Great Lakes Fleet Management and Science Support Workshop

Monday, April 22, 2024
1:27 PM

- Summary of outcomes of January 2024 science vessel coordination workshop (Mark Burrows, IJC)
    - Recognized need to expand efforts to address workforce development, training, and the deployment/use of autonomous vessels
    - Increased coordination with Smart Ships Coalition
        - Getting ready to roll out new webpage to show autonomous vessels: https://canamglass.org/autonomous-vessels
    - Tasked Training and Action Plan subcommittees
    - Shared lessons learned on recent vessel acquisitions
- Overview of IJC Science Advisory Board Winter Science Project (Michael Twiss and Marguerite Xenopoulos, Co-Chairs, IJC Science Advisory Board)
    - Previously discussed Feb 2022
    - Challenges facing Great Lakes field observations in winter
        - Technical - winter conditions are hard on sensors/other equipment
        - Training - difficult to get out on the water in winter safely to learn winter monitoring methods
        - Culture - inertia of never having collected winter data
    - Why do we need winter science - an example
        - HBCDD concentrations in fish are decreasing in Lakes Superior and Michigan but not changing or increasing in other lakes. More intense storms and less ice cover are leading to increased sediment resuspension and contamination of fish from suspended sediment. Management decisions to address contamination from sediment based on data from the ice-free period may be suboptimal.
    - Working group on winter science started ~ 2 years ago
        - Assessed winter science gaps, infrastructure needs, and science coordination with associated recommendations
    - Activities completed
        - Lit review
        - Summary of existing winter datasets
        - Two virtual and one in-person workshop
    - Final report anticipated late 2024
    - Preliminary findings
        - Any advancement in Great Lakes winter science is likely to have a high impact on the field, as few low-impact gaps or needs were identified by workshop participants
        - Lake access in winter is a key barrier to filling research gaps and is restricted by an overall lack of resources for winter science, including funding, training, staff, ships, sensors, and data platforms
        - Interdisciplinary efforts are essential to understand complex research questions, including crossing disciplinary data collection and analysis and integrating social science, economics, and Indigenous knowledge

        - Develop/deploy basic monitoring platforms and infrastructure (e.g., buoys, moorings, etc.) with capacity to modularly add sensors or instrumentation from multiple institutions or organizations
    - Q&A
        - Richard Ricketts: how easy is it for folks to get access to icebreakers? (existing icebreakers)
            - Michael: It takes some relationship building, my colleague Mike McCay has developed a good relationship with the Coast Guard and was able organize data collection as part of a Bowling Green limnology course using the cutter that breaks ice on Lake Erie. We have also been able to use our connections with ECCC to get onboard the Griffin, that became a cruise of opportunity where we could collect water if it wouldn't interfere with their primary operations. Not everyone can get out on ships, relationship building can take quite a while.
            - Maggie: Access does take relationship building, that does represent a barrier, potentially underrepresented groups not able to get on. We were kicked off the ship in 2014 because the ship was not a research vessel and they needed the ship time for additional icebreaking during that winter's polar vortex. A dedicated research icebreaker would certainly be better.
            - Richard: Ocean districts seem to be better integrated with the science community than here in the Great Lakes
            - Michael: agree, there's a culture difference there, but there's a younger group entering the Coast Guard and their exposure to the importance and uniqueness of the GL augers well for the future
    - For any follow up feedback, critiques, questions: mxenopoulos@trentu.ca
- Operational challenges of winter limnology and under ice research (panel moderated by Dennis Donahue, NOAA)
    - Panel members: Brandon Bastar (WI DNR - Sturgeon Bay), Steve Ruberg (NOAA GLERL), Pete Esselman (USGS), Warren Currie (DFO), Casey Godwin (CIGLR)
    - Brandon Bastar: Winter limnology challenges
        - We went from a steel vessel to an aluminum vessel and overbuilt it so we could operate during light winter conditions
        - Historically we have done Dec/Jan survey work, but our last winter survey was winter 2022. Funding was a major issue, but also, the marina requested that the boat be out of the water before Christmas
        - Icebreakers can't always get into small areas in ports, e.g. where you plan to dock
        - Challenges
            - Safety issues. Slips, trips and falls, need for cold weather gear = less flexible, risk of frostbite, hypothermia
            - Logistical challenges - wind waves and cold, limited access to dockage, availability of emergency assistance
            - Vessel systems: hull designed to break ice, propellers & shafts, internal or external removal of gear, ice buildup on the decks
            - Gear issues: does the gear hold up to being iced in or frozen? Temperature sensitivity, esp. carbon fiber and plastics. Do you have heated decks, hot water supply, specialty tools, can you deal with frozen lines and cables?
            - Property liability - damage by ice movement to docks or marinas/others' property, limited ability to work around winter recreationalists

        - Emergency response: who's going to come get you or assist with damages/repairs?
- Steve Ruberg
    - There is urgency with the climate changing so rapidly to have some capabilities for getting out and making physical and chemical observations during winter
    - A proper vessel is needed for data collection analogous to what is collected in the other three seasons (zooplankton nets, towing systems, etc.)
    - We've been working with an autonomous system, seeking funding to continue that out of Muskegon
    - Work w/cabled observatory - eventually want to combine cabled and AUV capabilities
    - Funded GLRI project with Mike McKay to collect winter data, deploy winter gliders, expanding on Mike's work in Morrow Bay to do Lake Erie work; separate project with Woods Hole to deploy AUV under the ice
    - In the long run, leveraging Coast Guard assets is a sure way to get out on the water, but research is secondary to their mission. For example, in 2015 a researcher set out on a 5 day cruise and it ended up becoming a 15 day cruise due to the need for icebreaking.
    - Dennis: In these years with low ice coverage, we've noticed higher incidence of extreme weather events, so if the trend for lower ice cover continues we're always going to have to deal with severe weather conditions
- Peter Esselman (USGS GLSC)
    - We have thought internally about winter research needs but haven't moved forward with a lot of winter sampling. Our large vessel gets tied up for the winter, crew takes leave, etc.
    - Select winter sampling needs
        - Status of incubating Lake Trout eggs in specific habitats
            - Nov-March, large or small vessel
            - Specific habitats 2-30 m depths
            - Need egg in hand, excludes video or eDNA methods
            - Currently testing pumps in November to suction eggs/larvae out of the sediment
            - Once ramps freeze cannot access via small vessel
            - Possible methods: ROV, AUV, through ice, large vessel in low ice hears
        - Status of incubating Coregonine eggs in specific habitats
        - Determine the habitats where bloater and kiyi spawn
            - Unknown timing, assume Dec-Apr?
            - Unknown depth, assume 10-100m?
            - Conduct in Lake Michigan, Superior, and/or Huron
            - Possible methods: egg traps with surface buoys, AUV video, drop video, eDNA?
        - Winter distributions of round goby
            - Evidence suggests divergent strategies in different contexts
            - Observed to 190 m in Lake Michigan by Jude et al.
            - Possible antagonistic interactions with deep water sculpin
            - Possible methods: micromesh gill nets, ROVs, AUV imaging, drop video, eDNA?

        - Winter dissolved oxygen dynamics
            - Potentially limiting to predators and prey fish
            - Possible methods: manual sampling through ice, AUVs
- Warren Currie, Fisheries and Oceans Canada (regional vessel coordinator - Great Lakes)
    - Current DFO Great Lakes vessels
        - Apr-Dec: CCGS Limnos, CCGS Kelso, RV Cisco
        - Icebreakers: CCGS Griffon, CCGS Samuel Risley, CCGS Judy LaMarsh (latter is the newest, will operate in concert with other two)
        - Planned builds for two ice-hardened science vessels, smaller than the Limnos, one in the upper and one in the lower Great Lakes
    - Winter operational challenges
        - Ice-hardened ship access
            - Science is only one of many priorities
            - Current fleet is aging and replacements are expensive
            - Winter operations are costly
                - Everything costs more in the winter than in the summer, maintenance requires different skill sets
        - Weather/cold temperatures
            - Maintenance and operations of vessels
            - Sub-zero operation of equipment (icing of ropes, nets, davits, sensors)
            - Decks become very slippery in winter
            - Lack of protected heated spaces for sampling (protection of samples)
                - Need heated spaces to keep things thawed, for example, a frozen plankton net becomes a solid cone and no longer functions
            - Supply of water for washing nets
        - Short day length
            - Can't operate for as long
        - Access to mostly seasonal services (fuel, dockage)
        - Limited Search and Rescue options
    - All missions requesting science vessel time go through the Canadian Ocean Infrastructure Portal, can request winter ship time, can see the schedule
    - Dennis underlined Warren's point about high winter costs, mentioned studies comparing June and January sampling: January sampling is 4-10x the cost
- Casey Godwin, CIGLR
    - Tying sampling to the availability of stable ice really limits what we're doing, collected some data in 2022 that we haven't been able to follow up on since due to lack of ice cover
    - Winter science is critically important but is going to place an extra burden on personnel - staff are already processing samples all winter, expanding winter sampling is going to require investment in expanding our lab capabilities
        - Warren Currie agreed with this point and added, "Labs and capacity for contractors (like taxonomists) are already stretched, much less having additional samples in winter"
    - Look to the EGLE project that took place in the 90s-early 2000s as an early winter science roadmap

- Q&A/Comments
  - Maxwell Morgan: Life rafts have to be sent in to be recertified, this takes a month, if you want to operate in winter you would need backups.
  - Megan O'Brien: How do you mitigate risks when consequence and likelihood are both high? Spikes on boots? Increased training on hypothermia? Shorter shifts to prevent fatigue?
  - Debbie Lee: Can you address the limitations of UAVs in winter?
    - Steve Ruberg: retrieval requires a high level of effort in winter if a UAV didn't come back, likely would want to start testing in an area where the Coast Guard is breaking ice anyway.
    - Warren Currie: AUVs will generally work fine during the winter, the issue is if problems arise, there are less opportunities to help
      - https://maritime-executive.com/article/university-of-gothenburg-auv-goes-missing-under-antarctic-ice-shelf
    - Peter Esselman: it's harder to have comms with a vehicle under ice, also colder water = less battery endurance. Need in-water charging [to work efficiently].
  - Rickard Ricketts: What do the researchers think about using hovercraft as winter platforms?
    - Warren: Hovercrafts are used in St. Lawrence for icebreaking by Coast Guard. Not the most conducive vessel to actually sample from, they're not designed for that.
    - Megan O'Brien: Mississippi River USACE also uses hovercraft for their winter monitoring
    - Steve Ruberg: We've been successful getting out on Maumee Bay in an airboat, but if ice is thin like this year and you break through you can get stuck
    - Warren: yes shoulder seasons/light ice is tricky for operations
      - https://www.geo.uib.no/polarhovercraft/
      - https://tos.org/oceanography/article/hovercraft-as-a-mobile-science-platform-over-sea-ice-in-the-arctic-ocean
  - Mark Burrows: Is there a minimum depth where a cabled system won't be hit by deep icebergs/rough weather?
    - Warren: Depends on location. Nearshore all bets are off, but generally 10 m is considered reasonably reliable
  - Scott Koproski (USFWS): After listening to the conversation surrounding winter sampling, It seems to me that exploring/utilizing technologies may be the best alternative. Considering all the safety/operational hazards associated with winter ops, coupled with shrinking agency budgets, staff/lab availability, training, cold-weather safety equipment, etc., the likelihood of getting our traditional science-ships out in the winter months seems low. I do see the value of winter sampling, especially when considering climate-change impacts to GL's fisheries, but without advanced technologies, I don't see significant and consistent improvements in winter sampling. Good conversation today and left with more questions than answers.
    - Warren: There are some measures (physical collection of samples - plankton, fishes etc.) which are not really possible using sensors yet, but the bulk of the limnological measures can be.

        - Casey Godwin: I agree Scott and Warren. I'd add many chemical parameters to that list. We're doing what we can with remote (stationary) samplers and water intakes, but neither is ideal
- Developing inter and intra-agency agreements to support vessel operations - Tyler Chapman, USGS
    - Funds out agreements: cooperative, intergovernmental, inter agency, and intra agency
    - Funds in agreements: collaborative, technical assistance, inter agency, and intra agency
    - Exchanging personnel or funds requires a formal agreement
    - Cooperative agreements
        - Government, through laboratories, provides personnel, services, facilities, equipment, intellectual property, or other resources
        - No funds provided by the Federal laboratories to the non-Federal parties
        - The non-Federal parties may provide funds or other resources toward specified research or development
        - Any property and equipment provided under technology transfer mechanisms will be provided in accordance with established property management policies and procedures
    - Collaborative agreements
        - USGS is authorized to perform collaborative work and projects in cooperation with other agencies, Federal, State or private, pursuant to 43 USC §36c
        - Statement of Work (SOW) must be agreed to by parties. Effective date shall be after the start date or once it is signed by parties, term may be up to five years
        - Collaborator will provide an estimated $[Collaborator (funds-in)] to the Project
        - Three options (1) all funds paid in advance (2) funds collected by invoice (3) parties agree to cover costs separately
    - Technical assistance agreements
        - USGS authorized to perform technical assistance under the Stevenson-Wydler Act (15 U.S.C. § 3710a(b)(3)(A), as amended)
        - Each Party will provide its own equipment necessary to support its participation in the technical evaluation
        - Requires SOW, term based on project completion (can be extended in writing)
        - Three options (1) all funds paid in advance (2) funds collected by invoice (3) parties agree to cover costs separately
    - Intra/inter-agency agreements
        - An Inter/Intra-Agency Agreement (IAA) is a written agreement between entities of different Federal agencies (inter) or within the same Federal agency (intra).
        - Must comply with requirements of recording statute in 31 U.S.C. § 1501(a)(1). Title 48 of the Code of Federal Regulations (CFR) codifies the FAR
        - Informal arrangements may not be used to exchange funds, personnel, services, or property; or to produce any kind of financial commitment or obligation.
        - Must clearly state the financial information for all parties. This includes a citation for when the funds expire for obligation
    - MOAs/MOUs do not involve payment or transfer of funding, useful for optimizing the benefits of efforts. Each party is responsible for contributing its own efforts and resources.
        - Steve Ruberg: have there been barriers to MOUs in the past?
        - Warren: Cross border agreements are not trivial and if we already have an existing network of "helpers" it might be more likely than a large collaborative agreement.
    - Some issues with crew sharing - different entities have different qualifications required
    - Tom: what do we need to do to facilitate inter-entity cooperation in a useful way?

    - Scott Koprowski (USFWS): A Mutual Aid agreement has been signed by the signatories of the JSP under the GLFC umbrella, so I think that is something that could be copied/modeled for gear recovery/vessel breakdown/etc. purposes as well.
    - Beth Hinchey-Malloy - EPA has had an interagency agreement with USGS, they deploy and retrieve the EPA SeaBirds and provide other monitoring support in Lake Erie
- Review of communication efforts regarding need to modernize GL fleet (Debbie Lee, NOAA)
    - Efforts to recapitalize vessels to date
        - In 2017, the IJC, GLC, GLFC requested that the GLWQA GLEC undertake a Great Lakes science vessel fleet assessment as vessels across all agencies were aging
        - In 2019, the NOAA OMAO Small Boat Recapitalization Plan was begun, involving all line offices, and was concluded in October of 2020
            - The plan recognized the SRV Laurentian as the highest priority for NOAA recapitalization
        - 2019 and 2020 House Report Language directed the USGS to conduct a survey with Federal, State, Tribal, academic and interested partners to identify resources needed for a Great Lakes integrated science plan. USGS provided the report February 7, 2020.
        - In 2019, Congressional direction to Office of Science and Technology Policy (OSTP), via the 2019 Departments of Commerce and Justice, Science, and Related Agencies Appropriations Bill, resulted in OSTP undertaking a study on Great Lakes research infrastructure and small research vessels
            - a final report was completed and submitted to OSTP, having been cleared by NOAA, USGS, EPA and other agencies
            - due to the change in Administrations, the report was never transmitted to Congress
            - NOAA Chief Scientist followed up with OSTP in 2021; OSTP said the report was too dated to submit to Congress
        - Also in 2019, the IJC's Science Advisory Board began the Great Lakes Science Plan Work Group
            - A final report, Great Lakes Science Strategy for the Next Decade,was completed and submitted to the International Joint Commission and approved in October 2022.
            - "Updating the Great Lakes research fleet and associated platforms is a high priority and represents approximately one-third of this investment to provide for the addition of purpose built, interdisciplinary, all-season state-of-the art platforms including ice-hardened and regional class research vessels capabilities."
            - In February, 2023 Commissioners approved the project Communication and Engagement Plan.
            - The SAB has developed a work plan to create the science implementation plan. The first meeting of the Science Plan Collaborative was Jan 24-25, 2024. The next meeting is scheduled for June 10-11.
        - In 2022, following passage of the Bipartisan Infrastructure Law, the GLFC and the IJC sent letters to DOC Secretary and NOAA Administrator supporting urgent recapitalization but no funds were allocated in the OMB approved spend plan.
        - On October 13, 2022, the GLC adopted a resolution "Improving Capacity for Great Lakes Icebreaking" that encourages Congress to replace the USCG 140-foot

icebreaking tugs in the Great Lakes to include research capabilities such as winter ecology and freshwater oil spill response and research.
        - The National Defense Authorization Act for FY23 contained the GL Winter Commerce Act (Sec. 11223) authorizing a new USCG ice breaker to include science mission requirements.
        - In the FY2023 Consolidated Appropriations Act, House Report language:
            - "…The Committee is concerned that the vessels of the Great Lakes ecosystem Federal research fleet are nearing the end of their useful service lives and are inadequate for the demands of their interdisciplinary research mission. The Committee directs NSF to coordinate with relevant Federal agencies to study and report back to the Committee no later than 180 days after the enactment of this Act on the costs of modernizing the vessels within the Great Lakes Research Fleet."
        - NSF submitted report to House Committee on Appropriations with input from NSF, NOAA, EPA, USGS, USFWS.
        - NSF noted other US federal agencies had vessels but they are not research vessels by build or design (USACE, USCG, NPS).
        - FY24 Appropriations language for EPA:
            - Research Vessels.—The Committee requests a report within 120days of enactment of this act containing all vessels in its fleet, includingeach vessel's age, purpose, and method acquired, as well astimeline and funding mechanism to replace its oldest vessels.
    - Next steps
        - Develop a common language to use when talking about the importance of the Great Lakes science vessel fleet to members of Congress, high level agency officials and other audiences.
        - What are persuasive key talking points?
            - What is the problem
            - Why is it important
            - What services these vessels provide
            - How long research vessels last
            - Status of the current Great Lakes fleet
            - How many research vessels we need
            - What it will cost
        - "A rising tide lifts all boats" –how do we message as a community while addressing individual entities needs?
    - Looking for feedback on the proposed talking points and the 1pg infographic developed by IJC's Rachel Wyatt, will share with group
    - Should phrase in terms of ice hardened-ness class we're seeking rather than 'safe for cold weather research'
    - Rebecca Klaper: National science committee looking at needs, will send info to Mark and Tom
- Wrap-up
    - Tom: we have a small training subcommittee that met a couple of weeks ago and is keeping those discussions going, hopefully will have progress to report at next January meeting
    - We're going to begin reworking the Action Plan document from the 90s, will crosswalk with Science Strategy and drop items that have been accomplished
    - Mark: thank you to IJC science coordination committee for their ongoing support.