The Future of the United States Academic Research Fleet

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The Future of the United States Academic Research Fleet

Topics

I. **What is UNOLS?** Brief description of UNOLS

II. **Status of the Fleet** History of Fleet to present

III. **Changing Requirements** ~~History~~ where to

IV. **Planning for the Future**

V. **Conclusions**

Topics

UNOLS

University National Oceanographic Laboratory Systems (UNOLS) institutions are joined for the purpose of coordinating oceanographic ships' schedules and research facilities. Primary functions of UNOLS are twofold:

was formed for ~~two~~ to support 2 primary functions:

1) » Facilitate the efficient and cost effective scheduling and operation of the 28 UNOLS research vessels in support of seagoing science;

2 » Plan for the development of a research fleet, deep-submergence facilities and shore facilities that will meet the sea-going needs of scientists at academic institutions and National Laboratories.

Ultimately, all decisions reside with funding agencies and the role of UNOLS is to provide input to those decision making processes.

UNOLS is not a funding agency

UNOLS

UNOLS Institutions and Vessels

UNOLS Institutions

Membership in UNOLS is open to those institutions which use or operate and use sea-going facilities and maintain an academic program in marine science.

Operator Institutions

UNOLS Institutions that operate UNOLS vessels or National Oceanographic Facilities.

UNOLS Vessels

U.S. research vessels generally operated in support of national oceanographic research programs, by academic institutions. Agencies that have provided major support include the National Science Foundation, Office of Naval Research and the National Oceanic and Atmospheric Administration. UNOLS vessels are regularly available to users outside of the operator institution.

UNOLS Institutions and Vessels

UNOLS Today

There are 59 UNOLS Institutions:

- **20 Operator Institutions**
- **39 Non-operator Institutions**

There are 28 UNOLS Vessels:

- **6 Navy Ships (5 Class I, 1 Class II)**
- **8 NSF Ships (1 Class II, 3 Class III, 3 Class IV, and 1 Class V)**
- **14 State or Private Ships (4 Class III, 6 Class IV, 4 Class V)**

The Federally owned vessels are operated under Charter Party Agreements with their respective UNOLS Operator Institution

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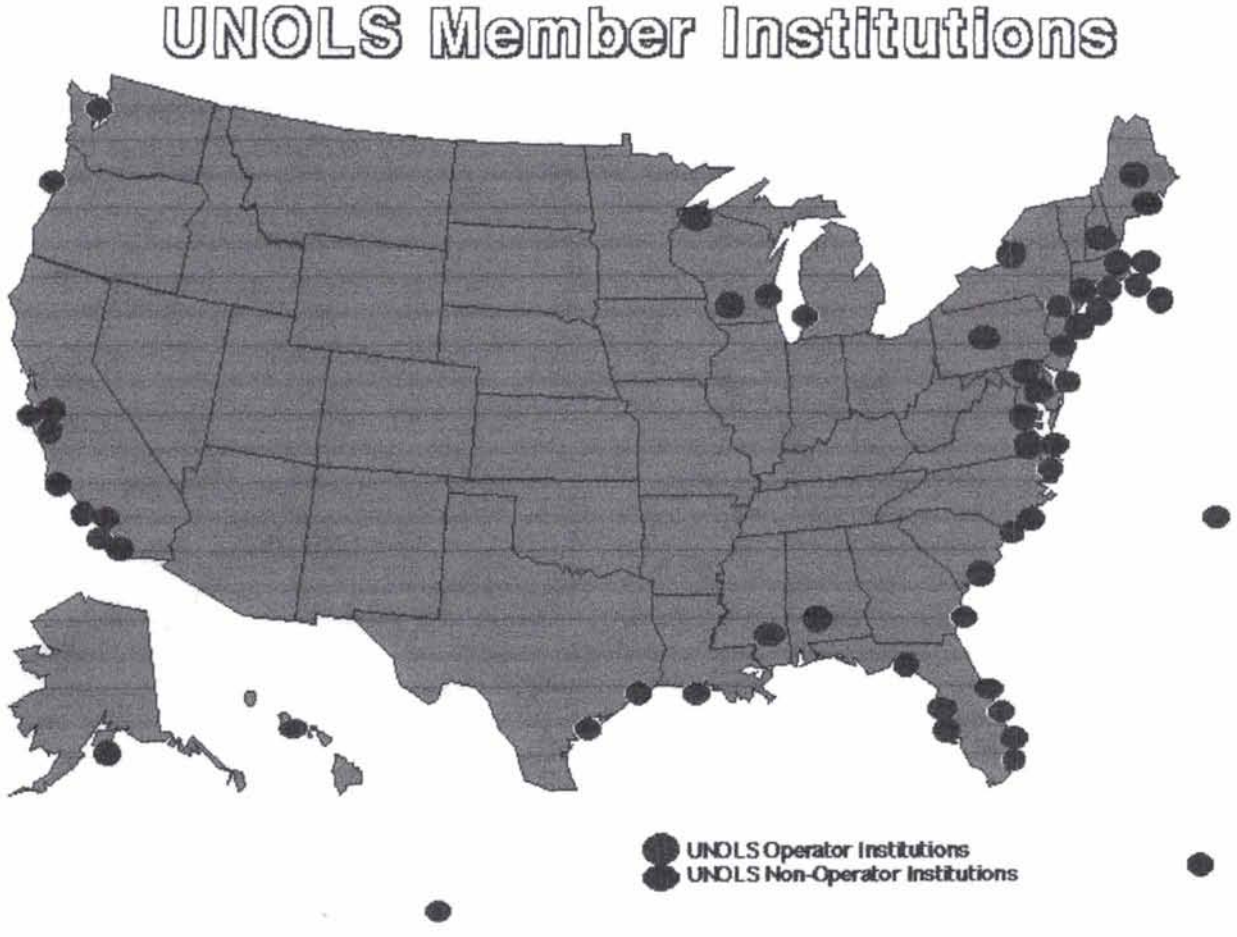
UNOLS Member Institutions



UNOLS Organization

UNOLS Council

The UNOLS Council acts on behalf of the UNOLS Membership as the operating and governing body of UNOLS.

- **Chair - Bob Knox, Scripps Institution of Oceanography**
- **9 Elected representatives from the UNOLS Institutions**
- **6 Ex-officio members (Standing Committee Chairs)**

UNOLS Office

- **Hosted at the University of Rhode Island**

Six Standing Committees

- **Ship Scheduling Committee (SSC)**
- **Research Vessel Operators' Committee (RVOC)**
- **Fleet Improvement Committee (FIC)**
- **DEep Submergence Science Committee (DESSC)**
- **Research Vessel Technical Enhancement Committee (RVTEC)**
- **Arctic Icebreaker Coordinating Committee (AICC)**

UNOLS Organization

Fleet Capabilities

The UNOLS Fleet offers access to a widely distributed set of ships with a variety of capabilities.

- General Purpose Ships
  - » Global/Expeditionary Ships
  - » Intermediate/Regional Ships
  - » Local/Near-shore Ships
- Specialized Capabilities
  - » Submersible Science
  - » Multichannel Seismics
  - » Other Specialized Facilities

Fleet Capabilities

UNOLS

UNOLS Fleet
Large and Intermediate Ships

SHIP	OPERATING INSTITUTION	OWNER	BUILT/ CONV. or M-L	SCIENCE BERTHS	LENGTH
CLASS I/II					
MELVILLE	Scripps Institution of Oceanography	Navy	1969/1990	38	279 ft.
KNORR	Woods Hole Oceanographic Inst.	Navy	1970/1989	34	279 ft.
THOMAS G. THOMPSON	University of Washington	Navy	1991	36	274 ft.
ROGER REVELLE	Scripps Institution of Oceanography	Navy	1996	37	274 ft.
ATLANTIS	Woods Hole Oceanographic Inst.	Navy	1997	24	274 ft.
MAURICE EWING	Lamont-Doherty Earth Observatory	NSF	1983/1990	32	239 ft.
MOANA WAVE	University of Hawaii	Navy	1973/1984	19	210ft.
Class III					
SEWARD JOHNSON	Harbor Branch Ocean. Inst.	HBOI	1984/1994	29	204 ft.
WECOMA	Oregon State University	NSF	1976/1994	20	185 ft.
ENDEAVOR	University of Rhode Island	NSF	1977/1993	18	184 ft.
GYRE	Texas A&M University	TAMU	1973/1980	23	182 ft.
OCEANUS	Woods Hole Ocean. Inst.	NSF	1976/1994	18	177 ft.
NEW HORIZON	Scripps Inst. of Oceanography	SIO	1978/1996	19	170 ft.
EDWIN LINK	Harbor Branch Ocean. Inst.	HBOI	1982/1988	20	168 ft.

All new or upgraded in last 10 years (exception of GYRE)

All upgraded in past 10 years

Class I = >250'
all Navy
(5)
Global

Class II = 200 - 249
(2)
1 Navy / 1 NSF

Class III = 150 - 200'
(7)
3 NSF

Regional

UNOLS Fleet: Class IV & V Ships

SHIP	OPERATING INSTITUTION	OWNER	BUILT/ CONV. or M-L	SCIENCE BUNKS	LENGTH
Class IV					
POINT SUR	Moss Landing Marine Lab.	NSF	1981	12	135 ft.
CAPE HATTERAS	Duke University/UNC	NSF	1981	12	135 ft.
ALPHA HELIX	University of Alaska	NSF	1966	15	133 ft.
ROBERT G. SPROUL	Scripps Inst. of Oceanography	SIO	1981/1985	12	125 ft.
CAPE HENLOPEN	University of Delaware	UD	1976	12	120 ft
WEATHERBIRD II	Bermuda Biological Stat. for Res.	BBSR	1981/1993	12	115 ft.
SEA DIVER	Harbor Branch Oceanographic Inst.	HBOI	1959/1992	12	113 ft.
PELICAN	Louisiana Universities Marine Cons.	LUMCON	1985	15	105 ft.
LONGHORN	University of Texas	UT	1971/1986	12	105 ft.
Class V					
URRACA	Smithsonian Tropical Research Inst.	Smith.	1986/1994	10	96 ft.
LAURENTIAN	University of Michigan	UM	1974	8	80 ft.
BLUE FIN	University System of Georgia	UG	1972/1975	8	72 ft.
CALANUS	University of Miami	UM	1971	6	68 ft.
CLIFFORD A.BARNES	University of Washington	NSF	1966/1984	6	66 ft.

(9)

Class IV = 100 - 149'

3 NSF

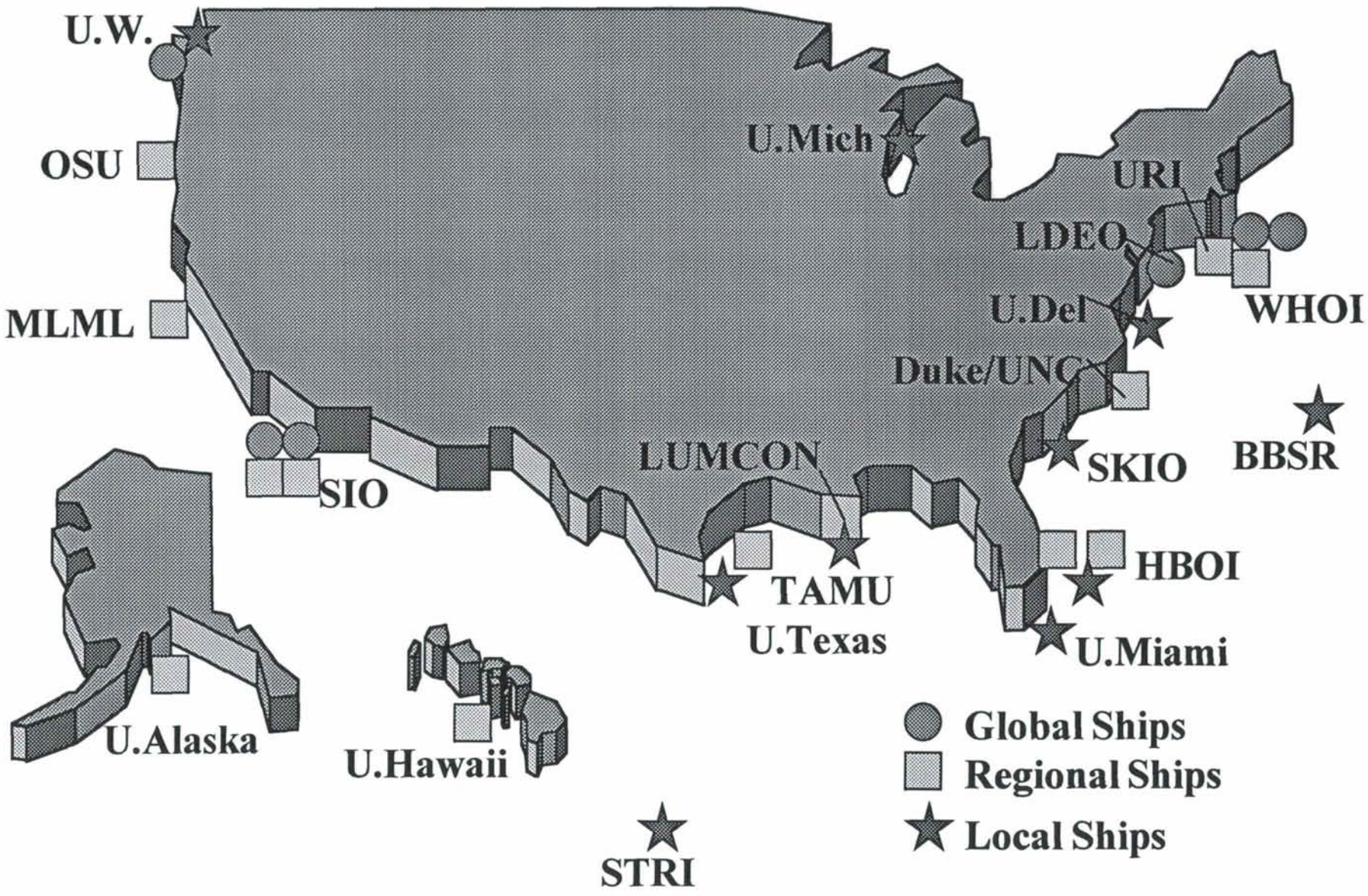
Regional as well as Local

Class V < 100'

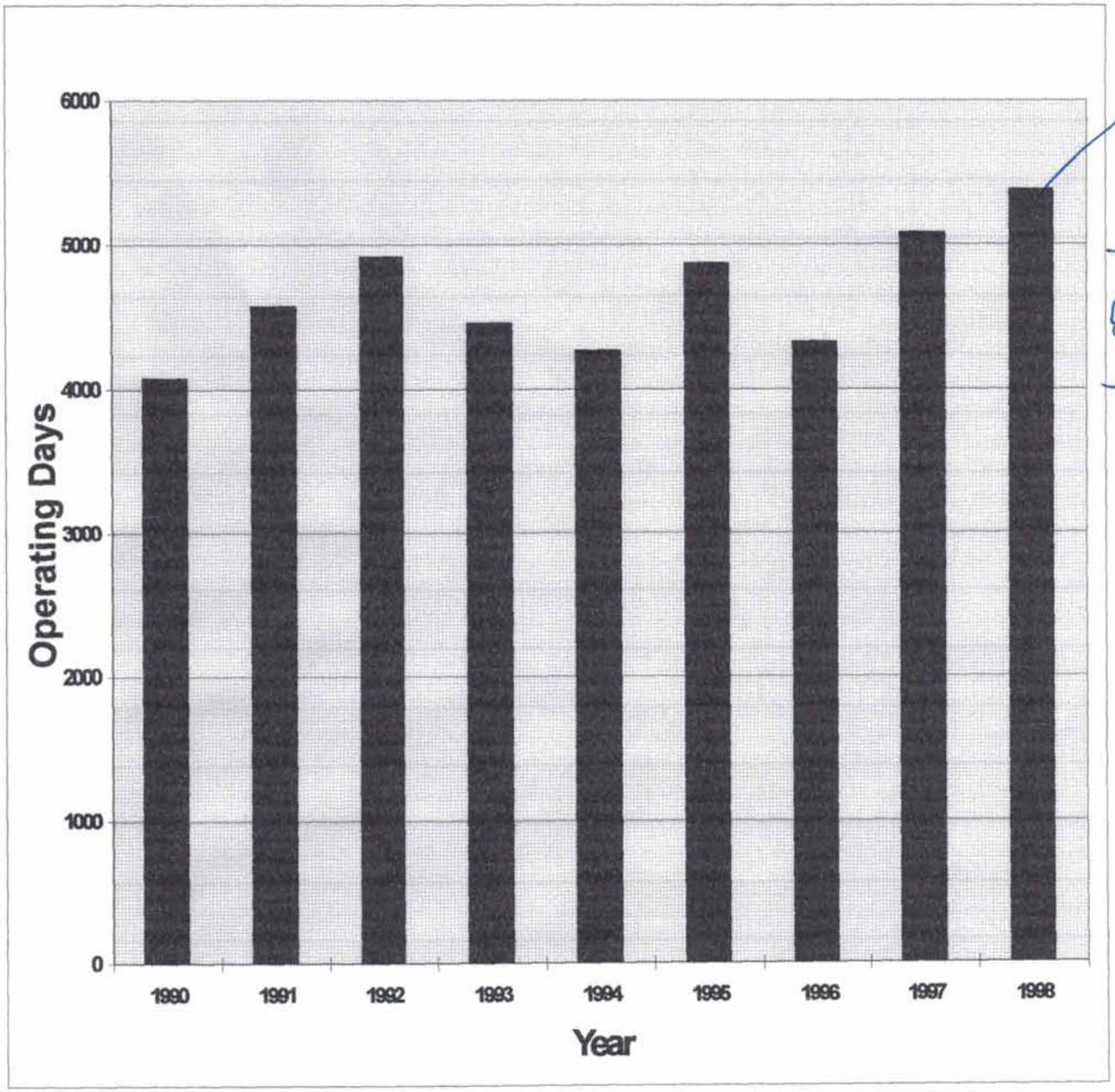
1 NSF

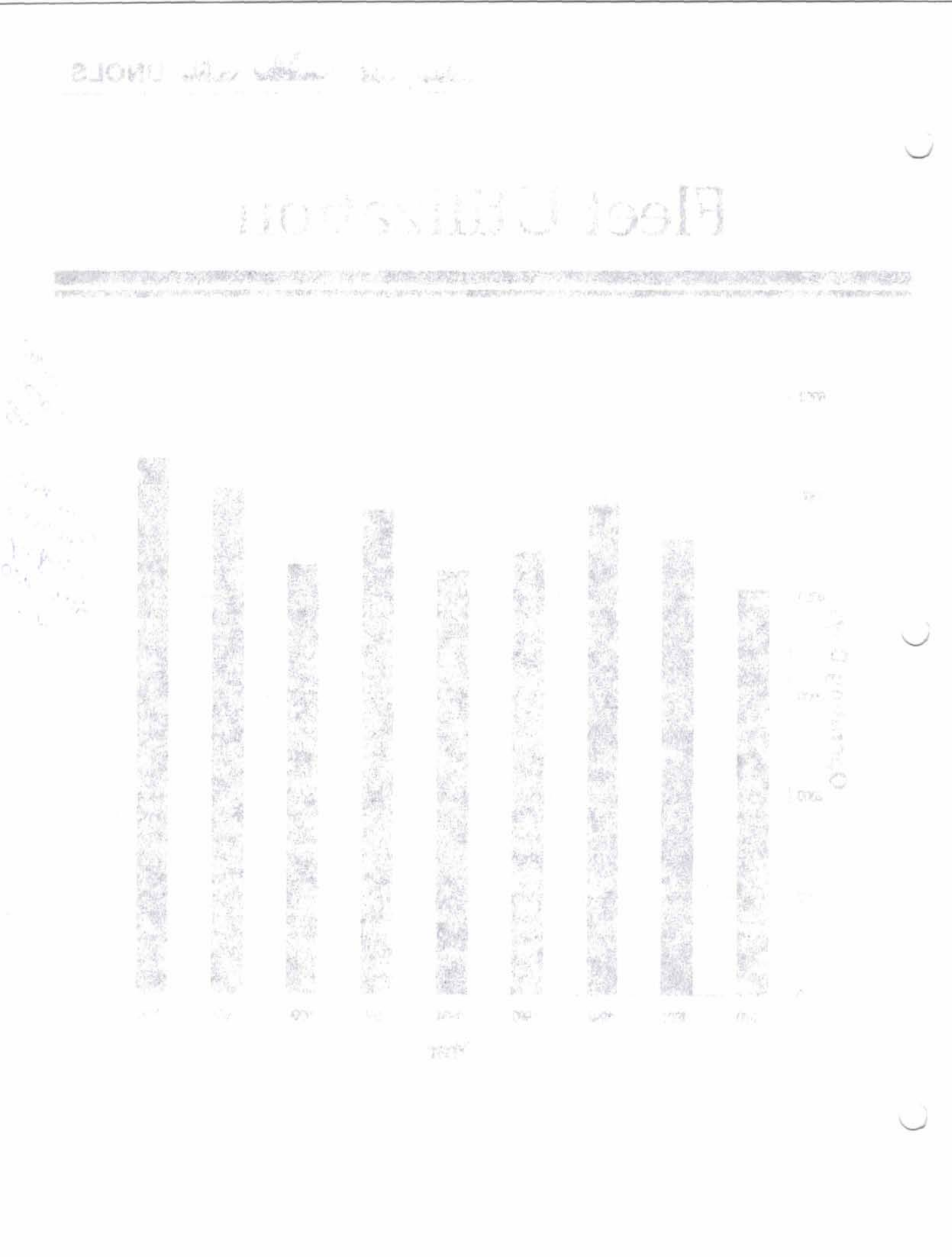
Local

UNOLS Home Port Locations



Fleet Utilization





History of UNOLS

1960's

- Robust Growth in Marine Science & Facilities

1969

- President's Commission on Marine Science (Stratton Commission) Recommends National Oceanographic Laboratory System (NOLS)

1972 - UNOLS is Formed

- Initial Thrusts
  - » Investigator Placement
  - » Cooperative Ship Scheduling
- Early Efforts
  - » Uniform Cost Accounting & Cruise Reporting
  - » Information Services & Equipment Pools
  - » Technical Services
  - » Foreign Clearance Procedures
  - » Specialized Facilities
  - » Safety Standards
  - » Fleet Replacement Planning

→ Provide Access to sea for all funded scientists in academic

↳ Coordinate the scheduling

History of UNOLS

UNOLS Fleet: Past and Present

1972	1998
9 Class II	5 Class I
6 Class III	2 Class II
7 Class IV	7 Class III
13 Class V	9 Class IV
35 Total Ships	5 Class V
	28 Total Ships

no Class I

- By 1973, five of the smaller ships dropped out of the fleet leaving 30 ships.
- The total number of ships over the years has not varied much.
- Significant turnover - 63 ships have been designated as UNOLS ships since 1972
- Only four ships of the original Fleet Remain:
  - » KNORR & MELVILLE - Major Refit 1989-1991
  - » ALPHA HELIX - SMR development in progress
  - » CALANUS - U.Miami has selected replacement design.

Replacement planning has begun

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[illegible]

[illegible]	[illegible]
[illegible] Class II	[illegible]
[illegible] Class III	[illegible]
[illegible] Class IV	[illegible]
[illegible] Class V	[illegible]
[illegible] Total Ships	[illegible]
	25

- By 1972, two of the [illegible] designed as UNCLAS [illegible]
- The total number of ships [illegible] was not varied [illegible]
- Significant [illegible] designated as UNCLAS [illegible]
- Only four ships of the original fleet remain.
  - NORA & [illegible]
  - ALPHA HELIX [illegible]
  - CALANUS [illegible] design

UNOLS Fleet: Past and Present

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UNCAS Fleet
Past and Present

Fleet Capabilities

The following spreadsheets give a comparative inventory of science and navigational equipment aboard UNOLS ships over a twenty six year period, 1972 to present.

Three "Global" ships, GILLISS, pre-stretched KNORR and the newest AGOR general purpose ship, REVELLE; are compared.

For the Intermediate class, TRIDENT, KANA KEOKI and post-overhaul WECOMA provide the comparative views.

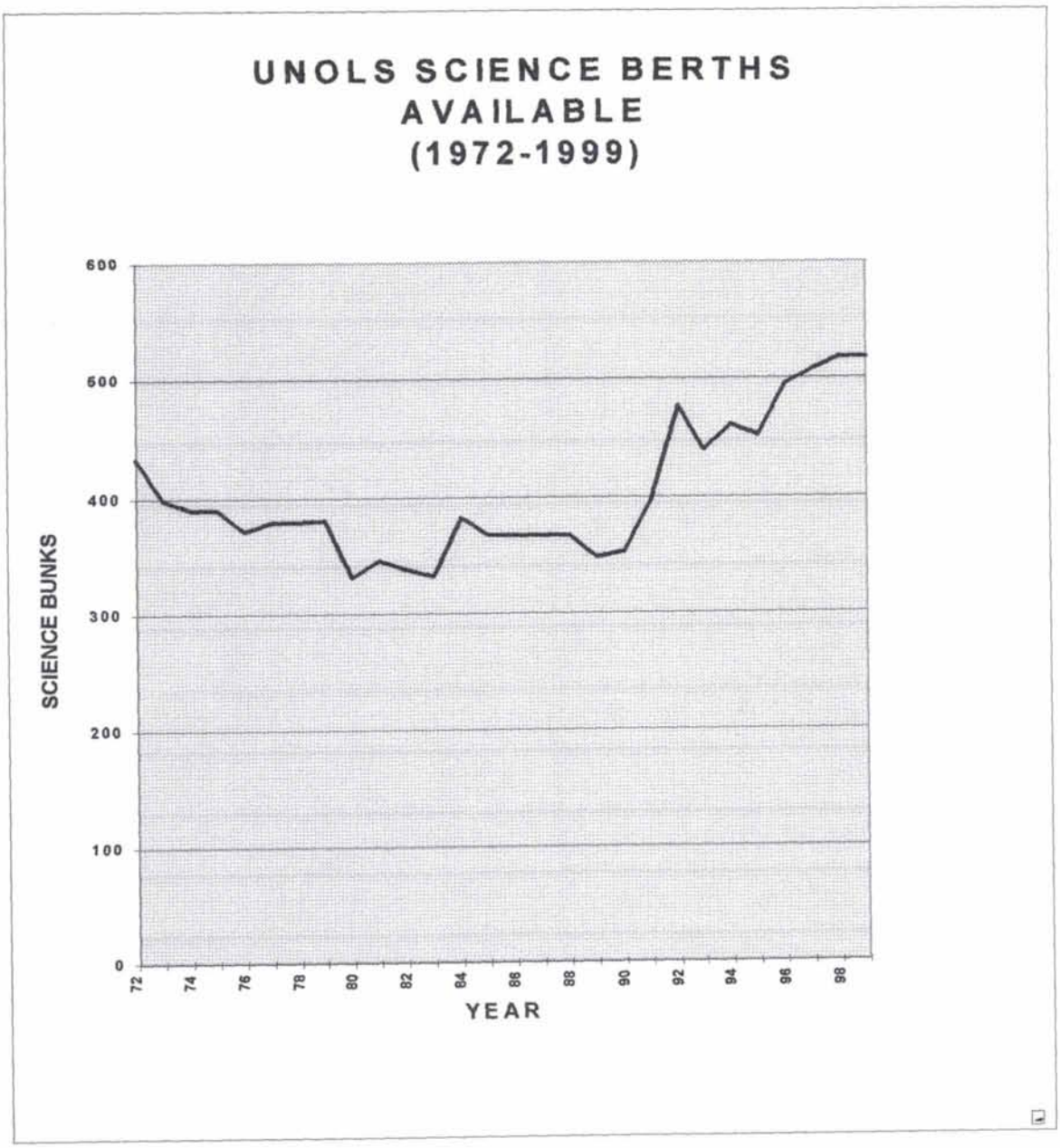
- **Not only has there been a dramatic increase in the technology aboard these ships through the years but the number of scientists verse the number of crew persons has shown a marked improvement.**
- **The combination of these two advancements have resulted in more efficient use of the platforms and a quantitative and qualitative increase in the data stream available to the scientific community.**

Fleet Capabilities

Global/Expeditionary Ships	1972-1980	1981-1989	1990-1998
Average Number of Ships	7	6	6
Typical Ship of the Class	GILLISS	KNORR	REVELLE
Length	209ft	245ft	274ft
Cruising Speed	11kts	10kts	13.5kts
Crew/Scientists ratio	1.16	1	0.59
Navigation			
LORAN	Y	Y	
TRANSIT Satellite		Y	
GPS			Y
GPS - Differential			Y
GPS P-CODE			Y
3-Axis GPS			Y
Electronic Charting			Y
Dynamic Positioning			Y
Dual axis speed log			Y
Communications			
H F Radio	Y	Y	Y
INMARSAT A		Y	Y
INMARSAT C			Y
INMARSAT M			
INMARSAT B			Y
SEANET			
M-SAT			
Scientific Equipment			
CTD		Y	Y
SEA SOAR/SCAN FISH			Y
Gravity meters			Y
Multi-Beam Sonar			Y
Chirp Sonar			Y
ADCP			Y
Bottom Sampling			
Coring		Y	Y
Coring 30 meter			Y
Wire/Ropes/Cables			
1/4"	Y		Y
1/2"	Y		
9/16"		Y	Y
.322 Conductor		Y	Y
.680 Conductor			Y
ROV Handling			Y
Other			
Hi spd computer network			Y
CD Rom Data Distribution			Y
Inkjet Hi Res. Color printer			Y

Intermediate/Regional Ships	1972-1980	1981-1989	1990-1998
Average Number of Ships	9	12	13
Typical Ship of the Class (150-200 ft)	TRIDENT	KANA KEOKI	WECOMA
Length	179 ft	156 ft	185 ft
Cruising Speed	11kts	11 kts	12
Crew/Scientists ratio	1.58	0.68	0.67
Navigation			
LORAN	Y	Y	Y
TRANSIT Satellite	Y	Y	
GPS			Y
GPS - Differential			Y
GPS P-CODE			Y
3-Axis GPS			Y
Electronic Charting			Y
Dynamic Positioning			
Dual axis speed log			Y
Communications			
H F Radio	Y	Y	Y
INMARSAT A			Y
INMARSAT C			Y
INMARSAT M			Y
INMARSAT B			
SEANET			
M-SAT			
Scientific Equipment			
CTD	Y	Y	Y
SEA SOAR/SCAN FISH			Y
Gravity meters		Y	
Multi-Beam Sonar			
Chirp Sonar			Y
ADCP			Y
Bottom Sampling			
Coring	Y	Y	Y
Coring 30 meter			
Wire/Ropes/Cables			
1/4"			Y
1/2"	Y		Y
9/16"		Y	Y
0.219 Conductor	Y		
.322 Conductor		Y	Y
.680 Conductor			Y
ROV Handling			
Other			
Hi spd computer network			Y
CD Rom Data Distribution			Y
Inkjet Hi Res. Color printer			

Science Accommodations



Changing Requirements

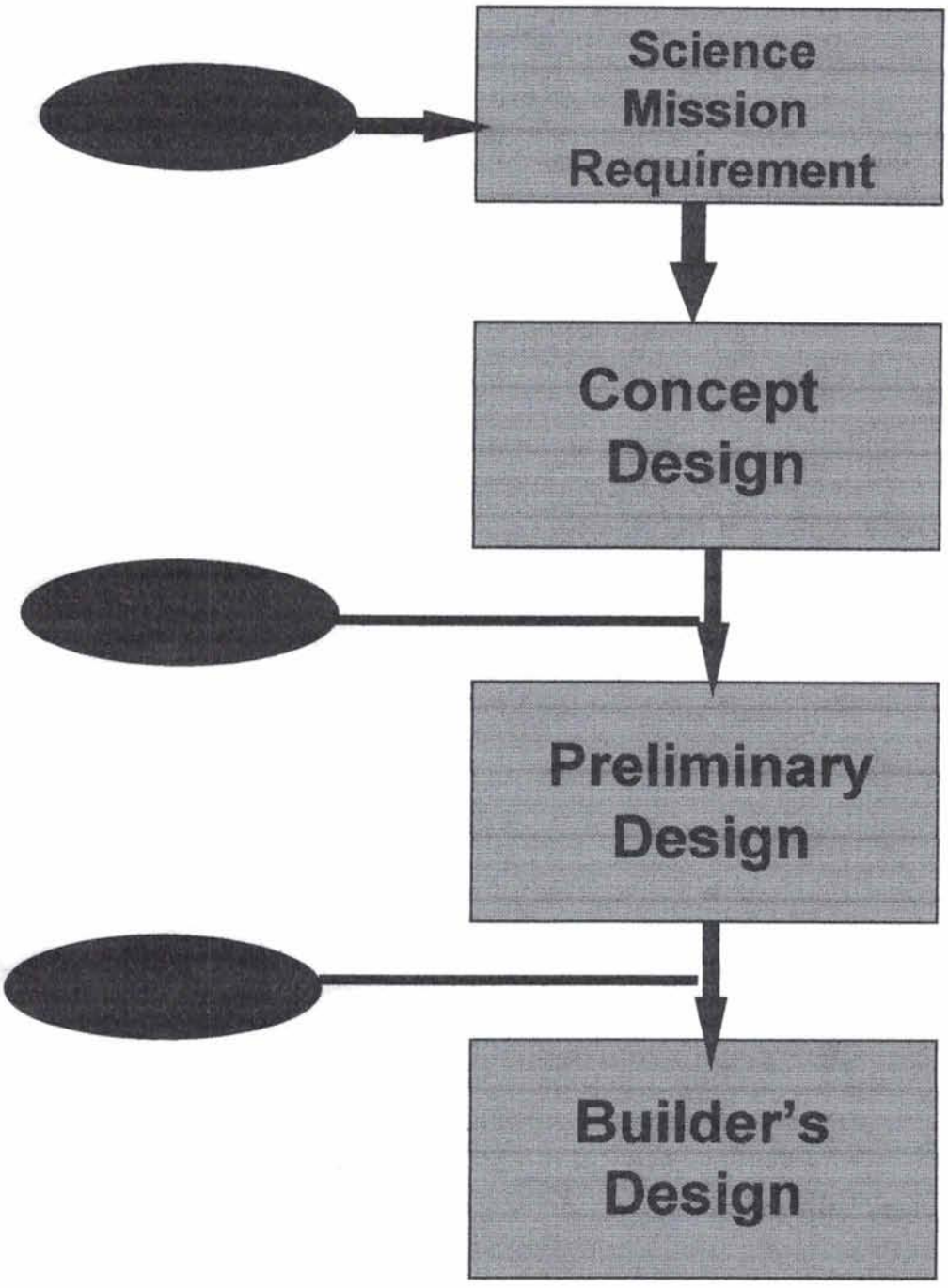
The Fleet has Evolved over the years with Changing Science Needs and Technology Upgrades.

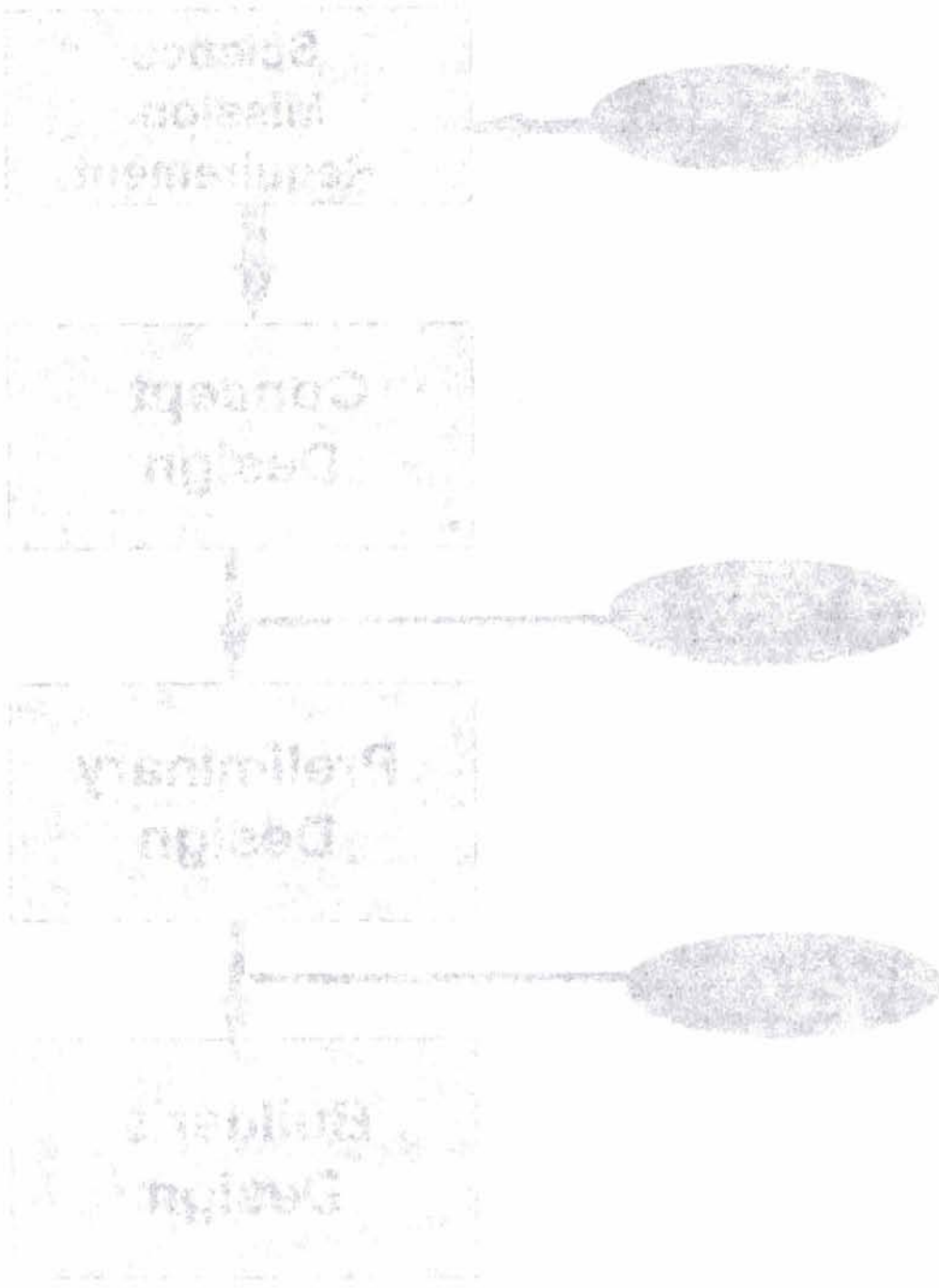
What role did FIC play?

- **One of UNOLS' Initial tasks was to form a working group to study the needs for replacing the aging UNOLS ships.**
- **This working group became the ad-hoc Fleet Replacement Committee.**
  - » **It provided planning for three OCEANUS Class ships and two CAPE class ships.**
  - » **Laid groundwork for the series of AGORs starting with AGOR 23, THOMPSON.**
- **When Improvement became higher priority, the committee changed its focus and its name. It is now called the Fleet Improvement Committee (FIC) and became a standing committee of UNOLS in 1988.**

Changing Requirements

UNOLS Fleet Replacement/Improvement Process





Components of an SMR Document

- - Endurance
- - Accommodations
- - Speed
- - Seakeeping
- - Station Keeping
- - Ice Strengthening
- - Deck Working Area
- - Cranes and Winches
- - Overside Handling
- - Towing
- - Laboratories
- - Special Facilities
- - Vans, Workboat, Science Storage
- - Acoustical Systems
- - Navigation / Positioning
- - Communications
- - Satellite Monitoring
- - Ship Control

Contents of this Section

SMR Library

Large Ships: Class I & II

- **Large High-endurance, General- purpose Research Ships**
- **Large Medium endurance, General-Purpose**
- **Large High Performance, General-Purpose, SWATH**

Intermediate Ships: Class III

- **Intermediate General-Purpose**
- **Intermediate General-Purpose SWATH**
- **Intermediate Ice-capable General-Purpose**

Small Ships: Class IV

- **Small General-Purpose**
- **Small General-Purpose SWATH**
- **Manned Spar Buoy (FLIP)**

SMR Applications

- **Development of plans for mid-life of OCEANUS Class**
- **Used to evaluate need for improvements to the CAPE class R/Vs**
- **Provided groundwork for development of conceptual designs and studies for:**
  - **» Large Oceanographic Research Ships**
  - **» SWATH vessels**
  - **» Arctic Research Vessels**
- **Used as templates for future SMR.**

SMIR Applications

Subcommittee:
- users of ALPHA H
- U. Alaska sci
- NOAA/Fisheries

Alaskan SMR

Operational Area:

Oceanographic Research (including Fisheries) in:

- **N. Pacific Ocean (year-round in open water)**
  - » **Gulf of Alaska & Bering Sea**
- **Chukchi & Beaufort (seasonally ice-covered) Seas**

Environmental Conditions:

- **Open water requires a stable platform**
- **90 F to -25 F**
- **Seasonal sea ice (up to 3')**

Size: Class III - 180' loa, 1600 gross tons, 13' draft

Science Party: 18-20

Endurance: 45 days

Total Lab Areas: 2000 sq. ft

Science Features:

- **General Oceanographic**
- **Fisheries**
- **Ice strengthening**

Alaskan SMART

Planning for the Future

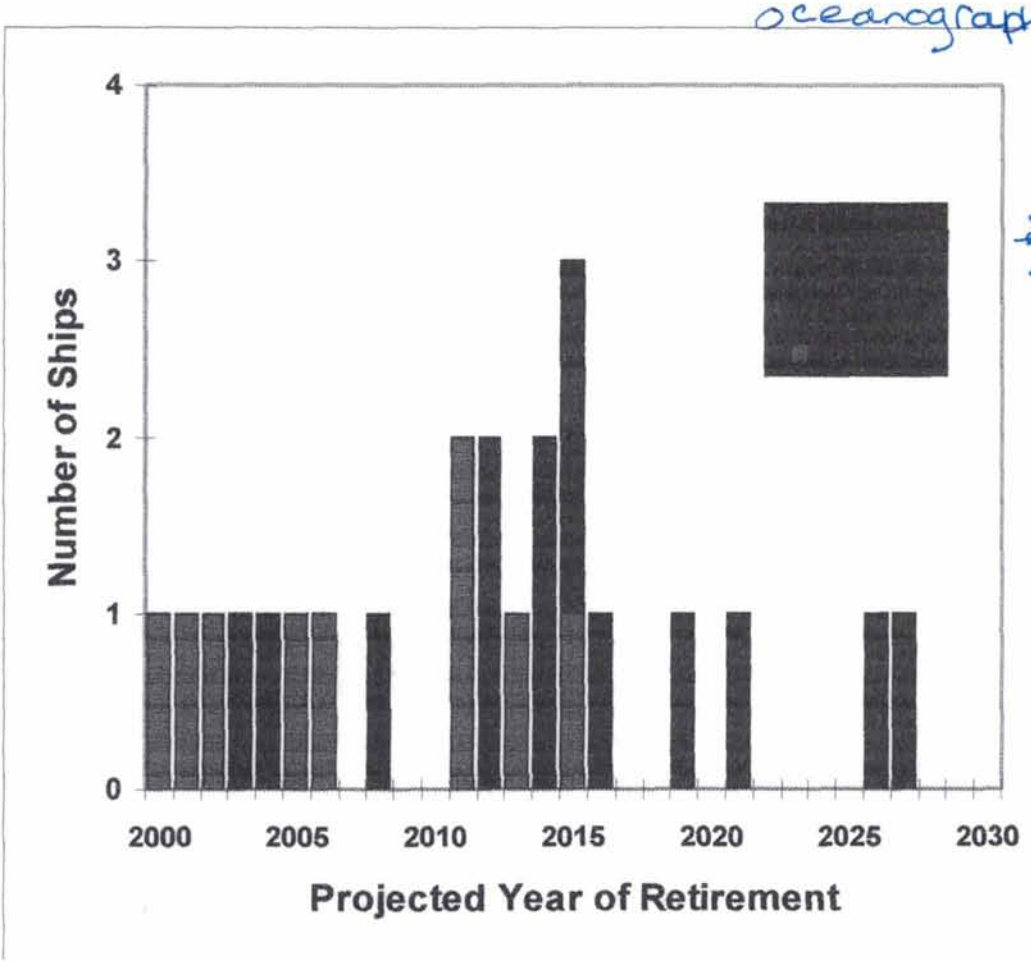
- **Another focus of FIC has been to develop a Fleet Improvement Plan (FIP).**
  - » **Trends in Oceanography and Facility Needs**
  - » **Trends and Issues Regarding the UNOLS Fleet**
- **The current plan was published in 1995 and is now in the process of being revised.**
- **The revision will offer an assessment of the UNOLS Fleet and will address:**
  - » **Ship-life projections**
  - » **Regulatory Requirements**
  - » **Agency science facility needs**
  - » **Fisheries Research**
  - » **ROV / AUV handling capability**
  - » **Long coring capability**
  - » **Coastal Facility Needs**
  - » **New technologies & support requirements**

Planning for the Future

UNOLS Fleet Improvement and Planning

access the fleet to determine if it can meet future oceanographic research needs

UNOLS must continue to ~~plan for new ships as many of the~~ Class III and IV ships are nearing the end of their useful life.



~~2015~~ 2005:
4 Class IV vessels reaching end of useful life
1 Class III
1 Class II

MAJOR UNOLS FLEET CHANGES IN THE NEAR FUTURE

Funded:

- **AGOR 26, a Small Waterplane Area Twin Hull Ship (SWATH) at University of Hawaii.**
- **USCG Research Icebreaker MICHAEL HEALY**

Under Consideration:

- **Coastal research vessels**
  - **» Small near-shore vessels:**
    - **– BLUE FIN Replacement**
    - **– CALANUS Replacement**
  - **» East Coast (Shelf to Slope)**
    - **– SMRs are under development: intermediate size ship with ability to carry large science parties**
- **ALPHA HELIX Replacement**

MAJOR UNCOMMITTED PROJECTS
(NOT IN NRA CAPITAL PLAN)

Funded:

- AGOR 26 a Small Waterplane Area Twin Hull Ship (SWATH) at University of Hawaii
- USCG Research Icebreaker MEDIUM ICEBREAKER

Under Consideration:

- Coastal research vessels
  - Small near shore vessels
    - BLUE FIN Replacement
    - CALANUS Replacement
    - East Coast (Saint Petersburg)
      - SMRs are under-powered for ocean operations
      - Intermediate size ship with [illegible]
      - carry large scientific parties
- ALPHA HELIX Replacement

Summary

- **UNOLS Fleet is in best condition ever.**
- **Nearing completion of a decade that will see nearly $200 M in capital improvements to the Fleet.**
  - » **Class I are new or they have undergone major mid-life refits.**
  - » **Most Class III have undergone major mid-life refits during the past five years.**
  - » **Replacement, construction, and upgrade of several small, coastal vessels are under consideration.**

Summary

- UNCLOS Fleet in its best condition ever.
- Nearing completion of a decade that will see nearly $200 M in capital improvements to the fleet.
  - Class I are new or like new vessels undergone major mid-life refits.
  - Most Class II have undergone major mid-life refits during the past five years.
  - Replacement, construction, and upgrade of several small coastal vessels are under consideration.

Conclusions

- The UNOLS Fleet has been effective in keeping abreast of accommodating modern research by providing new and updated platforms to perform needed studies.
- These seagoing facilities provide the platforms ~~in which the platforms~~ on which the bulk of American oceanographic research is performed.
- However, we must continue to plan for modernization and/ or new construction.
- The key ingredient in this process is the involvement of the user, sea-going scientist.

Conclusions

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- These seagoing facilities provide the platforms in which the platforms on which the bulk of American oceanographic research is performed
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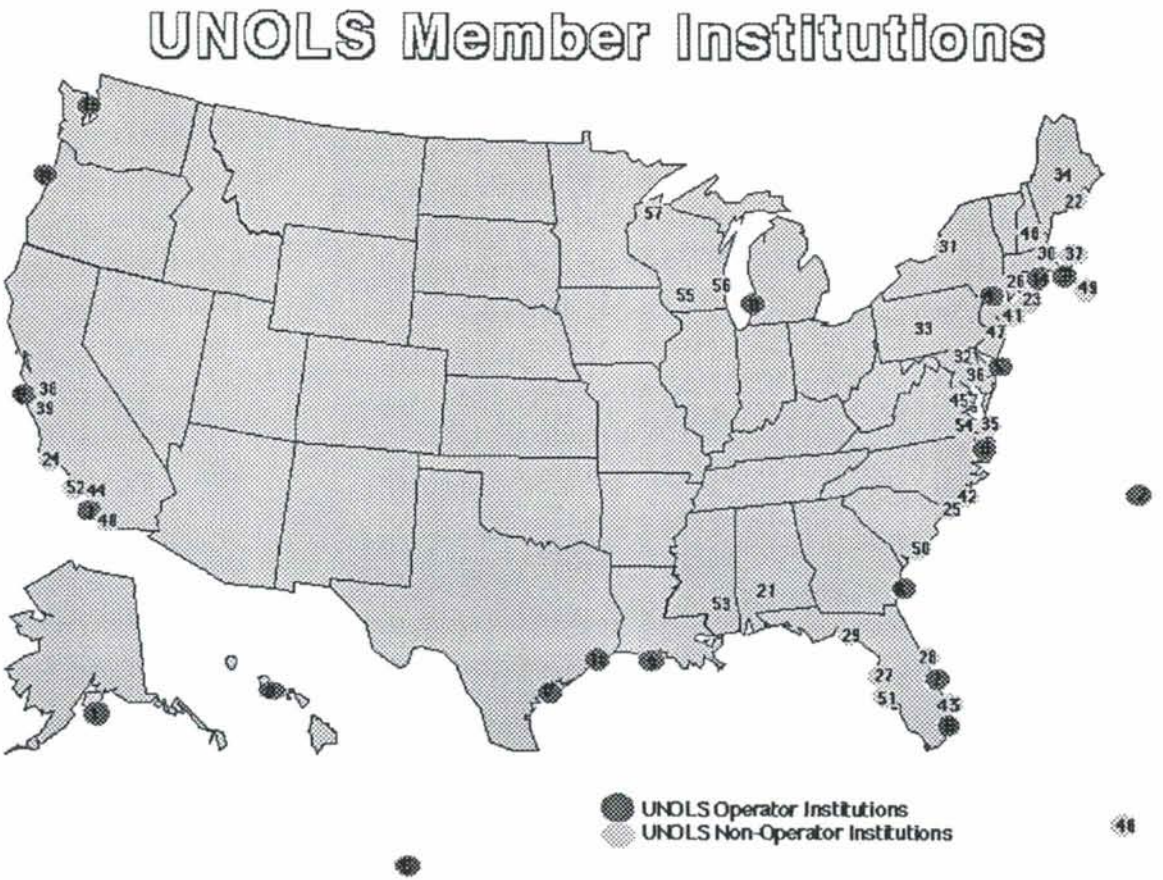
UNOLS Member Institutions



UNOLS Fleet Improvement and Planning

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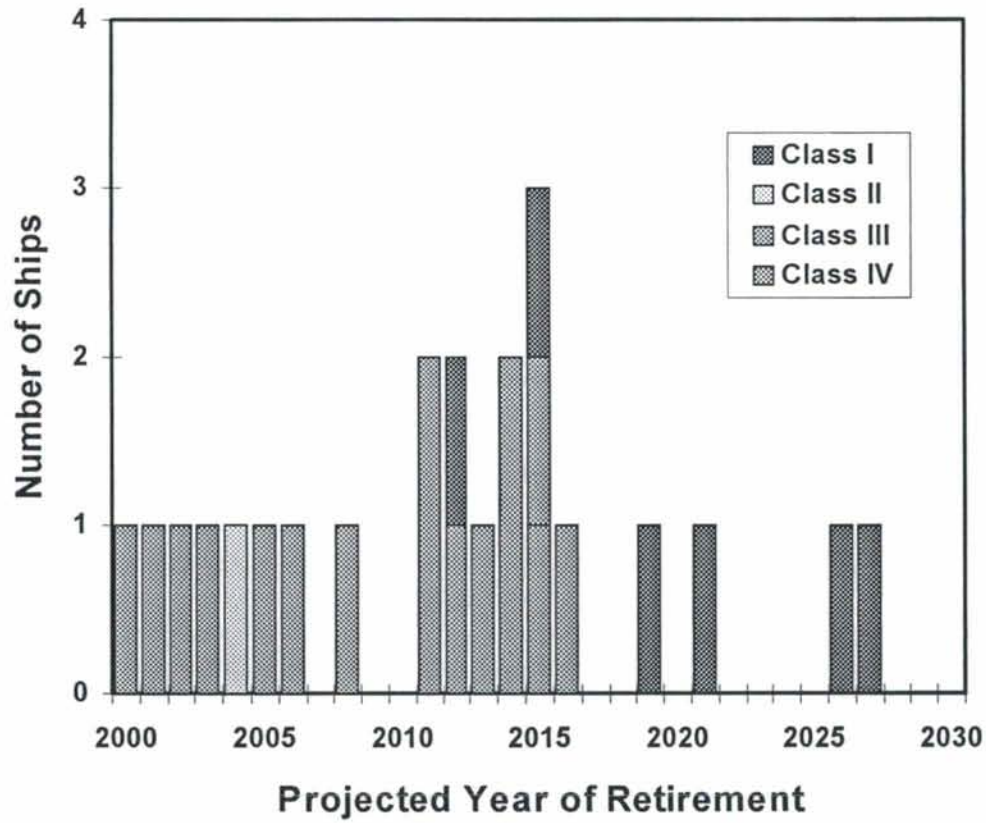

UNOLS Fleet Utilization