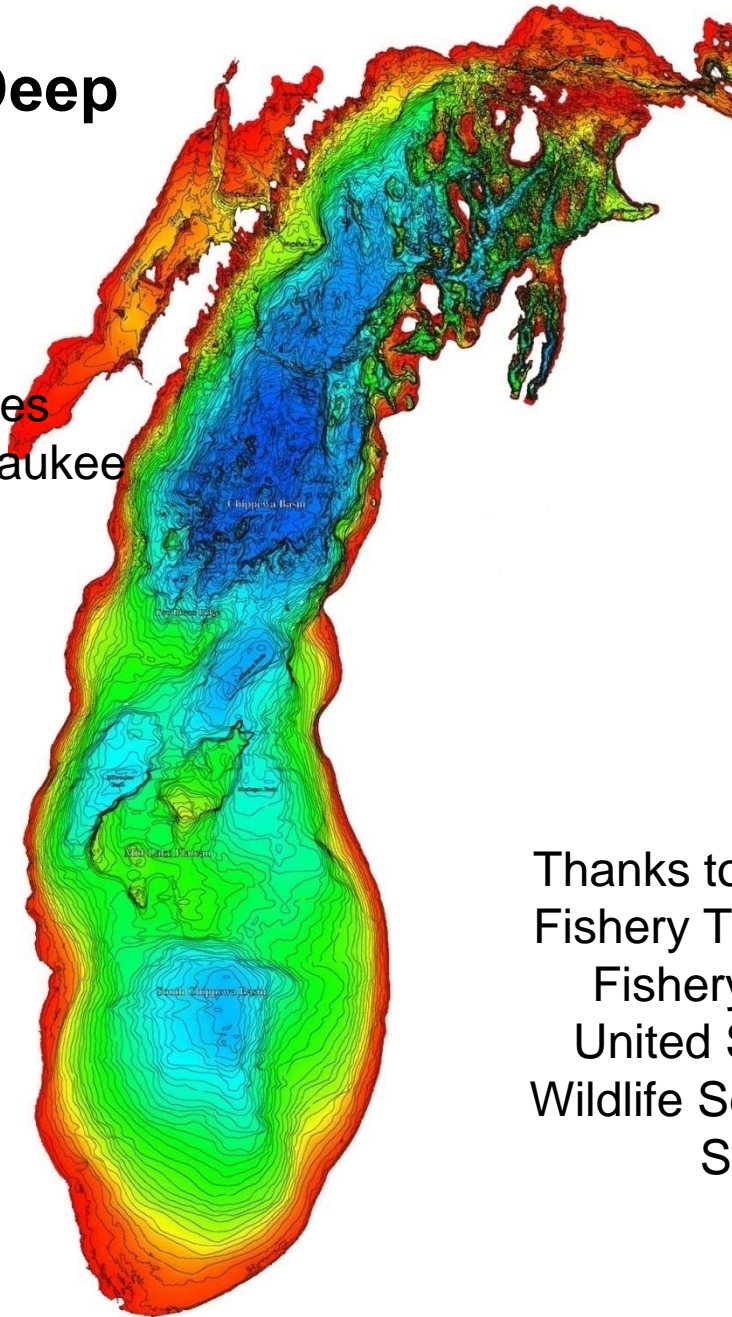
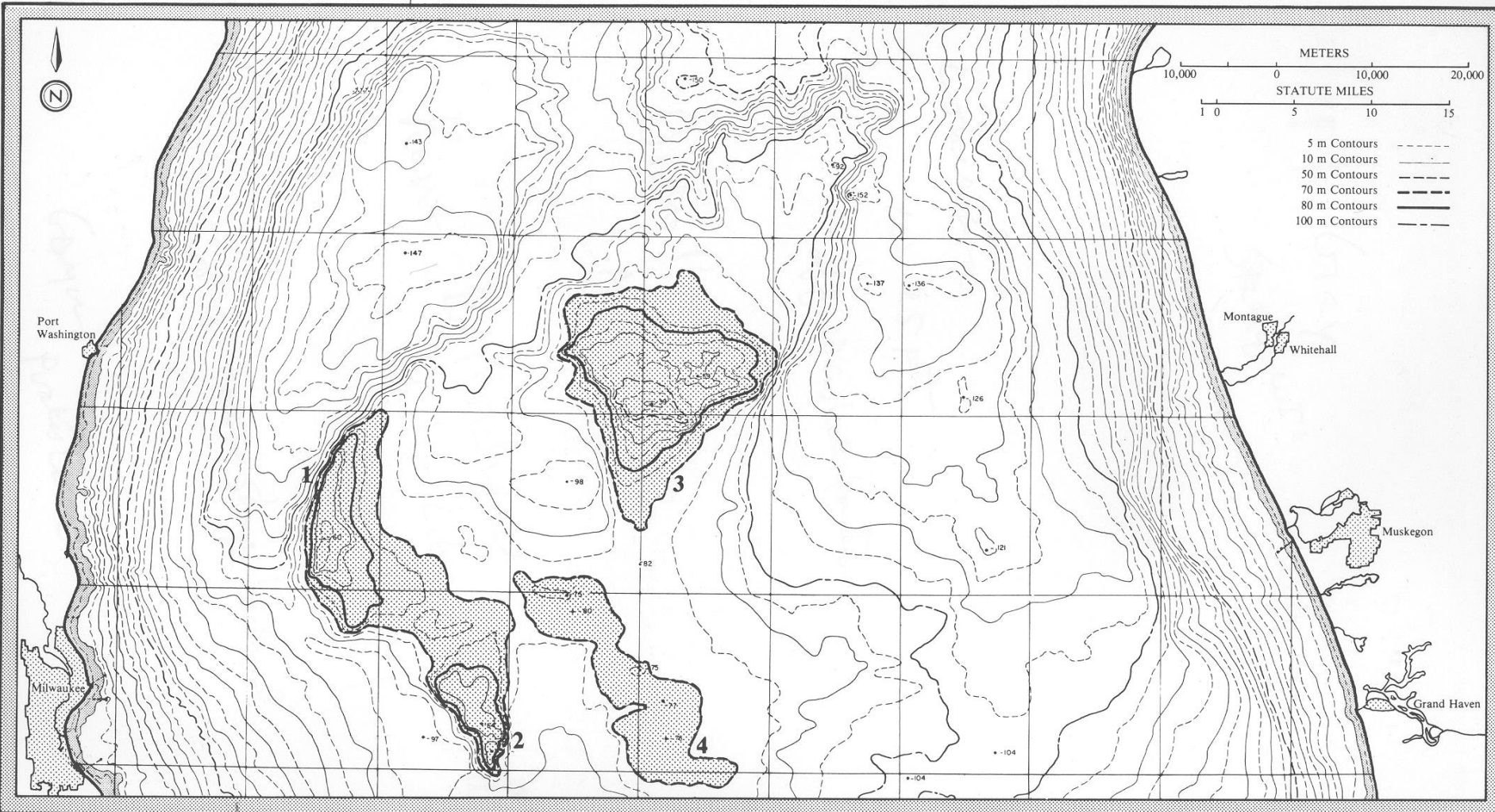


Lake Michigan's Deep Reefs

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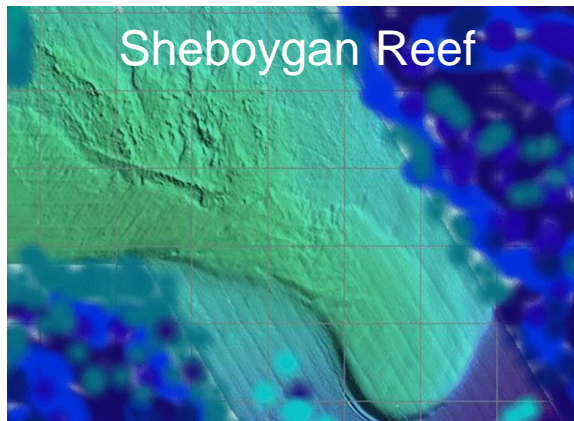
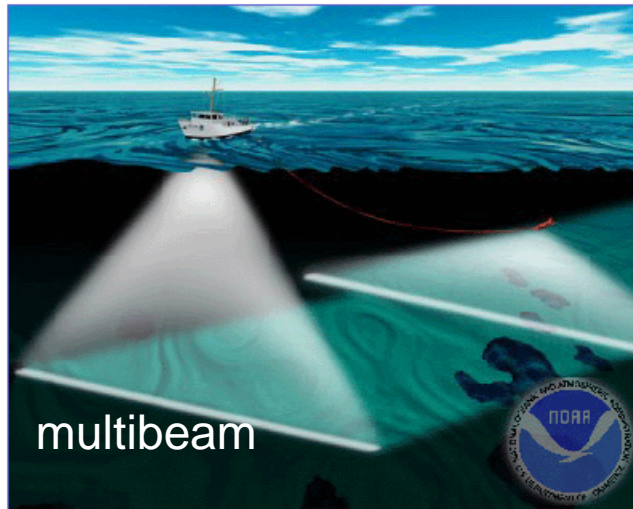
Thanks to the Great Lakes
Fishery Trust, Great Lakes
Fishery Commission,
United States Fish and
Wildlife Service, Wisconsin
Sea Grant.



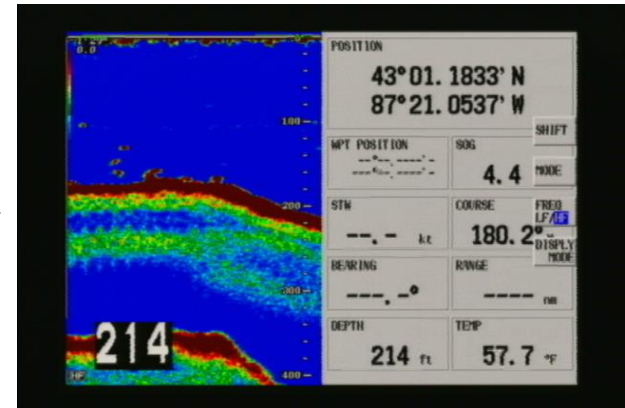
There are four summits of the Midlake Reef Complex, each numbered above. (1) is Northeast Reef (summit ~ 50 m), (2) is East Reef (summit ~ 50 m), (3) is Sheboygan Reef (Summit ~ 40 m), and (4) is Milwaukee Reef (unmapped). (from Coberly and Horrall).

Steps in initial location of lake trout spawning sites

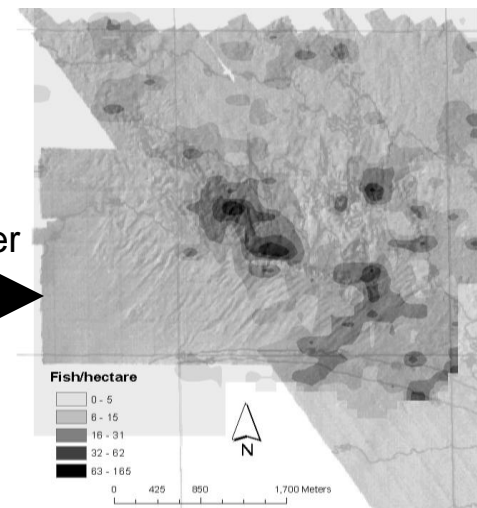
1. Bathymetry mapping using multibeam sonar (see Janssen et al. 2006). Multibeam sonar is shown on the left cartoon (below) and consists of many (~ 100) single sonar beams. An example map of Sheboygan Reef is shown below.



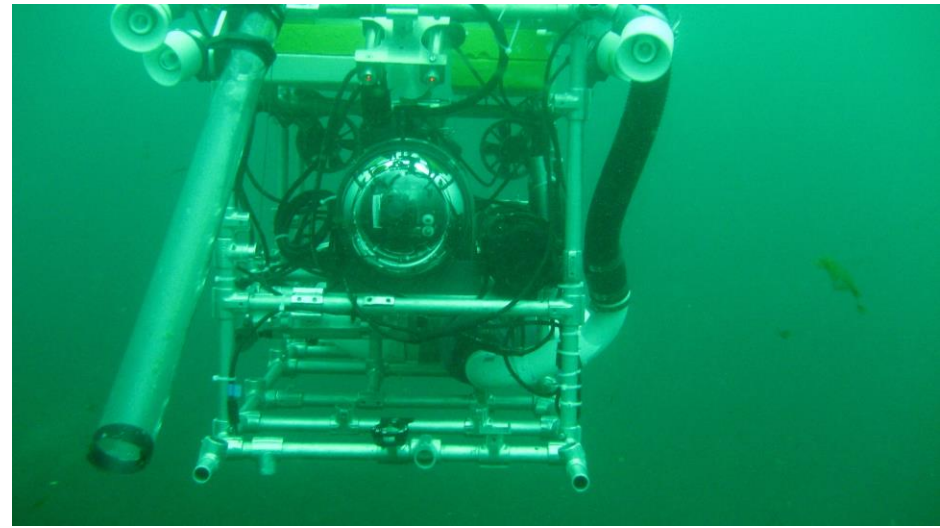
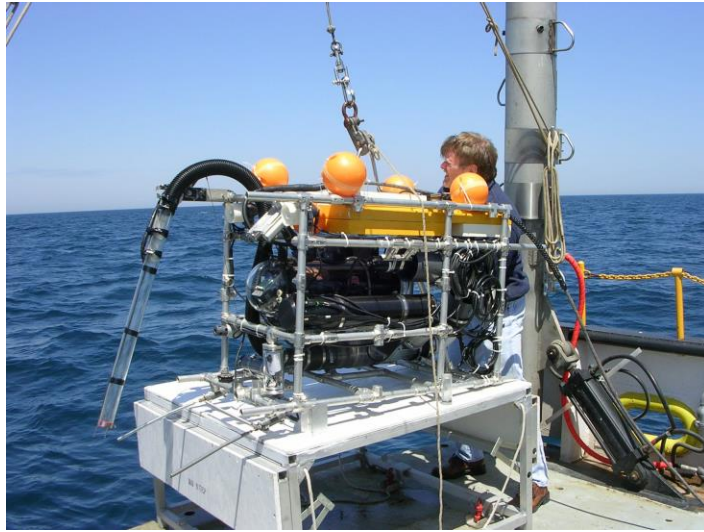
2. Use of bioacoustics to locate large fish, likely to be lake trout. To the right is the display of a conventional fish-finder. Continuous red is the bottom



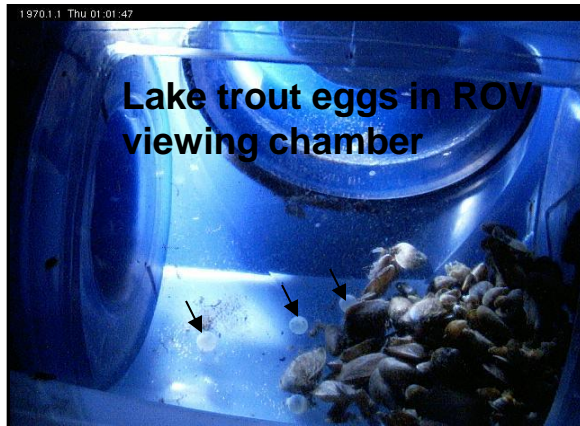
3. With a quantitative bioacoustic system concentrations of large fish can be "mapped" onto the bathymetry (Warner et al. 2009).



Collection of lake trout eggs and sac fry

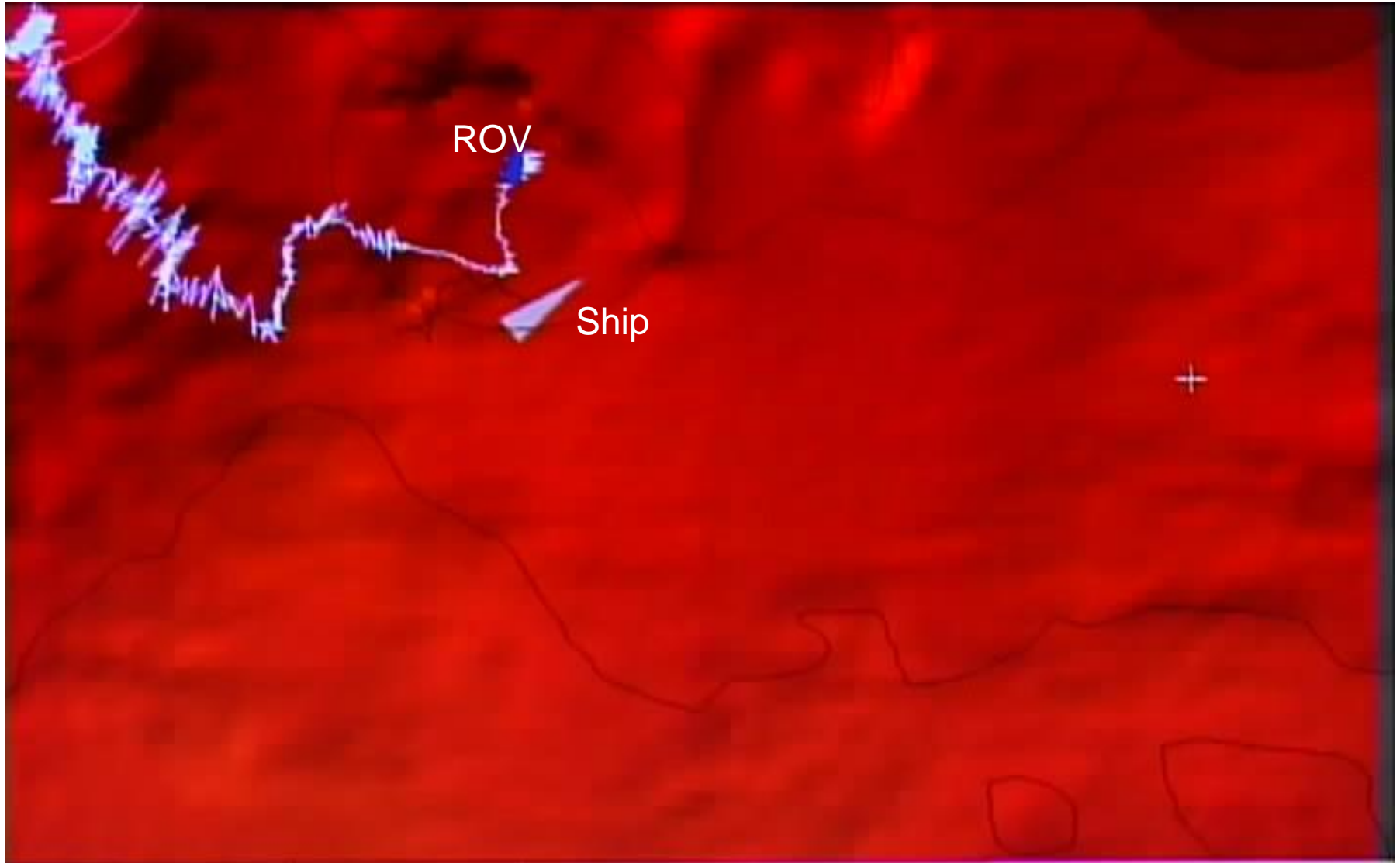


For collection of lake trout eggs and sac fry we use a highly modified, tethered Remotely Operated Vehicle (ROV) capable of suction sampling eggs and electroshocking sac fry as well as egg and fry predators (see Janssen et al. 2006).



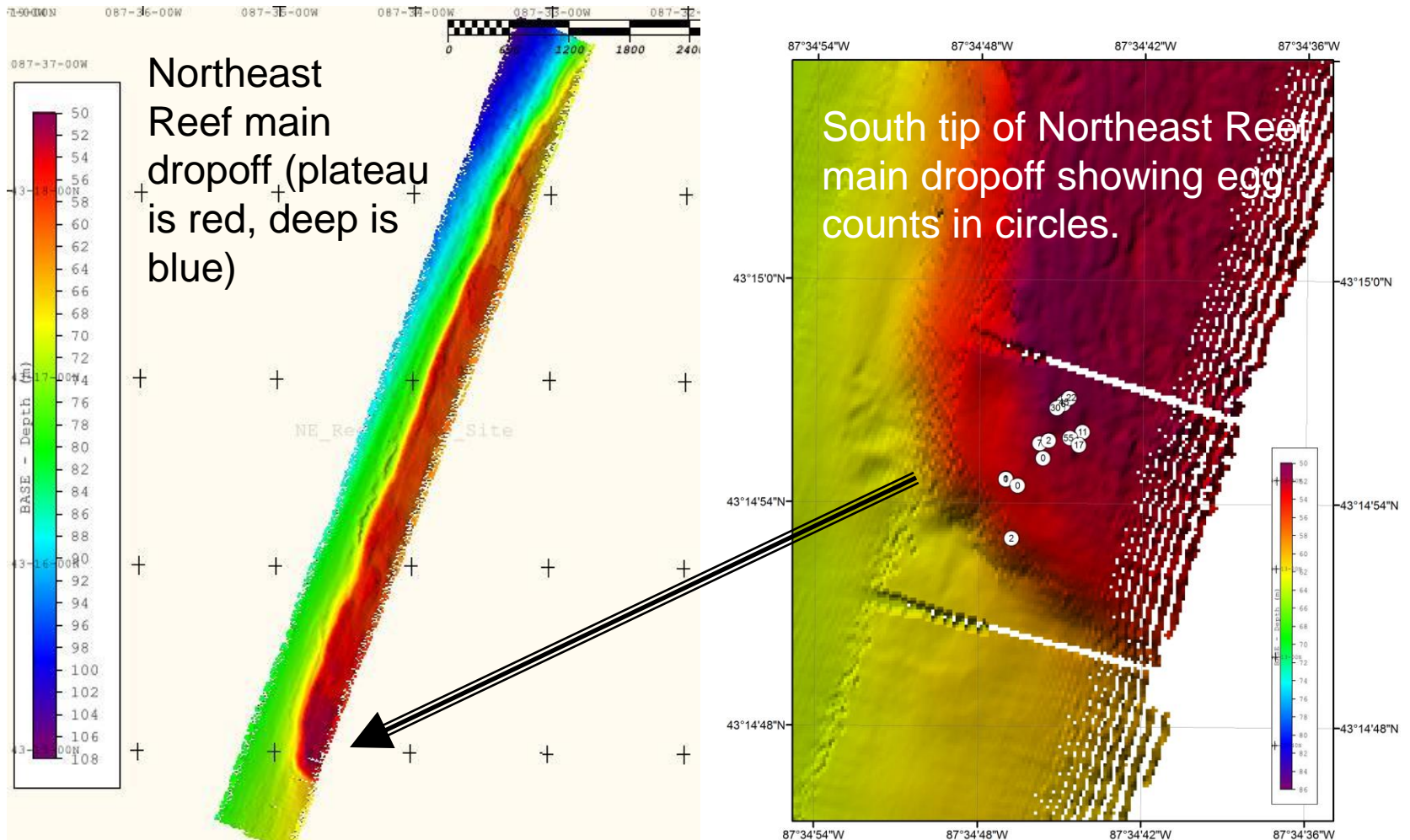
Tracking the ROV

The ROV can be tracked along the reef bathymetry map in real time.
Shown is a section of Northeast Reef



Mapping where eggs and sac fry are found

The location of sampled eggs and sac fry can be overlaid on bathymetry maps. Thus far eggs and sac fry have been found in cobble at and adjacent to dropoffs and at ridges (Janssen et al. 2006).

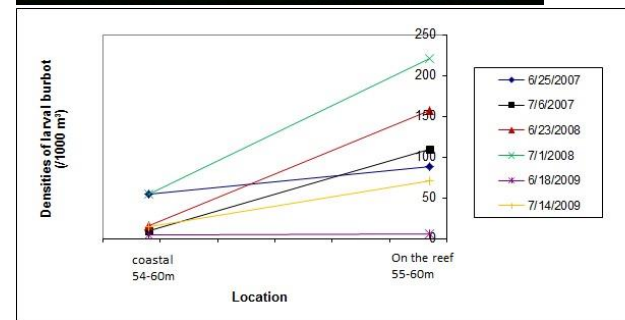
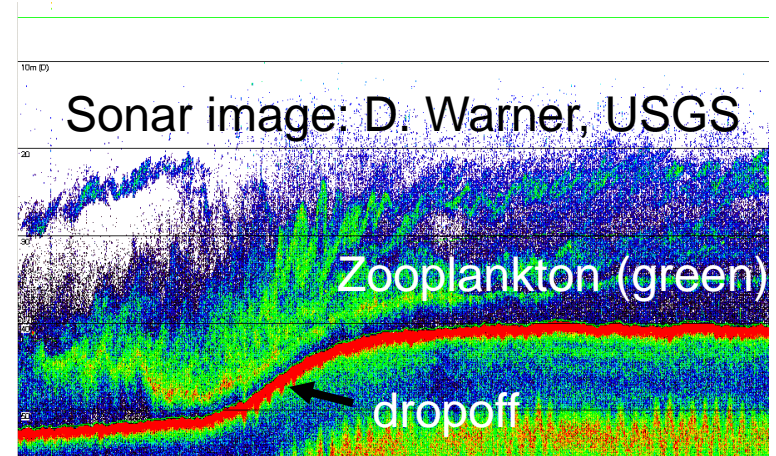


Another potential issue

The reefs concentrate fish prey such as microzooplankton,

mesozooplankton (*Mysis*) (Houghton et al. 2009),

and ichthyoplankton (burbot Larvae; Y. Wang, UW-Milwaukee In preparation)



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