The U.S. Academic Research Fleet

Testimony provided to the
Decadal Survey of Ocean Science Committee
15 February 2024

Dr. Deborah Bronk, Chair UNOLS Council
Doug Russell, UNOLS Executive Secretary
Dr. Kipp Shearman, Chair UNOLS Fleet Improvement Committee
Rose Dufour, NSF/GEO/OCE Ship Operations Program Director
Rob Sparrock, ONR Oceanographic Research Vessel Program Officer

Agenda

- UNOLS and the U.S. Academic Research Fleet (ARF)
  - What is the ARF?
  - How is the ARF used today?
- NSF Perspective
- ONR Perspective
- How might the ARF look in the coming decade?
- Key Take Aways

U.S. Academic Research Fleet 2024

- 17 oceanographic research vessels
- Size range: Global class to Coastal/Local class
- Vessels owned by NSF, the Office of Naval Research (ONR), and U.S. universities and laboratories
- Operated by 13 different institutions currently
- UNOLS coordinates access to ARF vessels and vehicles
- Adhere to the UNOLS Research Vessel Safety Standards (see: https://www.unols.org/document/research-vessel-safety-standards-rvss)

Global Class Vessels

R/V *Atlantis* / WHOI
ALVIN Support

R/V *Thomas G. Thompson* / UW

RV *Sikuliaq* / UAF

R/V *Roger Revelle* /
SIO

R/V *Marcus G. Langseth* /
LDEO
Seismic Research

Ocean/ Intermediate Class Vessels

R/V *Atlantic Explorer* / BIOS - BATS

R/V *Kilo Moana* / UH HOT

R/V *Endeavor* / URI
2024 last yr of service?

R/V Neil Armstrong / WHOI

R/V Sally Ride / SIO

Regional Class Vessels

R/V *Hugh R. Sharp* / University of Delaware

RCRVs (under construction)

R/V *Taani* / Oregon State University

R/V *Narragansett Dawn* / URI/East Coast Oceanographic Consortium

R/V *Gilbert R. Mason* / LUMCON & USM/Gulf-Caribbean Oceanographic Consortium

Coastal/ Local Class Vessels

R/V *Pelican* / LUMCON

R/V *Robert G. Sproul* / SIO

R/V *Savannah* / Skidaway Institute of Oceanography

R/V *Rachel Carson* / UW

R/V *Blue Heron* / University of MN-Duluth

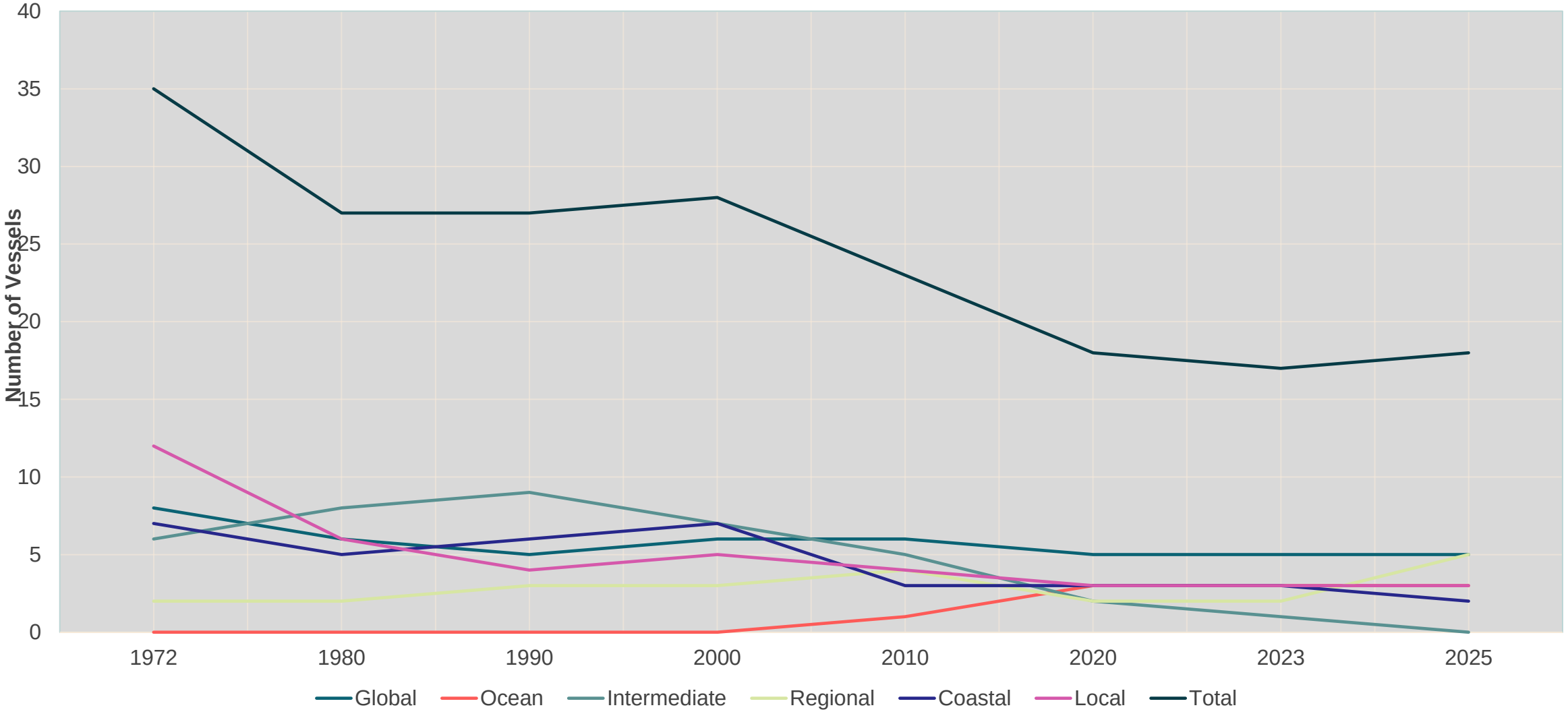
R/V *F.G. Walton Smith* / University of Miami

Academic Research Fleet Composition

1972-2025

	1972	1980	1990	2000	2010	2020	2023	2025
Global	8	6	5	6	6	5	5	5
Ocean	0	0	0	0	1	3	3	3
Intermediate	6	8	9	7	5	2	1	0
Regional	2	2	3	3	4	2	2	5
Coastal	7	5	6	7	3	3	3	2
Local	12	6	4	5	4	3	3	3
Total	**35**	**27**	**27**	**28**	**23**	**18**	**17**	**18**

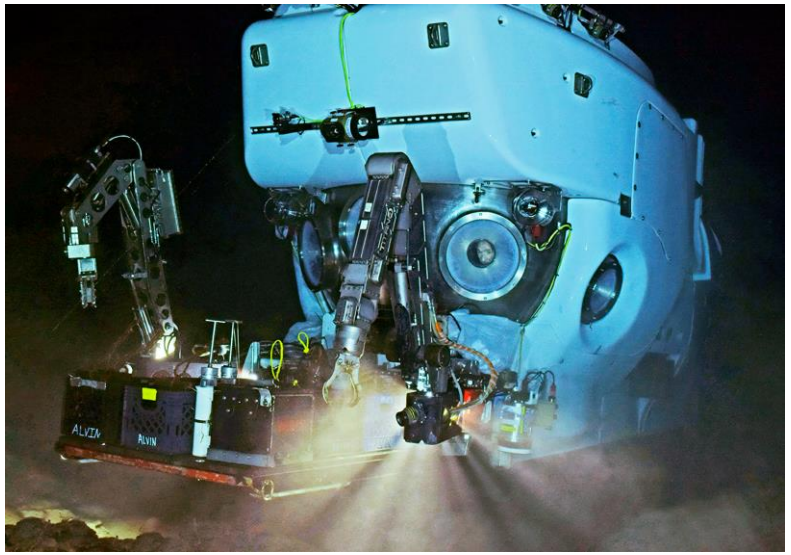
Academic Research Fleet Composition
1972-2025



Which also means a 4% decline in bunks for the science community

There is more than just the ships to the ARF and the UNOLS community…

National Deep Submergence Facility (NDSF)

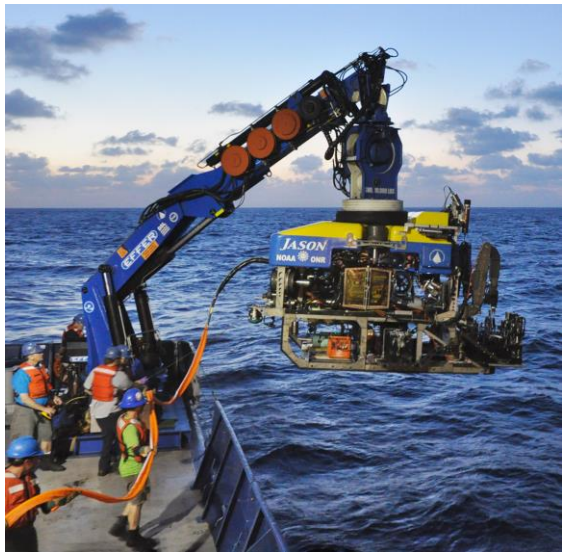


HOV Alvin

AUV Sentry

Operated by Woods Hole Oceanographic Institution (WHOI)

https://ndsf.whoi.edu/



ROV Jason

Pooled Equipment & Technical Support

- NSF/UNOLS Laboratory Van Pools
- NSF/UNOLS Winch Pools
- NSF/UNOLS Wire Pool
- UNOLS Technician Pool
- Ocean Bottom Seismic Instrument Center (OBSIC)
- OSU Marine Sediment Sampling Group (MARSSAM)
- WHOI Mooring Facilities & Services
- Multidisciplinary Instrumentation in Support of Oceanography (MISO) and Potential Fields Pool Equipment (PFPE)

Instrumentation & Data Support

- Multibeam Advisory Committee (MAC)
- Ocean Data Facility (ODF)
- Operation SWAB - Enhanced Isotope Testing
- Rolling Deck to Repository Program (R2R) / Underway Data Support
- University of Hawaii Currents Group / ADCP Support
- UNOLS Satellite Network Advisory Group (SatNAG)

Supporting Federal Agencies NSF, Navy/ONR, NOAA, USGS, BOEM

UNOLS Member Institutions

UNOLS Office

The UNOLS Community

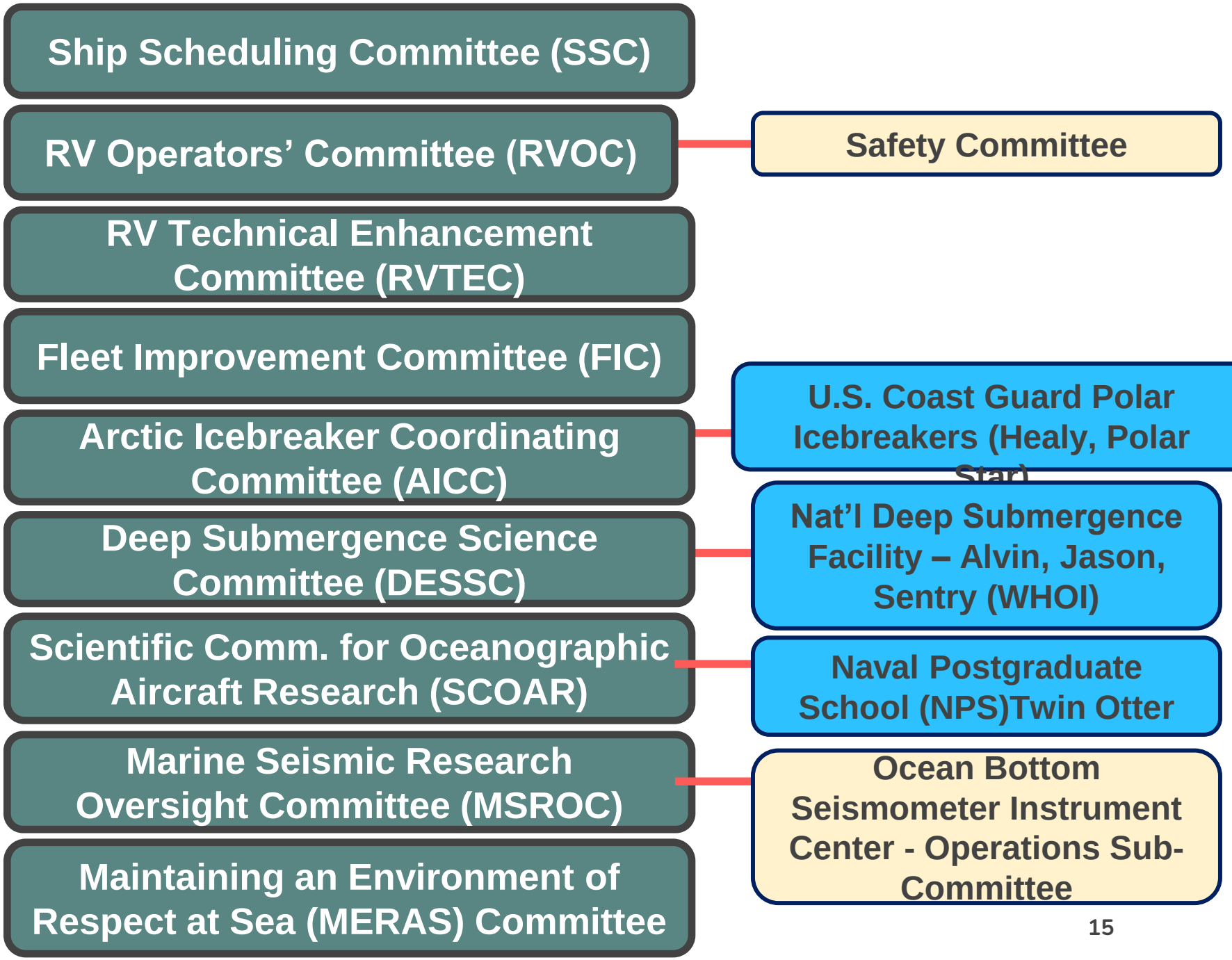
UNOLS Ship & Facility Operators & Tech Staff
RVs, Aircraft, Submersibles

UNOLS Council

The Sea-going Science Community

UNOLS Standing Committees

Report to UNOLS Council



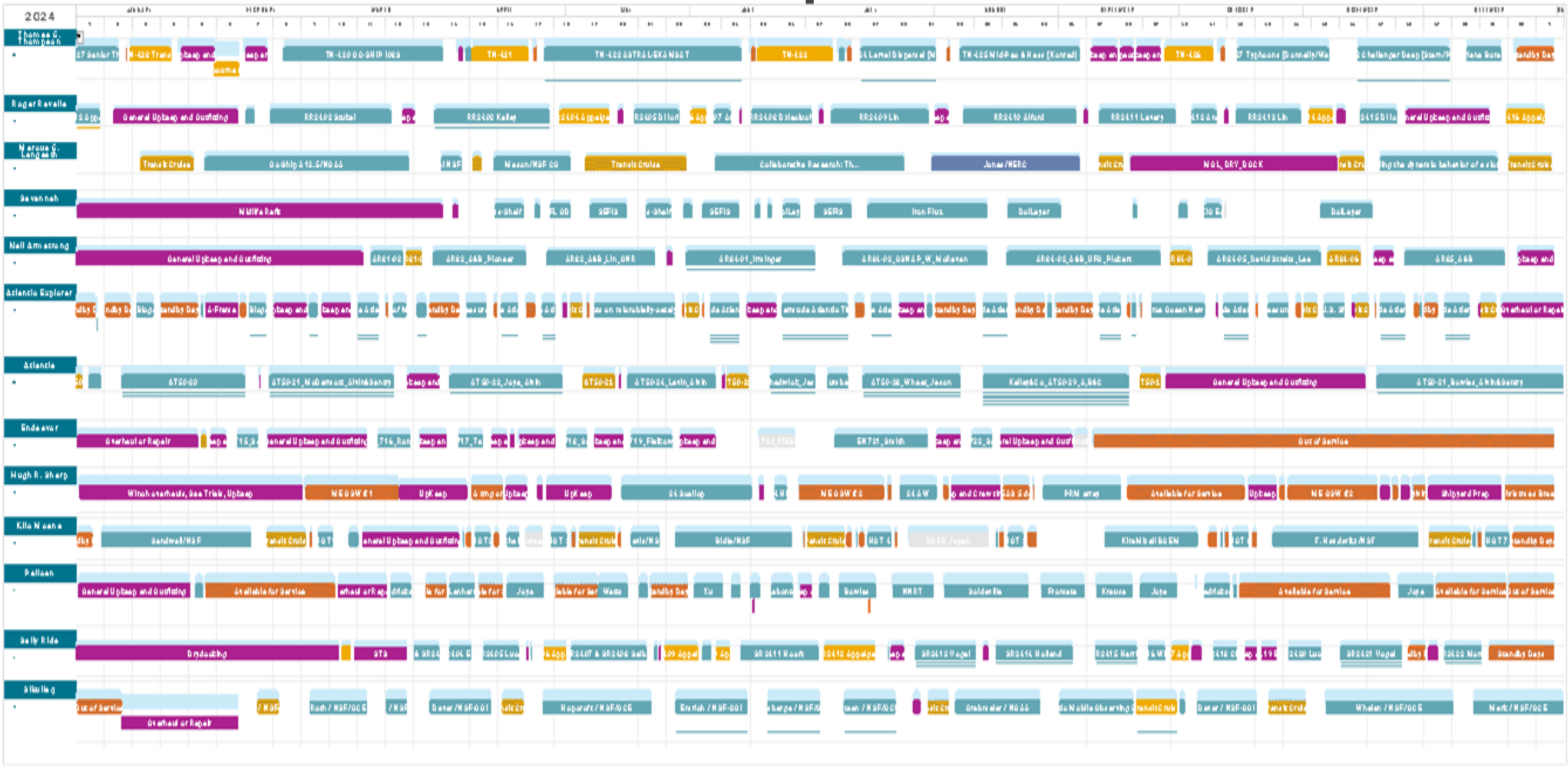
UNOLS Office - hosted by UW School of Oceanography

- Staff
  - Current – 6
    - Executive & Deputy Executive Secretaries
    - Technical Services Manager
    - Crewing Support Manager
    - MATE Internship Program Manager
    - Program Ops Specialist (0.8 FTE)
    - Risk Manager / Legal Advisor (0.2 FTE)
  - Adding a 0.5 FTE Admin Assistant for Travel
  - Adding a 0.8 FTE Project Assistant to assist with Marine Facilities Planning
  - Proposed adding a 0.5 FTE Safety Coordinator
- Contracts Developed & Administered
  - Fleet telemedicine support
  - MFP Development, hosting & support
  - Build America, Buy America Act support
  - Scheduling / MFP fleet support

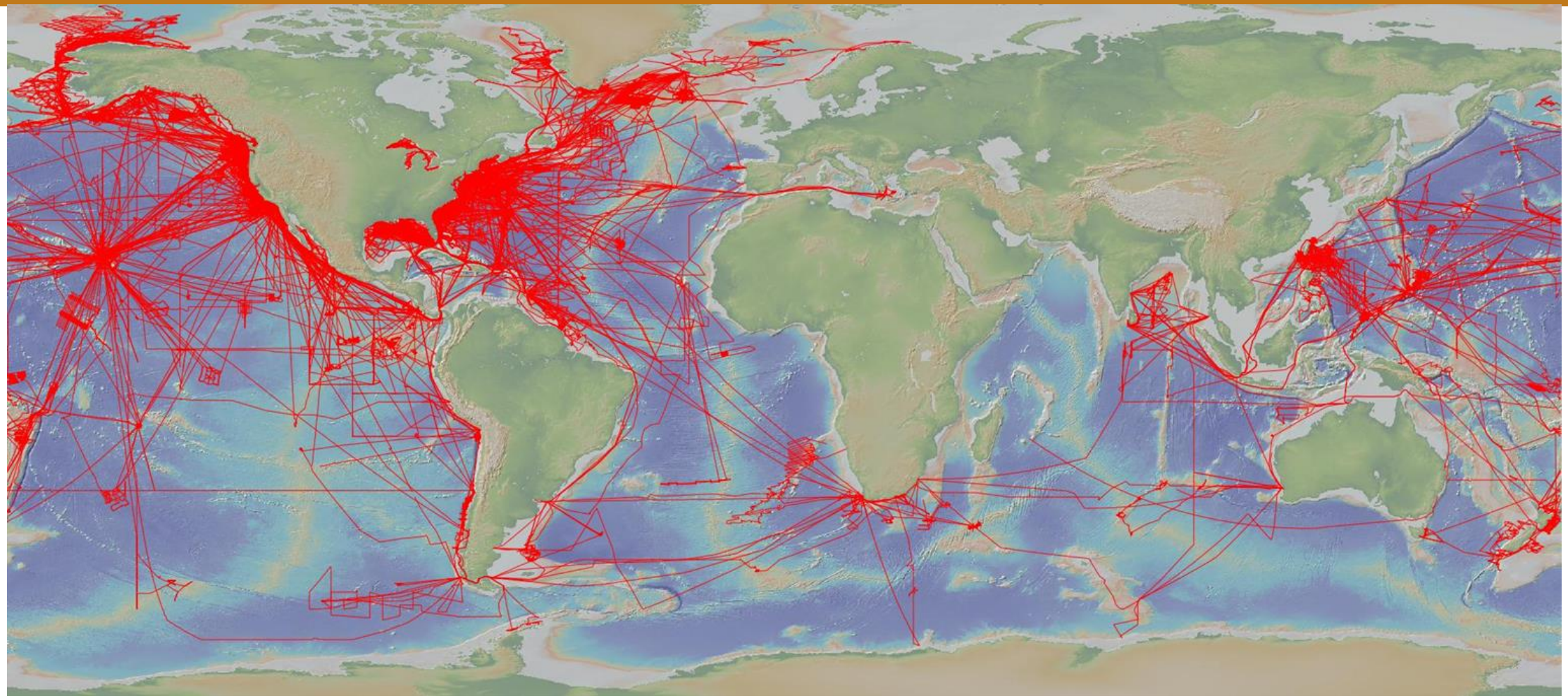
Taskings, responsibilities & staffing continue to grow

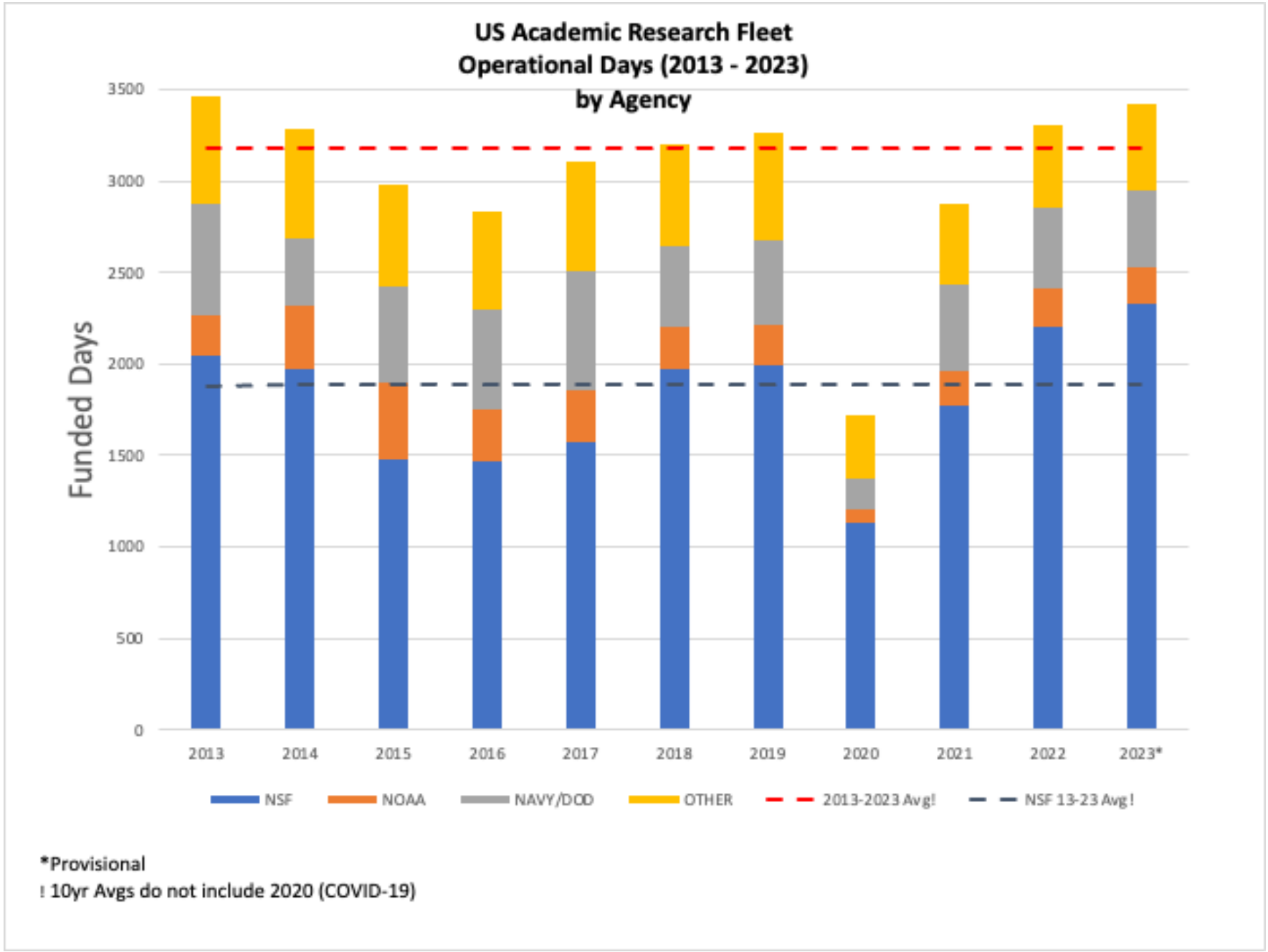
How is the Fleet being used?

2024 ARF Ship Schedules



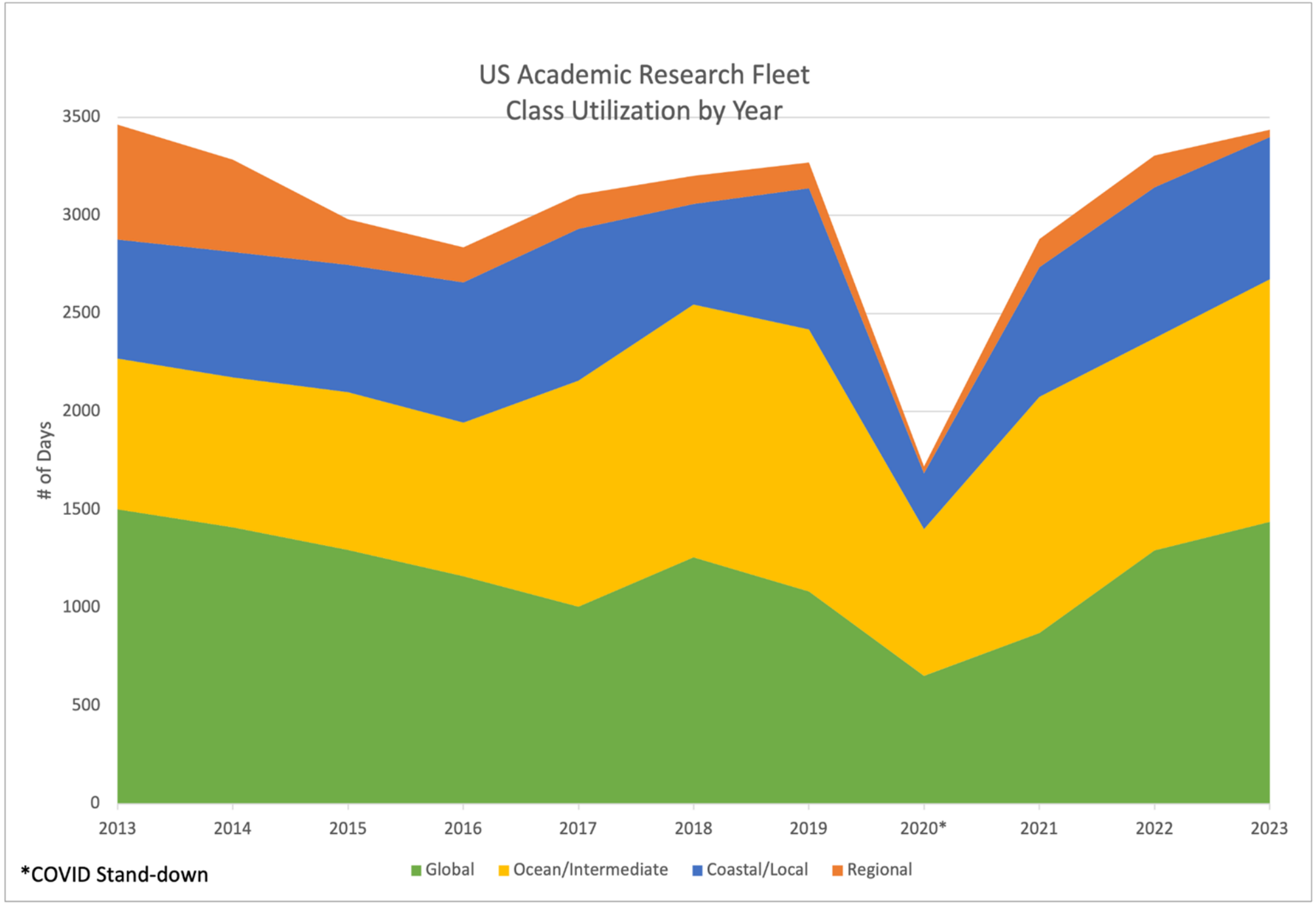
Where has the fleet been used? 2009-2024



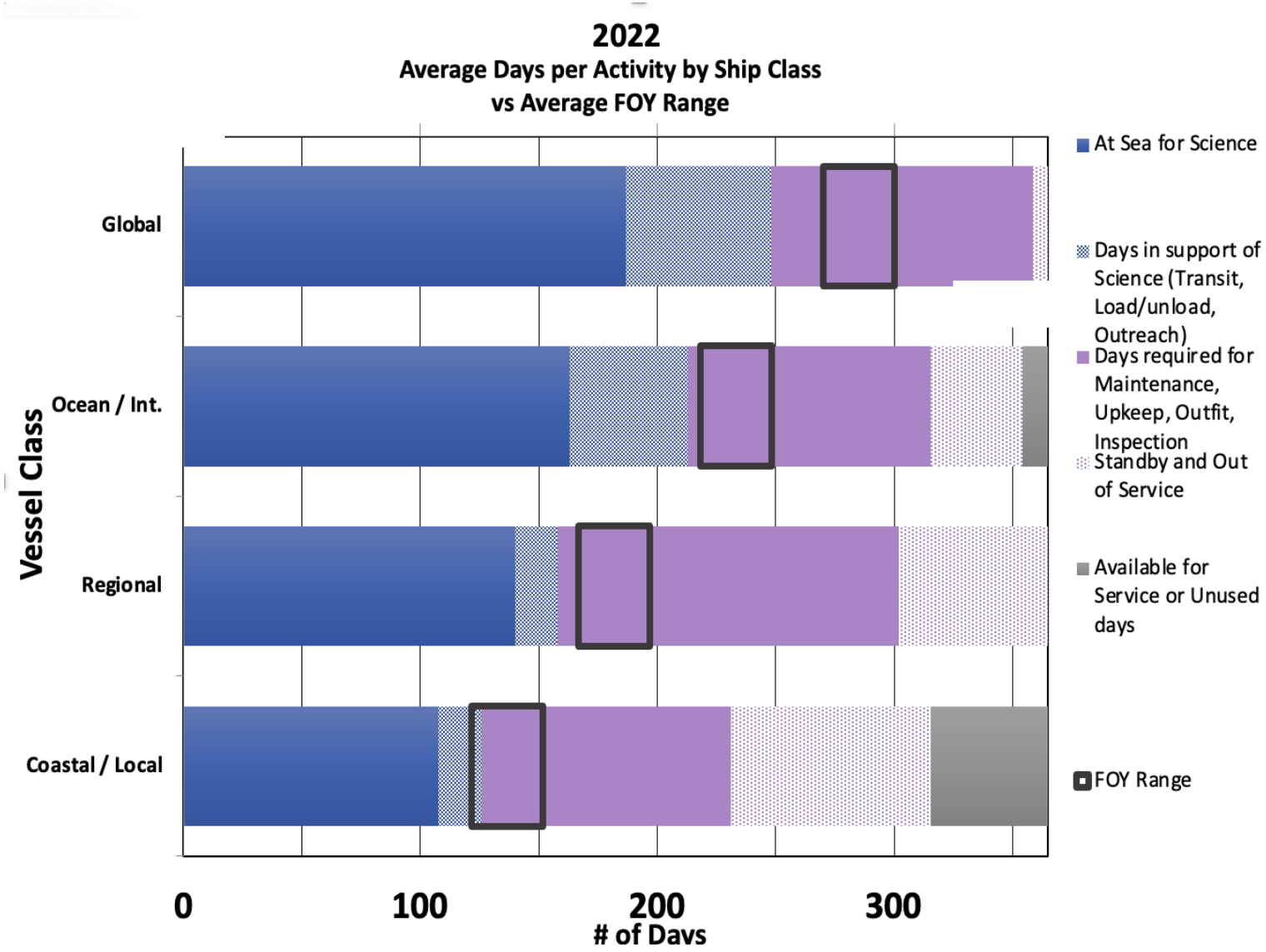


*Provisional

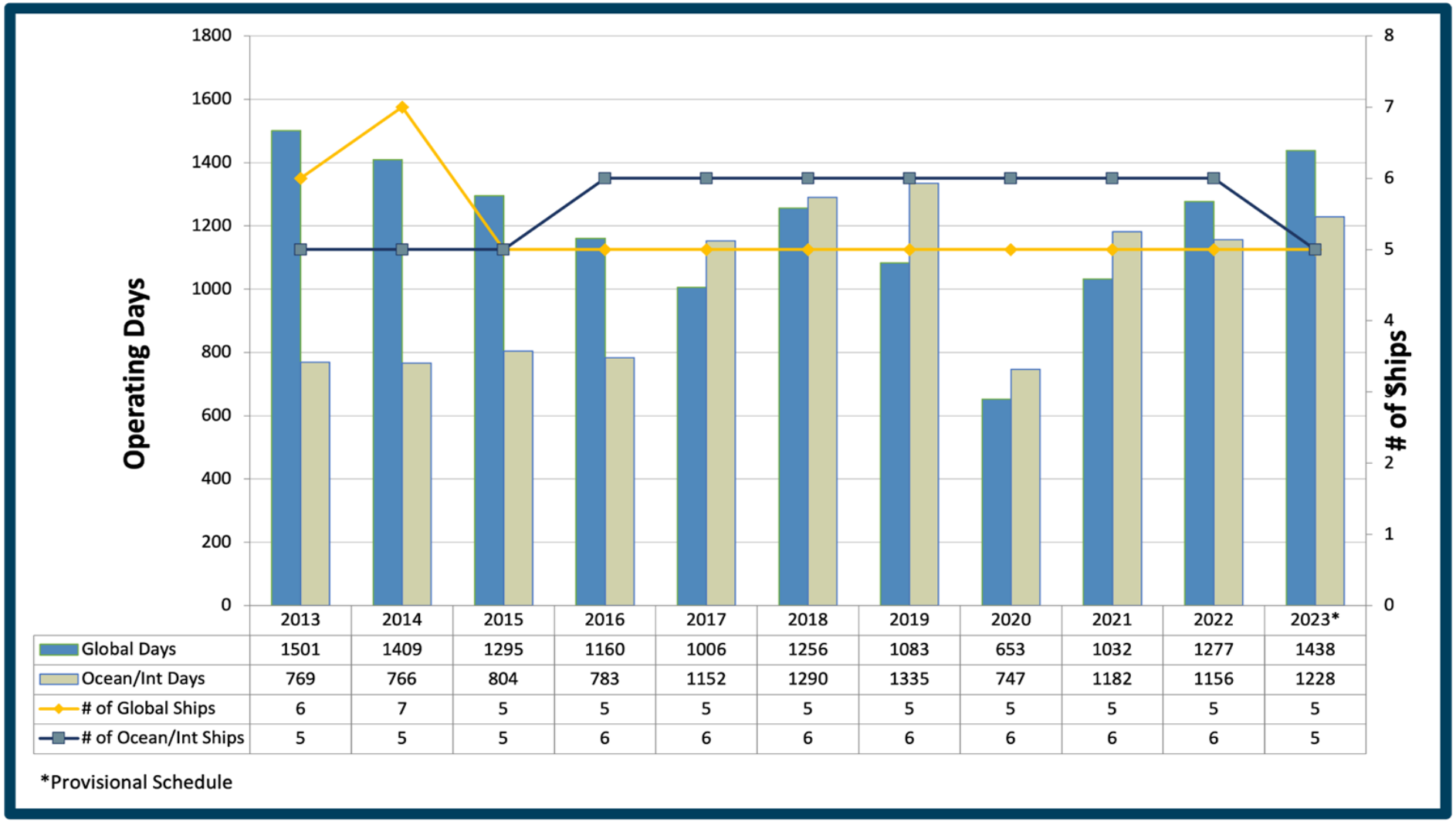
! 10yr Avgs do not include 2020 (COVID-19)


US Academic Research Fleet
Class Utilization by Year
3500
3000
2500
2000
1500
1000
500
0
# of Days
2013
2014
2015
2016
2017
2018
2019
2020*
2021
2022
2023
*COVID Stand-down
Global
Ocean/Intermediate
Coastal/Local
Regional

ARF Full Optimal Year



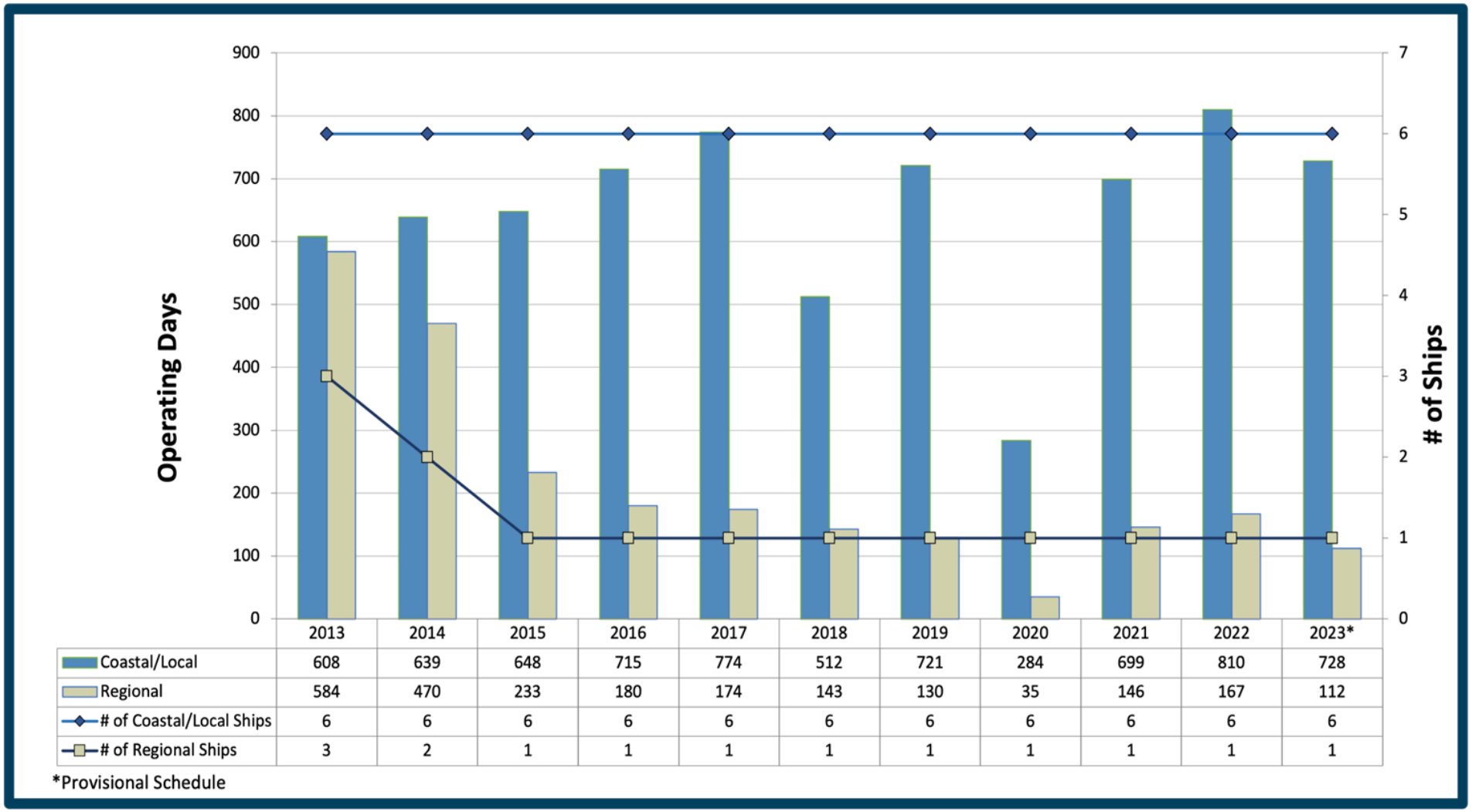
Fleet Utilization - Global/Ocean Classes



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023*
Global Days	1501	1409	1295	1160	1006	1256	1083	653	1032	1277	1438
Ocean/Int Days	769	766	804	783	1152	1290	1335	747	1182	1156	1228
# of Global Ships	6	7	5	5	5	5	5	5	5	5	5
# of Ocean/Int Ships	5	5	5	6	6	6	6	6	6	6	5

*Provisional Schedule

Fleet Utilization - Regional / Coastal / Local Classes



	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023*
Coastal/Local	608	639	648	715	774	512	721	284	699	810	728
Regional	584	470	233	180	174	143	130	35	146	167	112
# of Coastal/Local Ships	6	6	6	6	6	6	6	6	6	6	6
# of Regional Ships	3	2	1	1	1	1	1	1	1	1	1

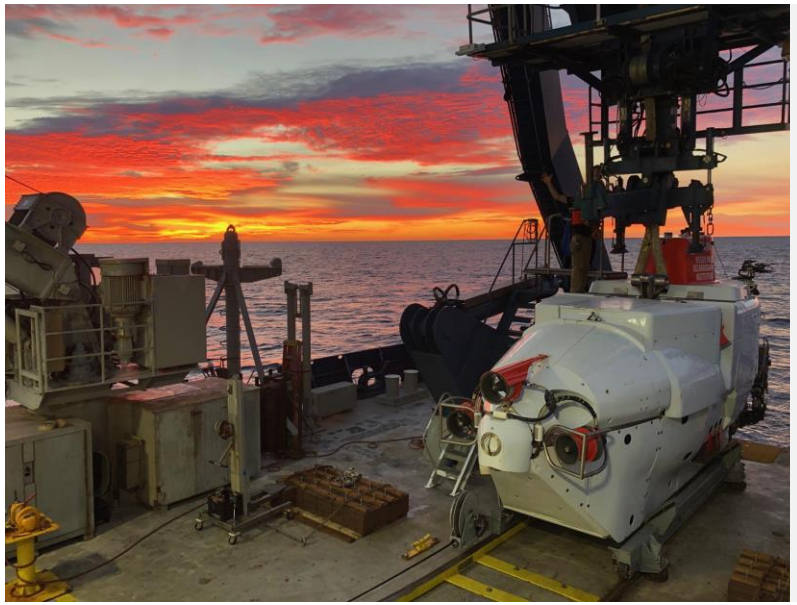
*Provisional Schedule

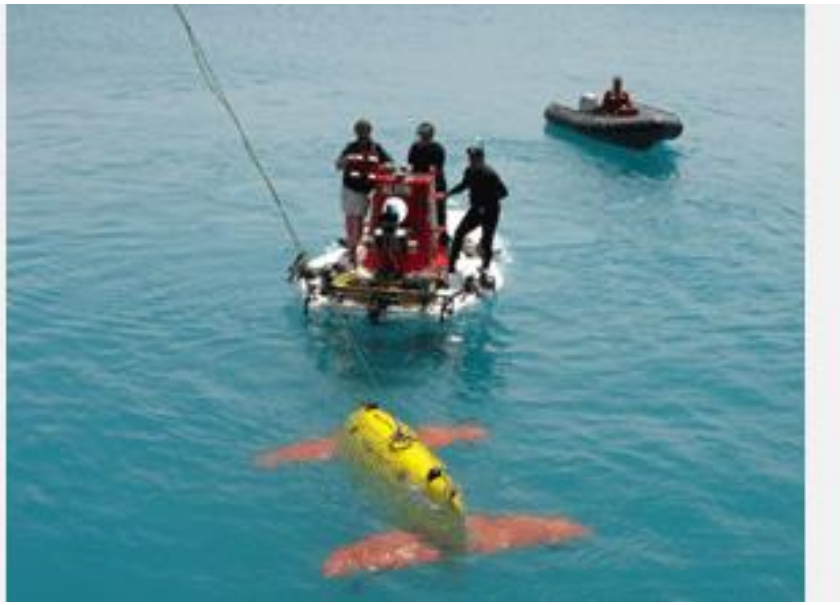
Who goes to sea on ARF vessels?
2012-2022

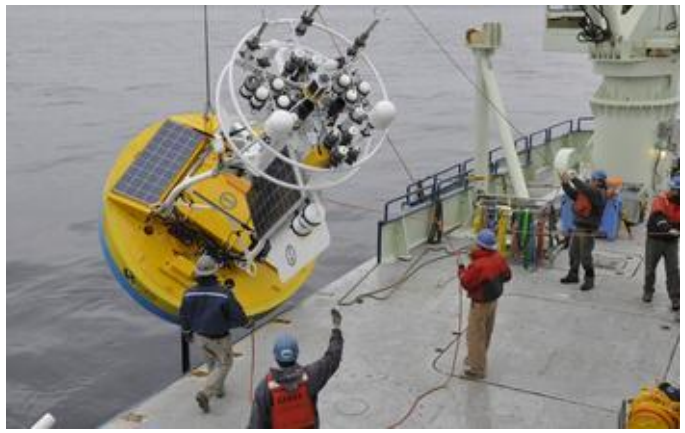
- Scientists - 12,000+
- Post Docs - 500+
- Graduate Students - 3,500+
- Undergraduate Students - 2,700+
- Educators - 500+
- Caveat: Data from R2R - not complete
  - didn’t utilize a Controlled Vocabulary for participant roles
  - not all operators reported all participants
  - new standards being developed and incorporated into MFP Cruise Planning

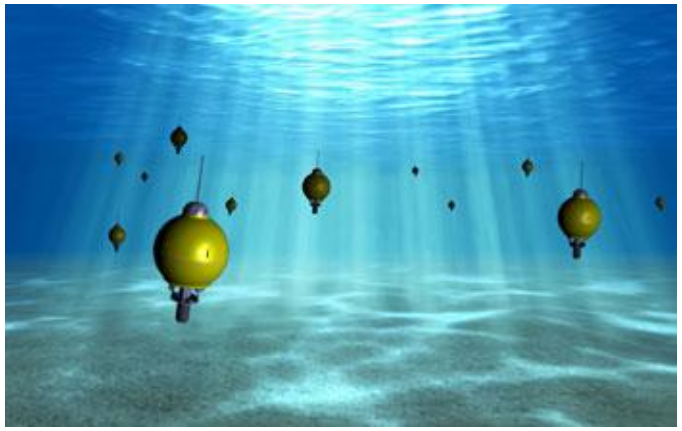
NSF Perspective

Rose Dufour







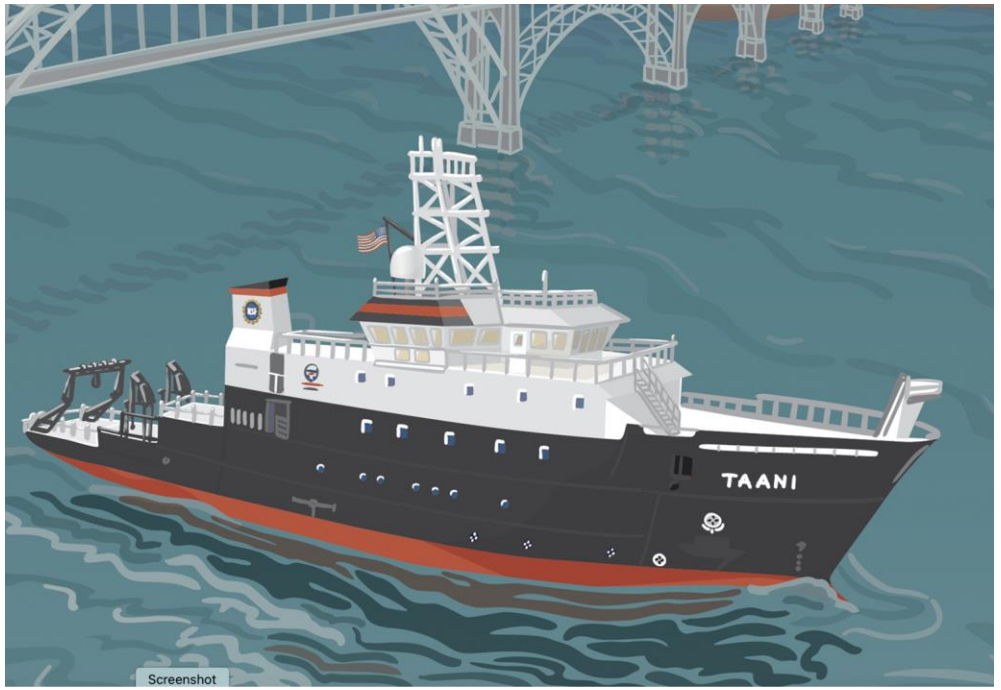


Sustained observations, Changing biology, Paleoclimate research, GEO Hazards, STEM and outreach programs to build the next generation of ocean scientists

"how might this look in the coming decade"

RCRV Update

- **Delivery:**
  - Vessel 1, 1 July 2025
  - Vessel 2, 1 January 2026
  - Vessel 3, 1 June 2026
- **Post Delivery:**
  - Outfitting, Operator and Science Trials = 262 days
  - Includes:
    - crew familiarization,
    - transits to home port,
    - ship outfitting,
    - 85 days of various science trials,
    - 54 days of warranty and haul out, and
    - final NSF inspection to satisfy the ARF acceptance



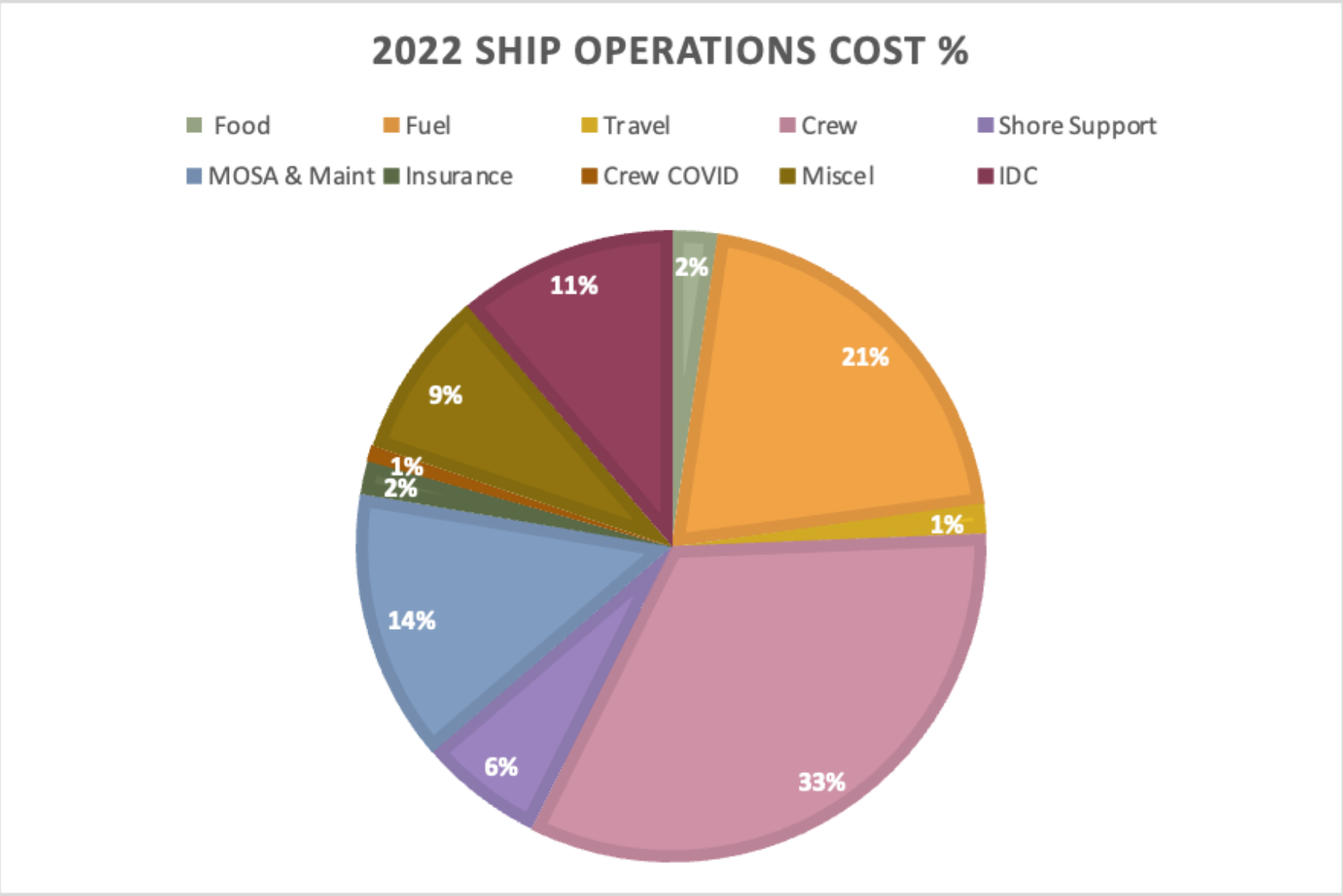
ARF Successes

- Barters to access foreign and other Federal Fleets
- Increases in NSF infrastructure funding
- Crewing retention
- Deferred maintenance
- Habitability upgrades
- Scientific Instrumentation funding has increased
- NSF Pools (Wire, Winch, Van)
- Early Career Scientist Training Opportunities

ARF Challenges

- Current Global / Ocean class
- Cyber Security
- Overuse of NDSF assets - makes scheduling a challenge
- Capability changes
- Less bunks for science community 4% decline - Complex ships requiring more crew members, collaboration internationally
- *Kilo Moana* not able to effectively do agency science to desired standards
- Pools – technology, autonomy, gliders with technical support – force multipliers
- Greening the Fleet, Net-zero by 2050
- Underutilization of local/regional class vessel

Prospective on what goes into Ship Day Rate



ONR Perspective

Rob Sparrock

ONR Perspective

- The Congressional Budget Office analyzes the Navy's annual, 30 year shipbuilding plan and assess its costs by law. However, non-Battle Force ships such as the Oceanographic Research Vessels (AGOR) are excluded from the plan. While there is not yet a formal build plan for a 2036 AGOR replacements, the current requirement is six AGOR.
- Next decade: between 2036 - 2042, three Globals (and sister ship *NOAAS Ronald H. Brown)* and RV *Kilo Moana* will reach End of Service Life (ESL).
- Additionally, RV *Sikuliaq, Sally Ride & Neil Armstrong* will likely need Midlife Refit which historically take a year or more and are needed in the same replacement period.
- Opportunities for 'Greening the Fleet' with new platforms designed to last 4-5 decades with the right mix of capacity and capabilities including newer technologies and affordability (open architecture, integrated power, unmanned systems, upgrades to DSV ALVIN).
- Risks with New Construction and Midlife Refit vessel program are shipyard delays that would force tough decisions such as extending existing vessels beyond ESL, delaying Midlife Refits, delaying equipment upgrades, or creating gaps in capacity and capability

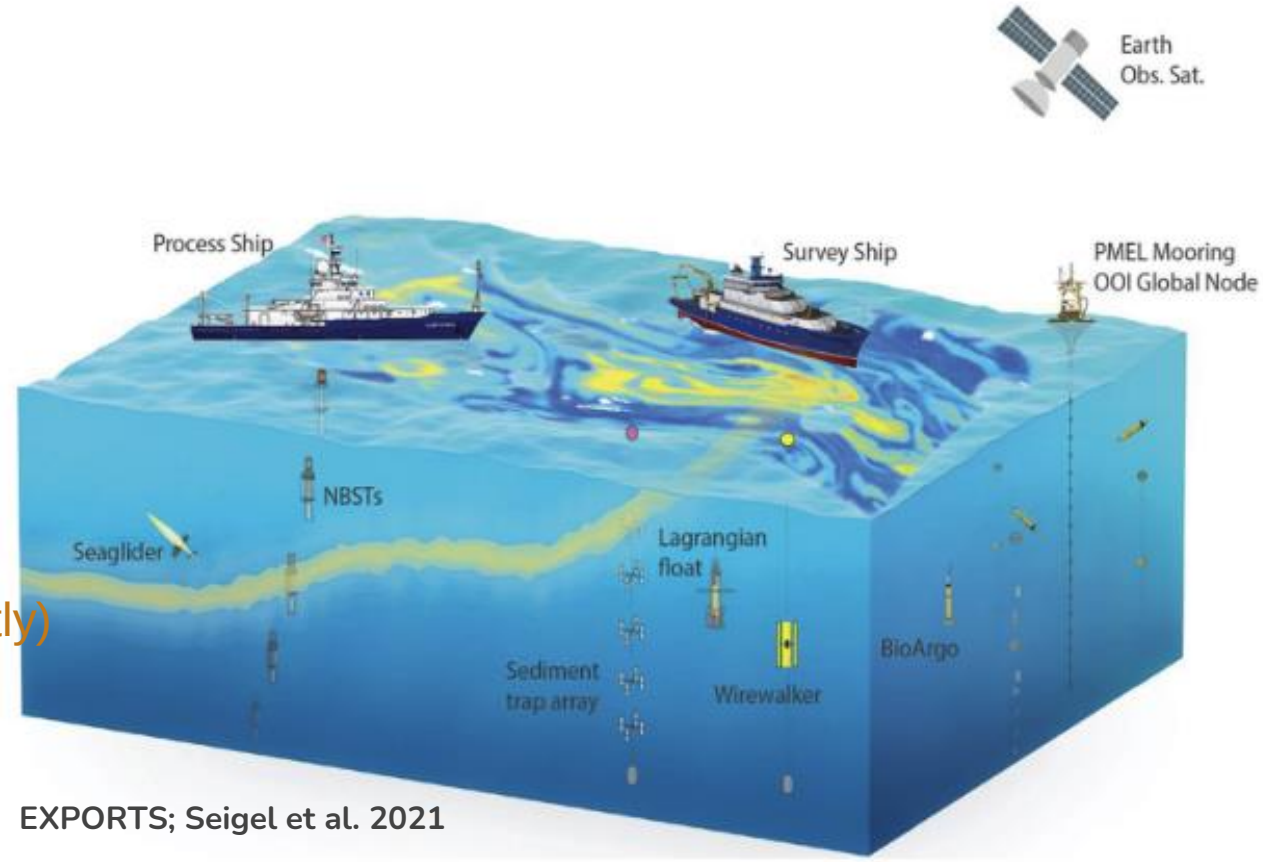
How might the ARF look in the coming decade?

Kipp Shearman

UNOLS
UNIVERSITY-NATIONAL OCEANOGRAPHIC LABORATORY SYSTEM

How might the ARF look in the coming decade?

- **Autonomy will be commonplace as technology becomes robust**
  - Never a replacement for people on ships
  - Enhance footprint, provide endurance, sample dangerous conditions
- **Finding the right composition of research vessels**
  - -Global class RVs are oversubscribed
  - -Coastal/Local class RVs are underutilized
- **Polar Research**
  - -Antarctic Research Vessel (2031 - unfunded currently)
  - -USCG Arctic Surface Capability Science Mission Requirements
- **Greening of the Fleet**
  - -Net-zero emissions from overall federal operations by 2050, including a 65 percent emissions reduction by 2030



EXPORTS; Seigel et al. 2021

How might the ARF look in the coming decade?

SHIP/CLASS	BUILT	Owner	LOA m(ft)	Science Berths	Total Ship Days Used (2022)	Ship Operation + Tech Day Rates	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	End Year
Global Class																											
Thomas G. Thompson	1991	NAVY	84 (274)	36																							2036
Roger Revelle	1996	NAVY	84 (274)	37																							2041
Atlantis	1997	NAVY	84 (274)	37																							2042
Marcus G. Langseth	1991	LDEO	71 (235)	35																							2025
Sikuliaq	2014	NSF	80 (261)	26																							2045
Total in Class							5	5	5	5	5	5	5	5	5	5	4	4	4	4	4	4	4	4	4	4	
Ocean/Intermediate Class																											
Kilo Moana	2002	NAVY	57 (186)	29																							2032
Endeavor	1976	NSF	56 (185)	18																							2022
Atlantic Explorer	1982	BIOS	51 (168)	20																							2026
Neil Armstrong	2015	NAVY	73 (238)	24																							2045
Sally Ride	2015	NAVY	73 (238)	25																							2046
Total in Class							5	5	5	5	5	5	5	5	5	4	4	3	3	3	3	3	3	2	2	2	
Regional Class																											
Hugh R. Sharp	2005	UDel	44 (146)	14																							2035
Taani	2024	NSF	60 (199)	16																							2054
Narragansett Dawn	2025	NSF	60 (199)	16																							2055
Gilbert R. Mason	2025	NSF	60 (199)	16																							2055
Total in Class							1	1	1	1	1	1	1	1	1	2	4	4	4	4	4	4	4	4	4	4	
Coastal/Local Class																											
Robert Gordon Sproul	1981	SIO	38 (125)	12																							2025
Pelican	1985	LUMCON	36 (116)	14																							2025
Walton Smith	2000	U.Miami	30 (96)	16																							2030
Savannah	2001	SkIO/UG	28 (92)	19																							2031
Blue Heron	1985	UMINN	26 (86)	6																							2030
Rachel Carson	2003	UW	22 (72)	9																							2033
Total in Class							6	6	6	6	6	6	6	6	6	6	4	4	4	4	4	2	1	1	0	0	
TOTAL NUMBER OF VESSELS							17	17	17	17	17	17	17	17	17	17	16	15	15	15	15	13	12	11	10	10	

Design Life Extended Life

Service Life for Current & Planned ARF Vessels

2025 - 2035 will see …

- the ARF shrink from
  - 18 to 10 vessels
  - 13 to 8 operating institutions
- three Globals end their design life and enter extended life
- the retirement of ALL Intermediate, Coastal, and Local vessels

Key Take Aways

Deborah Bronk

Bigelow | Laboratory for Ocean Sciences

Suggestions to be included in the plan:

- Should R/V Kilo Moana be replaced, and if so, with what?

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- Global/Ocean class capacity will be reduced due to retirements and mid-life refits – how do we fill the vacuum?

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- Should R/V Kilo Moana be replaced, and if so, with what?
- Global/Ocean class capacity will be reduced due to retirements and mid-life refits – how do we fill the vacuum?
- Coastal / Local class vessels are currently underutilized for science
    - Why?
    - Valuable for training – sufficient justification for their cost?

Suggestions to be included in the plan:

- Must optimize the use of autonomous tools as force multipliers for accomplishing science – do we need a national strategy?

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- National Deep Submergence Facility

"Is that still all we've got?"

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  "Is that still all we've got?"
- Fleet plans need to include a blueprint for achieving Carbon Net-Zero by 2050

Suggestions to be included in the plan:

- Must optimize the use of autonomous tools as force multipliers for accomplishing science – do we need a national strategy?
- National Deep Submergence Facility – “Is that still all we’ve got?”
- Fleet plans need to include a blueprint for achieving Carbon Net-Zero by 2050
- Investments in Cyber Security are essential

We need a BOLD new vision for the Academic Research Fleet and the funds to implement it

Dream Small

We need blue sky thinking to connect science needs with the fleet we need in the future.

Contact information

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