Shellogy:
Reading shells to empower reef scale management

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Auckland

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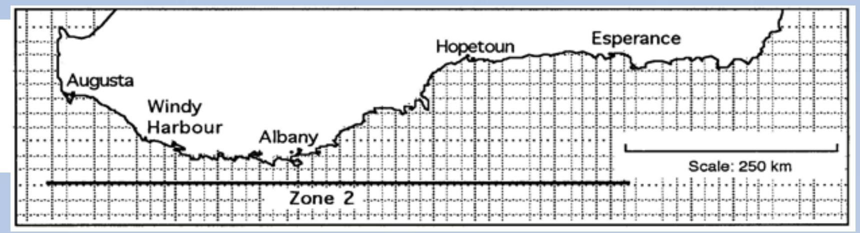
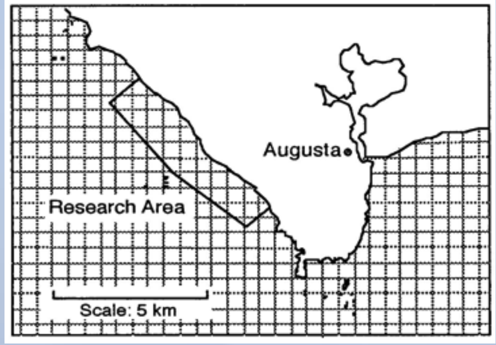
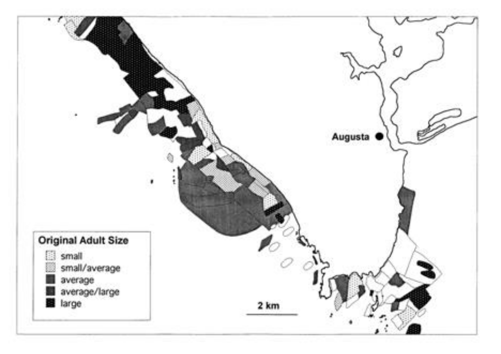
The Tyranny of Scale

Regional Scale of Management and Enforcement



Local Scale of Data Collection and Stock Assessment

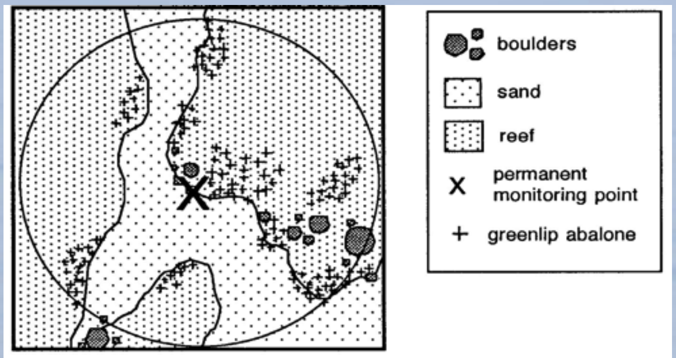




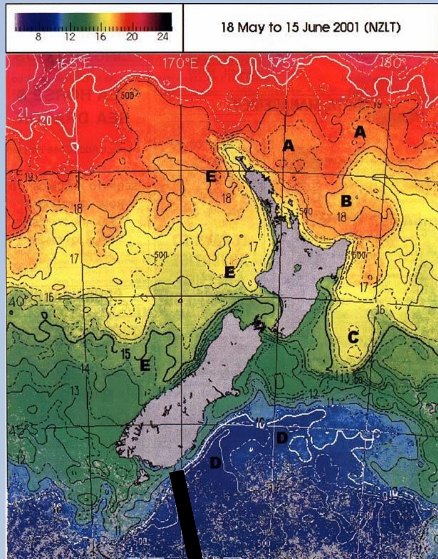
The Challenge:

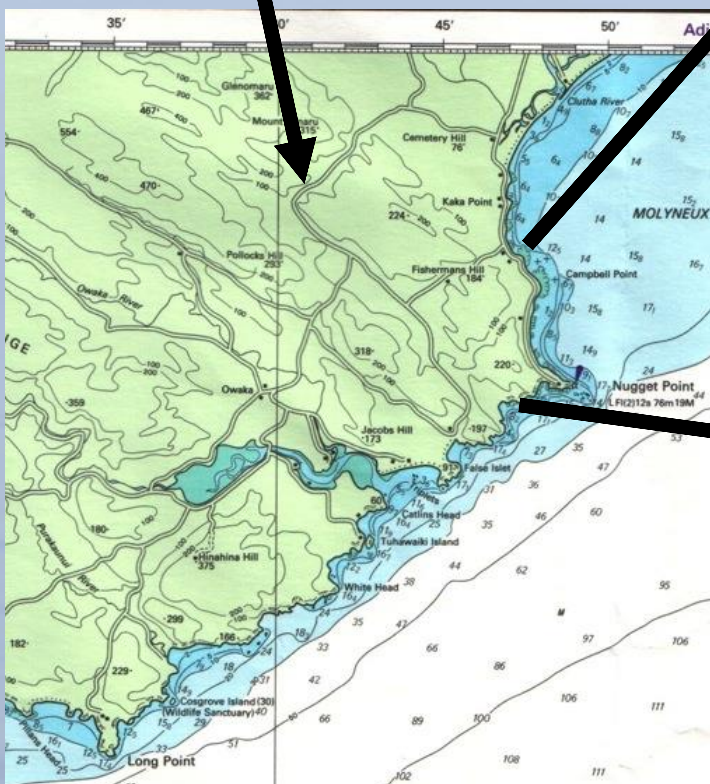
Managing at the Scale of Functional Stocks requires Motivated Diver Behaviour

10m Radius Survey Circle



Prince, J.D., C. Walters, R. Ruiz-Avila and P. Sluczanowski. (1998). Territorial user's rights in the Australian abalone fishery. Canadian Spec. Public. Fisheries and Aquatic Sciences 125. pp. 367-375.


18 May to 15 June 2001 (NZLT)
8 12 16 20 24
A
B
C
D
E


35′
45′
50′
Clutha River
Cemetery Hill
Kaka Point
MOLYNEUX
Fishermans Hill
Campbell Point
Pollocks Hill
Owaka River
Owaka
Nugget Point
Jacobs Hill
False Islet
Catlins Head
Tuhawaiki Island
White Head
Hinahina Hill
Cosgrove Island (30)
(Wildlife Sanctuary)
Long Point

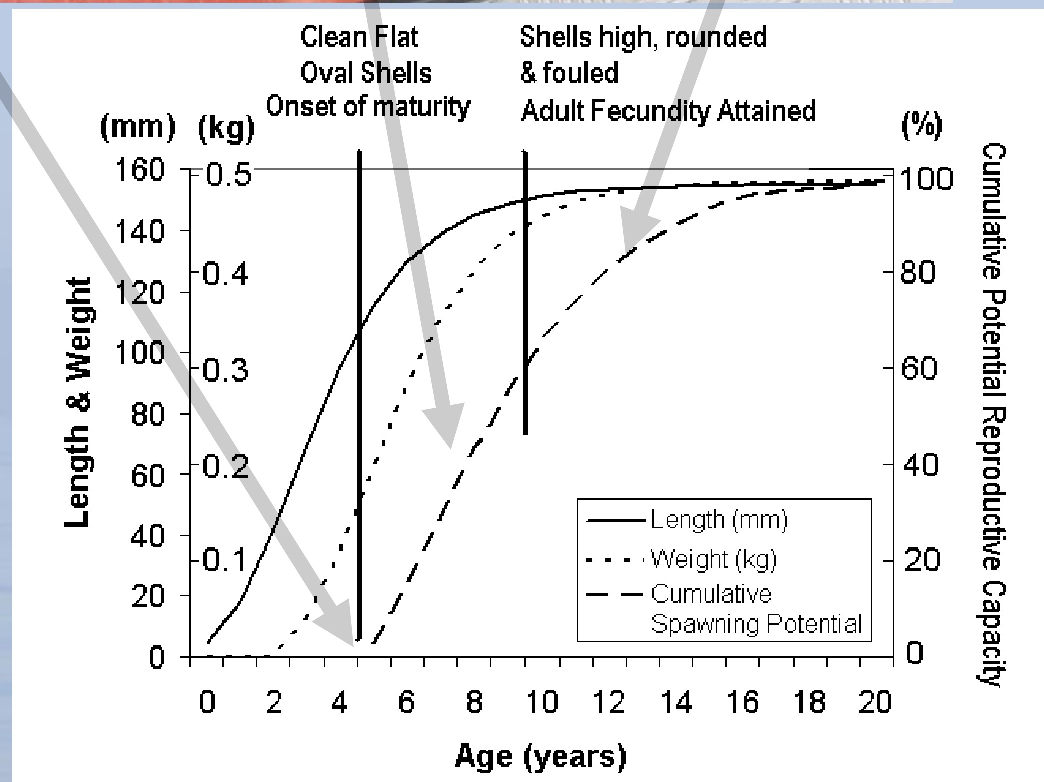
Emergence & Maturity

Shellogy:

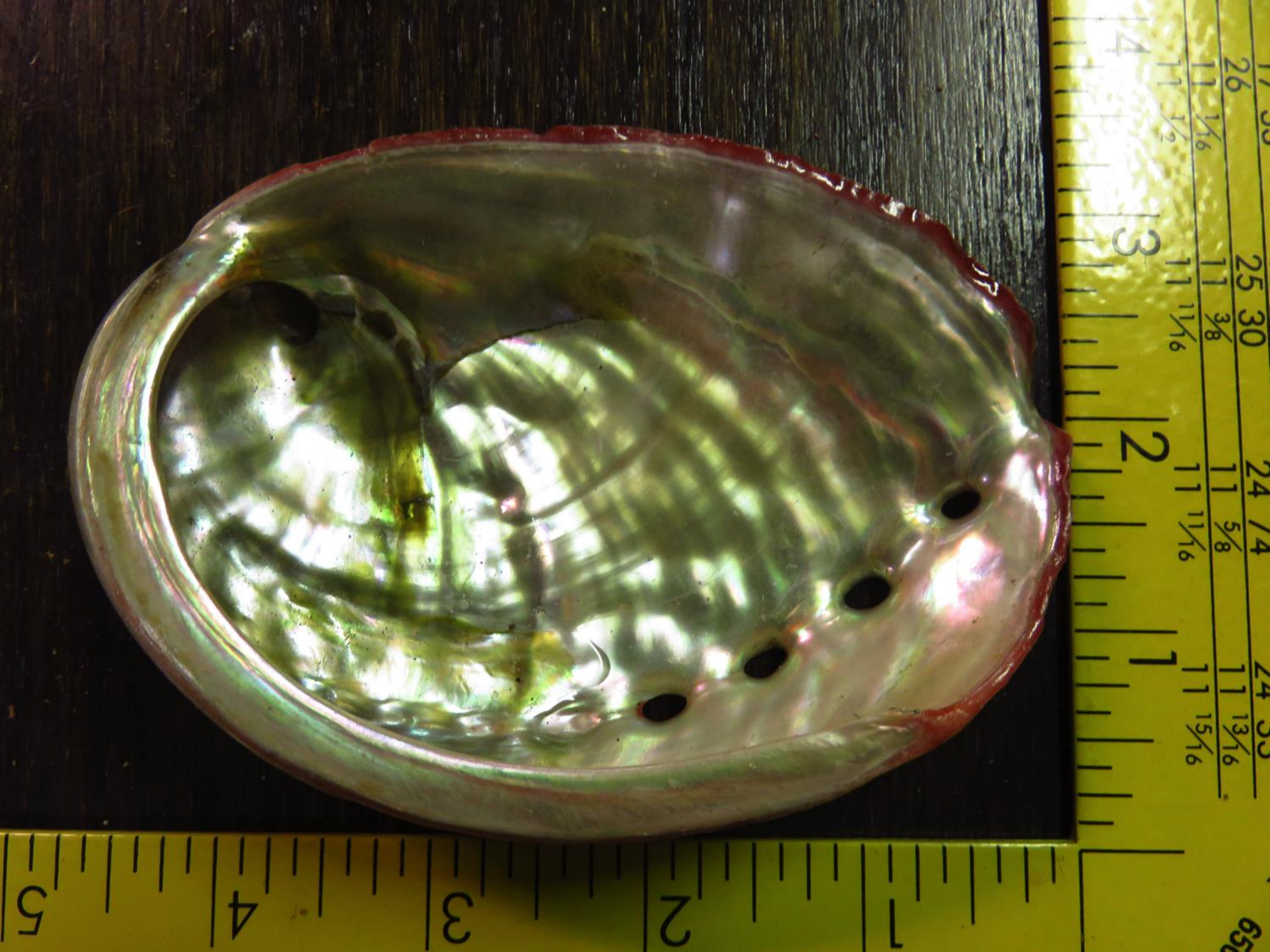
Using morphometric markers to visually assess reefs

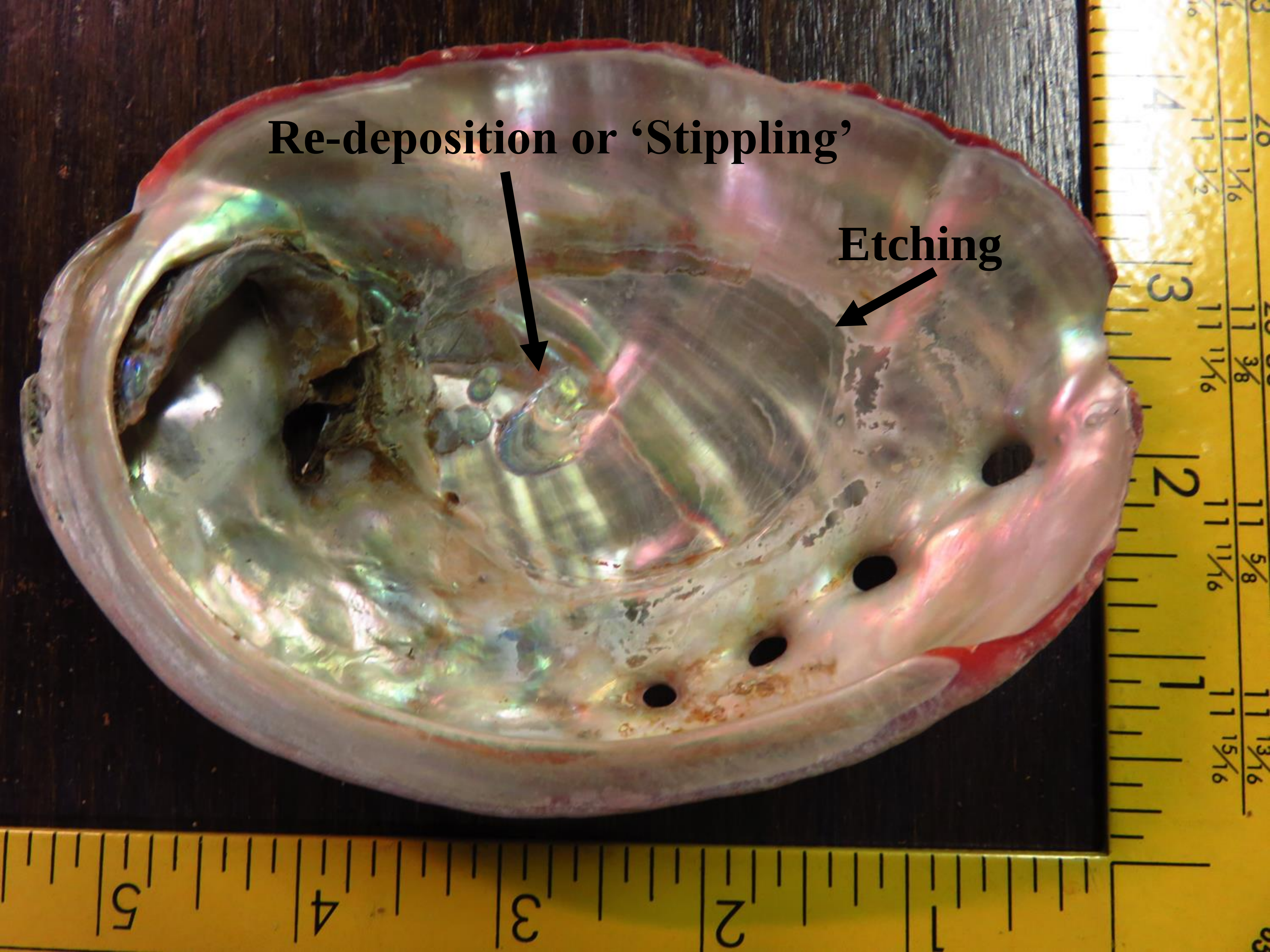
Shell Appearance:

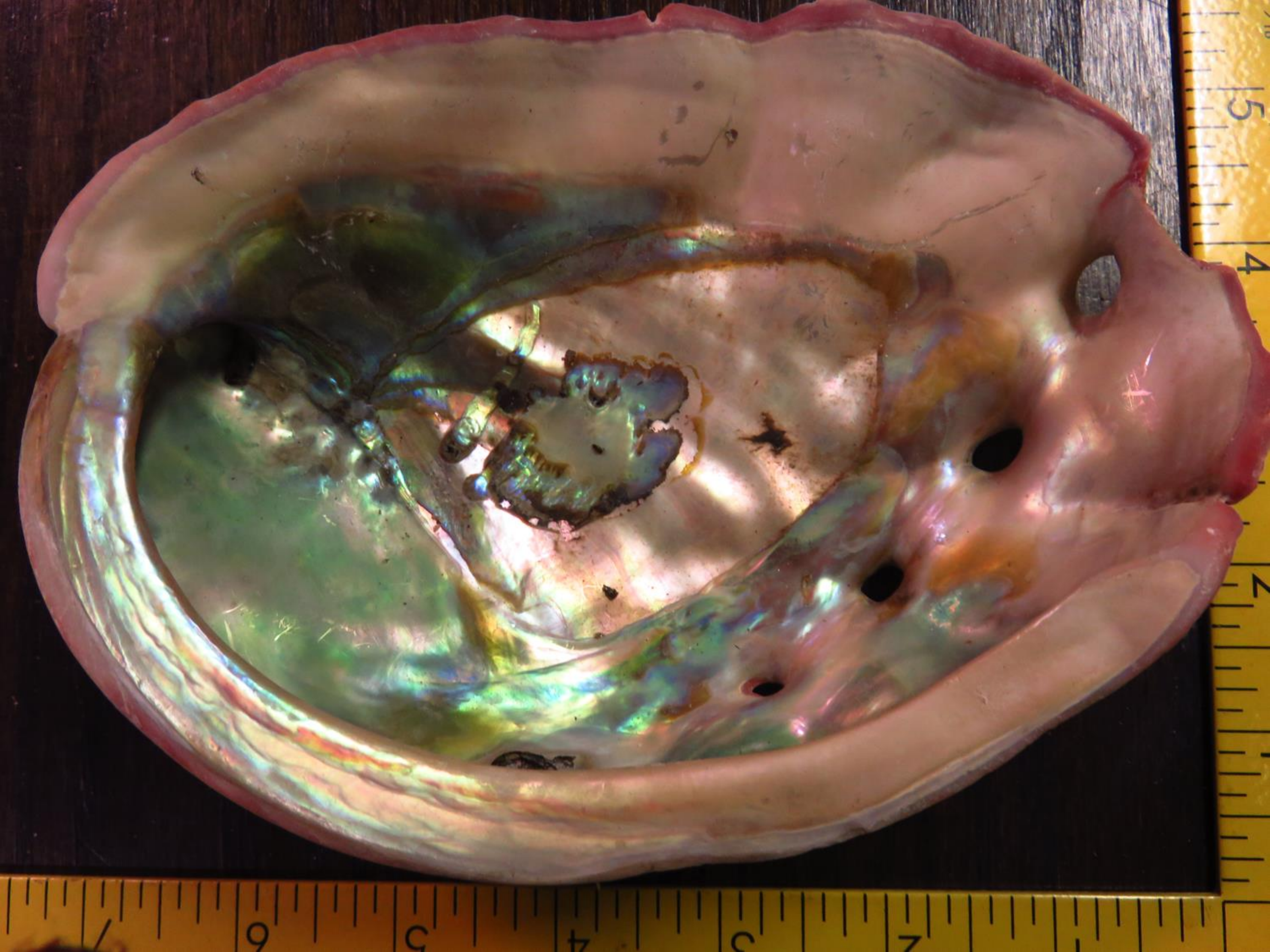
1. Doming & rounding
   (Height : Length ratio)
   (Length : Width ratio)
2. Fouling & Erosion
3. Breeding scar

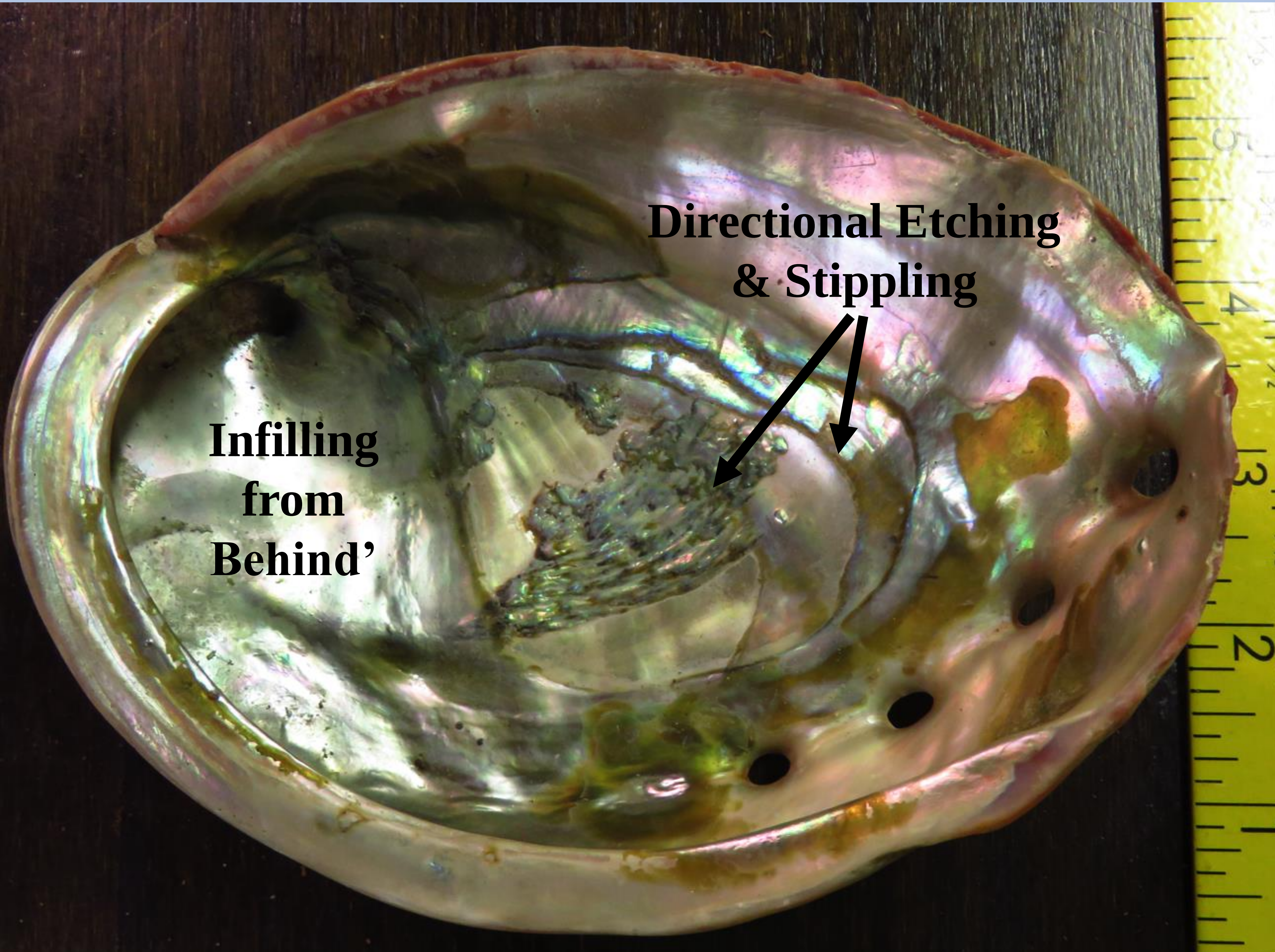


Prince J.D., Peeters, H., Gorfine, H. & Day R.W. (2008). The novel use of harvest policies and rapid visual assessment to manage spatially complex abalone resources (Genus _Haliotis_). *Fish. Res.* 94: 330-338.




Re-deposition or 'Stippling'
Etching




Directional Etching
& Stippling
Infilling
from
Behind’

Haliotis rufescens

Haliotis rubra

Haliotis laevigata

Haliotis rubra ***Haliotis laevigata***

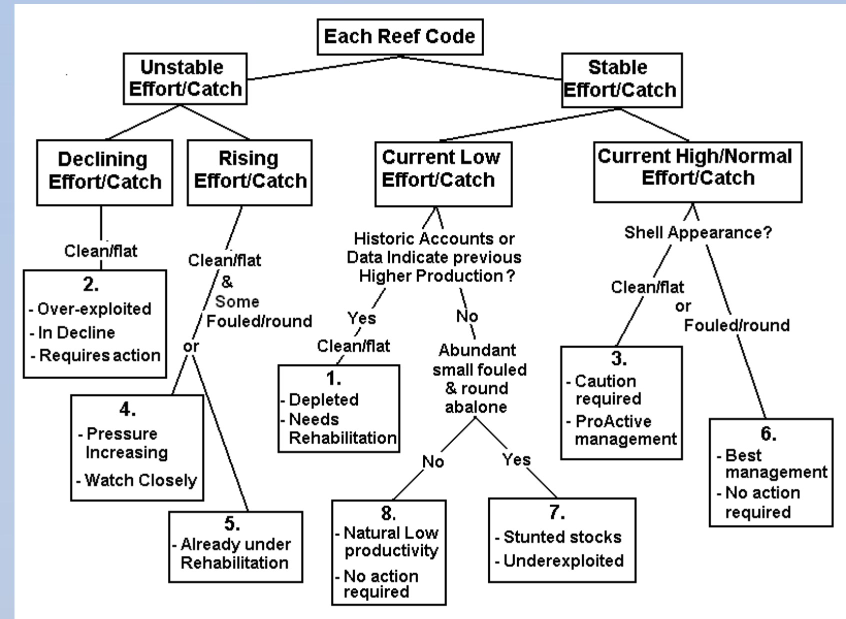
Haliotis rubra *Haliotis laevigata*


Abalone Working Group
Pilot Project
A Presentation to the California
Department of Fish and Wildlife
Feb 4, 2016


5 6 7 8 9 10
SEA RANCH

Shellogy

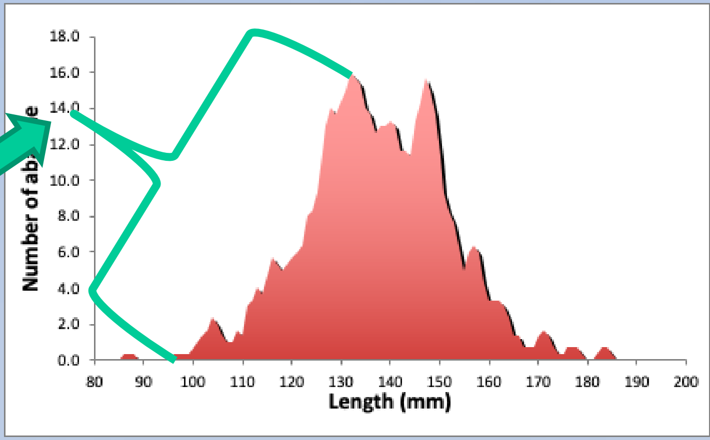
- **Sub-adults grow mainly in length, shells are thin, flat and oval.**
- **Abalone take several years to completely mature and should be allowed several years of breeding with full adult potential.**
- **Fully mature abalone are thick, round, and bowl-like, with well developed scars.**
- **Harvested abalone should be rounded and domed regardless of size.**
- **Catches comprised mainly of flat, clean oval shells indicate insufficient breeding to sustain future production.**



Rapid Assessment & Micro-Management

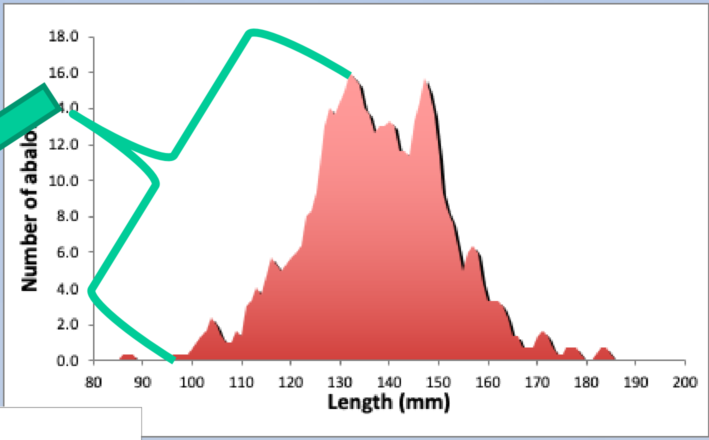
Estimating Maturity from Size of Emergence

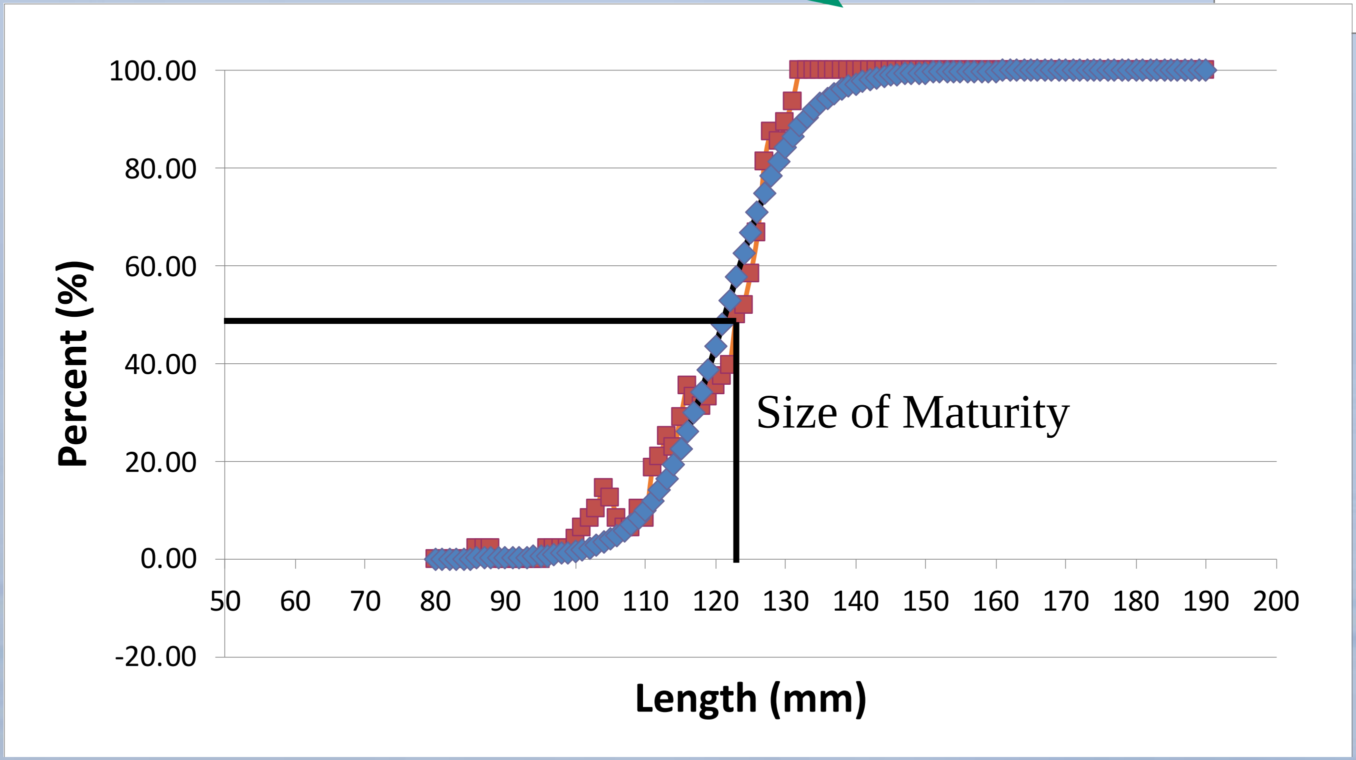
The Average Size of Clean Flat Shells Indicates Size of Maturity



Estimating Maturity from Size of Emergence

Size of Maturity estimated from Size of Emergence

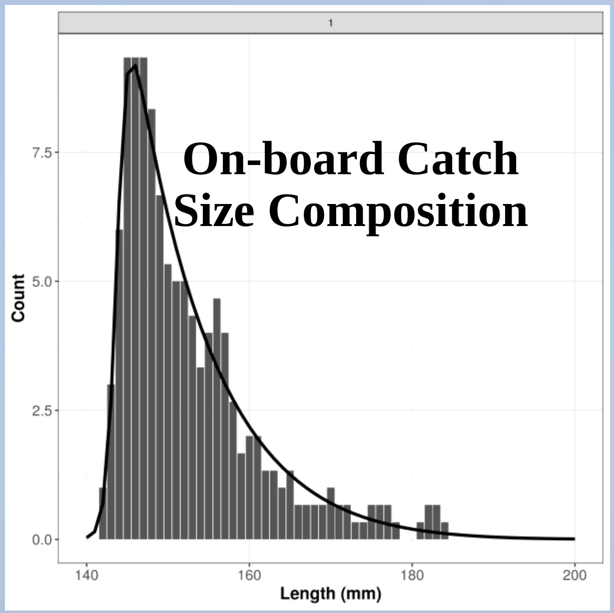




Prince, J.D., Harford, W.J., Taylor, B.M., Lindfield, S.J. Size distributions of fish spawning aggregations reveal a mismatch between physiological estimates of maturity and reproductive behaviour. Fish & Fisheries (2022 DOI: 10.1111/faf.12702)

L_{50} / L_{∞}
0.6

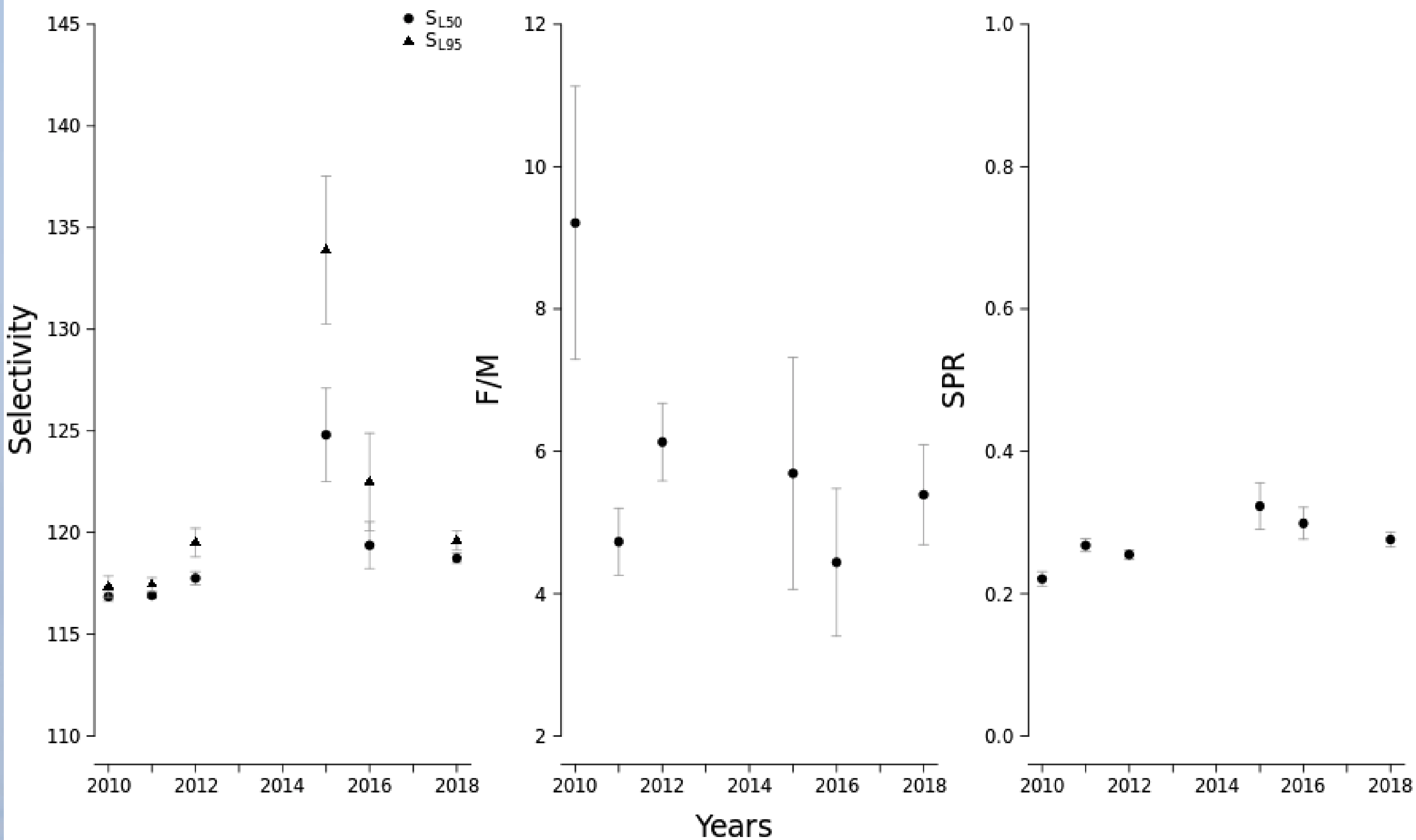
SPR Assessment



Sample	L50 (mm)	SPR 20%	L∞ (mm)	SPR
1	121	146	202	0.22
2	124	149	207	0.18
3	126	151	210	0.17
4	128	154	213	0.18
5	131	157	218	0.15
6	132	158	220	0.16
7	137	164	228	0.12

Hordyk, A., Ono, K., Valencia, S.V., Loneragan, N., Prince, J.D. 2015. A novel length-based estimation method of spawning potential ratio (SPR), and tests of its performance, for small-scale, data-poor fisheries. *ICES J. Mar. Sci.* 72, 217–231. *doi:10.1093/icesjms/fsu004*
Prince J.D. and Hordyk, A. (2018). What to do when you have almost nothing: a simple quantitative prescription for managing extremely data-poor fisheries. Fish & Fisheries. 20, 224-238. DOI: 10.1111/faf.12335

Disaster Bay



Harford, W.J., Natalie A. Dowling, N.A., Prince, J.D., Hurd, F., Bellquist, L., Likins, j., Wilson, J.R., (2018). An indicator-based decision framework for the northern California red abalone fishery, Ecosphere 10(1):e02533. 10.1002/ecs2.2533

Hordyk, A., Loneragan, N., Prince, J.D. 2015. An evaluation of an iterative harvest strategy for data-poor fisheries using the length-based spawning potential ratio assessment methodology. *Fish. Res.*171: 20-32. http://dx.doi.org/10.1016/j.fishres.2014.12.018


The End