

Red King Crab Populations in Southeast Alaska:

Evaluation of Three Independent Biomass
Estimates

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Alaska Board of Fisheries, Petersburg 1/15/2012



Outline

1) Background

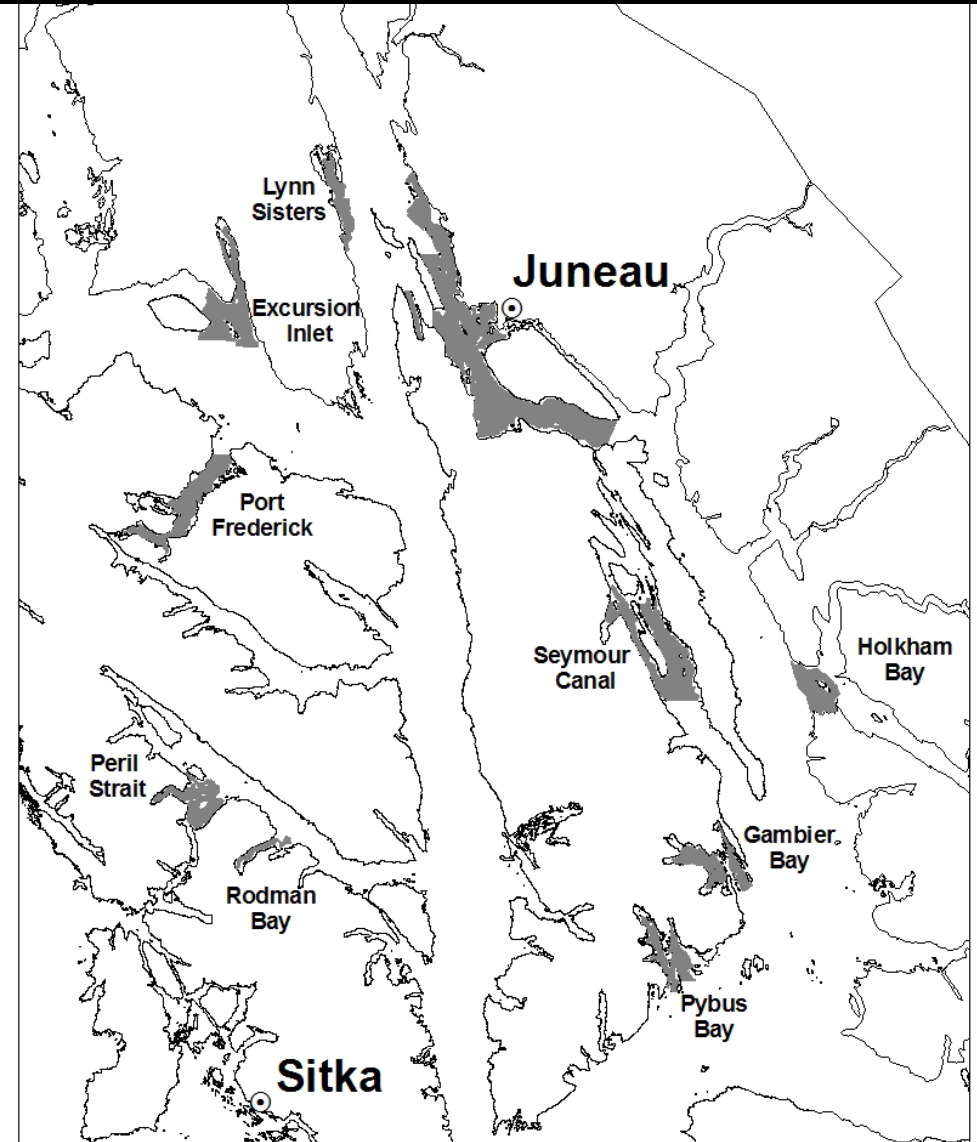
RKC in Southeast Alaska

2) Biomass Estimates

CSA, Depletion, Mark/Recapture

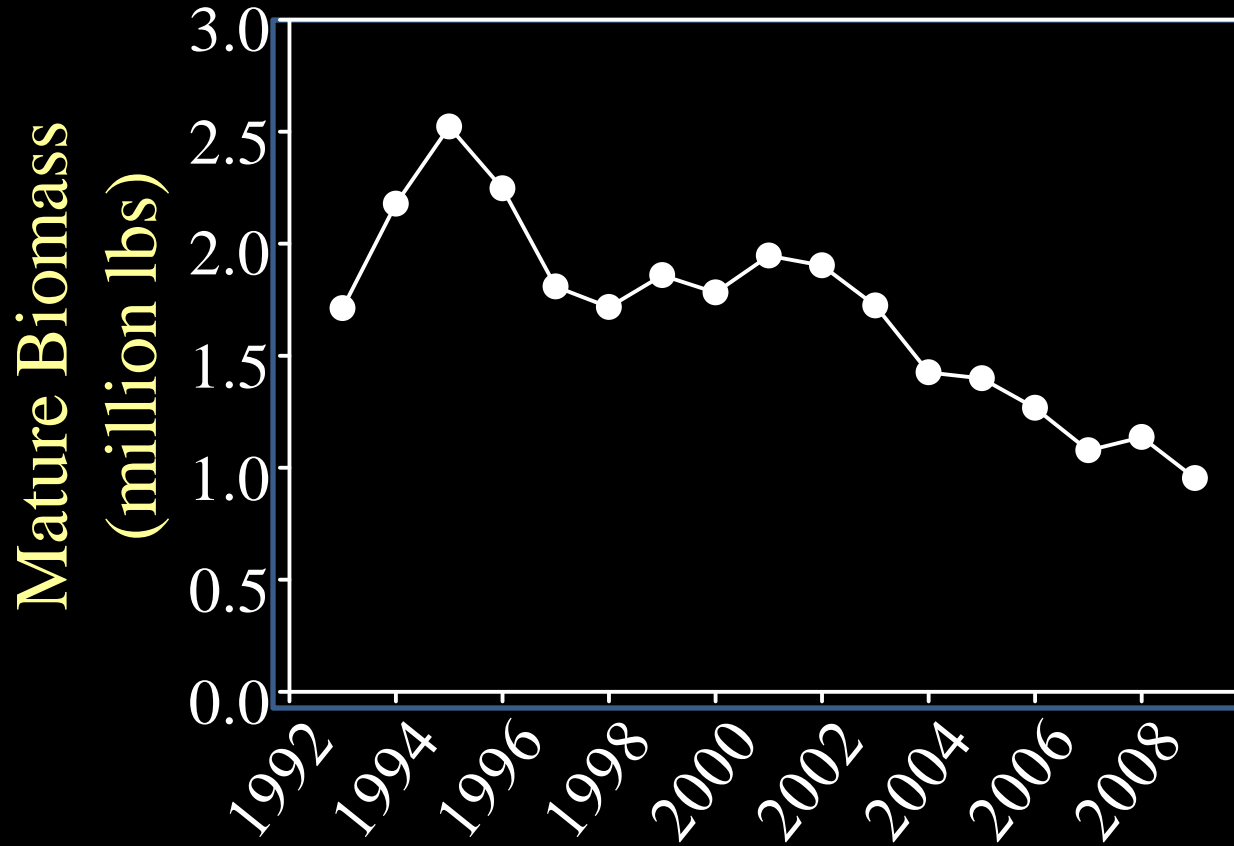
3) Biomass Comparisons

RKC Populations in SEAK

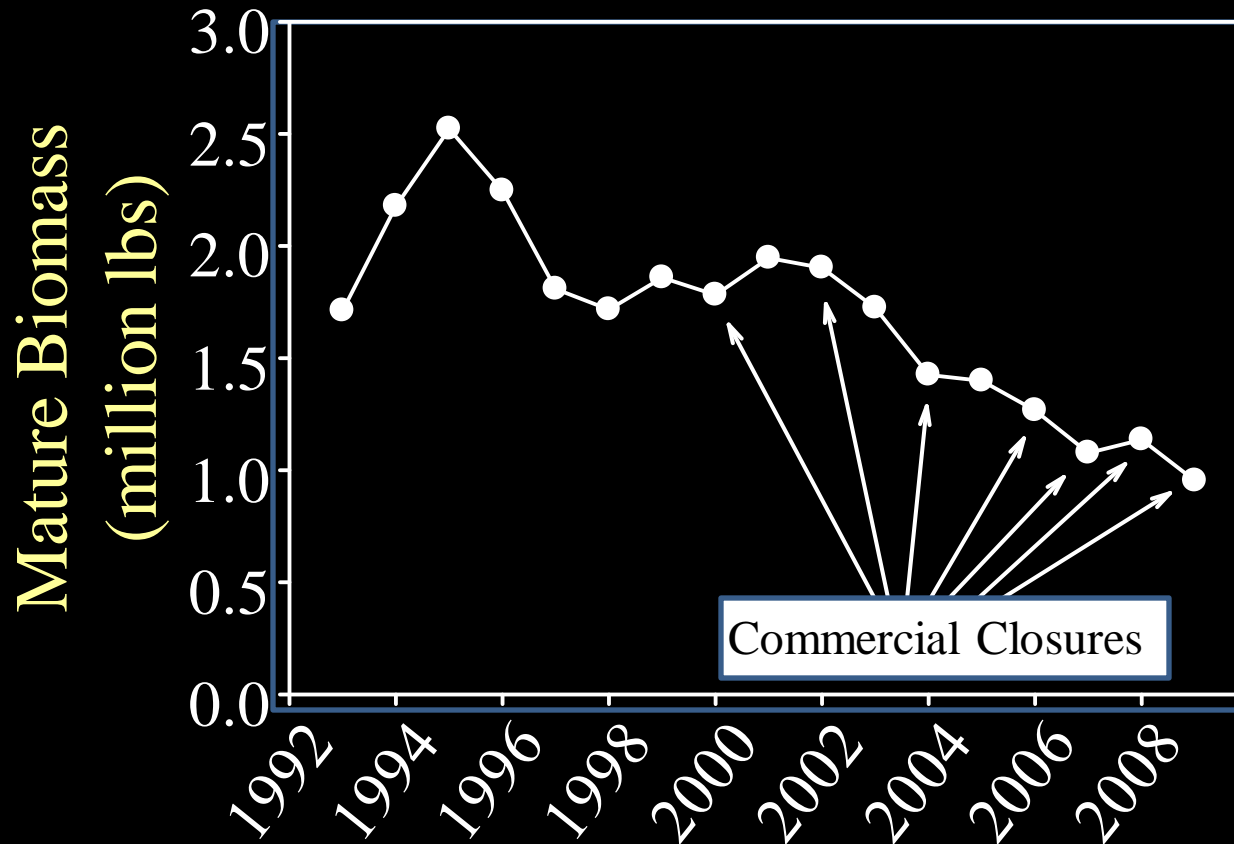


9 Surveyed Areas
70% of comm. catch
Fjord system
Small populations

RKC Regional Mature Biomass Estimates

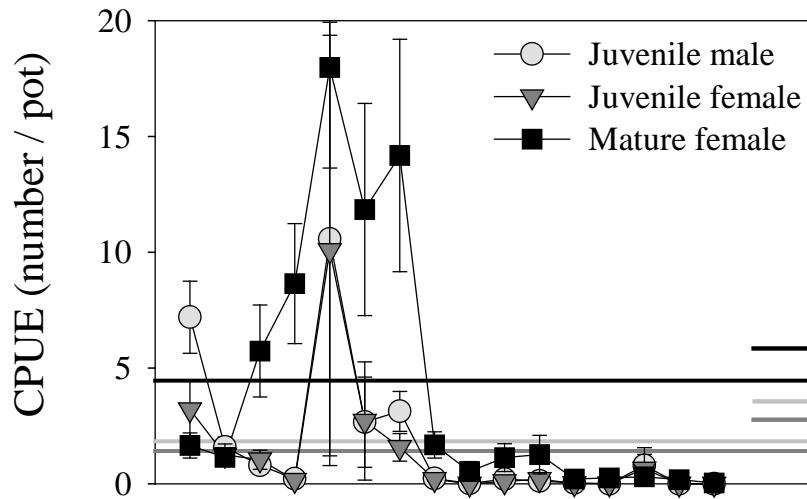
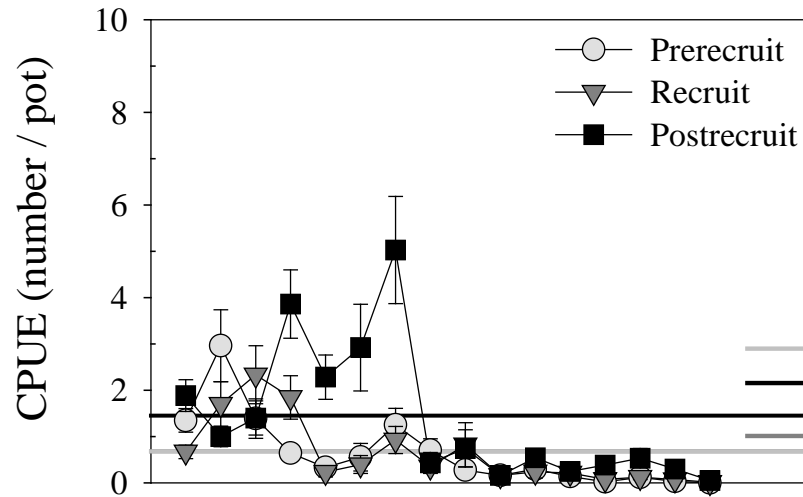


RKC Regional Mature Biomass Estimates



No response to closures,
But observations of crab from other fisheries (Tanner)

Seymour Canal



Population decline?
Migration?
What's the cause?

Main Question

Can we groundtruth RKC Biomass estimates?
(How do 3 estimates compare?)

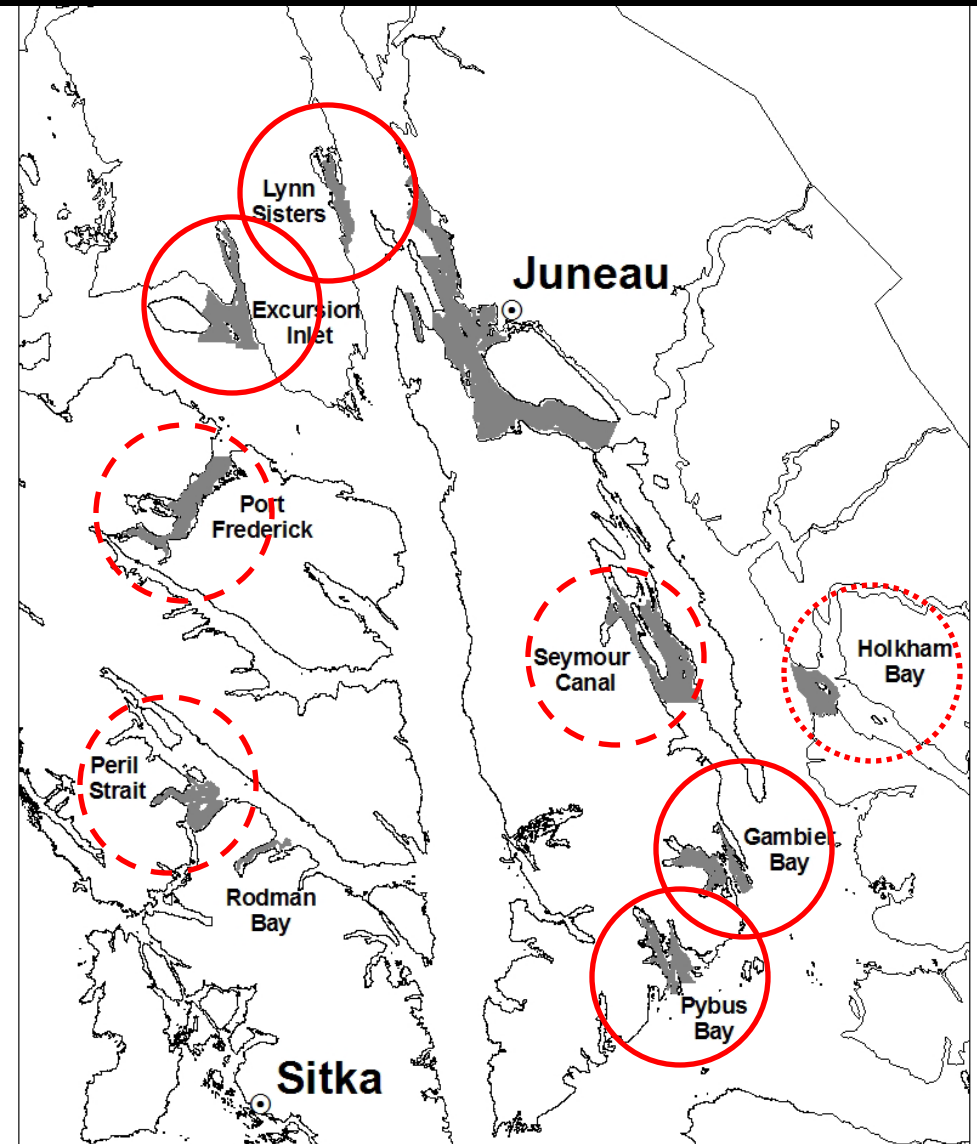
Scientifically sound and fleet support

Approach

3 Estimates
8/9 areas

4 completed
3 started
1 to do

Commercial
Vessels



Outline

1) Background

RKC in Southeast Alaska

2) Biomass Estimates

CSA, Depletion, Mark/Recapture

3) Biomass Comparisons

Catch-Survey Analysis

Commercial Catch + Survey CPUE \Rightarrow q

Abundance = CPUE / q

Assumptions:

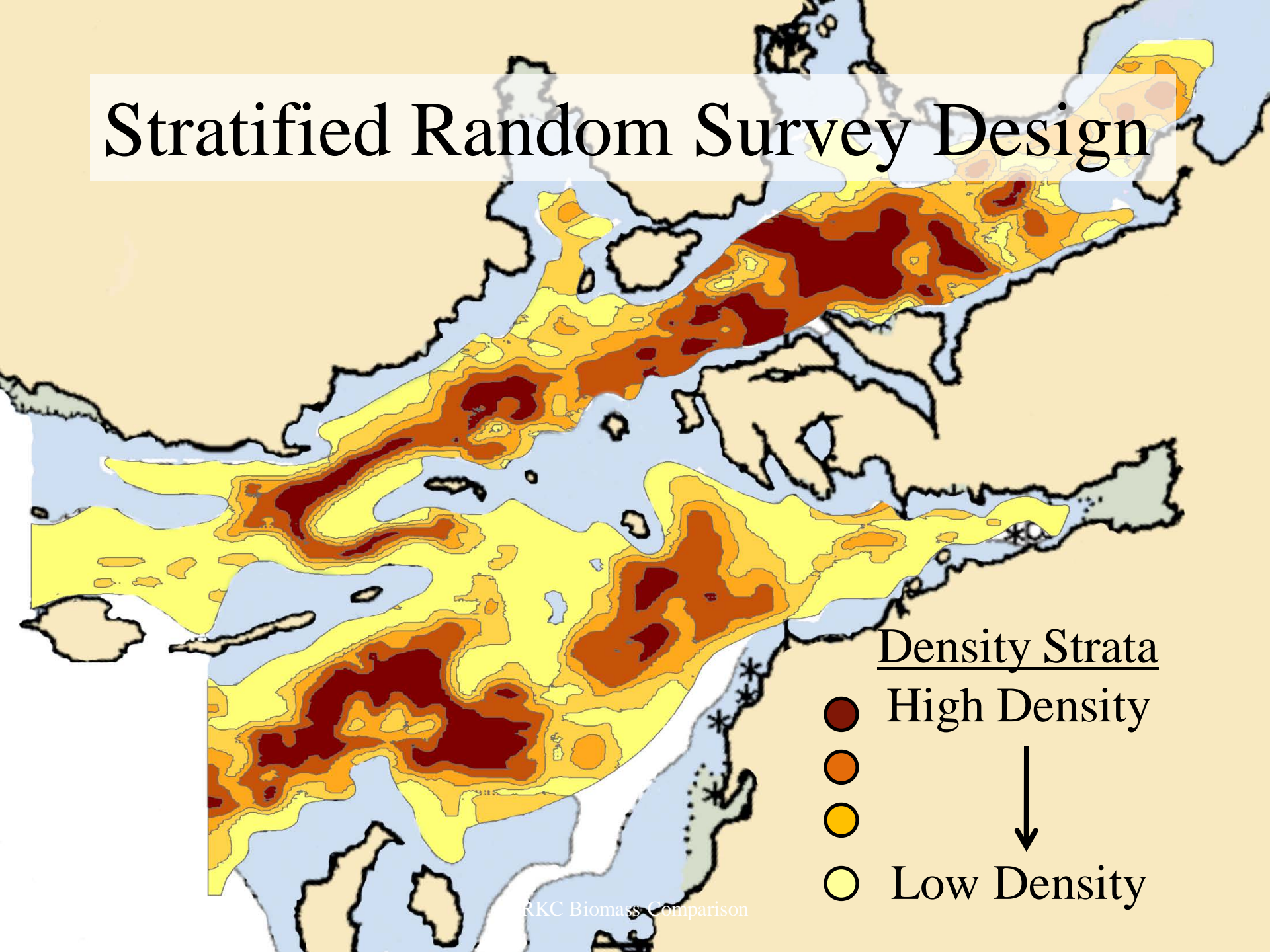
- Constant natural mortality

- Catchability (q) is equal for all mature crab

- No migration

- All crab have same probability of being caught
(random sampling)

Stratified Random Survey Design



Density Strata

● High Density

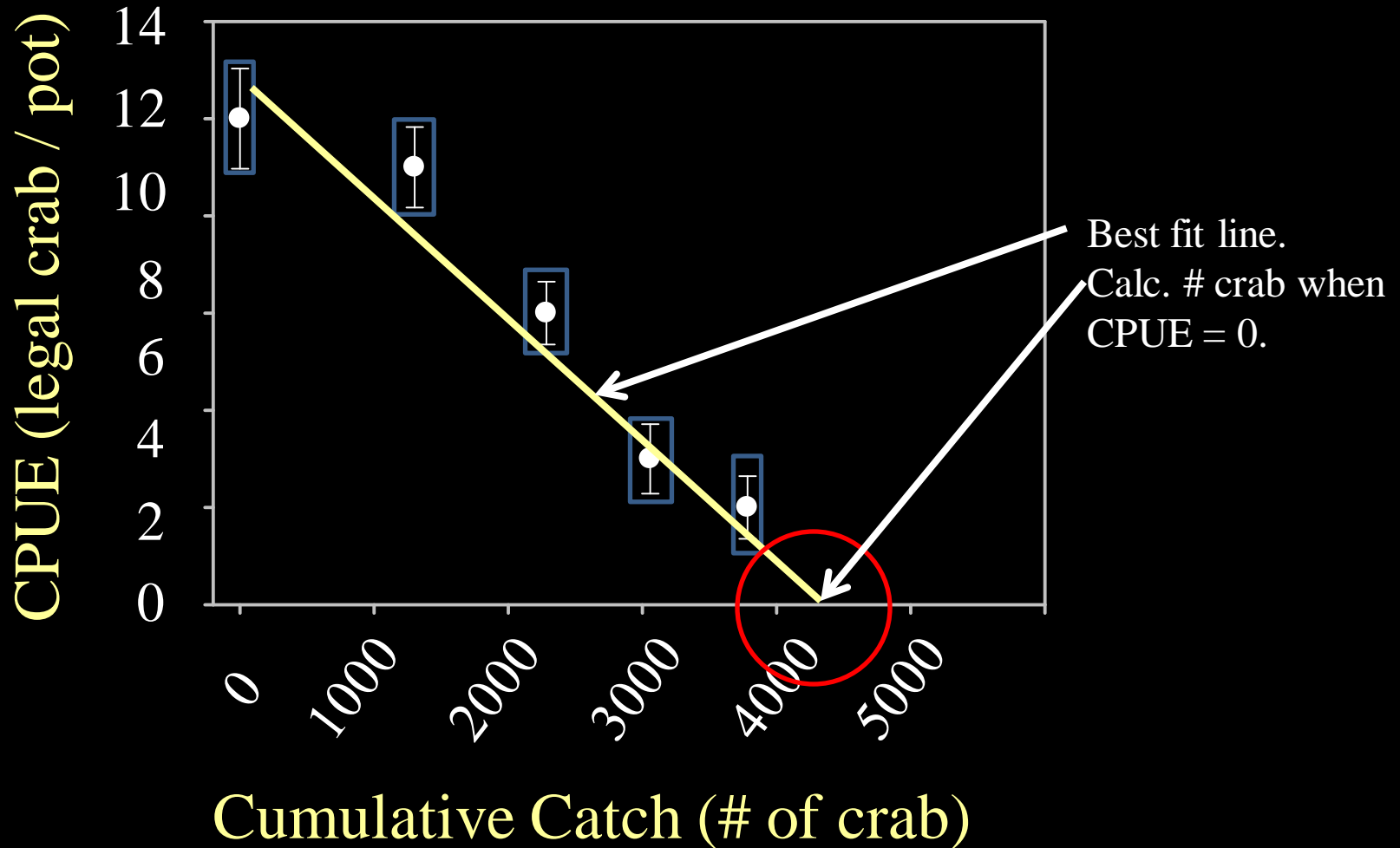


○ Low Density

Depletion Estimator

“Commercial Fishing”
Catch as many crab as
fast as possible.

Depletion Estimator



Mark/Recapture

Peterson Estimate

$$(n_1 n_2) / m_2$$

Recapture 30-60 days later

Outline

1) Background

RKC in Southeast Alaska

2) Biomass Estimates

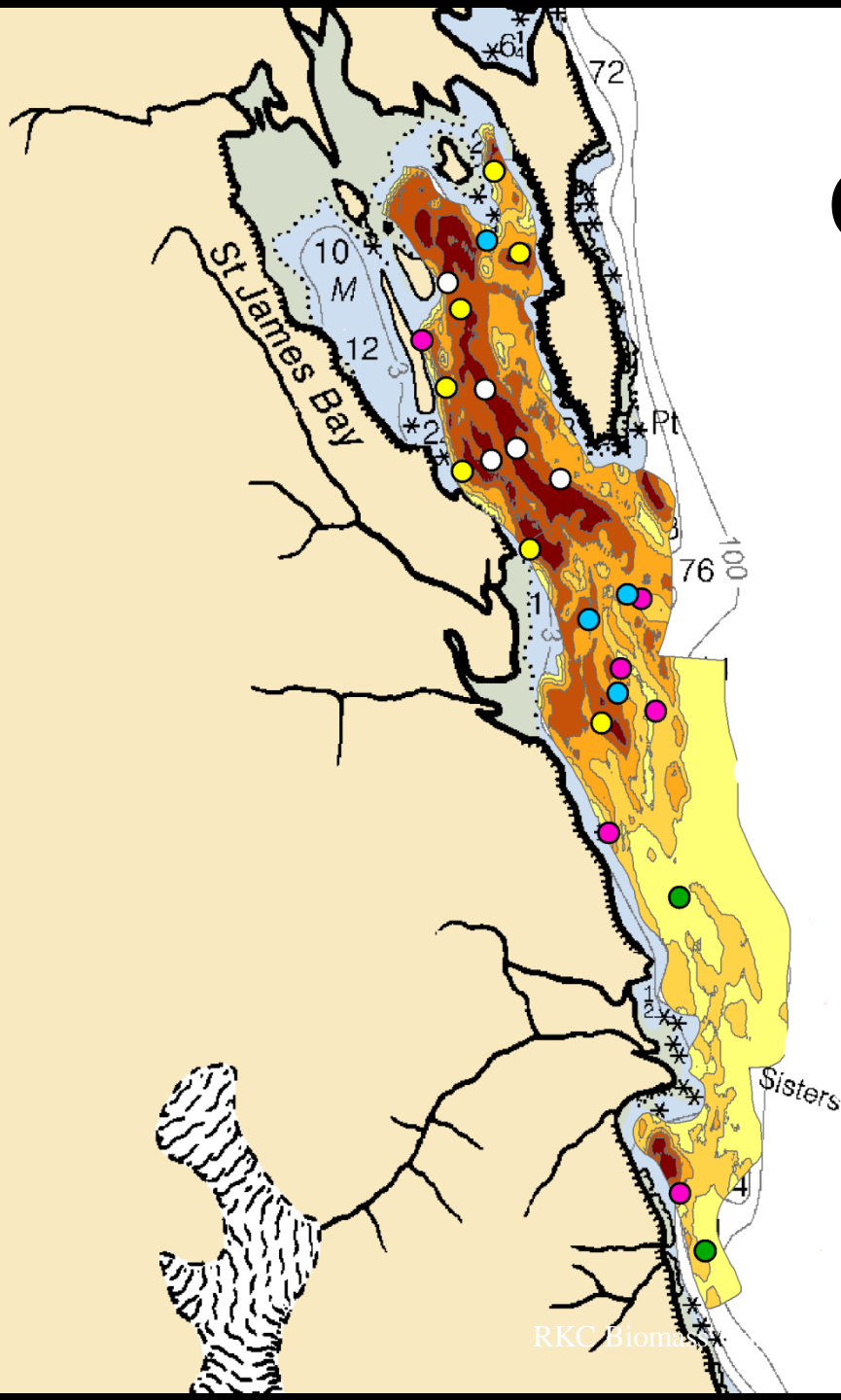
CSA, Depletion, Mark/Recapture

3) Biomass Comparisons

Catch-Survey

24 pot lifts
+ all historic data

N = 5,300 legal crab



Depletion

Legal Crab / Pot

● >10

● 6 – 10

● 1 – 5

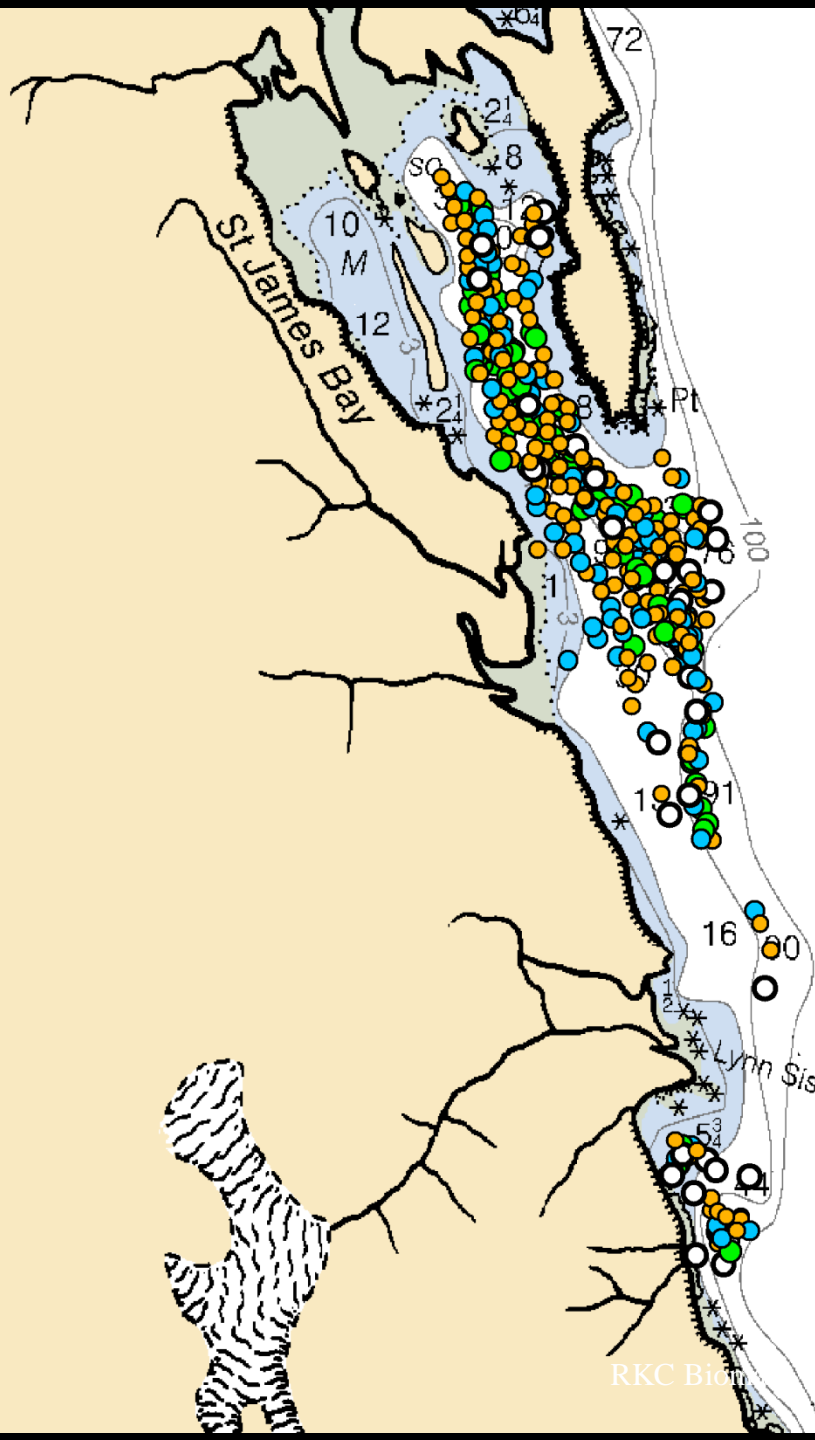
○ 0

Caught and marked: 2,424

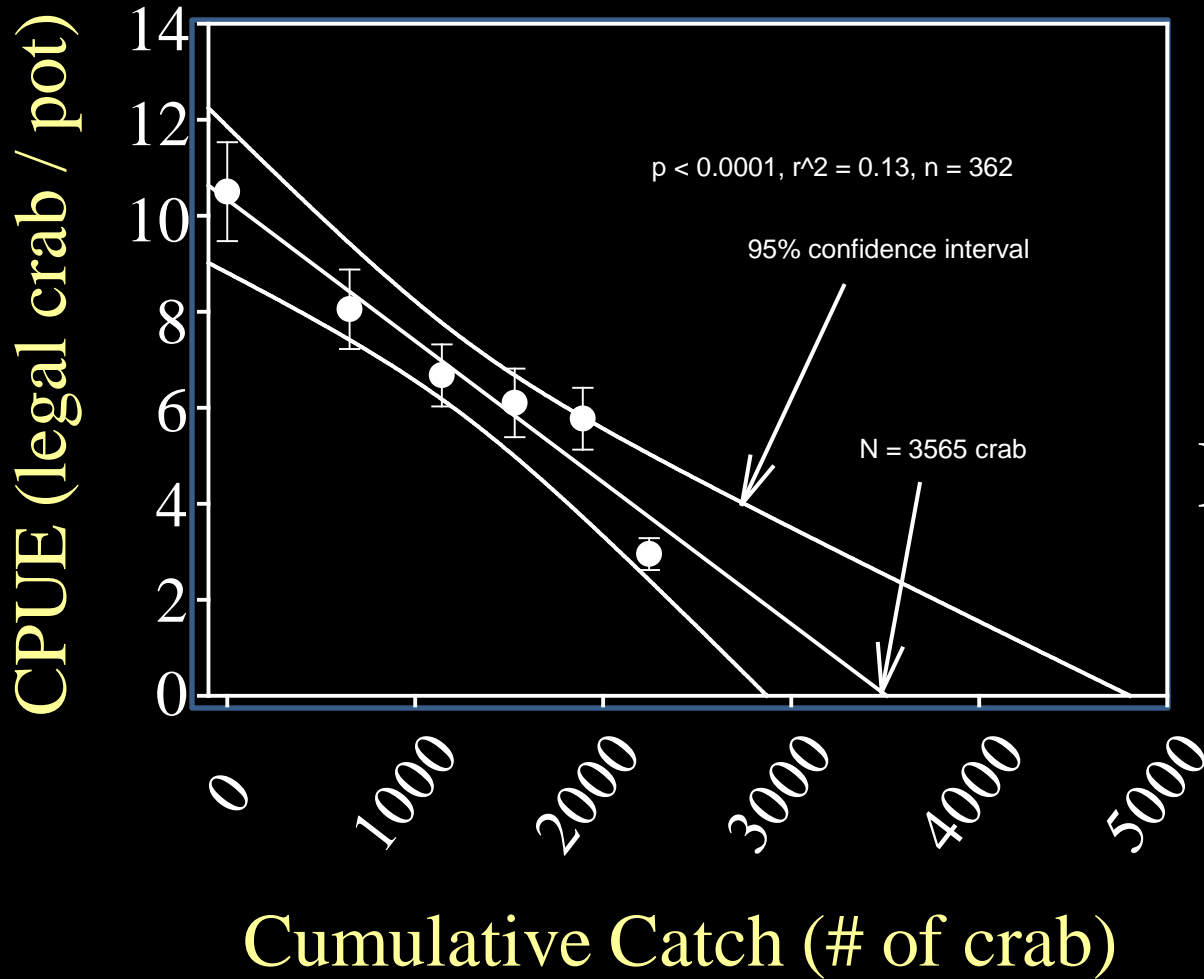
~ 20,000 lbs

362 total potlifts

(150 in 2003 fishery)



Depletion Estimator



$N = 3,565$

Recapture

Legal Crab / Pot

● >10

● 6 – 10

● 1 – 5

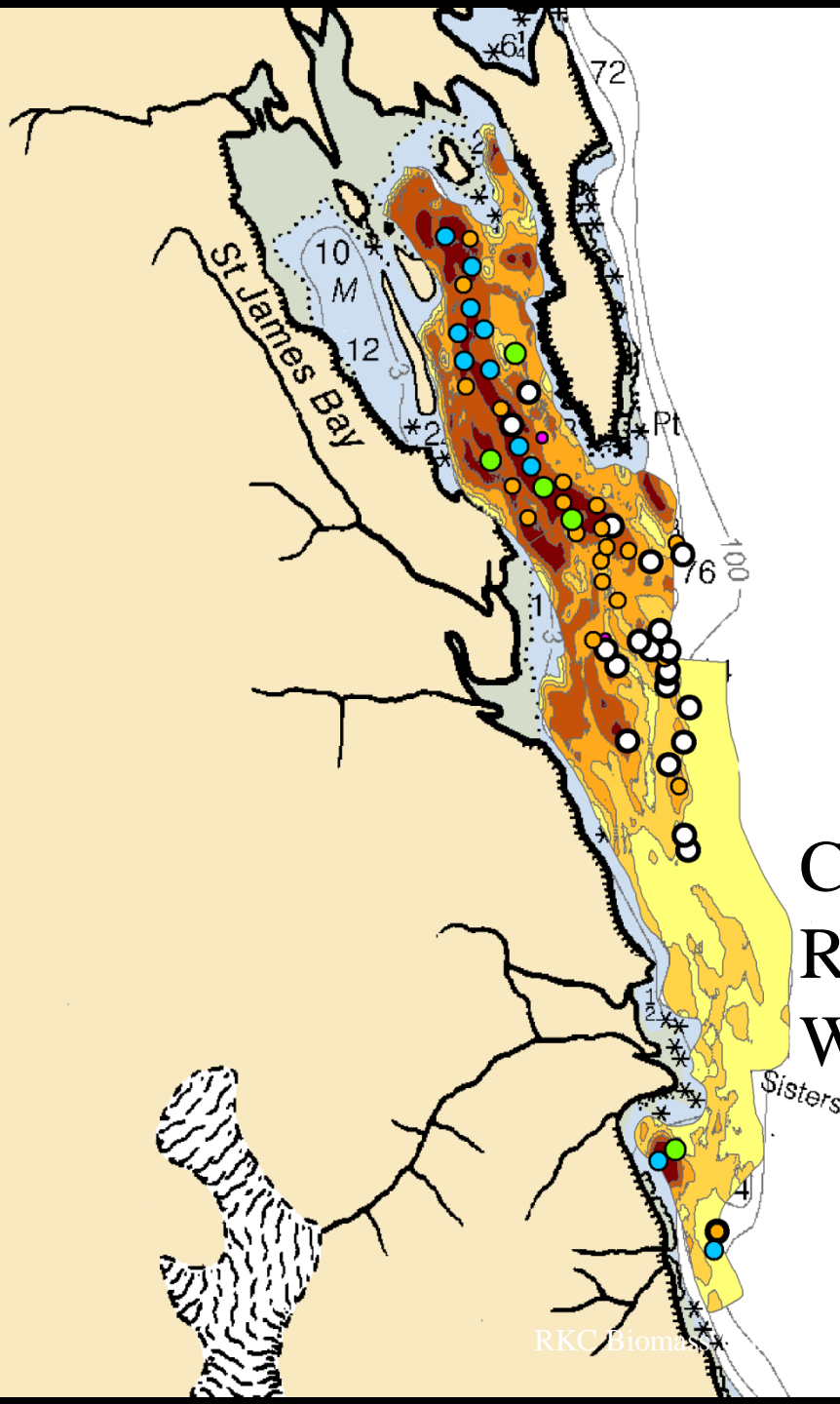
○ 0

Caught and marked: 2,424

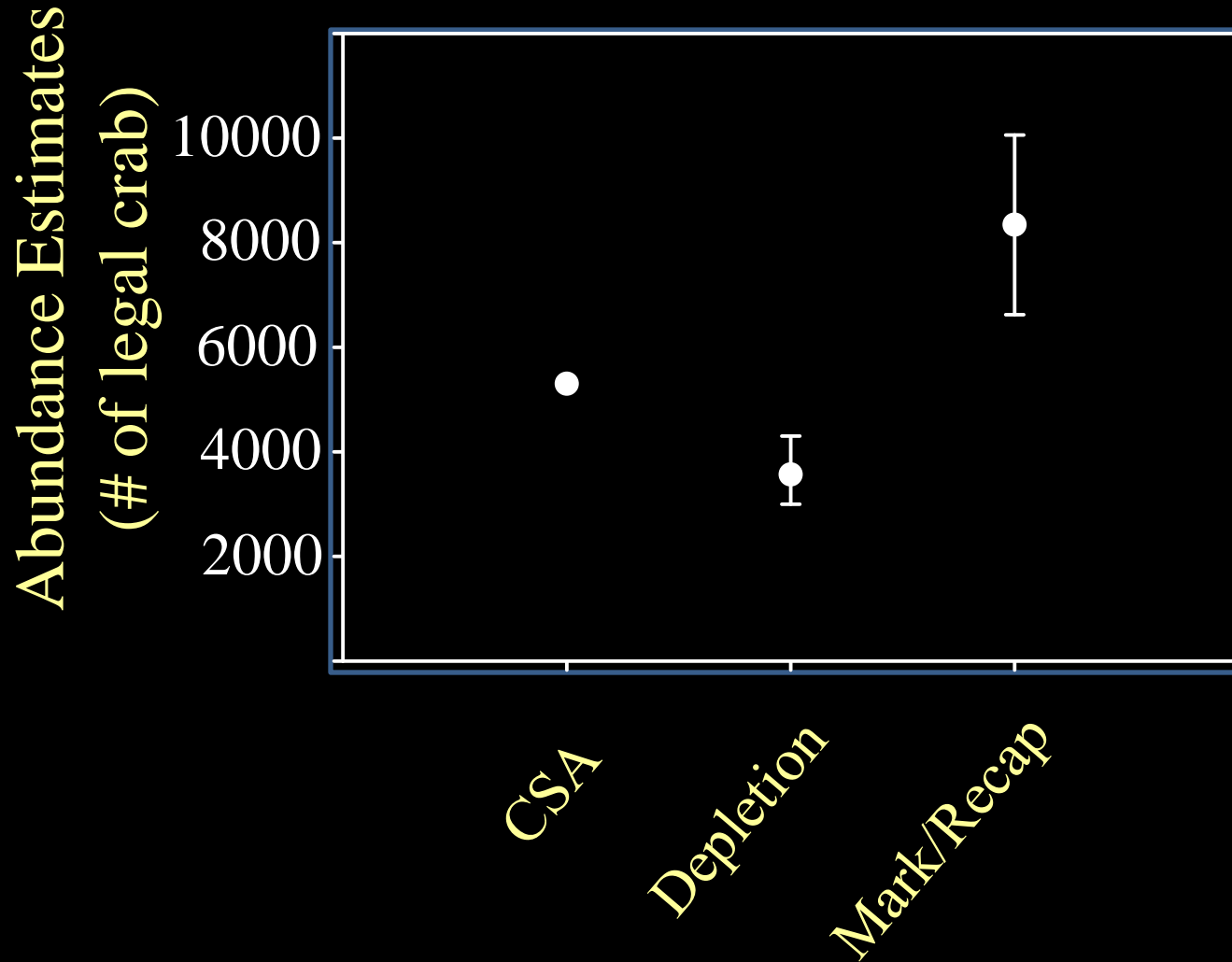
Recaptured: 209

With tags: 59

N = 8,340



Estimate Comparison



Catch-Survey Analysis

45 pot lifts
+ all historic data

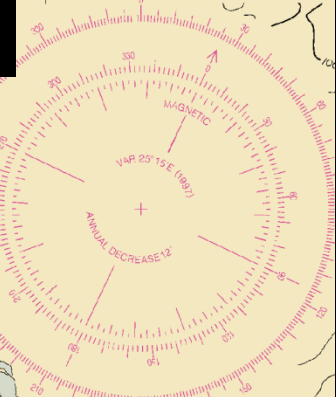
$N = 8,900$ legal crab

Depletion Estimator

TIDAL INFORMATION			
Place	Height referred to datum	Mean Higher High Water	Mean High Water
Pybus Bay (57° 0' N / 134° 03' W)	feet	14.3	13.4

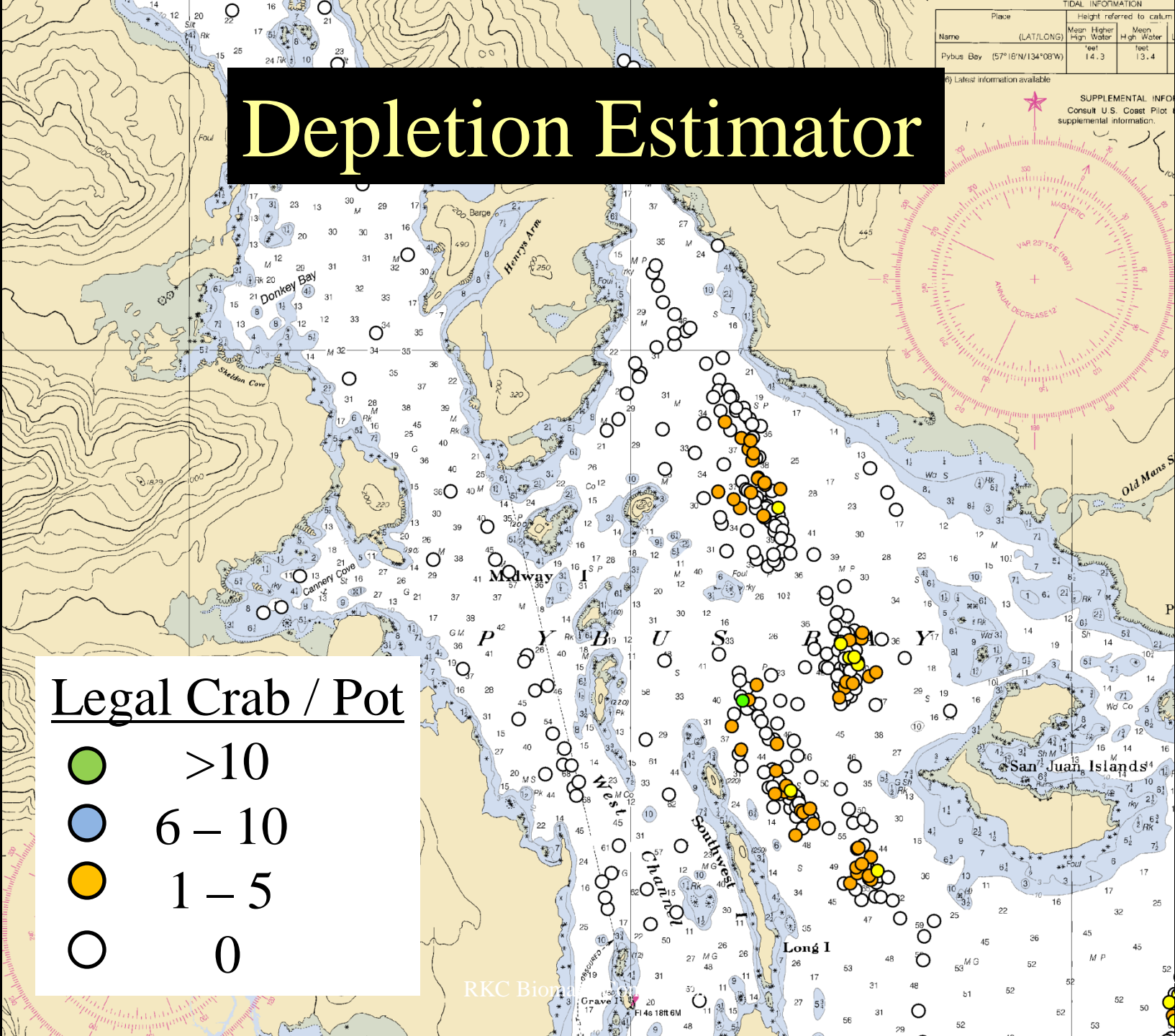
*) Latest information available

SUPPLEMENTAL INFO
Consult U.S. Coast Pilot
for supplemental information.

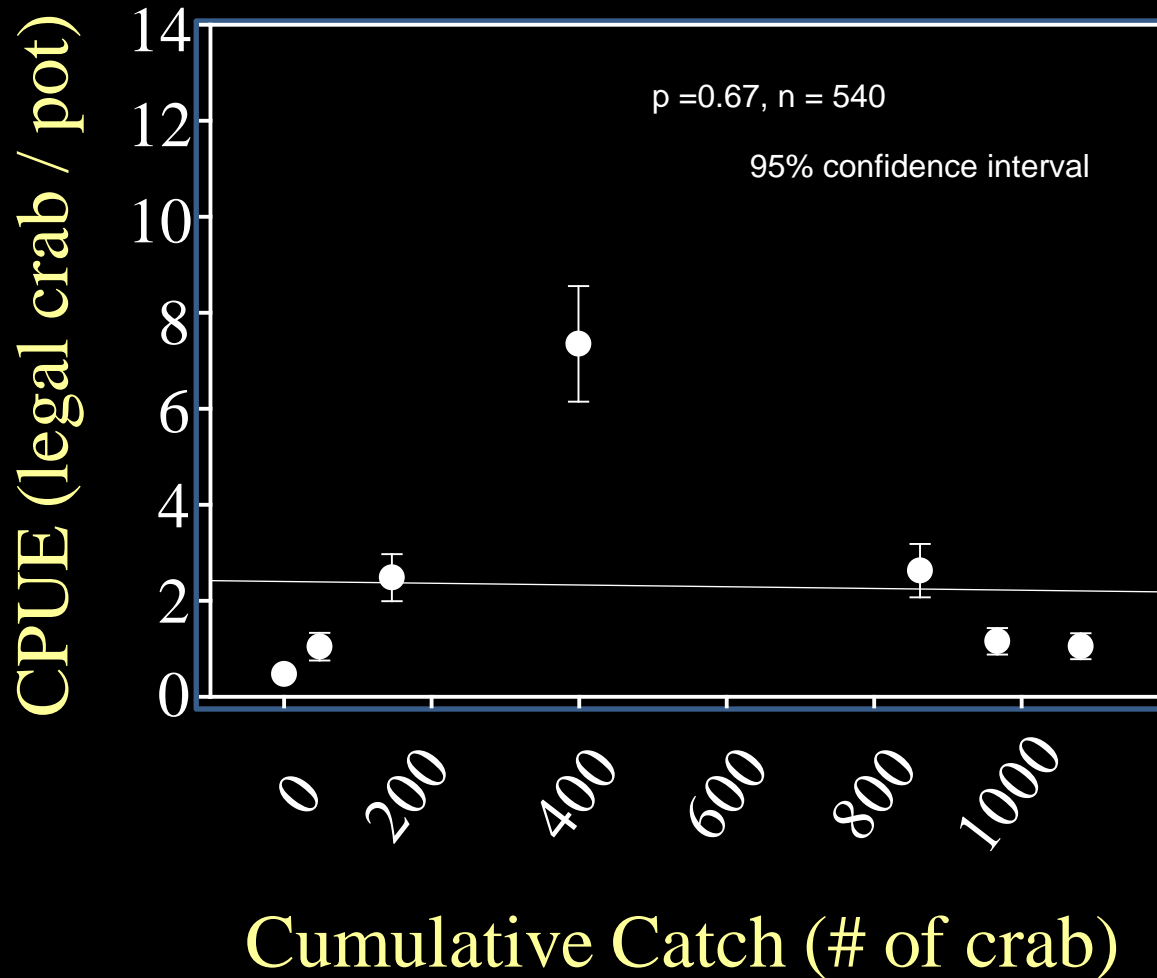


Legal Crab / Pot

- >10
- 6 – 10
- 1 – 5
- 0



Depletion Estimator



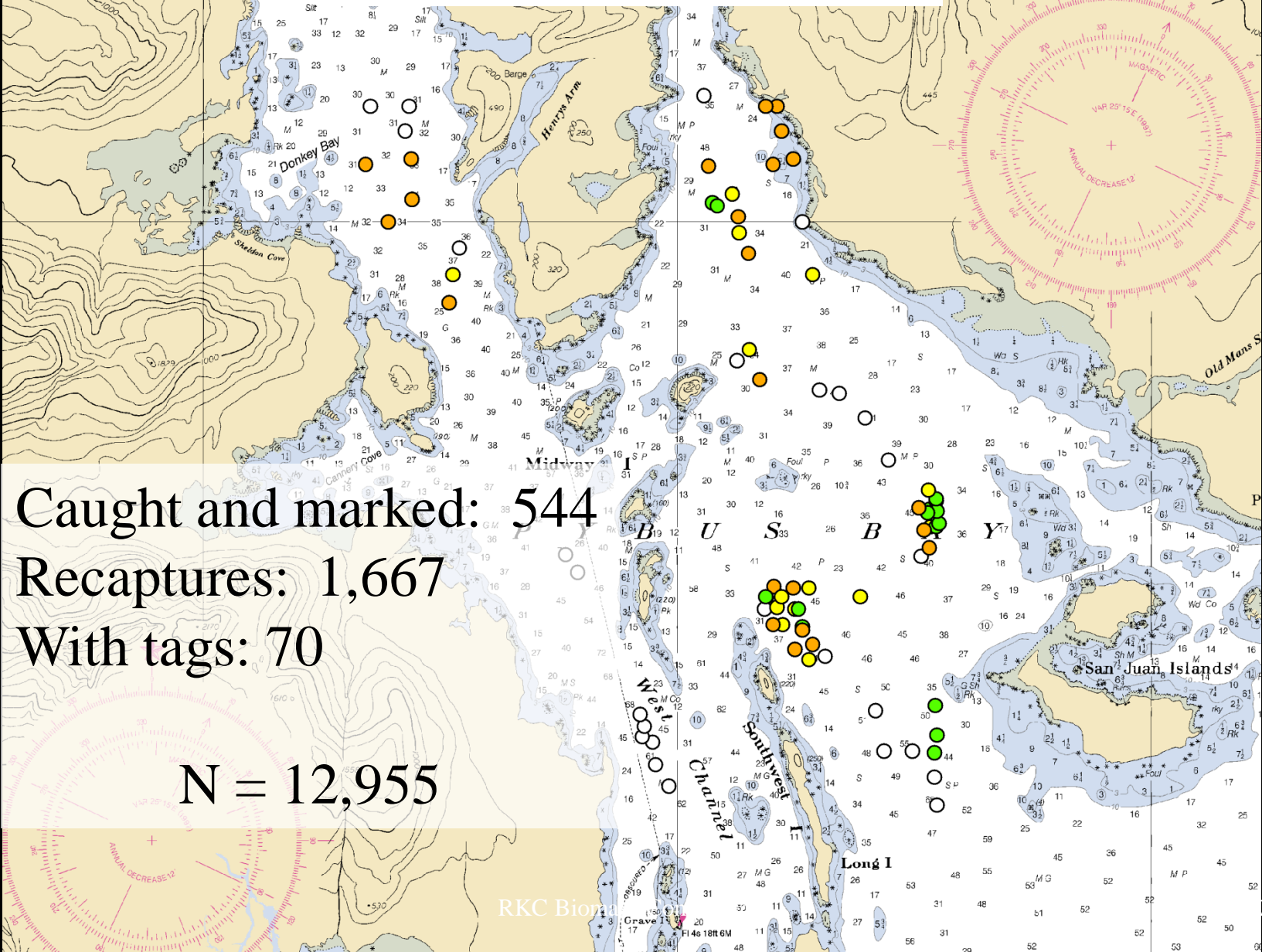
N = NA

Mark/Recapture

TIDAL INFORMATION			
Place	Height referred to datum	Mean Higher Water	Mean High Water
Name	(LAT/LONG)	feet	feet
Pybus Bay (57° 16' N/134° 03' W)		14.3	13.4

(396) Latest information available

SUPPLEMENTAL INFO
Consult U.S. Coast Pilot
for supplemental information.



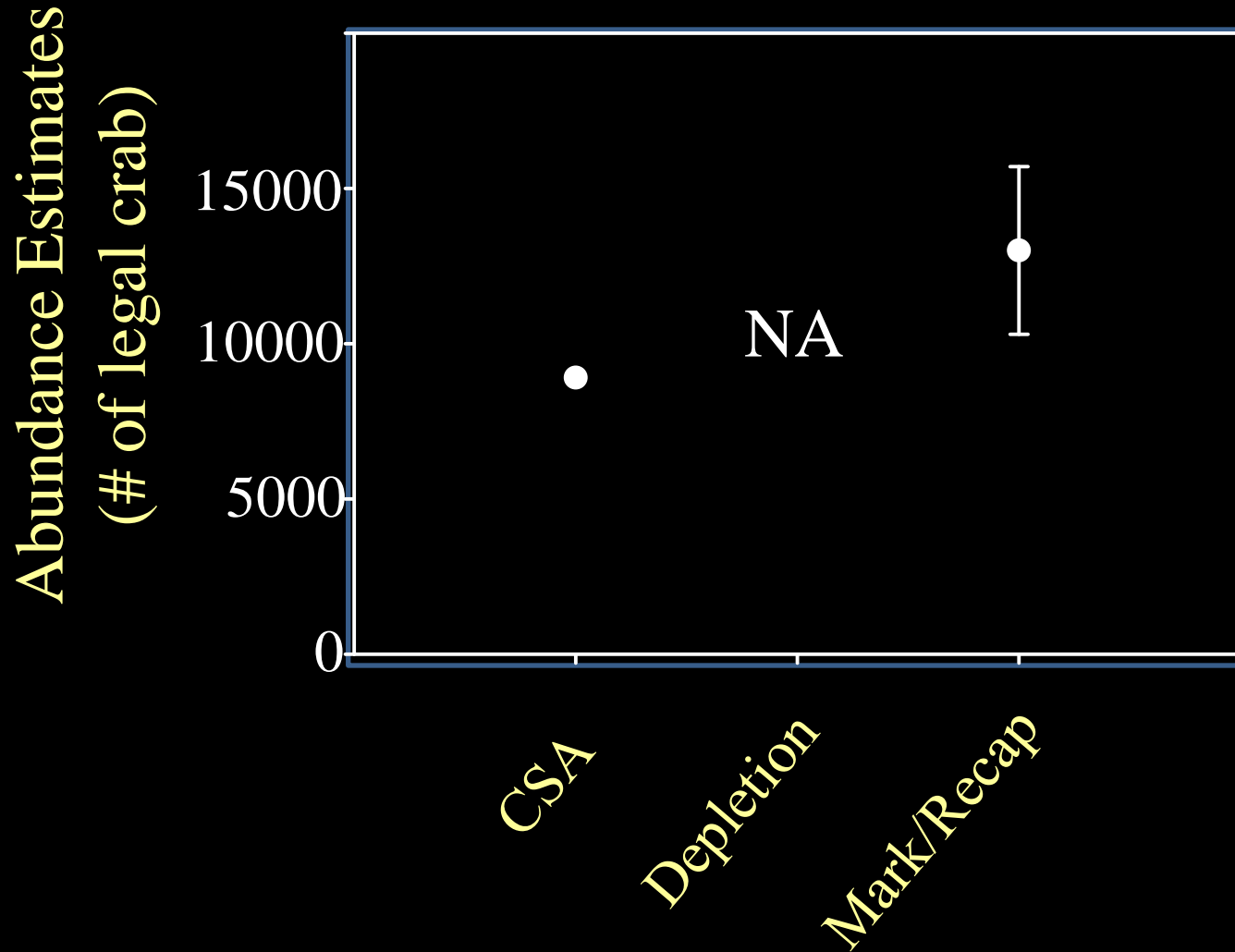
Caught and marked: 544

Recaptures: 1,667

With tags: 70

N = 12,955

Estimate Comparison



58°
30'

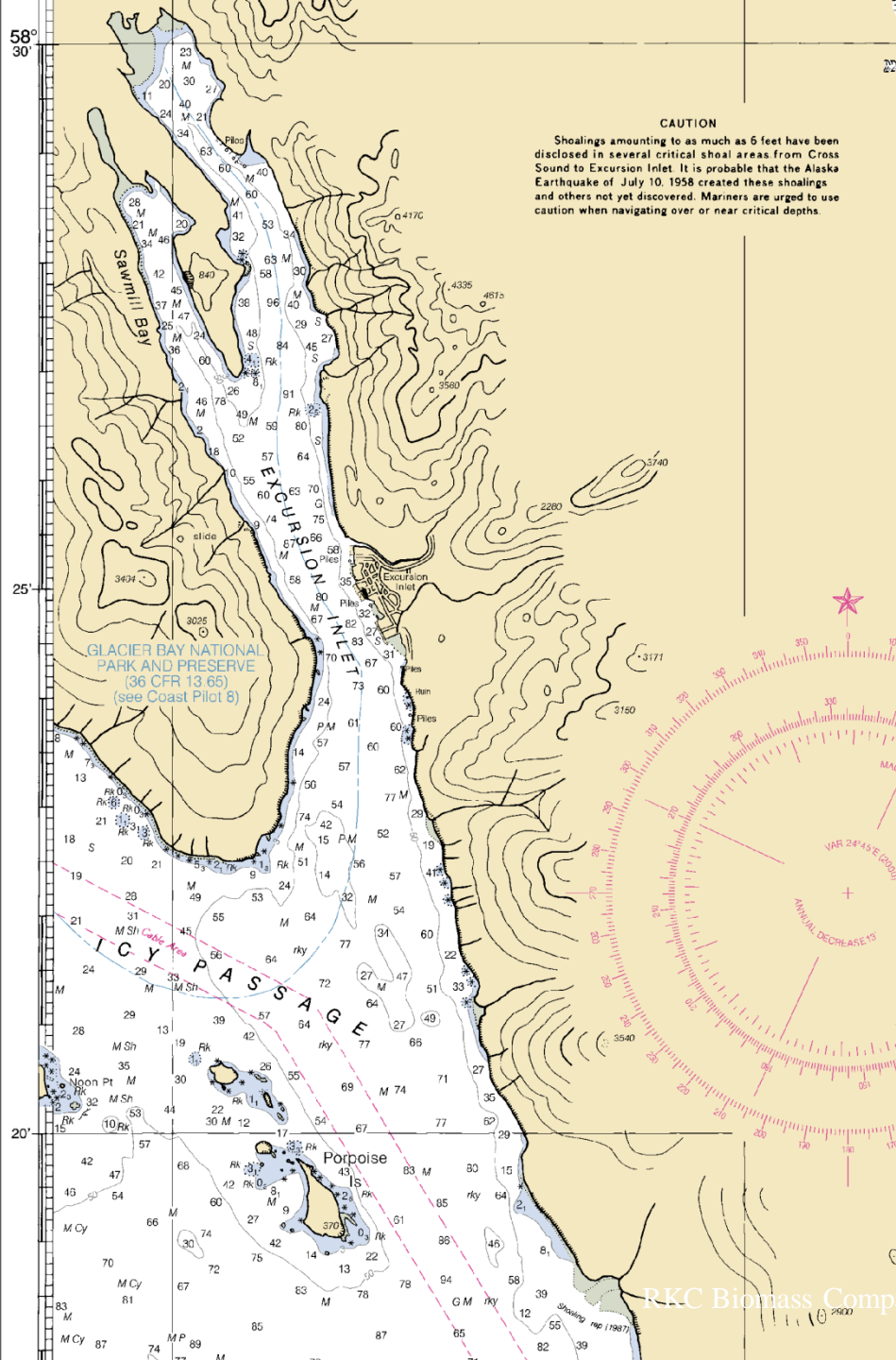
25'

20'

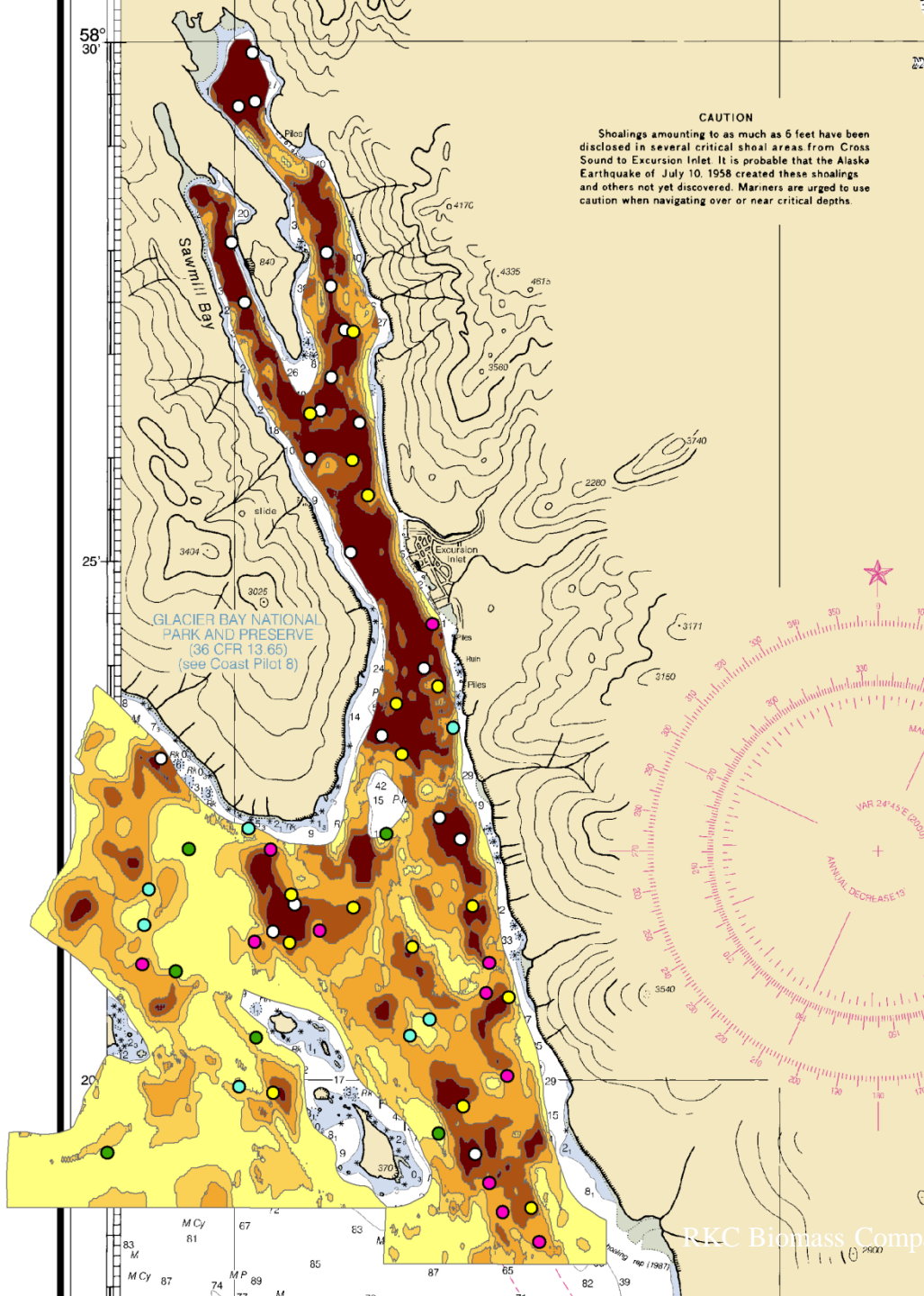
CAUTION

Shoalings amounting to as much as 6 feet have been disclosed in several critical shoal areas from Cross Sound to Excursion Inlet. It is probable that the Alaska Earthquake of July 10, 1958 created these shoalings and others not yet discovered. Mariners are urged to use caution when navigating over or near critical depths.

Excursion Inlet



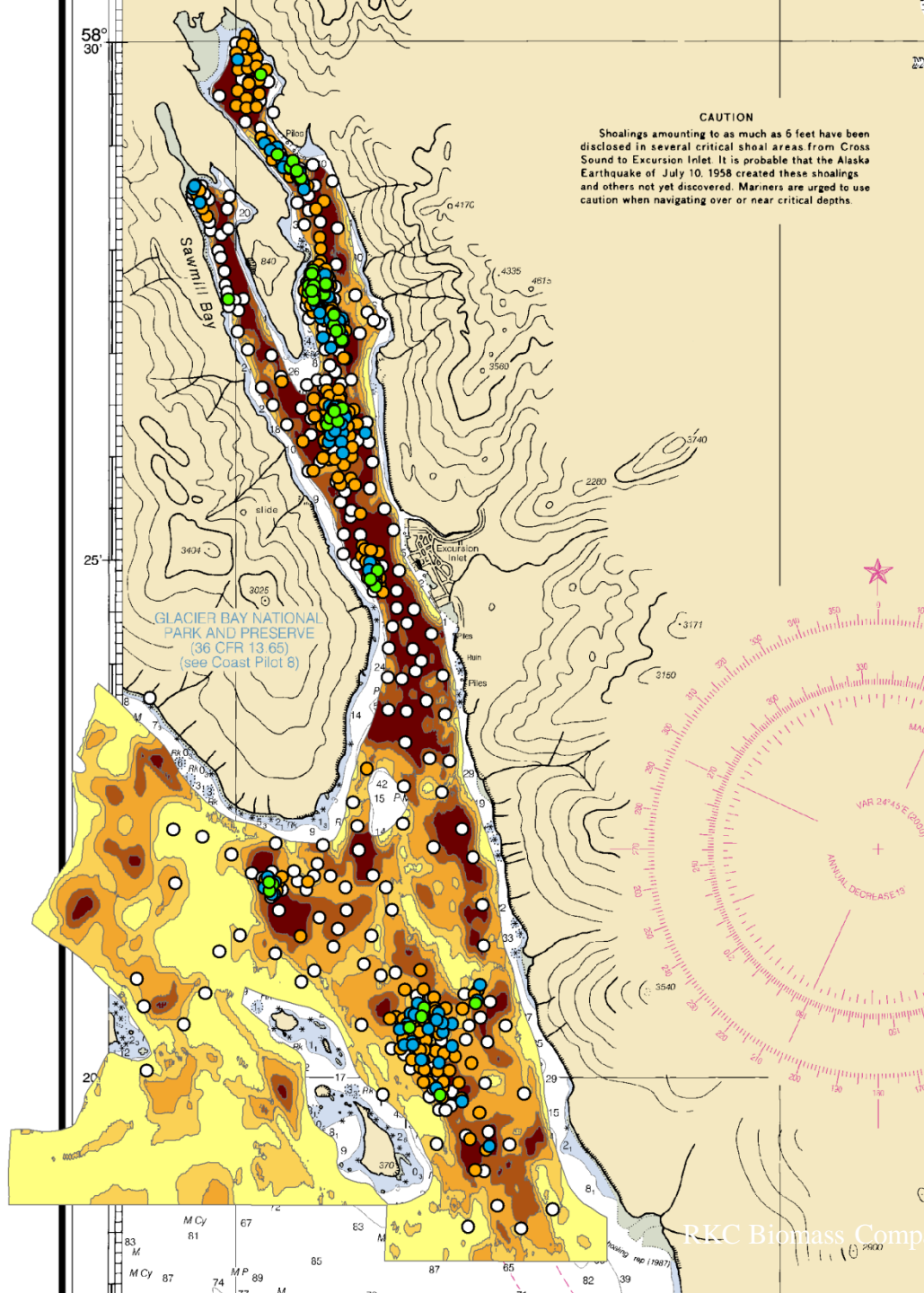
RKC Biomass Comp



Catch-Survey

44 pot lifts
+ all historic data

N = 2,500 legal crab



Depletion

Legal Crab / Pot

● >10

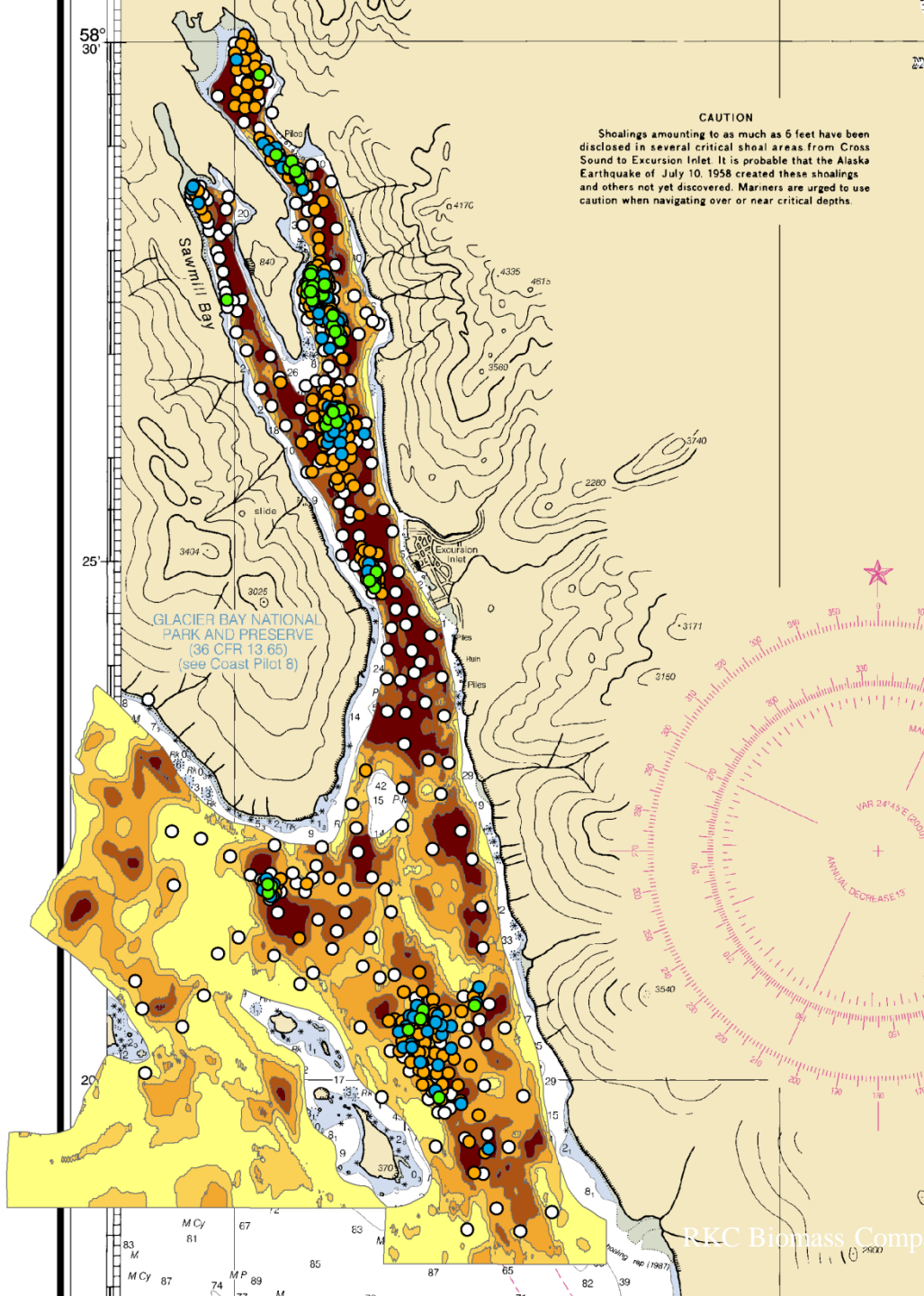
● 6 – 10

● 1 – 5

○ 0

Caught and marked: 1,690
 600 total potlifts
 (710 in 2003 fishery)

N = NA



Mark/Recapture

Caught and marked: 1,690

Recaptures: 312

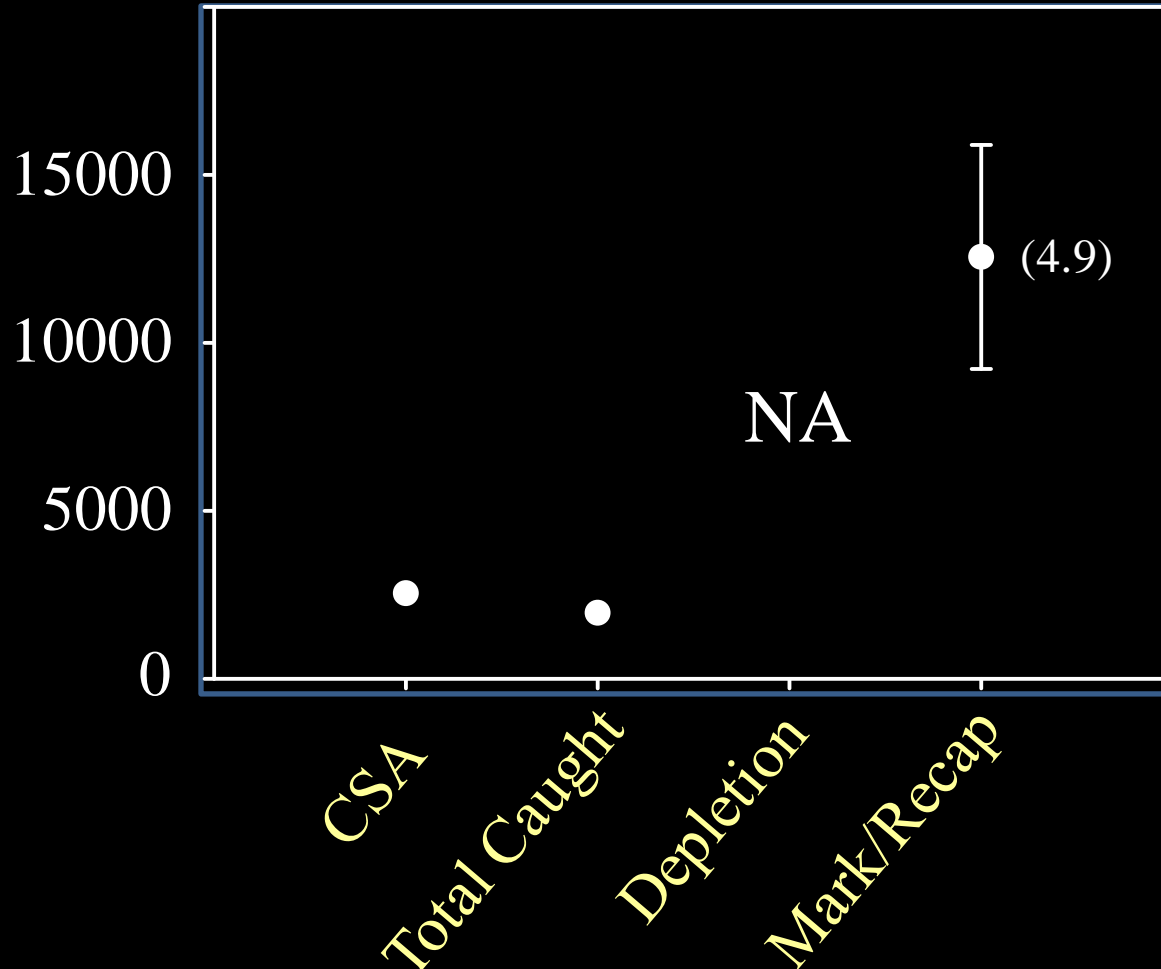
With tags: 42 (13%)

$N = 12,554$

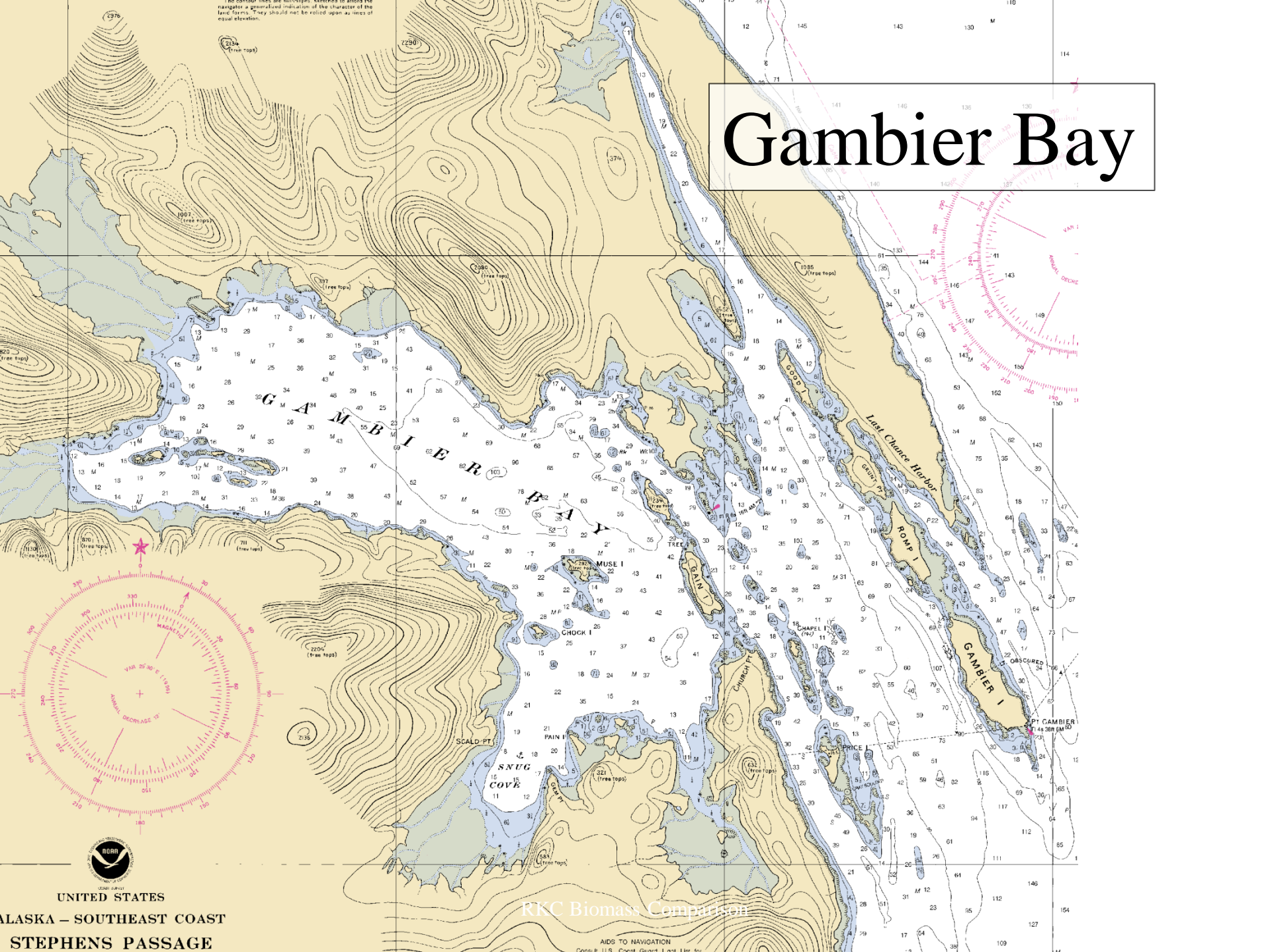
Estimate Comparison

Excursion Inlet

Abundance Estimates
(# of legal crab)



Gambier Bay



UNITED STATES
ALASKA – SOUTHEAST COAST
STEPHENS PASSAGE

RKC Biomass Comparison

AIDS TO NAVIGATION
Consult U.S. Coast Guard List 1/12 for

Gambier Bay

30 pot lifts
+ all historic data
N = 5,500 legal crab



UNITED STATES

ALASKA – SOUTHEAST COAST

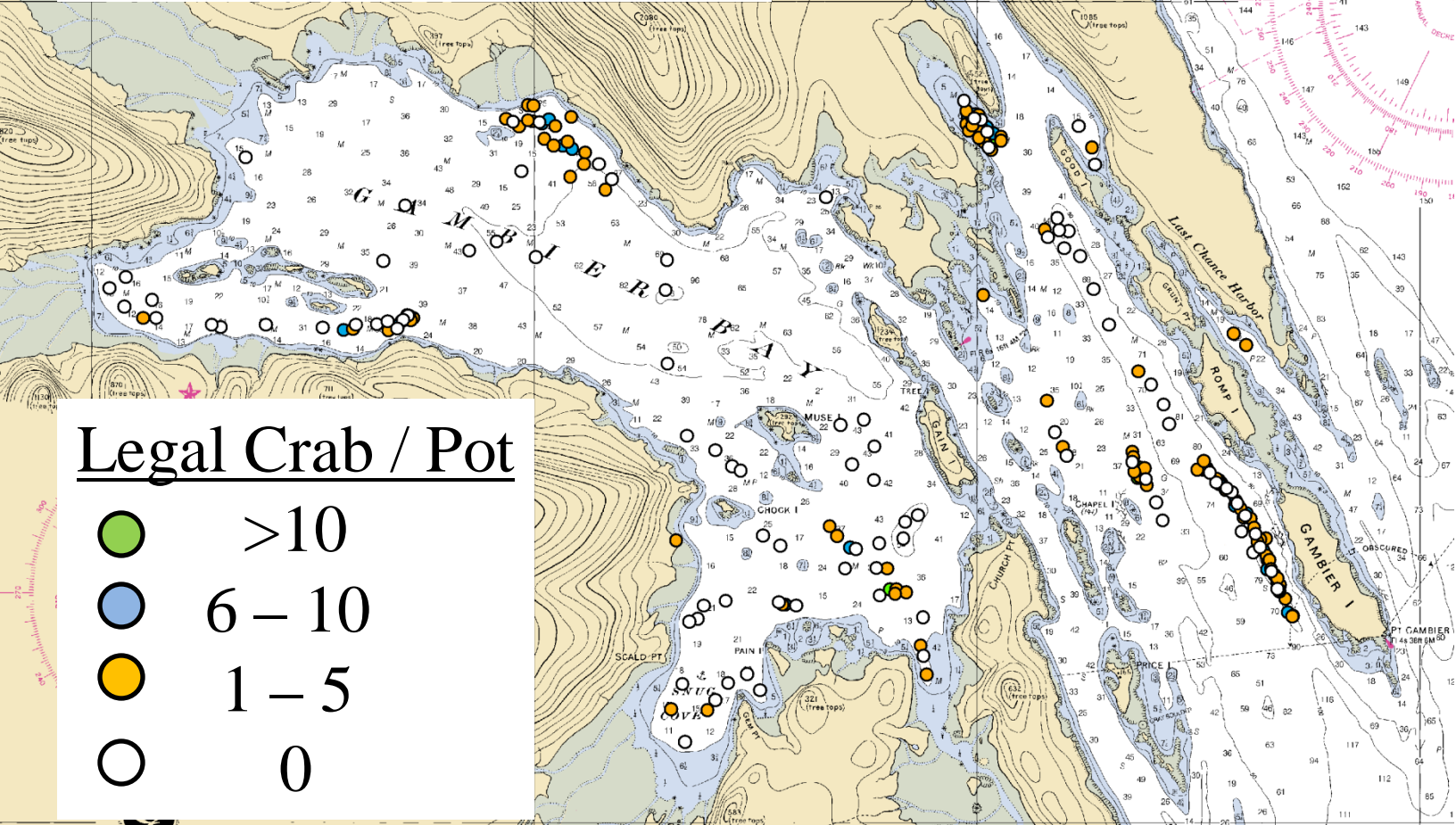
STEPHENS PASSAGE

RKC Biomass Comparison

AIDS TO NAVIGATION
Copyright U.S. Coast Guard. Not for sale.

Caught and marked: 852
277 total potlifts
(384 in 2003 fishery)

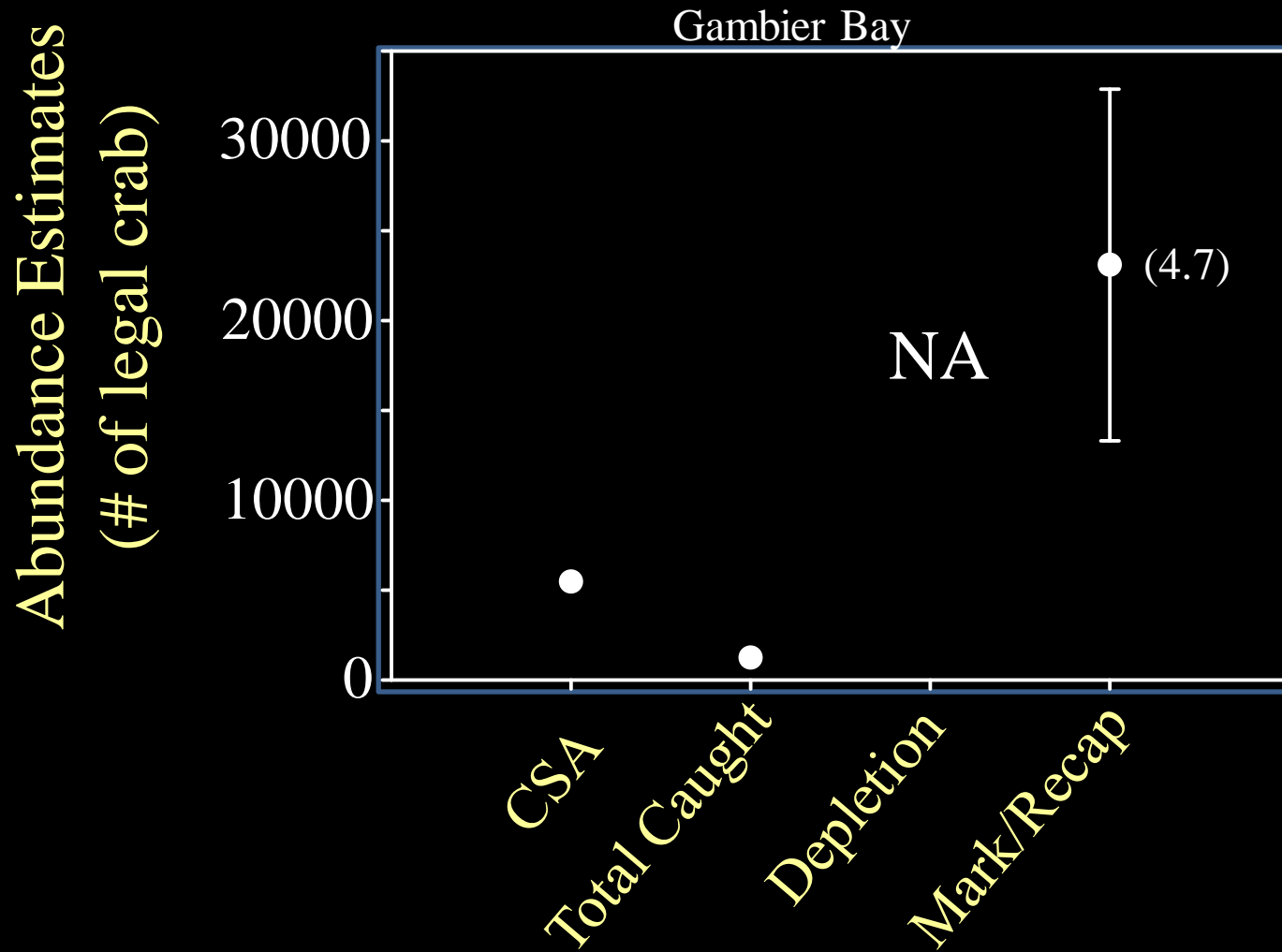
Gambier Bay



Legal Crab / Pot

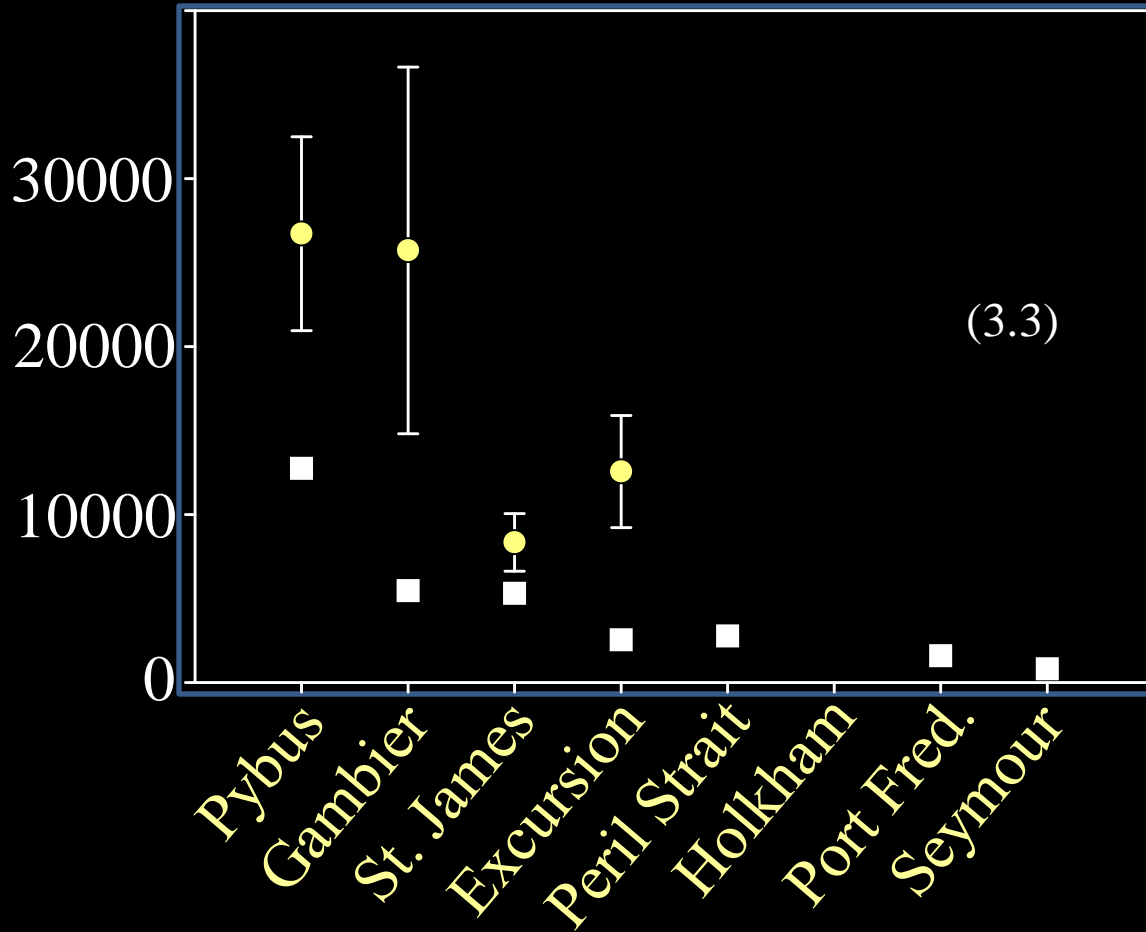
- >10
- 6 – 10
- 1 – 5
- 0

Estimate Comparison



Estimate Comparison

Abundance Estimates
(# of legal crab)



Conclusions

- 1) $CSA < \text{Mark/Recap}$ for 4 Bays
- 2) Depletion Estimate not reliable

What's next?

Are results consistent regionwide?
(4 areas left)

How will research be utilized?
(e.g., what do we do if CSA consistently
over/under-estimates)

Acknowledgements

Commercial Fleet

R. Littleton (Angjenl)
J. Jensen (Harvester)
Y. Nilsen (Aleutian Dream)
S. Savland (Chikamin)
J. Barry (Pillar Bay)
J. Kohlhase (Morgan Anne)
L. Norheim (Frigidland)
Randy Lanteigne (Icicle)
M. Erickson (AGS)
E. Norman (Taku Fisheries)
Julianne Curry (PVOA)

ADF&G staff

A. Messmer
Q. Smith
A. Olson
J. Stratman
S. Kelley
J. Meucci
T. Koeneman

