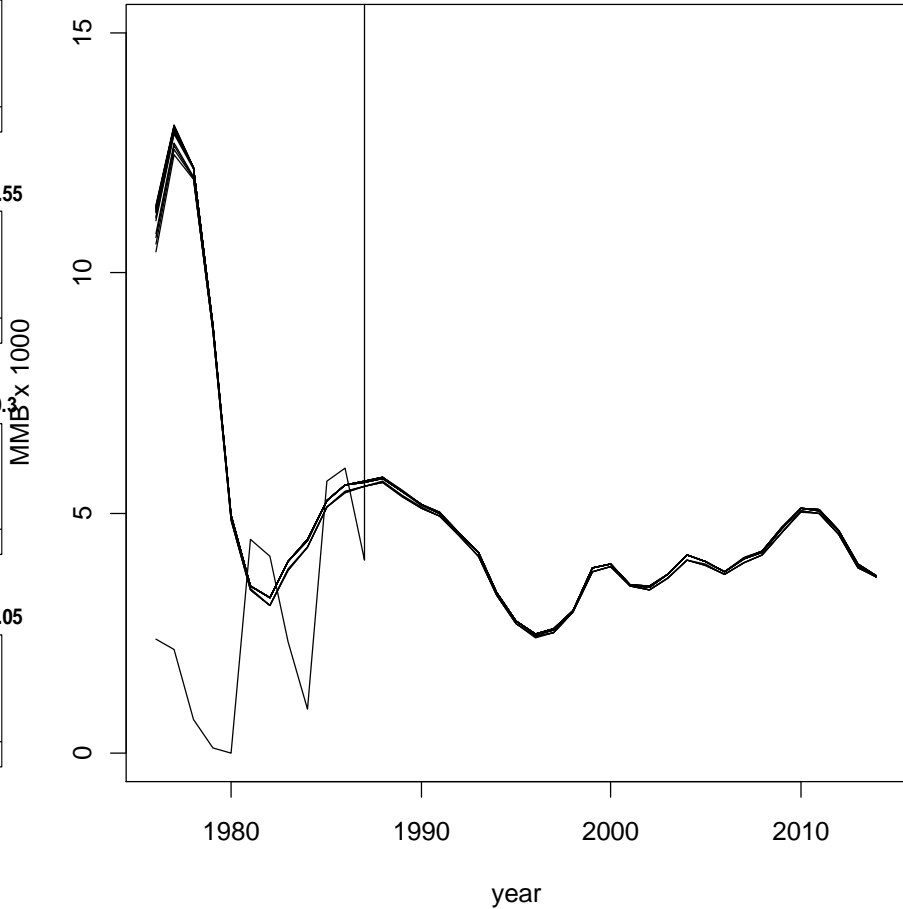
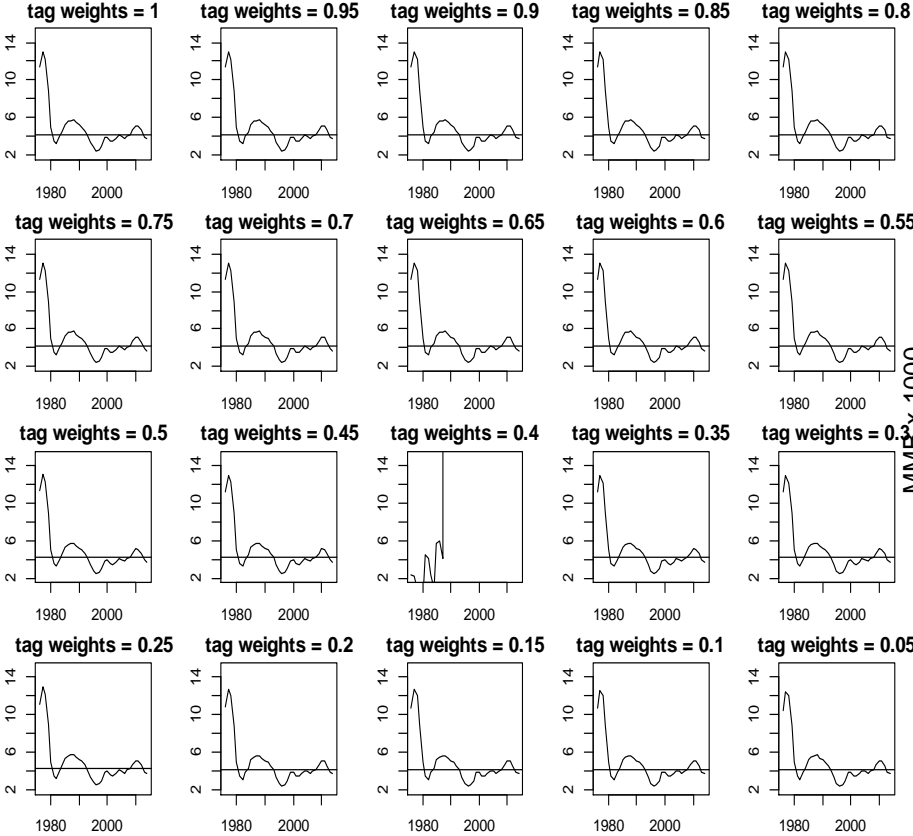
2014 model

Weight = 0.1



Winter pot survey selectivity became estimable

MMB projection for different weight



Little change in projections

Discussion

- The highest trawl survey estimate
 - Use as is?
- M: single vs. separate M
 - Single M: Biologically defensible assumption
 - Single M = > higher M = > higher OFL (Rejected in 2013 SAFE)
 - Separate M: Biologically indefensible assumption
 - No dramatic change in OFL
- Weights
 - Lower weights better estimates of winter pot selectivity
 - Little or no impacts on MMB projection
- Model parsimony
 - Parsimony of trawl selectivity parameters depends on data and model specification
 - Criteria for combining or separating selectivity parameters?

2015 NSRKC OFL for winter and summer fisheries

Calculation Question

OFL Calculation method

$$F_{OFL} = \gamma M, \quad \text{when } B / B_{MSY^{prox}} > 1,$$

Penalty function when $B/B_{MSY} < 1$

$$F_{OFL} = \gamma M (B / B_{MSY^{prox}} - 0.1) / 0.9,$$

$$\text{when } 0.25 < B / B_{MSY^{prox}} \leq 1,$$

$$F_{OFL} = 0, \quad \text{when } B / B_{MSY^{prox}} \leq 0.25,$$

Definition of B?

Projected MMB on Feb 01 or Jul 01?

Projected Jul 01 MMB?

Option 1: Feb 01* Nat mortality

Option 2: (Feb 01 - Ave winter harvest)*Nat mortality

Jan 2015 assessment model

- Use 2014 survey data as is
- Reduce tag-recovery weights
- Separate M
- Any suggestions welcome.