



Real-time cetacean detection from gliders

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WHAT?

- Acoustic detection of sperm whales (an endangered species) in real time from a Seaglider™

WHY?

- Why *detection*?
 - conservation, management
 - NOAA's obligations
- Why *acoustic detection*?
 - works well underwater
 - better than visual detection
 - long-range detection
- Why *real-time*?
 - can warn ships, fishing boats, etc. of animal presence
 - can send shore teams out for biopsy, behavior study, photo-ID, etc.
- Why *gliders*?

Compared to boats:

 - much lower carbon footprint
 - much cheaper

Compared to fixed recorders:

 - cover much more area

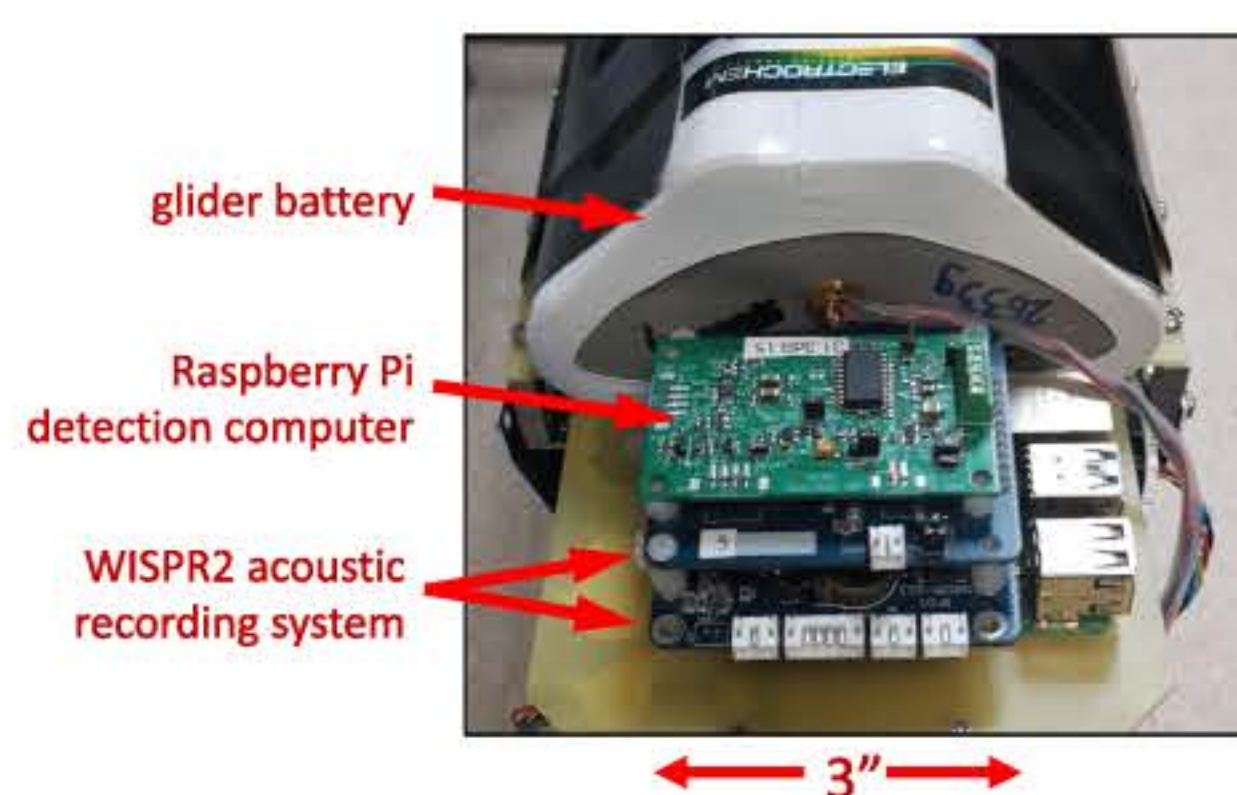
WHAT'S HARD ABOUT THIS?

- Severe glider constraints on...
 - space: ~10 cubic inches
 - power: ~1 watt
 - bandwidth: 10 kb data packet

HOW?

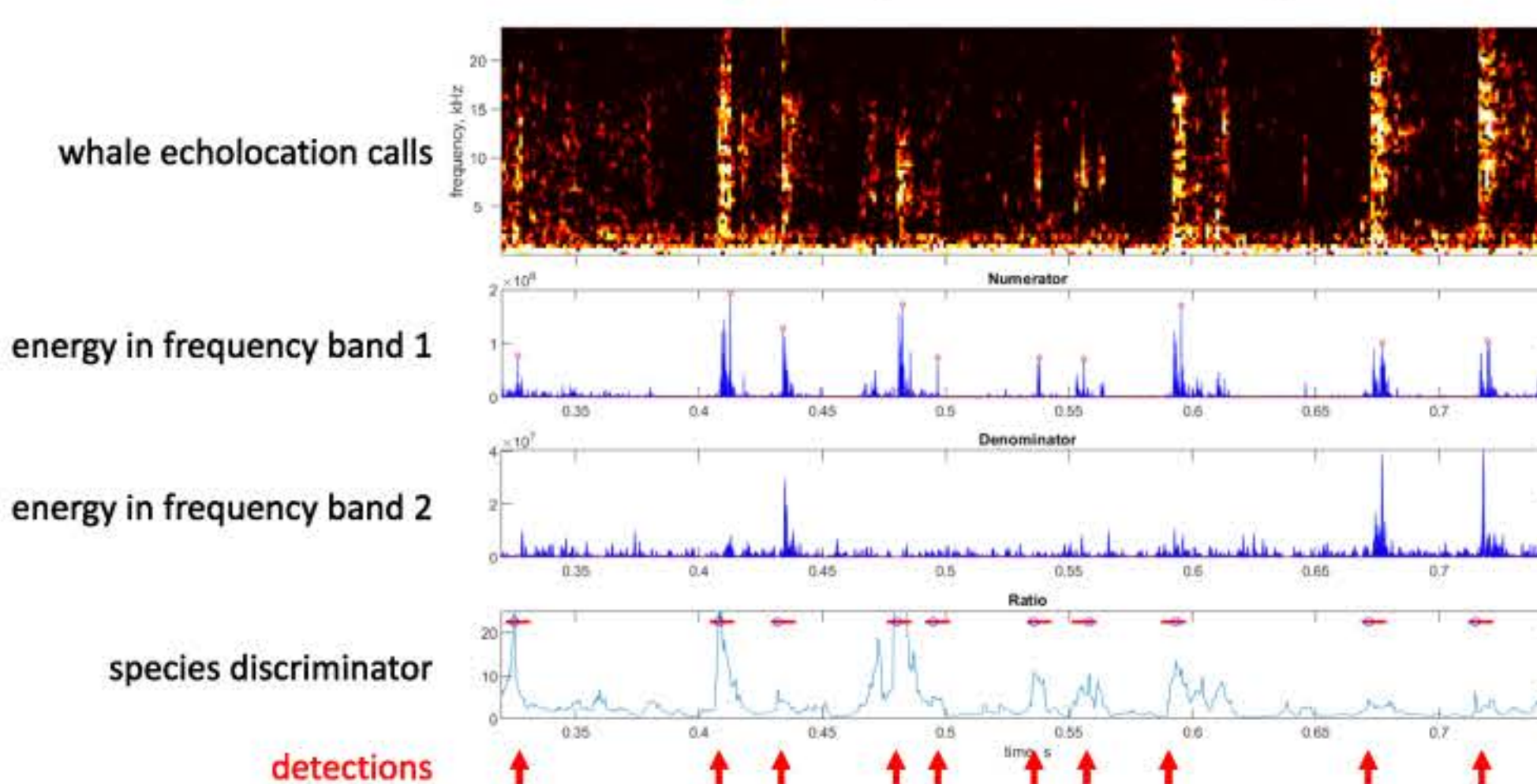
Hardware:

- Commercial sound recording system WISPR2 (EOS, Inc.)
- Piggybacked Raspberry Pi processor for detection



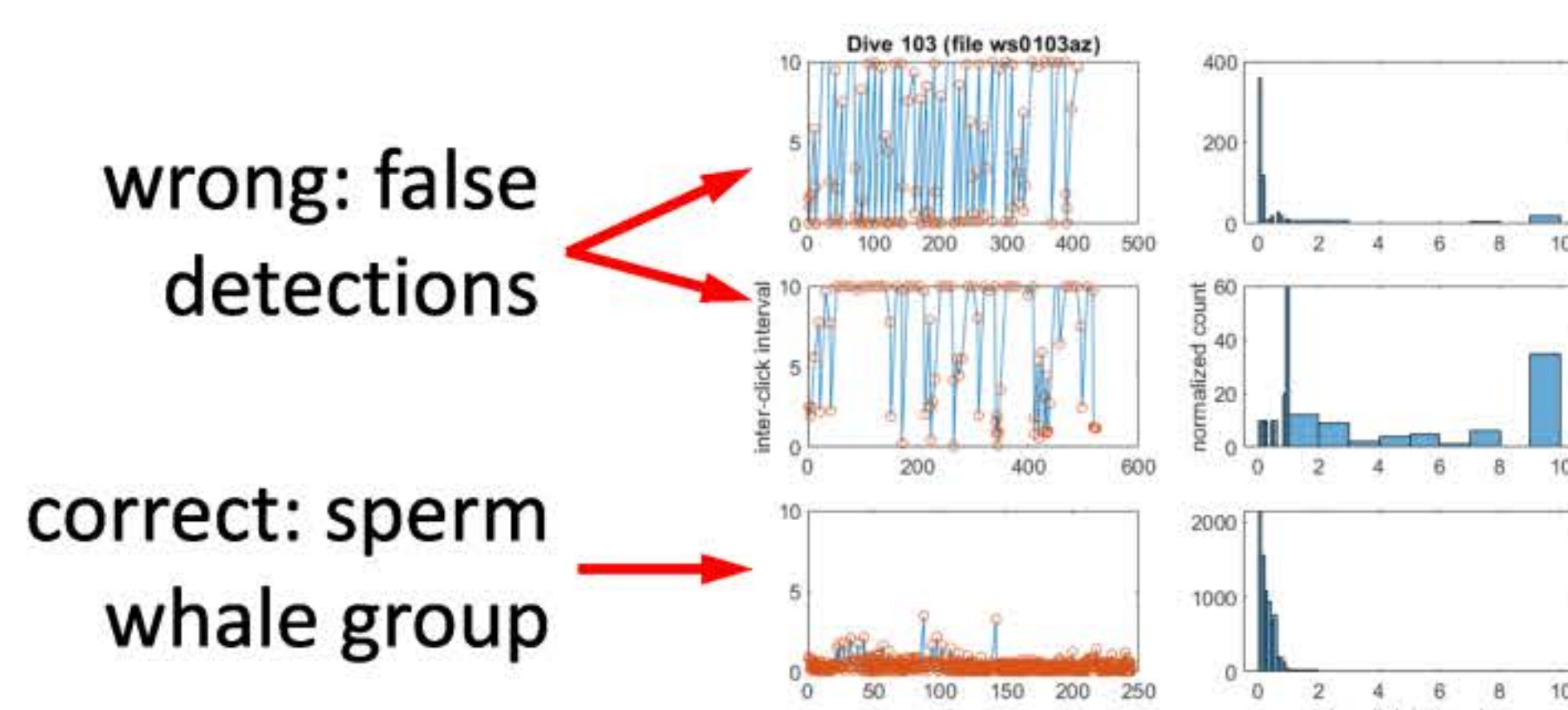
Software:

- Detection: Energy Ratio Maximization Algorithm (Klinck and Mellinger 2012)
- Low processing load (= low power use)
- Detects calls, separates species



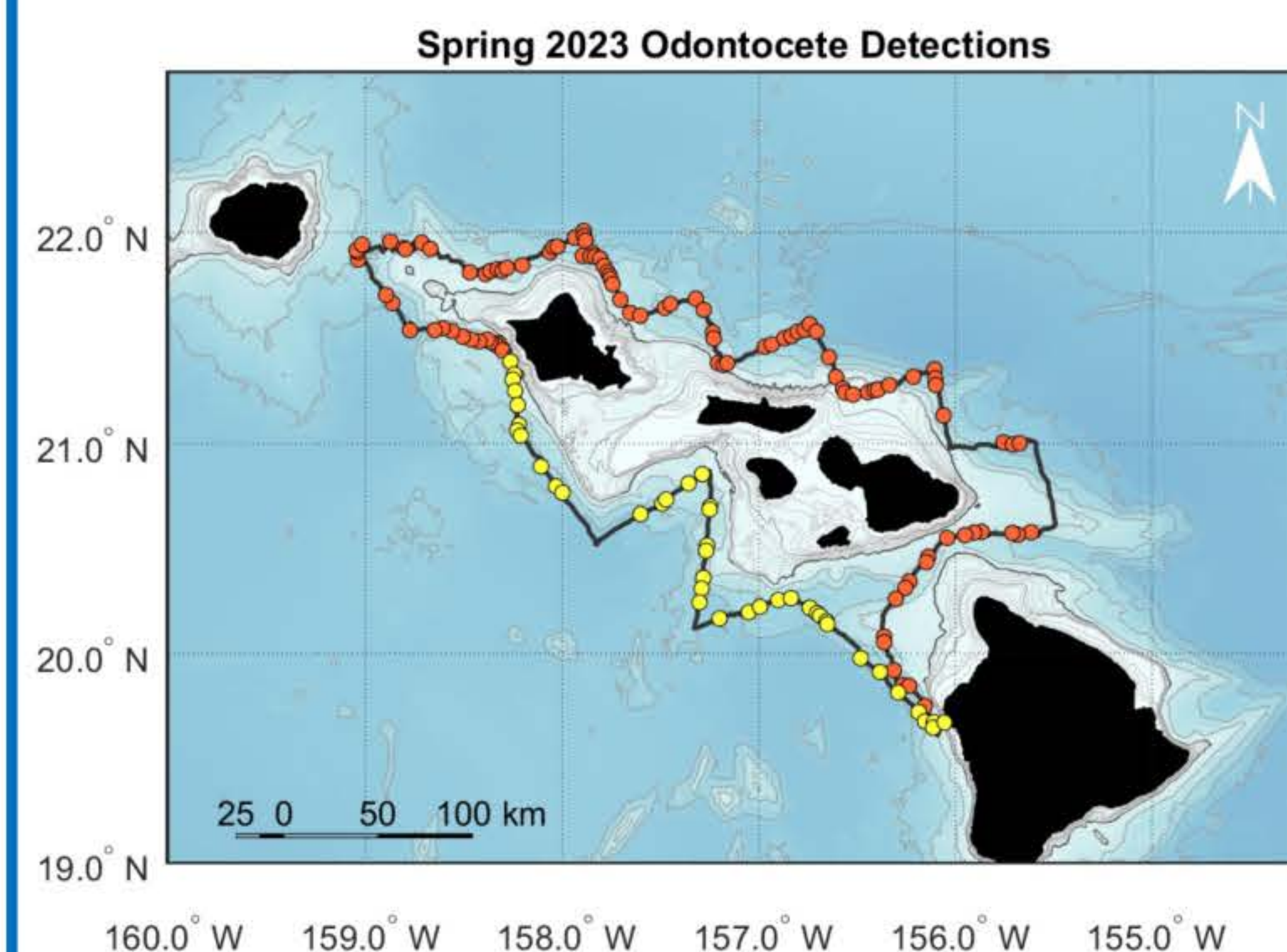
Communication:

- Send *detection report* to shore
 - has times of call detections
 - designed for humans to check:



RESULTS

Test flights in Hawaii, May-Jun '23



System worked!

- got whale detection reports
- 606 encounters reported

Detection performance:

- Before human check: 27% correct (expected this: had "safe" detector configuration to not miss whales)
- With human checking: 77% correct

Power use:

- WISPR2 uses 0.52 W
- Raspberry Pi uses 3.2 W
 - too much! BUT it runs only ~16 minutes per 5-hour dive
 - avg over a dive is 0.17 W – good!!

NEXT

- Improve detector
- Operate for 3 months
- Other species – false killer whale
- Transition tech to NOAA/NMFS PIFSC and SWFSC

