Using a Small ROV to Estimate the Abundance of Sensitive Rockfishes and Benthic Marine Fishes in a Broad-Scale Regional Survey

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Background

- Puget Sound rockfish populations in decline
- Traditional assessment tools not appropriate for sensitive populations or difficult habitats
- WDFW videographic methods
  - drop- camera
    - limited to 37 m depth
  - Inspection-class ROVs
    - 2004, 2005 – pilot surveys of San Juan Channel
    - 2008, 2010-11, region-wide, San Juan Islands

ESA Listed Rockfish

Threatened

Endangered

Non-lethal sampling

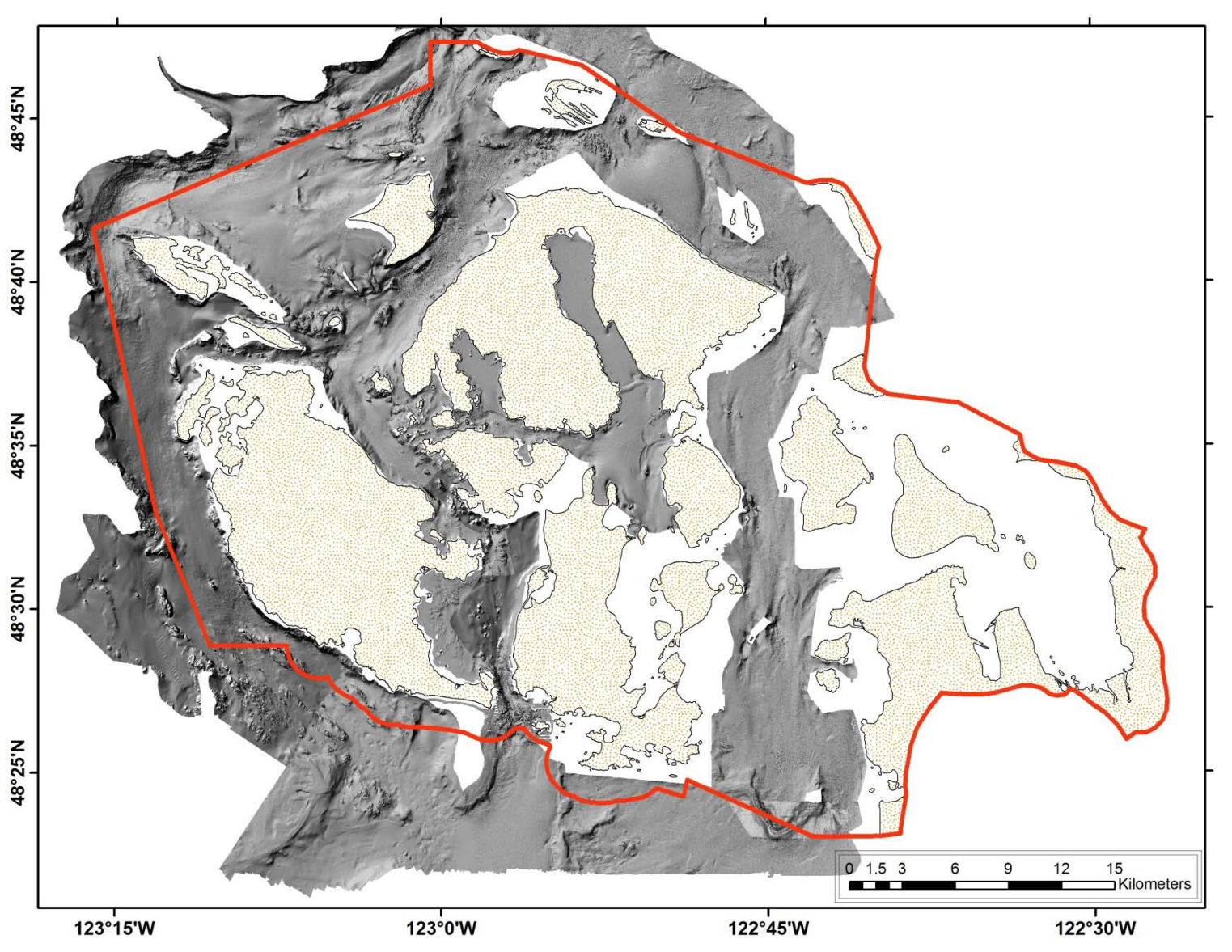
Seaeye Falcon

WDFW R/V Molluscan

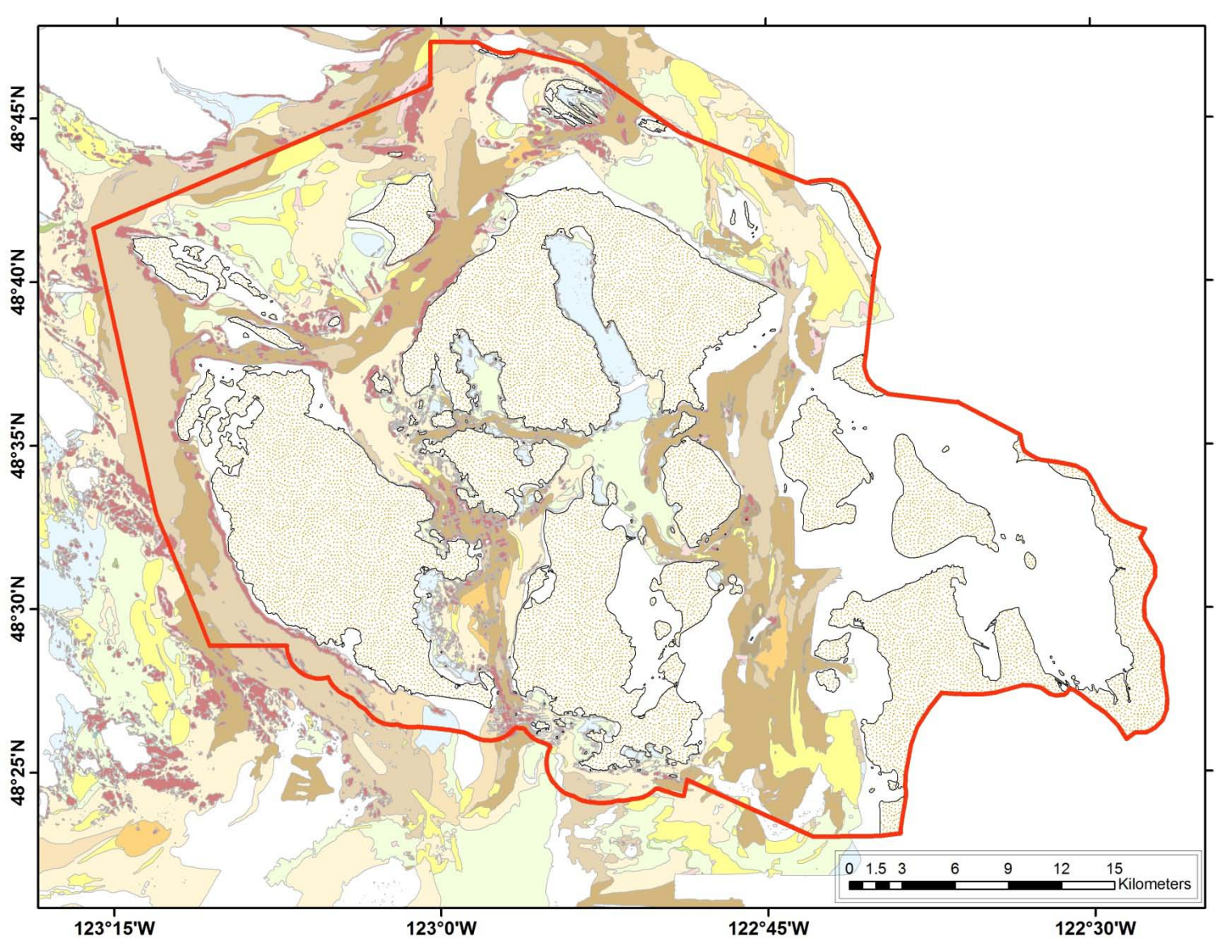
2008 ROV Survey

- San Juan Islands
- Habitat map of study area from MBES
- Limited to rock habitats
- Stratified-random design
  - Depth stratified along 20 fathom contour
  - Randomly selected start points
- Daytime sampling only
- Minimum transect distance of 250 m

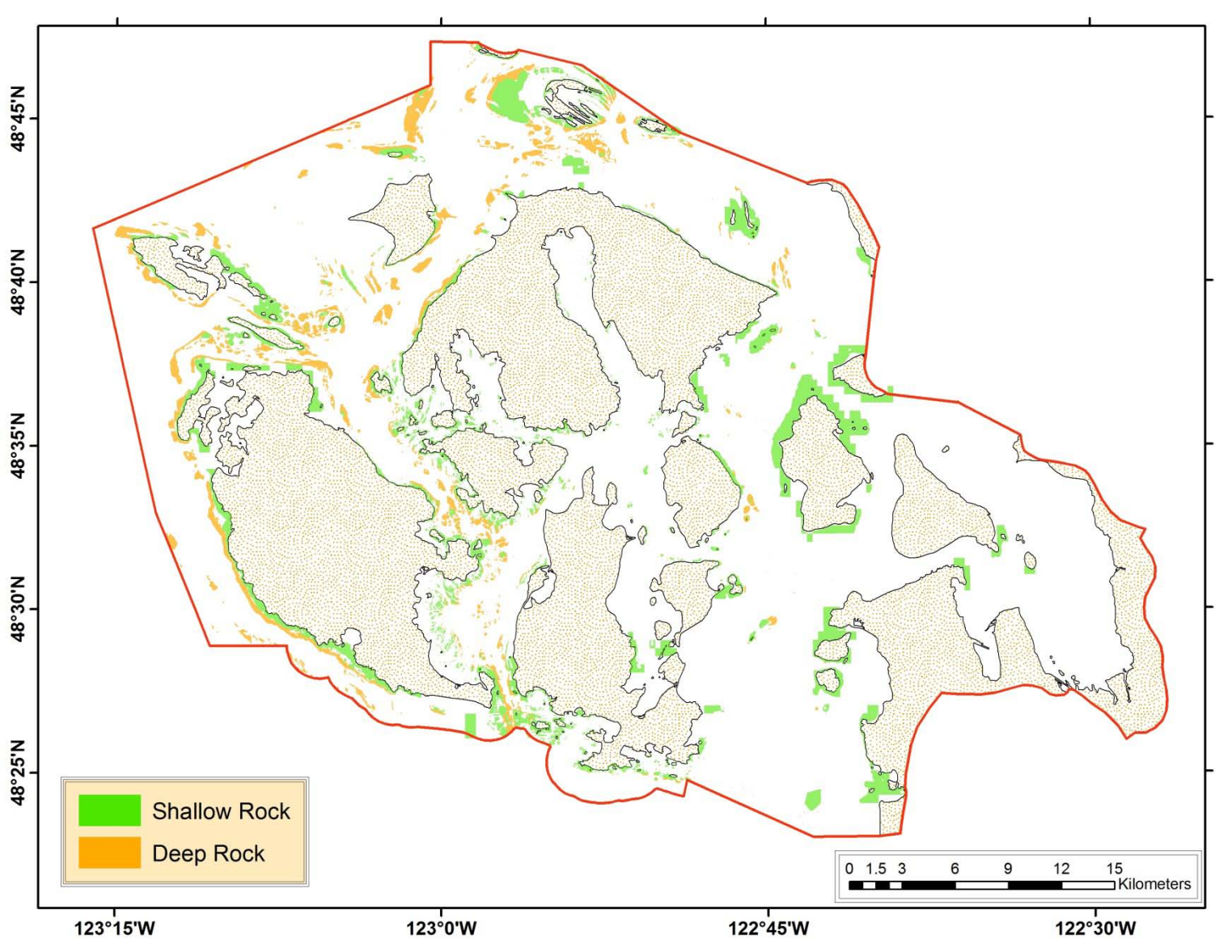
Multibeam imagery



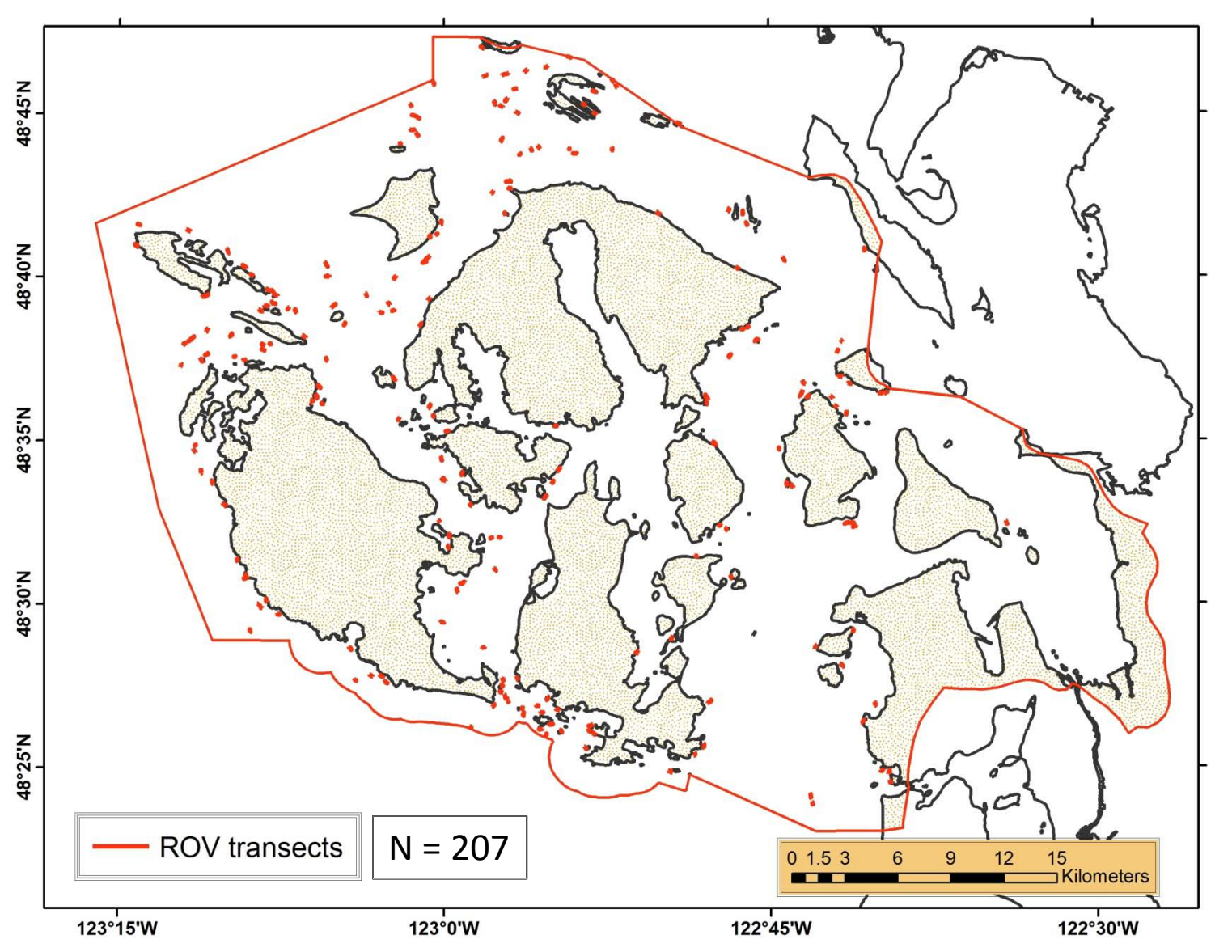
Interpreted MBES and backscatter



2008 ROV Survey final map



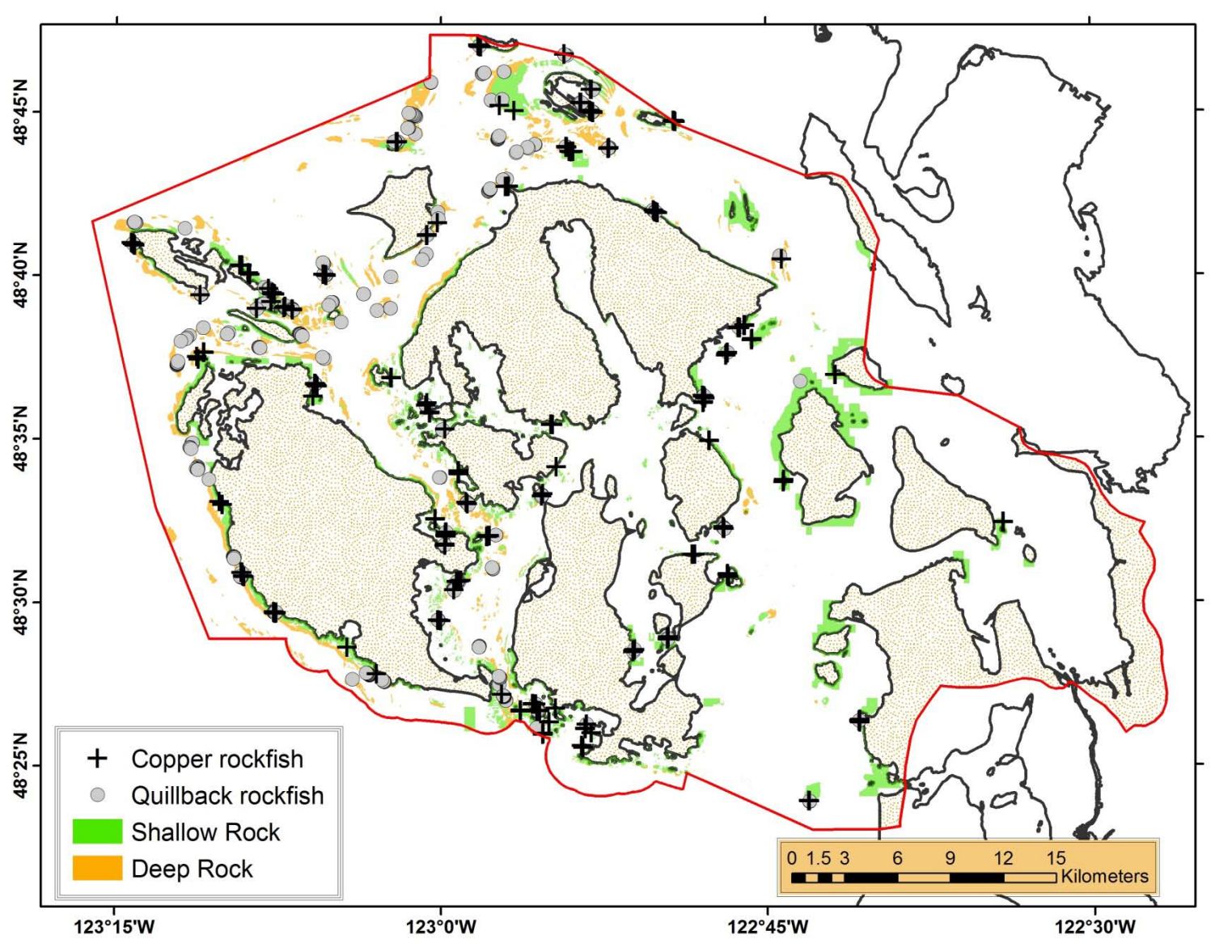
2008 Transect locations



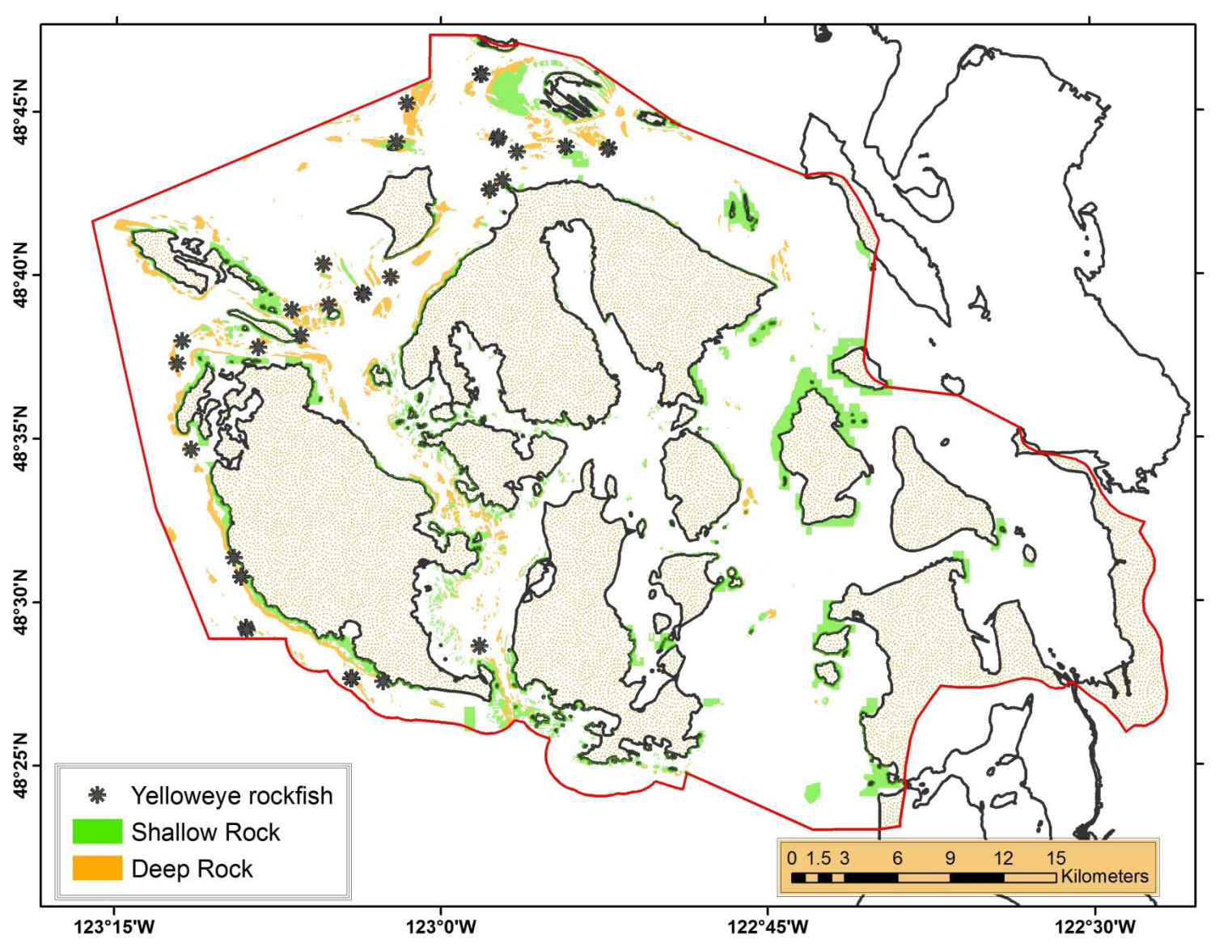
2008 Results

- 207 transects
- Rock encountered on 100% of transects conducted on geophysical map
- Rock encountered on 82% of transects conducted on WDFW low-res map
- Pop. estimates for 42 bottomfish species
  - 11 rockfish species
- SEs from 8-14% for most common species

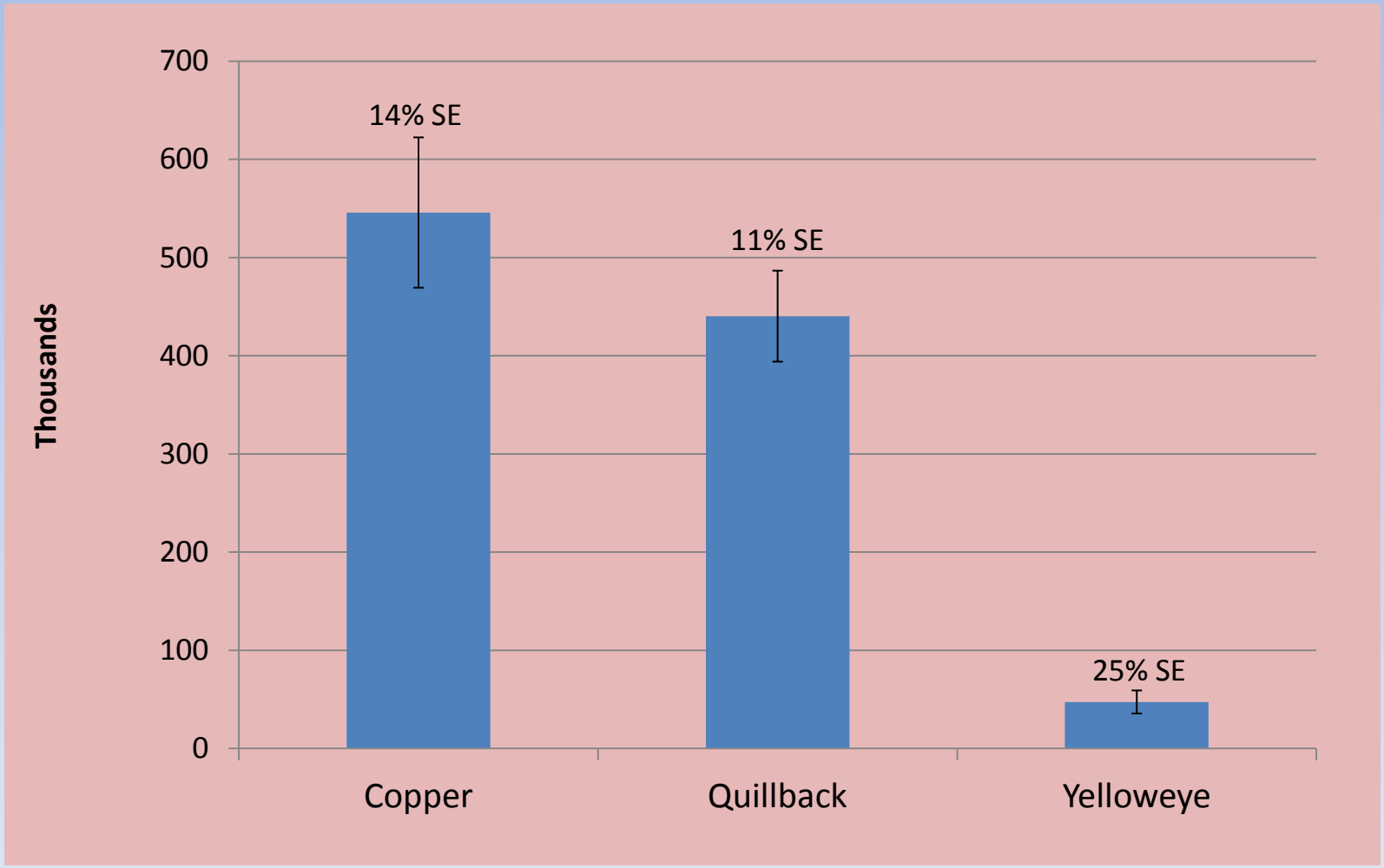
2008 Copper and Quillback locations



2008 Yelloweye rockfish locations



2008 Population estimates



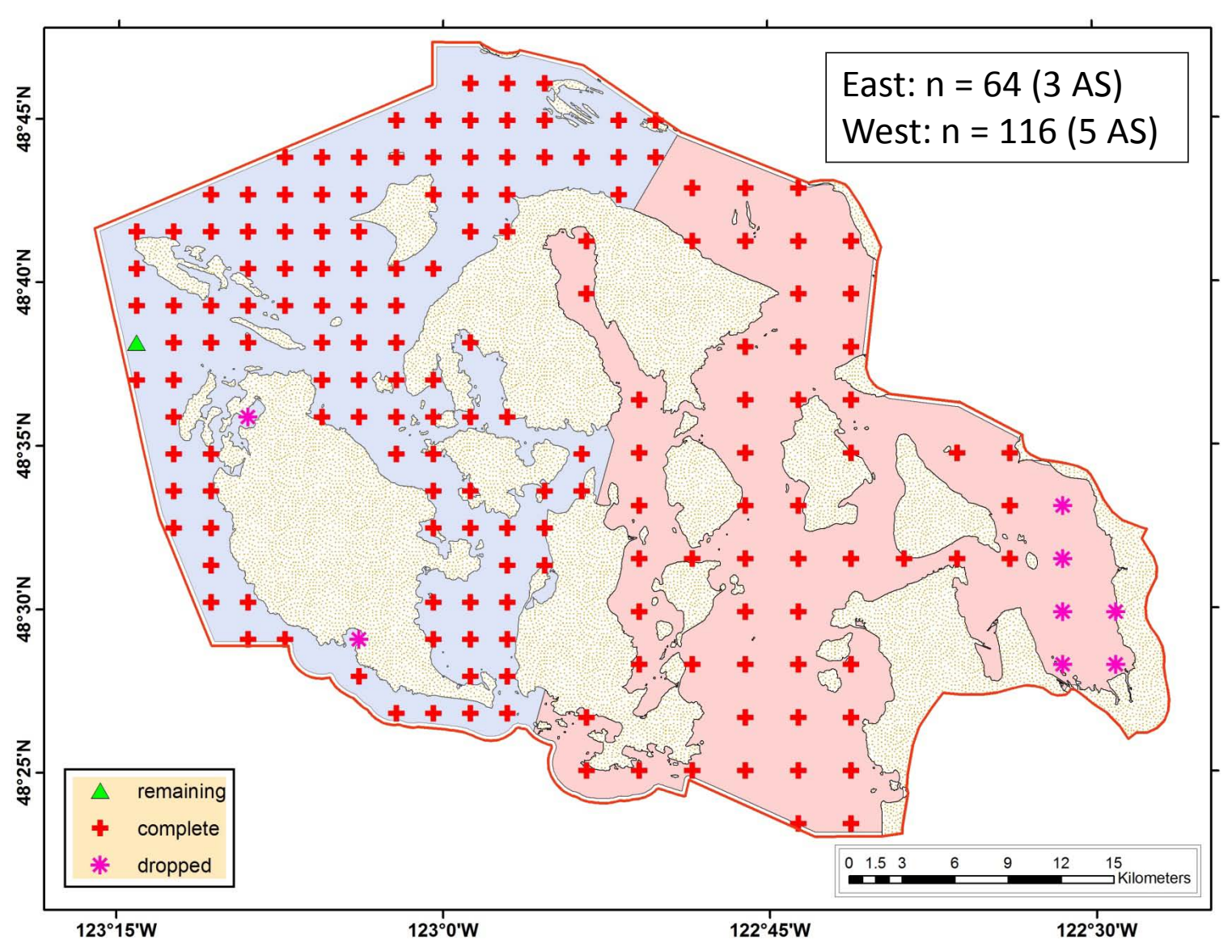
2010 ROV Survey

- San Juan Islands (same as 2008)
- All habitat types included
- Stratified-Systematic grid
  - stratified by area based on distribution of yelloweye rockfish seen in 2008
- 24-hour sampling
  - 24-hour study conducted to account for diurnal differences in sampling
  - Transects run for 30 minutes regardless of direction
- Stereological analysis
  - Control for “edge effect” bias

Stereology

- "the spatial interpretation of sections"
- The science of estimating higher dimensional information from lower dimensional samples
- Systematic Random Sampling (SRS)
  - Reduced variance when compared to Simple Random Sampling
  - Method is unbiased as long as the sampling set is chosen in a random manner

2010 ROV Survey Stations



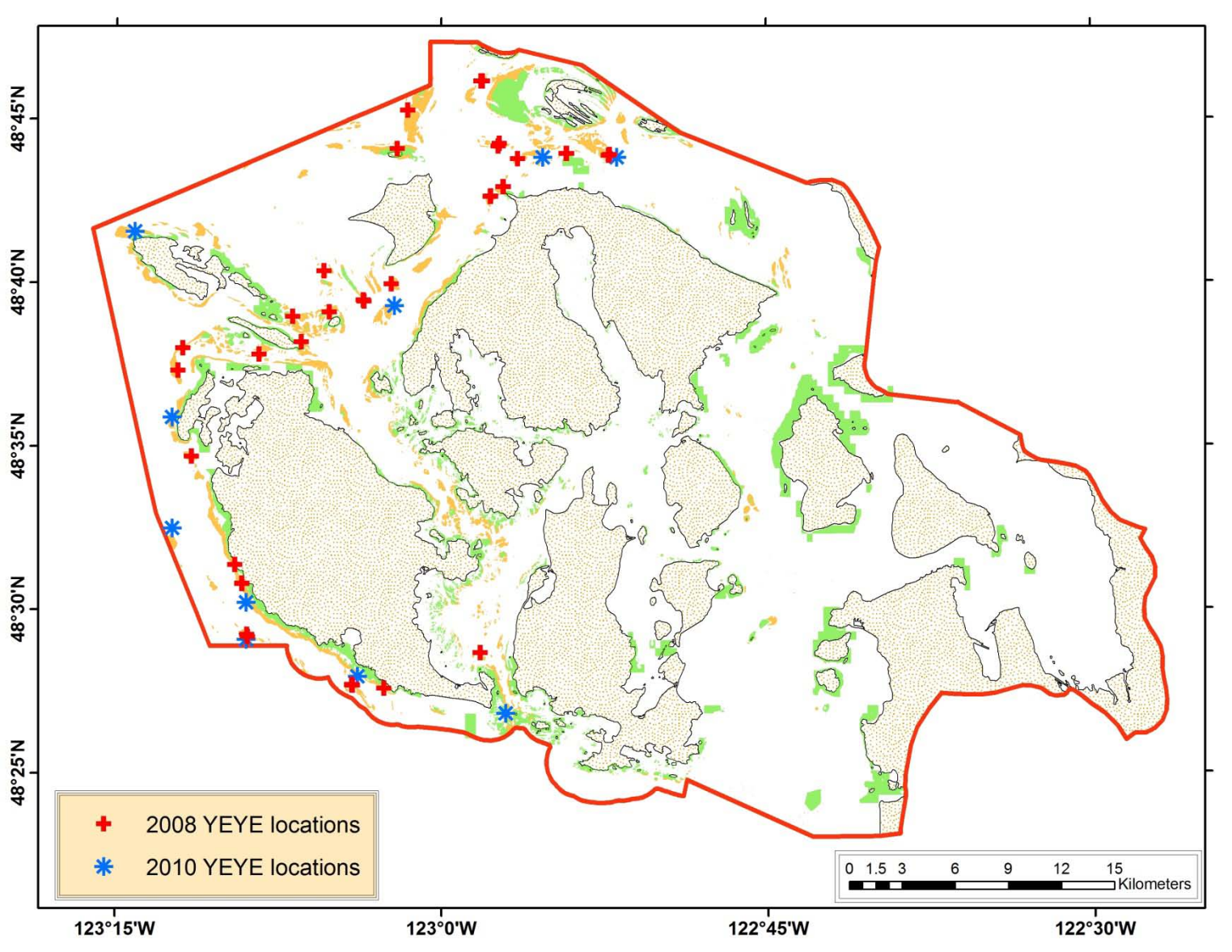
2010-11 Results

- 180 transects (172 primary, 8 adaptive)
- All habitats sampled
- Encounter rates for most common rockfish similar to 2008 on comparable habitats
- Rockfish species distributions consistent with 2008 but fewer species encountered
- Changes in ROV lighting configuration allowed for improved imaging of flatfish and small (<15 cm) bottomfish

Yelloweye rockfish

- 2008
  - 39 individuals on 25 transects
  - All juveniles and sub-adults (<40 cm)
  - Population estimate = 47,407 (24% SE)
  - All sightings on steep, complex rock
- 2010-11
  - 14 individuals on 10 transects
  - All juveniles and sub-adults (<40 cm)
  - All sightings on steep, complex rock

2008 and 2010 YEYE locations



Conclusions

- Small ROVs are an excellent tool for sampling in non-trawlable habitats
- Ability to image uncommon and rare species validates the use of ROVs for monitoring and assessment
- Repeatable surveys
- Technological additions (DVL, HD video, ranging system) will improve our ability to image fish and produce accurate population estimates

Acknowledgements

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- *Technology development*

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