

# **U.S. OCEAN-RELATED ACADEMIC INFRASTRUCTURE**

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## **EXECUTIVE SUMMARY**

The Oceans Act of 2000 was enacted on August 2000, establishing the Commission on Ocean Policy and calling for a report to Congress with recommendations for a comprehensive U.S. ocean policy. Among the required elements of the report is an “assessment of existing and planned facilities associated with ocean and coastal activities including human resources, vessels, computers, satellites, and other appropriate platforms and technologies.” Central to this infrastructure assessment is an evaluation of the U.S. investment in academic ocean sciences research and education. This report has been prepared to address this assessment requirement.

The academic ocean sciences community in the United States is exceptionally broad, diverse and diffuse. The ocean sciences are interdisciplinary in nature and encompass the natural science fields of biology, chemistry, physics and geology; ocean and coastal engineering; and marine policy. Students of the ocean sciences can be found in technical and two-year colleges, military academies, and universities in either undergraduate or graduate programs. Identifying these students and the institutional resources used to educate them is critical to understanding the current state of the ocean sciences community in this country and to identifying areas where additional efforts may be required to ensure a robust ocean sciences endeavor in the future.

### **Academic Research Funding**

The 79 academic programs surveyed in the study received total research support of \$932 million during academic year 2001-2002 (AY 2002). The federal government was the predominant funding source, providing \$598 million or about 64% of all the funds received. No other source of financial support exceeded 10% of the total. Non-federal funding sources included internal institutional support, states, private foundations, and private corporations.

The National Science Foundation, (NSF) was the largest federal funding source in AY2002, providing about \$214 million or more than a third of the total federal agency funding for the ocean sciences. This amount was equal to the combined investment of the two next largest agency funding sources, the U.S. Navy and the National Oceanic and Atmospheric Administration (NOAA). Navy and NOAA each contributed about \$107 million or 18% of the federal academic ocean sciences budget. Five other agencies or departments individually provided less than 8% of the total federal support. Their ocean sciences budgets were as follows: National Aeronautics and Space Administration (NASA) \$49 million; Department of the Interior \$27 million; Department of Energy \$12 million; Environmental Protection Agency \$14 million. The total federal contribution from agencies other than those listed accounted for about \$65 million of the research support for the surveyed institutions.

The research funding available in AY2002 to institutions surveyed supported a workforce of 7901 people. Thirty percent of that total was composed of graduate students. Research staff, technicians, and other non-technical staff together made up almost half (45%) of the remaining personnel supported by research funds. Professors constituted about 18% and postdoctoral researchers were reported as the smallest component (6%).

A subset of 10 institutions, the original members of the Joint Oceanographic Institutions, was selected to look at changes in funding levels over time. These selected programs are among the most comprehensive and best documented in the nation. However, survey data from each of the ten selected programs exist only for the academic year 1996-1997 (AY1997) and AY2002. Analysis of the AY1997 and AY2002 data provides a snapshot of the research support received by the academic ocean sciences community during these two school years.

The total amount of funding spent on research at the selected programs has increased from \$398.8 million in AY1997 to \$439.4 million in AY2002 (+10.2%). The federal government remains the largest source of funding for academic ocean science at the selected programs, but it is declining in importance. State and local funding of ocean research at the 10 selected programs has declined from 9.5% in AY1997 to 5.1% in AY2002. However, these programs' research budgets have increased in the face of overall declines in total federal, state and private funding.

This change raises the question of where institutions look to replace decreasing support from traditional sources. The data collected by this study may suggest answers. For example, while NSF was the only funding source to show a substantial increase, research dollars that could not be attributed to a traditional category grew from less than \$1 million in AY1997 to almost \$88 million in AY2002.

Looking more closely at the raw data in this "other research support" category suggests a number of reasons for this: (1) the responding institution could not provide enough information to classify funding under a better-defined category or the corresponding category was not available in the 1997 survey (e.g. "Other Department of Interior"); (2) the research support came from less traditional funding sources including foreign governments, international organizations, and quasi-governmental entities like local port authorities; (3) more institutions appear to be participating in consortia or pooling their funding from federal, state and private sources, making it impossible to assign the resources to a single category. Obvious examples of such arrangements are the National Oceanographic Partnership Program and the National Sea Grant College Program.

## **Facilities at U.S. Academic Institutions**

As part of the funding and facilities survey, an assessment was conducted of the current availability, age, and type of facilities and vessels housed at academic institutions that support ocean and coastal research.

Not surprisingly, the largest category of facilities reported was research vessels over 25 feet. Although research vessels under 25 feet almost certainly were undercounted, this category was the second largest followed by buildings and laboratories, underwater vehicles, general instruments, and supercomputers respectively. Very few institutions have replacement plans for their facilities, and a number of programs noted that lack of available funds was the primary factor preventing planning.

## **U.S. Graduate Programs**

Institutions surveyed received a relatively constant number of applications to 58 marine graduate programs offered in 2001 and 2002 (approximately 4000 per year). One-third of the applicants were admitted. The total number of graduate students in residence during Fall 2001 at 60 different programs was 3255. Thirty-six percent of these students were in a marine biology or biological oceanography program. Aquaculture and fishery sciences made up the next largest segment of this population (12%). The number of students in chemical oceanography, physical oceanography, marine geology and geophysics, and ocean engineering programs were about equal (between 9% and 10% each). Marine policy, coastal and estuarine studies, and "other" fields made up the remainder of the student population in residence during Fall 2001. The majority of students in the category entitled "other" were identified as studying "atmospheric and ocean sciences".

The overall gender distribution of graduate students in residence consisted of 53% men and 47% women. However, intra-field comparisons show that women dominated marine biology and biological oceanography and made up about half the students in chemical oceanography and marine chemistry and in marine geology and geophysics. Men were the majority in ocean engineering and physical oceanography. Twenty-three percent of students in residence as of Fall 2001 were foreign citizens. Eighty-eight percent of the U.S. citizens in residence were reported to be "white".

On the issue of support for graduate students in residence, the majority (56%) during Fall 2001 were supported by research assistantships. In contrast, traineeships made up the lowest percentage of reported student support (1%). Ten percent of the students in residence had teaching assistantships; 13% had fellowships; 8% received support from some other source; and 12% received no financial support. This aspect of the graduate student experience is important, since the type of support a student

receives in graduate school influences the development of research, teaching and management skill sets. Such opportunities can limit or expand a student's awareness of different career paths and job sectors open to them.

With regard to degrees awarded, a total of 737 students received a masters or doctoral degree between July 2000 and June 2001. After graduation, 25% of the degree recipients were employed at a four-year college, university or a university-affiliated research center. Doctorate recipients comprised most of that 25% (127 doctoral degree recipients compared to 59 masters degree recipients). On the other hand, a higher percentage of masters recipients were employed by a federal agency or private (for-profit) organization (133 masters degree recipients compared to 61 doctoral degree recipients). Unfortunately, approximately 26% of the programs surveyed could not report the initial employment of their recent graduates.

The largest number of master and doctoral degrees were awarded in marine biology or biological oceanography and the distribution of degrees in other fields can be found in Chapter 5. The gender and racial distributions of degree recipients was similar to ratios seen among graduates in residence.

### **Undergraduate Programs at Two-year and Four-year College and Universities**

Interest in ocean sciences and related fields is strong at the undergraduate level. Among students at four-year and two-year institutions more than eleven thousand students were enrolled in a semester-long or year-long introductory ocean science-related course in 2002. This enrollment comprised almost nine thousand students at 4-year colleges and 2,500 at 2-year programs.

The baccalaureate degree programs offered by institutions surveyed are marked by a diversity of sub-fields and, in fact, the category "other" contained the largest number of bachelors degrees awarded in AY2001 (26% of total number of degrees awarded). A large number of undergraduates who received degrees in the ocean sciences studied marine biology (21%) and marine science (19%). The marine transportation and safety field graduated 11% of the ocean science students in AY2001. Overall 59% of the bachelors degrees awarded were given to men and 41% went to women.

Baccalaureate programs were asked to provide information on where their students go after college. These students went to graduate school (12%), were employed as K-12 teaches (1%), were employed in the military (13%), went to work in the private sector (18%), or were employed by the civilian government (5%). However, the post-graduation plans of almost half of the students were unknown to department or program administrators.



With respect to the 2-year programs, 12 institutions awarded 595 certificates or associates degrees between July 2000 and June 2001. The most popular fields included marine technology, commercial diving, and marine transportation and safety. Of these graduates, 95% of the associates degrees and certificates were awarded to men; 5% were awarded to women. These data on degrees awarded by gender are consistent with those collected for the 1999-2000 academic year through the U.S. Department of Education's Integrated Postsecondary Educational Data System (IPEDS). The overwhelming majority of graduates went into the general workforce.

### **Faculty of Marine Academic Programs**

A total of 2562 faculty were involved in baccalaureate and graduate ocean science related programs at 86 schools. CORE asked each department not only to provide the numbers of people employed as faculty, but also the full-time equivalents (FTE) allotted to their department or program. Overall, 2227 FTEs were allotted to 86 programs. Most of those (72%) were in tenured or tenure-track positions. The majority (75%) of job openings at the institutions surveyed are for tenure-track positions.

Fifty-nine programs reported 374 (67.3%) of their postdoctorates were men; 185 (33.1%) were women. This ratio of men to women is approximately equal to the ratio found among assistant professors. In addition, recently released data from the National Science Foundation on earned doctorates during 2000-2001 show a similar figure (32.7%) for women earning ocean science-related degrees.

Fifty-eight programs provided citizenship data on their postdoctoral researchers. Individuals were almost evenly split with 298 foreign citizens and 256 U.S. citizens. Of the U.S. citizens (155) only 6% (9) represented minority ethnic or racial groups.

One commonly held belief in the ocean sciences community is that the ocean sciences are primarily graduate fields of study. However, this study examined the ocean sciences in a broad sense, as well as, a set of sub-fields. This study found there are almost as many programs offering ocean science related baccalaureate degrees as graduate degrees. In addition, 1,200 students received baccalaureate degrees in ocean sciences or related fields in the 2000-2001 school year compared to 800 graduate degrees awarded (Chapters 5 and 6). Therefore, undergraduate students and the faculty that teach them are a significant part of the academic ocean sciences community.

## **Conclusions**

There is an exceptionally high level of diversity with respect to the scientific fields encompassed by the academic ocean sciences community. These fields include the natural science fields of biology, chemistry, physics and geology; ocean and coastal engineering; and marine policy, and the depth of the academic ocean sciences community ranges from training students at community colleges to graduate schools.

There is strength in that diversity. The academic ocean sciences community has built a strong base capable of reaching out to other disciplines, forging unique partnerships, and adapting to address emerging national issues. Whether it is ocean engineers who will design the next generation of Navy vessels, physical oceanographers who will increase our understanding of global climate change, marine biologists who will use sound science to better manage our nation's fisheries, or marine technicians who will operate and maintain an integrated ocean observing system, graduates in the ocean sciences are poised to provide the scientific information and support necessary to form the basis of sound public policy.

Future studies should address a critical component to the U.S. infrastructure supporting marine research, management and education that was not fully examined by this study—the U.S. ocean-related workforce.

Some questions that might be studied within this broad area include:

- What degrees are required for various jobs and what level of education is desired?
- Is holding degree in ocean sciences an impediment to finding jobs in other fields?
- Are we educating our students for the diversity of jobs that are available?  
Furthermore, are our formal educational programs flexible enough to meet the changing workforce needs in the ocean sciences and related fields?

It will also be important to begin tracking retirement and hiring in ocean science-related job sectors. No reliable numbers on this segment of the U.S. workforce exist and the ocean sciences community, broadly defined, is small enough that the estimates which do exist are probably spurious because they are based on small sample sizes within a subset of the entire U.S. science and engineering workforce.

This study provides an important snapshot of the ocean sciences community today; illustrating the community's strengths and highlighting areas where efforts must be concentrated in order to address current shortcomings. It also provides a useful basis of comparison on which to measure the continuing health of community. However, in order to track that health, such studies must be conducted routinely.

## CHAPTER ONE: INTRODUCTION

The Oceans Act of 2000 was enacted on August 2000, establishing the Commission on Ocean Policy and calling for a report to Congress with recommendations for a comprehensive U.S. ocean policy. Among the required elements of the report is an “assessment of existing and planned facilities associated with ocean and coastal activities including human resources, vessels, computers, satellites, and other appropriate platforms and technologies.” Central to this infrastructure assessment is an evaluation of the U.S. investment in academic ocean sciences research and education. This report has been prepared to provide that evaluation.

Since the end of World War II and the adoption of Vannevar Bush’s model of public support for basic research, the academic community has been the leader in understanding and developing solutions to ocean-related problems. The innovation inherent in the research process has provided the primary source of knowledge of the oceans. From the late 1960s to the mid 1980s, the federal investment in basic research for the ocean sciences was about seven percent of the federal basic research budget.

Ocean sciences education programs in the United States also have evolved over the past half century, but with a much lower investment than research programs. In 1929, a National Academy of Sciences committee chaired by F.R. Lillie produced the report, *“Oceanography: Its Scope, Problems, and Economic Importance,”* which stated:

The general paucity of opportunities for instruction in this general field is so obvious that it needs no detailed survey for corroboration.

The graduate student, sufficiently devoted to the subject and fitted for advanced instruction or research, finds far fewer avenues than the importance this field of science demands.

The advance of Oceanography in America now suffers from one of its greatest handicaps, for progress in this science is a matter not only of ships, laboratories and money, but far more of men, which implies opportunities for education. And it is of men that there is now the most serious shortage.

It is in fact, one of the most serious obstacles to advances in this field that it is not now possible for a student to obtain a course of instruction, properly graded upward from the elementary introduction to advanced research, in any one American University. In America the oceanographer must today be largely self-taught in the basic aspects of his subject.

Today, the academic ocean sciences community in the United States is exceptionally broad, diverse and diffuse. The ocean sciences are interdisciplinary in nature and

encompass the natural science fields of biology, chemistry, physics and geology; ocean and coastal engineering; and marine policy. Students of the ocean sciences can be found in technical and two-year colleges, military academies, and universities in either undergraduate or graduate programs. Identifying these students and the institutional resources used to educate them is critical to understanding the current state of the ocean sciences community in this country and to identifying areas where additional efforts may be required to ensure a robust ocean sciences endeavor in the future.

Efforts have been made in the past to quantify the academic ocean sciences. In 1978, Joint Oceanographic Institutions (JOI) began collecting and analyzing data on graduate education at the JOI schools. At its inception, the JOI analysis included only ten schools with ocean science programs. The JOI survey population grew in the early 1990s and the survey was taken over by the Consortium for Oceanographic Research and Education (CORE) following its incorporation in 1994. CORE, with its expanded membership base, reached out to a larger survey population and has continued to collect these data every two years. The last CORE survey of graduate education and academic research capabilities was conducted in 2000.

CORE is not the only source of data on graduate education and research capabilities in the United States. The National Science Foundation (NSF) maintains one of the largest and oldest data sets on all science and engineering fields. Other academic professional societies such as the American Geophysical Union (AGU) also have collected data on doctoral education in the ocean sciences. However, these existing data sets have inherent weaknesses. First, the true breadth of the ocean sciences community is not adequately represented in the NSF or AGU data because of the way in which the various sub-disciplines are categorized and, therefore, counted. Those data sets both concentrate on physical sciences (physical oceanography and marine geology and geophysics) and do not take into account numerous facets of the ocean community. Similar gaps in the data exist in the data collected in previous years by JOI and CORE.

As the NSF and AGU data is incomplete in the number of ocean science fields they survey, and the JOI and CORE data has also not encompassed the entire community, there was a clear need to provide the U.S. Commission on Ocean Policy with an up-to-date picture of the ocean sciences community. There was a need to evaluate the community both in terms of the educational investments being made at the undergraduate and graduate level and the capabilities and human resources available at the U.S. universities and research centers. In order to address this need, the Commission on Ocean Policy contracted with CORE to conduct a survey of administrators at marine science and policy institutions in United States to collect information on students, professors, funding and facilities at the undergraduate and graduate level.

CORE initiated this data collection via e-mail surveys that addressed a set of topic areas determined through discussions with the Commission staff. The topic areas included:

- ◆ Numbers of undergraduates at 2-year and 4-year institutions with a major or minor in marine science, oceanography, or related field;
- ◆ Graduate applications, enrollments and offers by field, gender, race/ethnicity, and citizenship<sup>1</sup>;
- ◆ Numbers of PhDs and Masters degrees awarded by field, gender, race/ethnicity, and citizenship;
- ◆ Graduate student support mechanisms, such as assistantships and fellowships
- ◆ Numbers of postdoctoral researchers employed by field, gender, race/ethnicity, and citizenship;
- ◆ Duration of postdoctoral appointments;
- ◆ Employment of recent graduates with bachelors, masters and doctoral degrees
- ◆ Numbers of faculty, technicians<sup>2</sup>, and non-clerical administrators etc.;
- ◆ Amounts of grant support at institutions by source (agency, foundation, state government, etc.);
- ◆ Capitol investments other than those managed by the University National Oceanographic Laboratory System (UNOLS) (research vessels; ROVs, mass spectrometers, hyperbaric chambers, submarines, supercomputers, etc.);
- ◆ Plans to replace or procure non-UNOLS vessels and facilities.

As the list suggests, the Commission's information needs ranged widely from personnel to financial data. Consequently, it was necessary to develop five different surveys. Each participating U.S. marine science and policy institution received from one to four surveys based on the level and scope of its programs. The pool of survey recipients is listed in Appendix A. A total of 489 surveys were distributed to 148 departments at 139 institutions. Individuals from ocean-related programs or departments at each institution were contacted via email, mail, and telephone to solicit their response to the surveys. In addition, a number of reminder notices were sent in order to ensure a high response rate and answer recipients' questions about the survey. Chapter 2 provides a more detailed explanation of the methodology for the study.

The study was conducted in a short time frame. It was also necessary to conduct the surveys during a less than optimum academic time of year. Most of the institutions recognized the importance of providing the information to the Commission and submitted responses. CORE received 336 responses from the potential pool of 489 surveys, a 69% overall response rate. Response rates varied among the five different surveys reflecting, in large part, the availability of the requested information. In general, the response rates were significantly lower from two-year colleges (52%) and highest from institutions that had participated in CORE surveys in the past.

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<sup>1</sup> Questions will differentiate between U.S. and non-U.S. citizens, but will not request information about nationality.

<sup>2</sup> Laboratory and ship-board technicians

## CHAPTER TWO: METHODOLOGY FOR THE STUDY

The initial step in the study was to identify appropriate participants in order to solicit information from the entire community of U.S. institutions of higher learning and research involved in coastal and ocean research and education. Those institutions include departments of geosciences, biology, physics and environmental sciences that offer ocean-related certificates, majors, minors, and graduate degrees. A database of recipients was constructed using the membership lists of CORE and the National Association of Marine Laboratories, and the Marine Advanced Technology Education Center's list of community colleges. Additional input was received from the staff of the U.S. Commission on Ocean Policy. CORE did not, however, include informal educational organizations such as aquaria, science centers and zoos. A complete list of the 148 departments and programs and 139 institutions solicited for this study is provided in Appendix A<sup>3</sup>.

Each of the study surveys covered a unique aspect of ocean sciences programs. Two-year undergraduate colleges were asked to complete a comprehensive questionnaire. Other institutions received surveys requesting information in four areas: faculty workforce; funding and facilities; graduate programs; and four-year undergraduate programs. The five survey instruments were distributed via electronic mail.

Surveys were distributed in late May and early June 2002. This coincided with the end of the spring semester, traditionally the busiest time of the year for academic administrators. Survey recipients had three to four weeks to respond to our survey. Following receipt of the survey, survey recipients were contacted through email and telephone. Additional completion time was given as needed to ensure an accurate and high response rate. The resulting response rate was 76% for institutions solicited and 69% for programs within those institutions. CORE received 75% of the faculty surveys, 66% of the funding and facilities surveys, 71% of the graduate surveys, 66% of the undergraduate surveys, and 52% of the two-year surveys distributed to the academic ocean sciences community. A detailed breakdown of surveys and responses is provided in Table 2-1.

The experimental design of the study was based on recommendations from the American Institute of Physics (AIP). Initially, the study was planned as an online survey through a web site. While this would have eliminated the need for data entry, concerns were raised that this approach would make it more difficult for institutions to respond. Given the interest in conducting a comprehensive study, the e-mail survey was selected as the approach that would be easiest for the survey recipients to fill out and return.

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<sup>3</sup> In addition to the programs solicited by CORE for this study, a few programs returned surveys to CORE that were sent to them by one of the programs originally contacted. Hence, the actual number of surveys received overall is greater than the number distributed by CORE.

A database in Microsoft Access 97 was developed to link all survey recipients and responders to the surveys by means of an institutional code number. Data entry forms were developed for each of the five survey instruments and data were exported to Excel 97 for review and analysis. All data were checked for inconsistencies in reporting both prior to data entry and during analysis. Whenever possible, the persons who filled out the survey were asked to clarify any questionable numbers. If an inconsistency proved to be irreconcilable, that response was eliminated.

In some cases, data simply were not available from the institution's program. This is particularly true for the demographic information on gender and ethnic background of students, faculty and postdoctoral researchers. In future studies, it may be easier to gather such information accurately by surveying individuals directly rather than requesting information through an institutional survey.

In addition to the survey data, several other information sources on postsecondary education and support were used for comparison. The National Science Foundation's WebCASPAR system, an online database for computer-aided science policy analysis and research, provided statistics on science and engineering graduate education and funding. The National Center for Education Statistics' Integrated Postsecondary Education Data System (IPEDS), also available through the WebCASPAR system, provided information on undergraduate departments. In addition, survey data was compared with data collected by AIP, JOI and CORE. The ability to make cross-disciplinary comparisons and historical trends was limited due to different survey methods used and the fact that some of the data sets were incomplete.

The study did provide useful insights for strengthening any future surveys. For instance, the questions on graduate student salaries and the relative full-time-equivalent associated with the salary level were unclear and the responses could not be included in the analyses. The study also pointed out the importance of expanding and updating the list of contacts. While the population surveyed was more inclusive of a broadly-defined ocean sciences community than any study conducted to date, we did discover that our database falls far short in the area of community colleges. A review of programs offering certificates and associates degrees through the IPEDS shows minimal overlap between the institutions included in the study and those listed in the IPEDS database as offering marine-related associates degrees or certificates. Any further investigation should reconcile the two listings.

**Table 2-1.** Summary of response rates by survey type and program or institution.

Survey	# of Programs <sup>4</sup> Solicited	# of Programs that responded	% Received	# of Institutions Solicited	# of Institutions that Responded	% Received
<b>2-Year College Survey<sup>5</sup></b>	25	13	52%	25	13	52%
<b>Faculty Survey</b>	122	91	75%	101	77	76%
<b>Funding and Facilities Survey</b>	131	86	66%	81	76	94%
<b>Graduate Survey</b>	101	72	71%	83	59	71%
<b>Undergraduate Survey</b>	110	73	66%	90	63	70%
<b>Total # of Surveys</b>	489	335	69%	380	288	76%

<sup>4</sup> Throughout this report the authors will use programs to refer to any independent laboratory or any program, department, or school within a larger university or college.

<sup>5</sup> Two-year colleges were given one survey which incorporated sections on funding and faculty that are comparable to the faculty survey and funding and facilities survey distributed to all other programs. Thus, in certain sections of this report the number of responses reported for funding and faculty will appear to be higher than the numbers noted in the table above.



## **CHAPTER THREE: RESEARCH FUNDING AND PERSONNEL**

Information on funding for ocean sciences research in the academic year 2001-2002 (AY2002) was requested from 156 programs at 106 institutions. Those surveyed included community colleges, baccalaureate programs, independent research institutions and large research universities. Eighty-nine institutions conducting 99 programs responded to the survey. Of the responses, data from 79 programs were useable in the analysis.

Some institutions were unable to differentiate between education and research funds. For example, this distinction was particularly difficult for institutions with substantial funding from internal sources within the university, college, or independent research institution.

Two-year colleges were the smallest category of responses with only thirteen institutions contributing. These colleges also had substantially smaller research funding budgets and several respondents indicated that their grant support is focused on education and training programs rather than research. For this reason these institutions were not included in the AY2002 analyses on research funding.

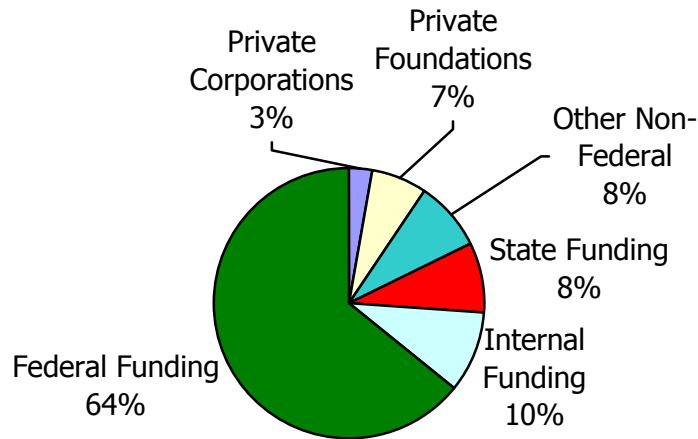
### **AY2002 Research Funding and Personnel**

The 79 academic programs surveyed in the study received total research support of \$932 million during AY2002 (Figure 3-1). The federal government was the predominant funding source, providing \$598 million or about 64% of all the funds received. No other source of financial support exceeded 10% of the total. Non-federal funding sources included internal institutional support, states, private foundations, and private corporations.

The National Science Foundation, (NSF) was the largest funding source in AY2002, providing about \$214 million or more than a third of the total federal agency funding for the ocean sciences (Figure 3-2). This amount was equal to the combined investment of the two next largest agency funding sources, the U.S. Navy and the National Oceanic and Atmospheric Administration (NOAA). The Navy and NOAA each contributed 107 million or 18% of the federal ocean sciences budget. Five other agencies or departments individually provided less than 8% of the total federal support. Their ocean sciences budgets were as follows: National Aeronautics and Space Administration (NASA) \$49 million; Department of the Interior \$27 million; Department of Energy \$12 million; Environmental Protection Agency \$14 million. The total federal contribution from agencies other than those listed accounted for about \$65 million of the research support for the surveyed institutions.

### Sources of Research Support during 2001-2002

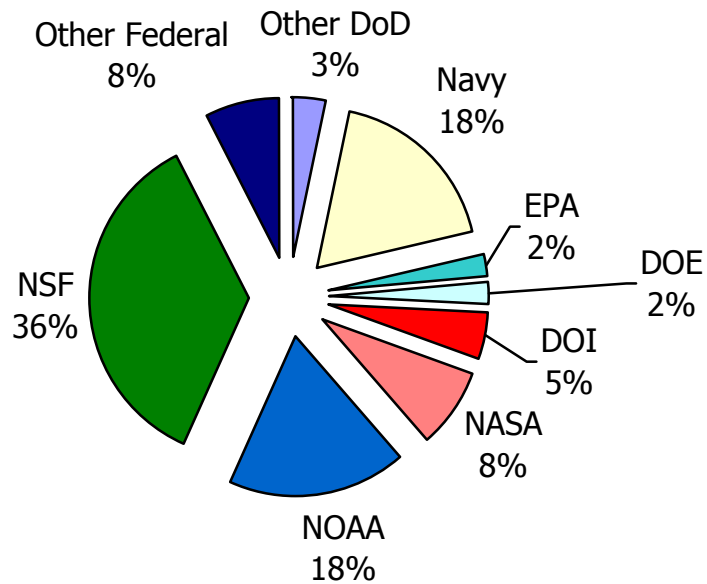
Total Support = \$931,969,353



**Figure 3-1:** Sources of research support at 79 programs during AY2002.

### Federal Support of Ocean-related Research 2001-2002

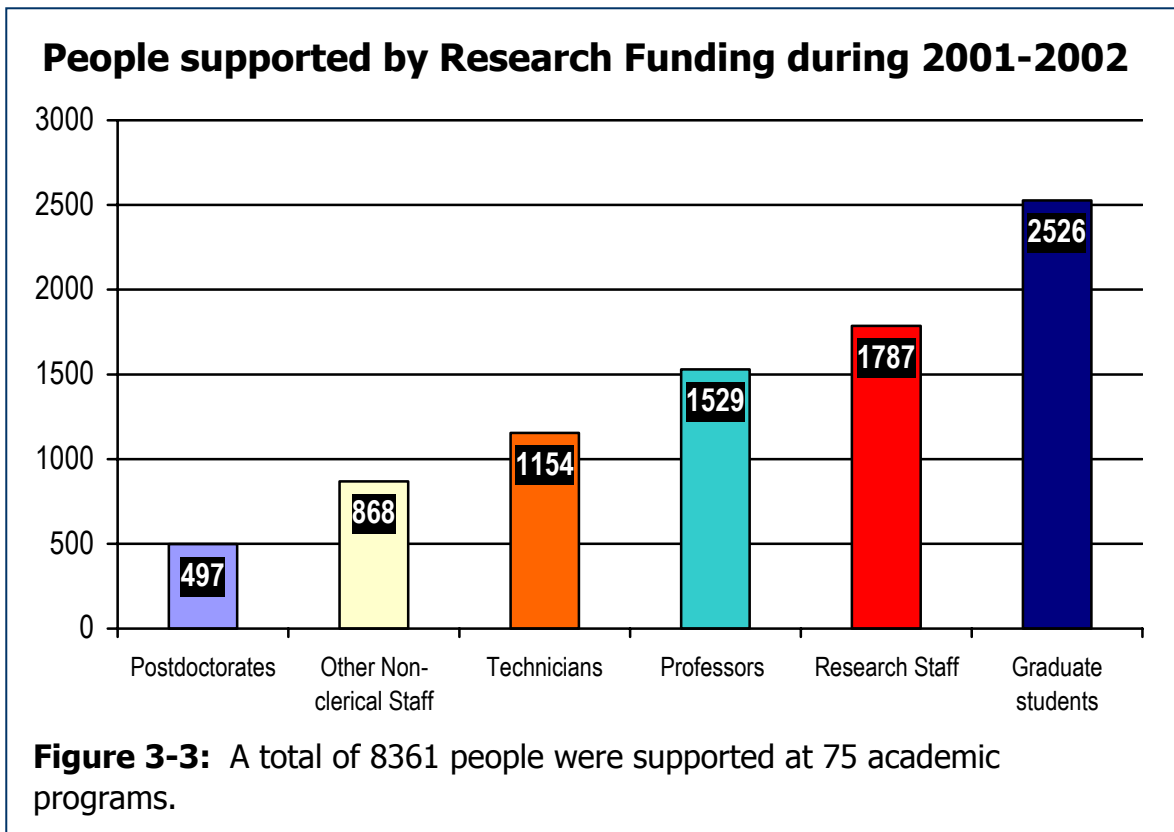
Total Federal Funding = \$597,987,955



**Figure 3-2:** Federal research support at 79 academic programs during AY2002.

The research funding available in AY2002 supported a workforce of 8361 people (Figure 3-3). Thirty percent of that total was composed of graduate students. Research staff, technicians, and other non-technical staff together made up almost half (45%) of the remaining personnel supported by research funds. Professors constituted about 18% and postdoctoral researchers were reported as the smallest component (6%).

Information on professors and postdoctoral researchers was requested in the faculty survey and the funding and facilities survey. The data from those surveys are summarized in Chapter 8. The total number of professors and postdoctoral researchers given in the funding and facilities survey was significantly lower than the total number reported in the faculty survey. This difference is likely due to a combination of factors. One possibility is that the response rate for the funding and facilities survey was lower than for the faculty survey, so the reported numbers represent the collective workforce at a smaller number of institutions in the former survey. Another factor may be that institutions characterized individuals differently in each of the surveys. Finally, it is important to recognize that the funding and facilities survey requested the program to identify individuals supported by the research funding information they submitted. The faculty survey requested information on all personnel regardless of the source of support, thus, the total would include those supported by funds categorized in the response as non-research funds.



## **Funding at Selected Ocean Sciences Programs, AY 1997 and AY 2002**

The ten original members of the Joint Oceanographic Institutions (JOI)<sup>6</sup> have among the largest and most comprehensive of the nation's ocean sciences research programs. As such they provide a useful subset of national programs for examining changes in the academic ocean sciences community and for the rest of this analysis will be referred to as selected programs. Although surveys of the selected programs have been conducted since 1978, those surveys did not include a request for funding information. In 1995, CORE began a biennial assessment of the capabilities of its membership. Since that time, CORE has conducted four capabilities surveys, including the current survey. However, survey data from each of the selected programs exist for the academic year 1996-1997 (AY1997) and AY2002 only. Analysis of the AY1997 and AY2002 data provides a snapshot of the research support received by the academic ocean sciences community during these two school years. The ten programs selected represented 11% of the 86 respondents to the CORE 2002 survey on funding and facilities.

A number of interesting points emerged from the comparisons between the AY1997 and AY2002 numbers for this subset of programs. The total amount of funding<sup>7</sup> spent on research at the selected programs has increased from \$398.8 million in AY1997 to \$439.4 million in AY2002 (+10.2%). The federal government remained the largest source of funding for academic ocean science at the selected programs, but it is declining in importance. In AY2002, federal support was 71.6% of the total for this subset of programs. This is a decrease of 13.0% from AY1997 when federal funds made up 84.6% of the research dollars at the 10 programs.

Only three federal agencies, NSF, NASA and USGS, have seen increases in their support for academic ocean science at the selected programs. NSF has increased its research support by approximately \$13.4 million, and now represents 42.7% (+6.9%) of the total federal funds supporting the selected programs (Table 3-1).

Among the federal agencies, funding from the Navy has seen the biggest decline during this five-year period, from 24.8% to 19.6%. State and local support of ocean research at the selected programs also has shown a substantial drop, from 9.5% in AY1997 to 4.8% in AY2002.

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<sup>6</sup> These selected institutions include Columbia University (Lamont-Doherty Earth Observatory), Oregon State University (College of Oceanic and Atmospheric Sciences), Texas A&M University (College of Geosciences), University of California at San Diego (Scripps Institution of Oceanography), University of Hawaii (School of Ocean & Earth Science & Technology), University of Miami (Rosenstiel School of Marine and Atmospheric Sciences), University of Rhode Island (Graduate School of Oceanography), University of Texas at Austin (Institute for Geophysics), University of Washington (School of Oceanography), and Woods Hole Oceanographic Institution. Since 1998 JOI membership has expanded to include other schools but we did not include these since they were not part of the older data sets.

<sup>7</sup> Funding figures in this chapter have not been adjusted for inflation.

Despite the overall declines in total federal, state and private research funding, the research budgets of the 10 selected programs have grown by 10.2% since 1997. This situation raises the question of where the institutions now look to replace decreasing support from their traditional funding sources. Other than NSF, the only funding category to show substantial increases is the catchall, "Other (non-federal) Research," growing from less than \$1 million in AY1997 to almost \$88 million in AY2002. Closer examination of the raw data suggests that funding was lumped in this category for a variety of reasons. First, the responding program did not provide enough information to classify funding under a better-defined category or the corresponding category (e.g. "Other Department of Interior") was not available in the 1997 survey. Second, the selected programs appear to be receiving research support from a number of less traditional funding sources including foreign governments, international organizations, and quasi-governmental entities like local port authorities. Another explanation may be the growth in the funding provided under partnerships and matching arrangements. More institutions appear to be participating in consortia or pooling their funding from federal, state and private sources, making it impossible to assign the resources to a single category. Obvious examples of such arrangements are the National Oceanographic Partnership Program and the National Sea Grant College Program.

**Table 3-1:** The following table summarizes the differences between the AY1997 and AY2002 federal agency funding at selected ocean sciences programs.

<b>Federal Agency</b>	<b>AY1997 Amount (\$ M)</b>	<b>% of AY 1997</b>	<b>AY 2002 Amount (\$ M)</b>	<b>% of AY 2002 Total</b>
NSF	120.7	35.8	134.2	42.7
Navy	83.8	24.8	61.6	19.6
Other DoD	10.0	3.0	5.2	1.6
NOAA	48.1	14.3	47.7	15.2
NASA	19.9	5.9	26.5	8.4
DOE	5.4	1.6	3.8	1.2
EPA	1.2	0.4	1.4	0.5
USGS	1.7	0.5	2.2	0.7
MMS	2.8	0.8	1.4	0.5
Other Federal	43.7	12.9	30.5	9.7
<b>Total Federal</b>	<b>337.4</b>	<b>100.0</b>	<b>314.5</b>	<b>100.1<sup>8</sup></b>

<sup>8</sup> Sum of percentages are greater than 100 because of rounding.

## **Comparison of 10 Selected Programs to All Other Programs, AY2002**

In the previous section of this report, the 10 JOI programs were selected as a subset for examining changes in funding between AY1997 and AY2002 because they were the most consistently identified subgroup within the ocean sciences community for which such information is available. These 10 schools are among the nation's largest, receiving 47% of all research dollars in the ocean sciences, 53% of the federal ocean research budgets and employing about 43% of the related workforce in AY2002. At the same time, it is important to recognize that these institutions are unlikely to be representative of the ocean sciences community as a whole. For this reason, it is necessary to examine how the selected programs compare to all other programs in the CORE study with respect to support for research and personnel in AY2002.

Respondents from both the selected programs and all other programs acquired most of their research support from the federal agencies. However, for the selected programs, federal support comprised roughly 72% of all research funding compared with 58% for all other programs. The other programs appear to make up this difference through a greater reliance on funding from private corporations, private foundations and state governments.

For the selected programs, the primary federal funding sources were NSF (43%), Navy (20%) and NOAA (15%). These agencies also provided a significant part of the research budgets of the other schools' programs as follows: NSF (28%); NOAA (21%); and Navy (16%).

Similarities between the two groups of programs can be found in the level of ocean science research funding provided by NOAA. NOAA provided a total of \$107.4 million in research funding to the survey respondents of which the 10 selected programs received 44%.

In contrast, the Navy, NASA and NSF invested more heavily in the selected programs. For example, the Navy funding for all survey respondents totaled \$107.3 million, of which 57% went to the selected programs while 54% of NASA's \$49.0 million was awarded to the selected programs. In addition, \$214.4 million or 63% of NSF's ocean research support in AY2002 supported the selected programs, while \$80.3 million or 37% of the NSF ocean research support went to all other schools. In contrast, the ocean science research funds from the U.S. Environmental Protection Agency (EPA), U.S. Geological Survey (USGS), Mineral Management Services (MMS), and U.S. Department of Energy (DoE) generally support coastal and applied research and go predominantly to all other programs in the study. These agencies' funding was distributed as follows:

- 10% of EPA's \$14.1 million went to the 10 selected programs; 90% of the went to all other programs;
- 35% of USGS' \$6.3 million went to the 10 selected programs; 65% went to all other programs;
- 40% of MMS' \$3.5 million went to the 10 selected programs; 60% went to all other programs;
- 30% of DoE's \$12.6 million went to the 10 selected programs; 70% went to all other programs.

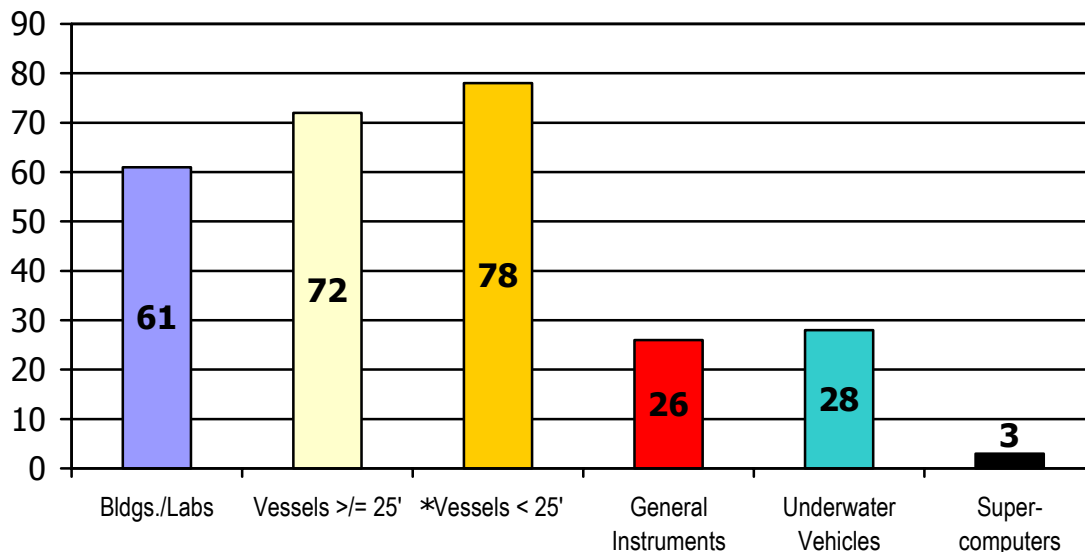
In summary, the 10 selected programs received a majority of NSF's, the Navy's and NASA's financial contribution to ocean science research while the remaining 76 programs in our study received a majority of the funding by EPA, DoE, MMS, NOAA and USGS.

## CHAPTER FOUR: FACILITIES AND VESSELS

As part of the funding and facilities survey, an assessment was conducted of the current availability, age, and type of facilities and vessels housed at academic institutions that support ocean and coastal research. Because the University-National Oceanographic Laboratory System (UNOLS) maintains data on the UNOLS fleet, those vessels were specifically excluded from this study. Information was solicited from 131 programs at 81 institutions, and 86 programs (66%) responded, listing for each type of vessel or facility, its age, its primary owner, and any plan for replacement. Programs were also asked when replacement would occur, but CORE received too few responses to provide a meaningful summary of that request.

Figure 4-1 summarizes the types of vessel and facilities that respondents listed, including vessels, buildings and laboratories of all sizes, shapes and types. For the purpose of this analysis, vessels were broken down into two categories, those greater than or equal to 25 feet in length and those less than 25 feet.

**Non-UNOLS Vessels & Facilities  
May 2002**



**Figure 4-1 :** General instruments include mass spectrometers, gene sequencers, particle counters, etc. Underwater vehicles include submersibles (peopled), tethered vehicles, remotely providing data per category can be found in Table 4-1. \*This category likely represents less than the actual number of small vessels used for ocean science research purposes.

While the smaller vessels are clearly an important part of the research infrastructure, larger vessels are more indicative of the ability to conduct long-term studies further



from shore. The number of small vessels is likely to be under-counted since most programs were unable to quantify every skiff and “Boston whaler” owned by their institution. Similarly, the number representing general instrumentation is very likely a low estimate.

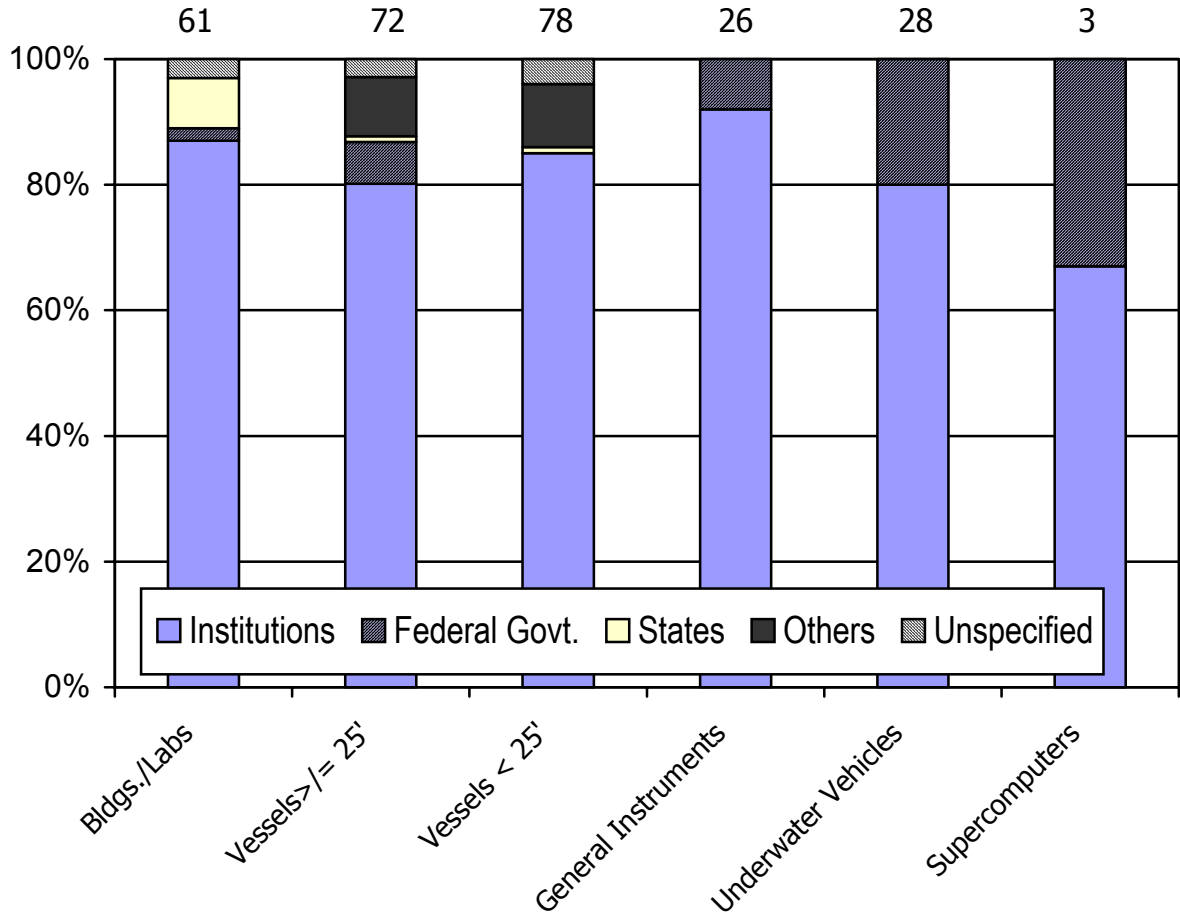
The age and replacement plan information for the categories of facilities and vessels mentioned above can be found in Table 4-1. Research vessels made up the most populous category with a total of 150 reported. About 60% of the larger vessels greater than 25-feet were less than 20 years old, with a quarter being 10 years old or less. Very few institutions have replacement plans for their facilities, and a number of programs noted that lack of available funds was the primary factor preventing planning.

**Table 4-1:** Non-UNOLS Vessels and Facilities in the Academic Ocean Sciences Community as of May 2002.

<b>Type</b> (n= number of institutions)	<b>Total #</b>	<b>Mean Age</b> (years)	<b>Min. Age</b> (years)	<b>Median Age</b> (years)	<b>Max. Age</b> (years)	<b># with replacement plan</b>
<b>Bldgs. And Labs</b> (n=24)	61	16	1	10	60	10
<b>Vessels &gt;/= 25 feet</b> (n=38)	72	20	0.25	18	53	14
<b>Vessels &lt; 25 feet</b> (n=17)	78	14	1	14	38	4
<b>Underwater Vehicles</b> (n=15)	28	13	0.25	10	40	5
<b>Supercomputers</b> (n=2)	3	4.5	1	4.5	8	1
<b>General Instrumentation</b> (n=19)	26	6.7	0.3	5.5	18.0	4

As Figure 4-2 illustrates, an overwhelming majority among all categories of vessels, facilities and instrumentation were owned by the institution. The federal government was the second most frequently listed owner, primarily for special instrumentation, underwater vehicles and large research vessels. States have a stake in a small number of research vessels of various sizes and a larger number of buildings and laboratories.

### Ownership of Facilities at Ocean-related Academic Programs as of May 2002



**Figure 4-2:** Fifty-four programs contributed data. The number per category is listed above each column.

## CHAPTER FIVE: GRADUATE PROGRAMS

This analysis is based on 63 different graduate programs. The graduate survey asked various questions regarding applications, offers, enrollments, degrees granted, and postgraduate employment. A copy of the survey is provided in Appendix B, pp. 57-63.

### **Applications, Offers and Acceptance Rates**

Applications to 58 marine graduate programs remained relatively constant in 2001 and 2002 at approximately 4000 per year. One-third of the applicants were admitted each year (Table 5-1).

**Table 5-1:** Summary of acceptance rates at 58 graduate programs in the United States.

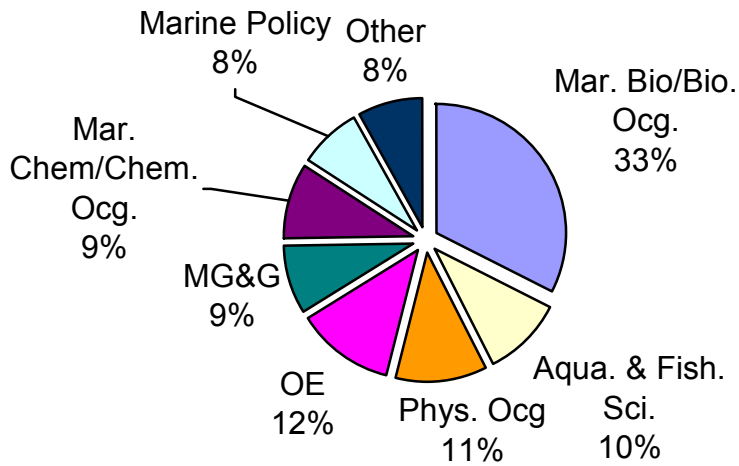
<b>Graduate Programs</b>	<b>Applications</b>	<b>Offers</b>	<b>Percent of Applications Accepted</b>
Fall 2001	3992	1393	35%
Fall 2002	4020	1286	32%
Both 2001 & 2002	8012	2679	33%

### **First Year Enrollments**

First-year enrollment numbers for Fall 2001 were provided by 57 different academic graduate programs (Figure 5-2). One-third of the students admitted into a marine graduate program were admitted into marine biology and biological oceanography. The remaining two-thirds of admitted students were almost equally distributed among other marine-related fields. Of the students in the category entitled "other", 30% were enrolled in a hydrographics program at the University of Southern Mississippi.

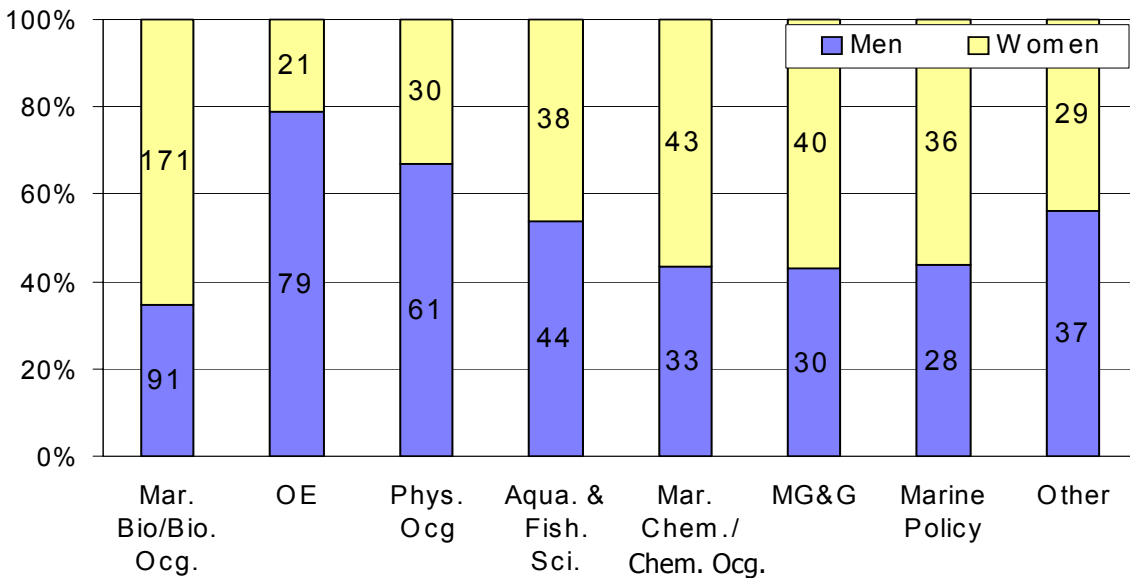
The ratio of men to women who enrolled for the first time during Fall 2001 was 1:1 (Figure 5-2). Following marine biology and biological oceanography, the second largest field for women was marine geology and geophysics (57%) followed by marine chemistry and chemical oceanography (56%). In contrast, men made up the majority in ocean engineering (79%) and physical oceanography (67%). Data on citizenship was reported for 671 newly enrolled students. Of that group, 21% were foreign citizens. Of the U.S. citizens enrolled during Fall 2001, ethnicity and race were reported for 96% of the population and is summarized in Table 5-2.

**First-year Enrollments in Ocean-related Graduate Programs, Fall 2001**



**Figure 5-1:** Fifty-seven programs reported 814 students enrolled for the first time in Fall 2001. Aqua.= aquaculture; Chem. = chemical or chemistry; Fish. Sci. = Fishery Sciences; Mar. = marine; Ocg.= oceanography; OE= ocean engineering; MG&G = marine geology and geophysics. Other= atmospheric and ocean sciences, climate sciences, environmental toxicology, hydorgraphics, remote sensing, wetlands ecology and unspecified fields.

**First-Year Enrollments by Gender and Field, Fall 2001**



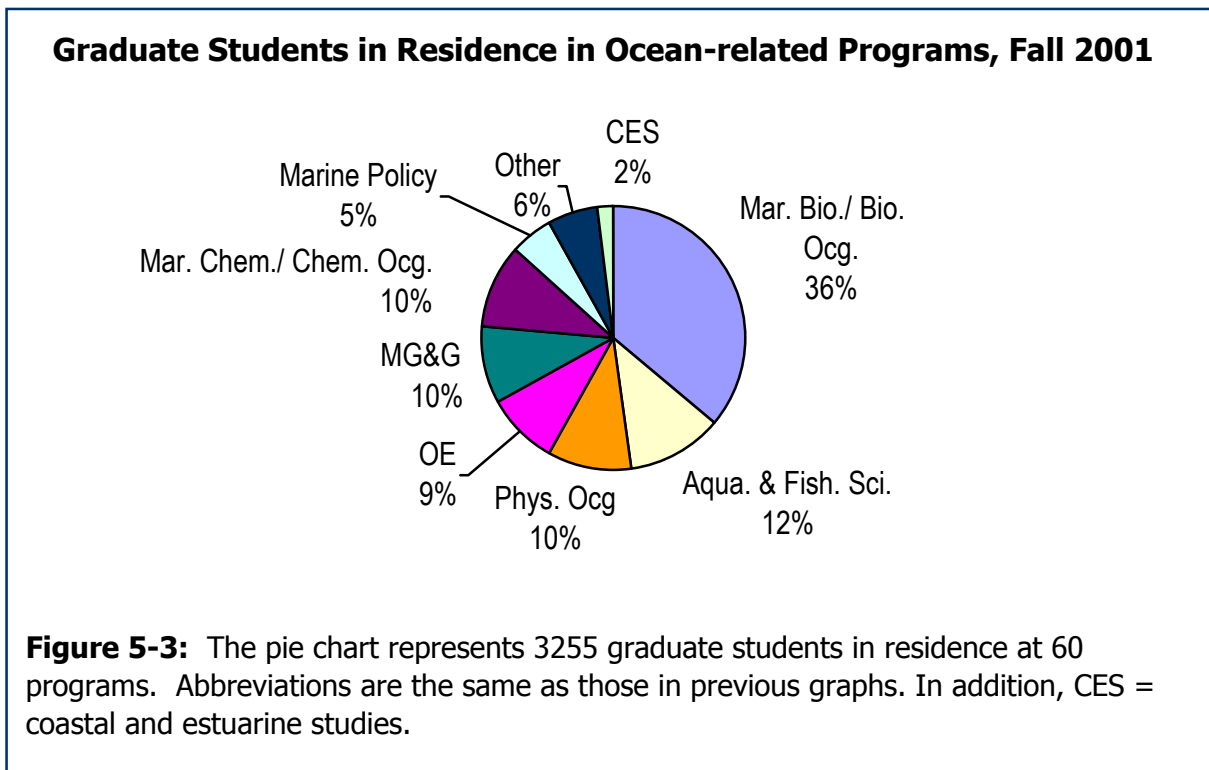
**Figure 5-2:** Gender reported for 811 first-year students at 57 graduate programs.

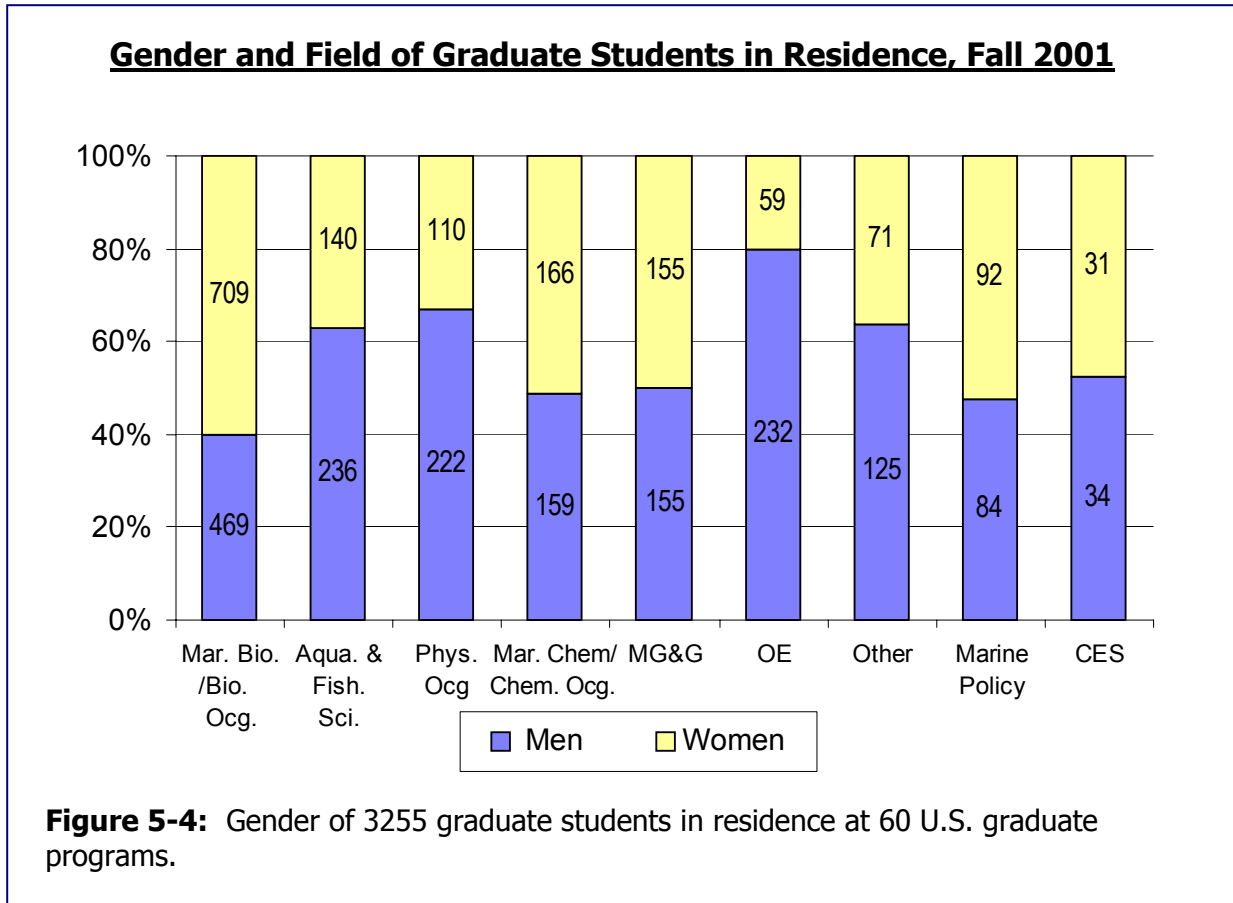
**Table 5-2:** Ethnicity/Race of U.S. citizens enrolled in ocean-related graduate programs for the first time during Fall 2001. Forty-nine (49) programs reported data on 577 students.

Ethnicity/ Race	White	Hispanic	Asian American	Native American	African American	Other
<b>Total</b>	517	22	12	3	13	10
<b>% of Total</b>	89.6%	3.8%	2.1%	0.5%	2.3%	1.7%

**Graduate Students in Residence**

The total number of graduate students in residence during Fall 2001, including first-year enrollments, was provided by 60 different academic programs (Figure 5-3). Thirty-six percent of the students in a marine-related graduate program were in a marine biology and biological oceanography program. Aquaculture and fishery sciences made up the next largest segment of this population (12%). The number of students in chemical oceanography and marine chemistry, physical oceanography, marine geology and geophysics, and ocean engineering programs was about equal (between 9% and 10% each). Marine policy, coastal and estuarine studies, and “other” fields made up the remainder of the student population in residence during Fall 2001. The majority of students in the category entitled “other” were identified as studying “atmospheric and ocean sciences.”





The gender distribution of graduate students in residence consisted of 53% men and 47% women (Figure 5-4). Similar to the gender ratios by field for first-year enrollments, women dominated marine biology and biological oceanography and were the majority in marine chemistry and chemical oceanography and in marine geology and geophysics. Men were the majority in ocean engineering and physical oceanography. Twenty-three percent of students in residence as of Fall 2001 were foreign citizens. Of the U.S. citizens in residence, ethnicity and race were reported for 95% (2191) of the population (Table 5-3). Eighty-eight percent were identified as “white” in the survey.

**Table 5-3:** Ethnicity and race of U.S. citizens in residence in ocean-related graduate programs during Fall 2001. Forty-eight programs provided data on 2191 students which is approximately 95% of total students in residence for whom citizenship was reported.

<b>Ethnicity/ Race</b>	<b>White</b>	<b>Hispanic</b>	<b>Asian American</b>	<b>Native American</b>	<b>African American</b>	<b>Other</b>
<b>Total</b>	1936	99	60	8	35	53
<b>% of Total</b>	88.4%	4.5%	3.1%	<1%	1.6%	2.4%

### **Types of Student Support**

Forty-six graduate programs reported on the type of support - if any - their 2673 students had received during Fall 2001 (Table 5-4). Of that group, the majority (56%) were supported by research assistantships. Conversely, traineeships made up the lowest percentage of reported student support (1%). In addition, 10% of the students in residence had teaching assistantships; 13% had fellowships; 8% received support from some other source; and 12% received no financial support.

Comparisons with the physics and life sciences fields show that the graduate programs in the ocean sciences are more dependent than most others on research assistantships. In physics and life sciences, higher percentages of the student populations are supported by teaching assistantships and traineeships. In addition, the life and physical sciences garner much larger total numbers of these funding mechanisms because their overall student populations are so large.

The portion of students in marine graduate programs receiving “other” types of support (including self-support) is approximately 20% of the total. This is higher than those students in atmospheric sciences, astronomy and physics, but is lower than those in the life sciences (Table 5-4). Many students in marine graduate programs included in the “other support” category are students who support themselves. The students who provide their own financial support often attend masters-level policy and management programs that do not offer research assistantships, fellowships, or traineeships.

A plurality (42%) of students in the life sciences are either self-supported or their support does not fit into the other categories. The large size of this segment may be due in part to the students in professional medical programs. Still, the life sciences are the most diverse in terms of the types of graduate funding. By contrast, student support in the atmospheric sciences is the least diverse, relying mostly on research assistantships. Similar to the ocean and atmospheric sciences, a high percentage astronomy students are supported by research assistantships, but this is balanced by low numbers providing their own support, a slightly higher percentage in traineeships, and a significant portion employed by teaching assistantships.

While these numbers and percentages may not be surprising to those familiar with graduate education in scientific fields, it is important to pay attention to this aspect of the graduate student experience, since the type of support a student receives in graduate school influences the development of research, teaching, and management skill sets and can limit or expand a student’s awareness of different career paths and job sectors open to them.

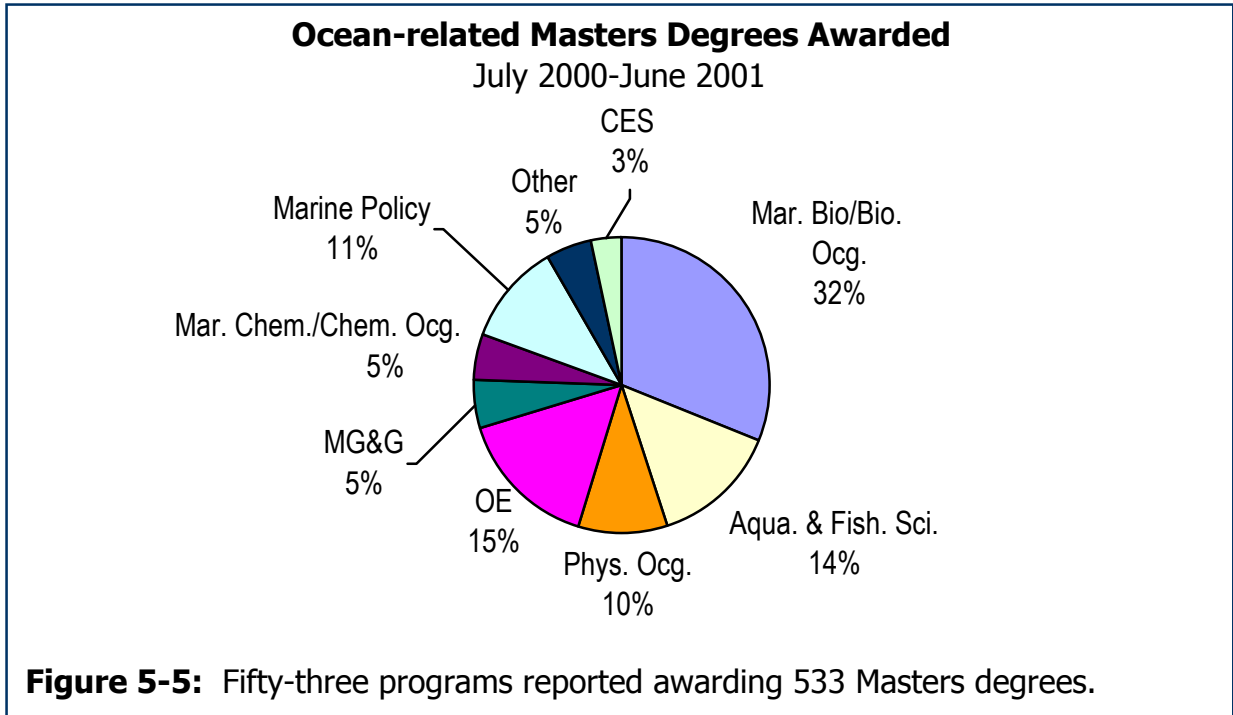
**Table 5-4:** Comparison of graduate student support among several scientific fields. Data on other fields are derived from Web CASPAR system and cover students in residence as of Fall 2000. Data on the ocean sciences and related fields covers students in residence as of Fall 2001. Total numbers of students for each discipline are listed in parentheses.

<b>Type of Student Support</b>	<b>Ocean Sciences</b> (2673)	<b>Astronomy</b> (823)	<b>Atmospheric Sciences</b> (844)	<b>Life Sciences</b> (9811)	<b>Physical Sciences</b> (2673)
Fellowship	13.0%	15.0%	5.7%	8.5%	8.5%
Traineeship	1.0%	2.5%	0.0%	9.0%	2.0%
Teaching Assistant	10.0%	27.0%	12.3%	12.5%	38.0%
Research Assistant	56.0%	51.5%	66%	28.0%	43.5%
Other	20.0%	4.0%	16.0%	42.0%	8.0%

**Masters Degrees Awarded**

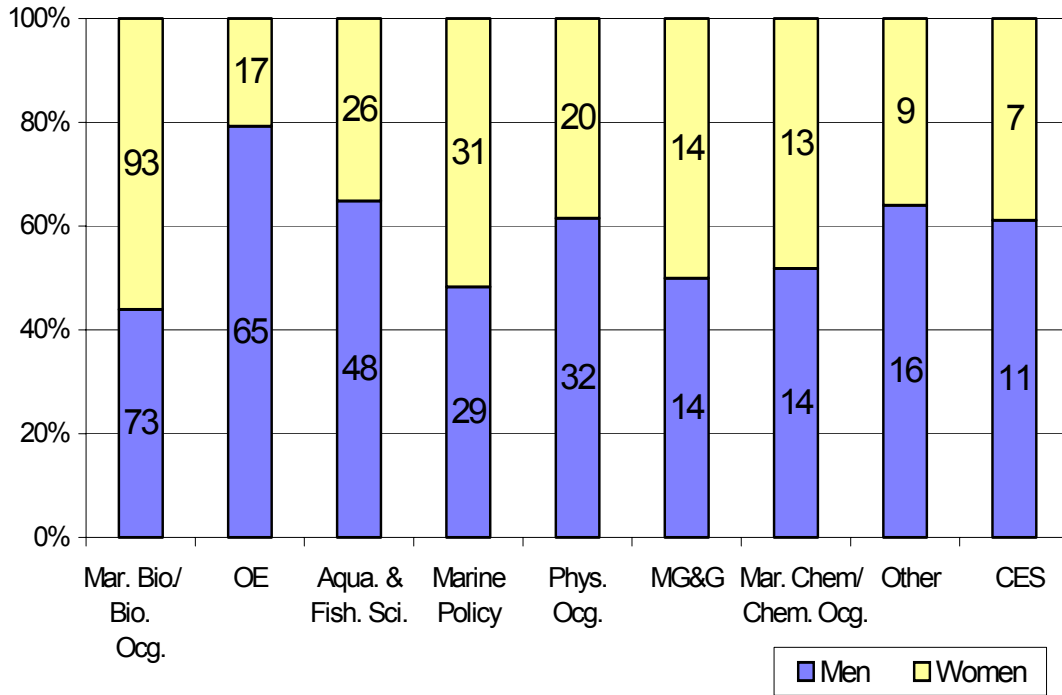
Masters degrees were awarded from 53 different programs with approximately one-third of those degrees in marine biology and biological oceanography (Figure 5-5). Aquaculture and fishery sciences accounted for another 14% of the masters degrees earned. Marine Policy was the area of specialization for about 11% of the degrees earned, while ocean engineering and physical oceanography were 15% and 10% of the number respectively. The remainder of the degrees awarded were in marine chemistry and chemical oceanography, marine geology and geophysics, coastal and estuarine studies, and “other”. Specified “other” fields included atmospheric and ocean sciences, hydrographics, interdisciplinary oceanography, marine science, non-thesis oceanography, and remote sensing.





Overall, 57% of the masters degrees were earned by men and 43% were earned by women (Figure 5-6). Men comprised the majority in almost all fields except marine biology and biological oceanography and marine policy. However, degrees awarded in marine chemistry and chemical oceanography and marine geology and geophysics were equally distributed among men and women. These data were provided by 52 programs for 532 students.

**Masters Degrees Awarded by Gender and Field**  
July 2000-June 2001



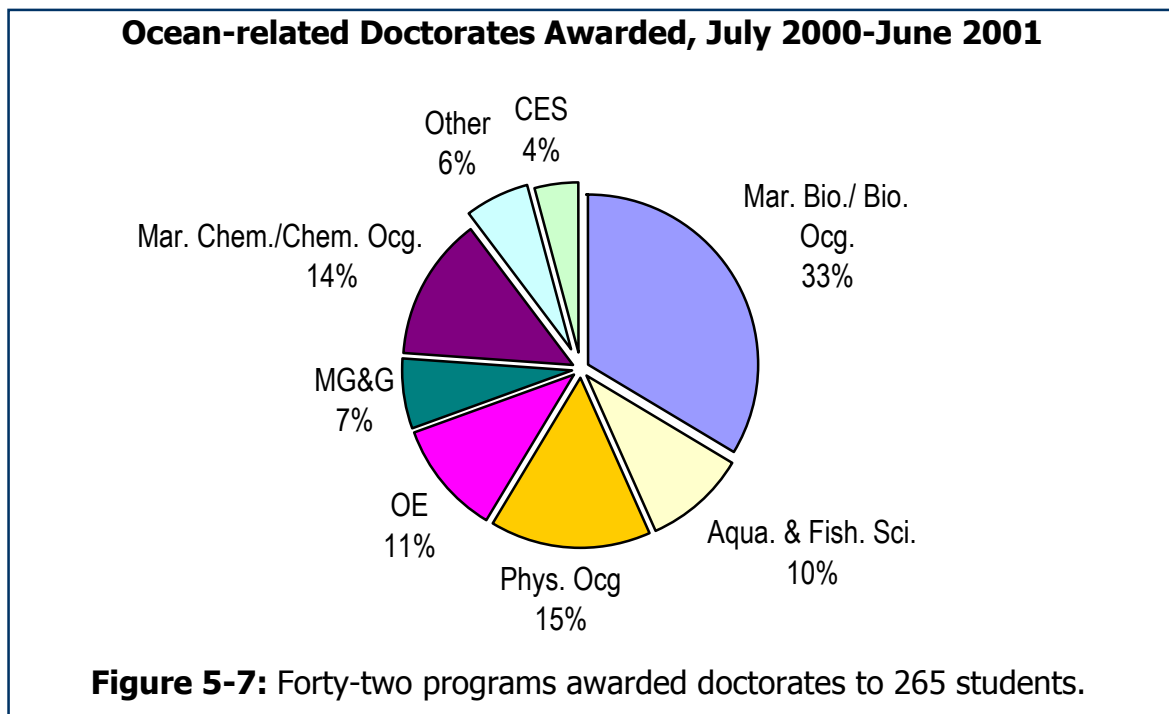
**Figure 5-10:** Fifty-two programs provided data on field and gender of 532 masters degree recipients between June 2000 and July 2001.

Citizenship information was provided by 50 programs for 492 people who received a Masters degree between July 1, 2000 to June 30, 2001. Of that group, 15.6% were foreign citizens; 84.5% were U.S. citizens.

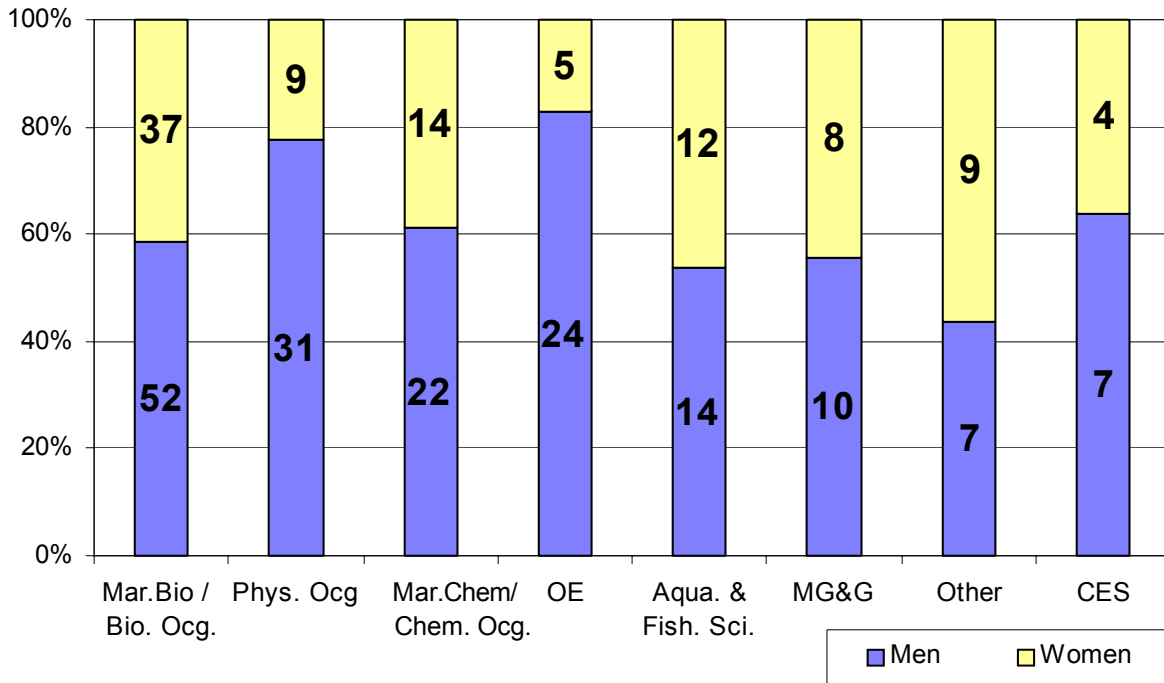
In addition, 45 programs reported ethnicity and race for 380 (91%) of the U.S. citizens who received their masters degree during the same time period. This group was predominately white (339 or 89%), although it also included 23 Hispanic Americans, 6 African American, 5 Asian Americans, and 1 Native American.

## **Doctoral Degrees Awarded**

Ocean-related doctoral degrees were awarded to 265 students by 42 different academic programs. The highest number—one-third—of degrees were awarded in marine biology and biological oceanography, followed in order of abundance by physical oceanography, marine chemistry and chemical oceanography, ocean engineering and fishery sciences. The “other” category included atmospheric and ocean sciences, general oceanography, fisheries oceanography, interdisciplinary oceanography. In addition, four doctorates were awarded in marine policy (Figure 5-7). Overall, a majority (63%) of the doctorates were awarded to men (Figure 5-8).



**Doctoral Degrees Awarded by Gender and Field, July 2000-June 2001**



**Figure 5-8:** Forty-two programs provided gender and field data on 265 doctorate recipients. Overall 63% were earned by men and 37% were earned by women.

Forty programs reported citizenship for 245 of the 265 doctorate recipients. Of this group, 81 (33%) were foreign and 164 (67%) were U.S. citizens. This is the highest ratio of foreign to U.S. citizens among all graduate student cohorts mentioned in this study.

As with the other student groups, ethnicity/race was reported for U.S. citizens only. The ethnic/racial diversity among the doctorate recipients was slightly greater than that of the other graduate student populations surveyed (Table 5-5).

**Table 5-5:** Ethnicity/race of the doctorates awarded between July 2000 and June 2001. Thirty-two programs provided data on 149 doctorates who are U.S. citizens.

Ethnicity/ Race	White	Hispanic	Asian American	Native American	African American	Other
Number	129	8	7	0	1	4
%	86.6%	5.4%	4.7%	0.0%	0.7%	2.7%

## **Post-graduation Employment**

Information on recipients of masters or doctoral degrees was provided for 737 of the 798 students reported receiving those degrees between July 2000 and June 2001. Upon graduating, 25% of the degree recipients were employed at a four-year college, university or a university-affiliated research center. Doctorate recipients comprised most of that 25% (127 doctoral degree recipients compared to 59 masters degree recipients). In contrast, a higher number of masters recipients were employed by a federal agency or private (for-profit) organization (133 masters degree recipients compared to 61 doctoral degree recipients). Unfortunately, approximately 26% of the programs surveyed could not report the initial employment of their recent graduates.

The programs surveyed were able to report initial employment for fewer masters (34% unknown) than doctorates (10% unknown) (Table 5-6).

**Table 5-6:** Where did graduates go after degree was awarded? Data cover those students who were awarded degrees between July 2000 and June 2001.

<b>Post-graduation Employment</b>	<b>Masters Degrees</b> 485 recipients from 48 programs	<b>Doctorates</b> 252 recipients from 40 programs
Foreign students who left the USA	5% (25)	8% (21)
Employed in a four-year college or university	5% (25)	29% (75)
Employed in university-affiliated research center	7% (34)	21% (52)
Employed in a federal agency	17% (81)	13% (33)
Employed in a state agency	3% (16)	2% (4)
Employed in a non-profit organization	4% (19)	2% (4)
Employed in private, for-profit sector	11% (52)	11% (28)
Employed in other*	7% (34)	4% (10)
Employment unknown	34% (166)	10% (25)
Enrolled in another university	7% (33)	not applicable
Notes: "Other" was not specified in the survey responses. Numbers of students are shown in parentheses.		

### **Comparison of Selected Ocean Sciences Programs with All Other Programs**

Since 1978 data has been collected on many aspects of graduate programs at the ten JOI schools referred to in Chapter 3 as the selected programs. In the early 1990's, this data collection effort expanded to include an additional 10 to 15 graduate programs. However, individual institutions within this group did not provide graduate program data consistently throughout the years, making reliable comparisons with the older data impossible.

## **CHAPTER SIX: UNDERGRADUATE PROGRAMS AT FOUR-YEAR COLLEGES AND UNIVERSITIES**

One hundred ten programs at 90 institutions were surveyed about their ocean-related undergraduate programs. Of that group, data from 65 programs were used in the analyses below. Programs were asked to provide information on numbers of bachelors degrees awarded by field and gender. CORE also requested the number of marine minors awarded, the number of students who took an introductory level Marine Science course (Oceanography 101 or the equivalent), and where students went after getting their bachelors degree in a marine field. The complete survey is located in Appendix B.

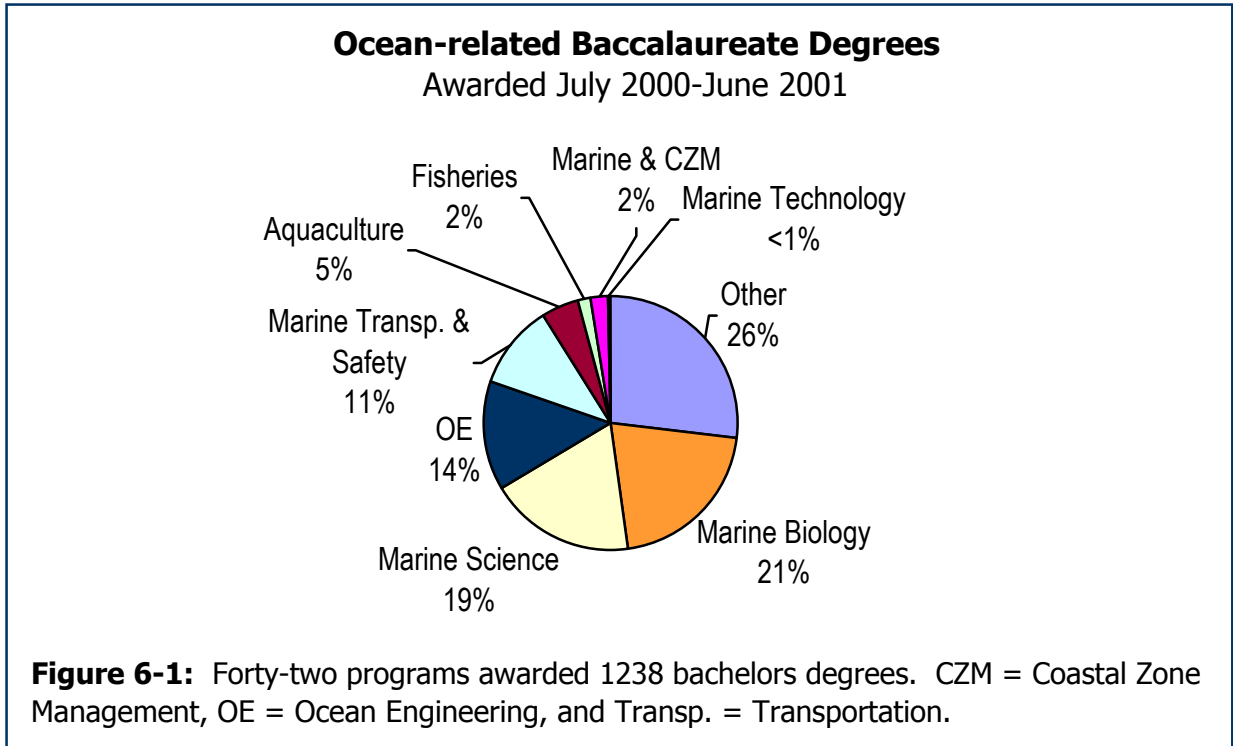
### **Baccalaureate Degrees Awarded**

The schools surveyed that offer undergraduate degrees in the ocean sciences awarded a total of 1238 baccalaureate degrees in the 2000-2001 academic year (AY2001). Degrees were awarded in the fields of marine science, marine biology, marine technology, marine transportation and safety, aquaculture, fisheries, marine and coastal zone management, and a category labeled "other" (Figure 6-1).

The baccalaureate degree programs are marked by a diversity of sub-fields, and in fact the "other" category contained the largest number of bachelors degrees awarded in AY2001, 26%. Survey respondents graduated students in the following "other" subfields:

- Aquatic and Fishery Sciences
- Atmospheric and Oceanic Sciences
- Biology
- Coastal Engineering
- Coastal Studies
- Earth Systems Science and Policy
- Earth and Ocean Sciences
- General Physics
- Geology, Geology and Geophysics
- Marine Affairs
- Marine Environmental Studies
- Marine Studies
- Marine Transportation
- Meteorology
- Naval Architecture & Marine Engineering

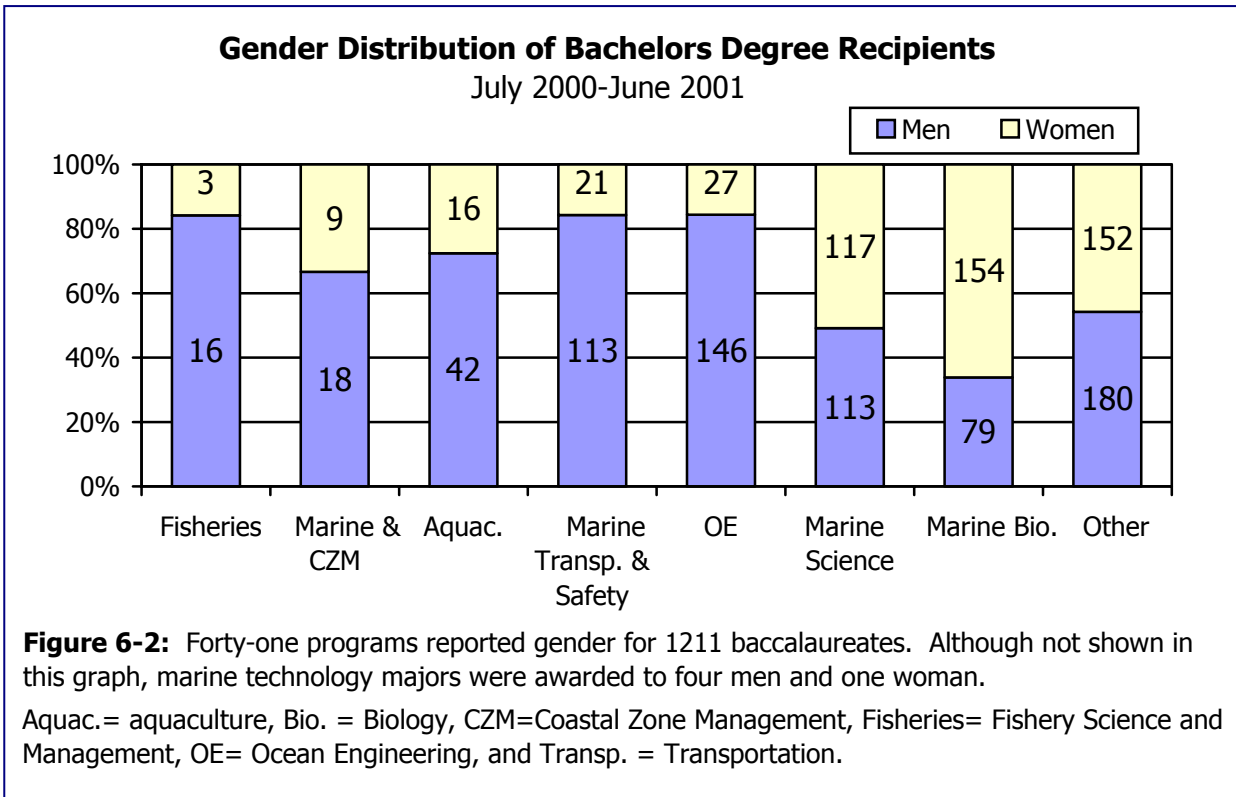
A large number of undergraduates who received degrees in the ocean sciences studied marine biology (21%) and marine science (19%). The marine transportation and safety field graduated 11% of the ocean science students in AY2001.



Only twenty-four of the programs surveyed awarded a marine minor. Of those programs, 16 programs awarded a total of 140 minors in a marine field during AY2001. Compared to some other disciplines, like physics, this is a large number of minors awarded for a relatively small field. Anecdotal evidence indicates that this may be due to the largely multidisciplinary nature of the ocean sciences which makes it well suited to being offered as a complementary focus of a larger core discipline such as physics, biology or chemistry.

Information on gender was provided for 1211 of the 1238 baccalaureates awarded during AY2001 (Figure 6-2). Women dominated the marine biology and marine sciences degrees awarded, but men were the majority in all the other majors. Overall 59% of the bachelors degrees awarded were given to men and 41% went to women.





### Introductory Courses

In an effort to assess the potential impact of ocean science-related programs at four-year colleges and universities, survey recipients were asked if their department or program taught an introductory level marine science course (Oceanography 101 or the equivalent) for one or two semesters.

Forty-six baccalaureate programs indicated that during AY 2002, 8687 students had taken one or two semesters of an introductory course. To put this number in context, we calculated the percentage of the potential pool of freshman students at 24 institutions. We also calculated the total number of freshman who took an introductory physics course at the same 24 institutions. (Data on other scientific fields were not available for this comparison.) We found that approximately 7% of this cohort of 93,962 freshman took an introductory marine science (or similar) course, while 17% were enrolled in Physics 101 for non-physics majors.

We made several assumptions when making these calculations. First, that these introductory courses are taken primarily by freshman. Second, that student enrollments between 1998 and 2001 were stable. This is important because the most recent data available on the total freshman enrollments covers the 1998-1999 academic year while

the data on Physics-101 enrollments covered the 2000-2001 academic year and the numbers from this study cover the 2001-2002 academic year.

It should also be noted that a similar question was asked of the community college programs. Thirteen community colleges responded that 2450 of their students were enrolled in an introductory ocean sciences course offered by their department. They represented 22% of the total enrollments in this kind of course as reported by both four-year and two-year programs. The actual contribution of the community colleges is probably higher because CORE only received responses from 50% of the two-year programs surveyed.

### **Post-baccalaureate Employment**

Forty-two baccalaureate programs provided information on where 1116 of their students went after college. However, the post-graduation plans of almost half of these students were unknown to the department or program administrators (Table 6-1). Further study of where students from each field go, and whether they are being prepared for a job or higher degree (or neither) would be worthwhile, both as a first step in acquiring feedback from programs on their career preparation of students for careers and to assess the programs' workforce contributions.

**Table 6-1.** Post-college activity of 1116 bachelors degree recipients between July 1, 2000 and June 30, 2001.

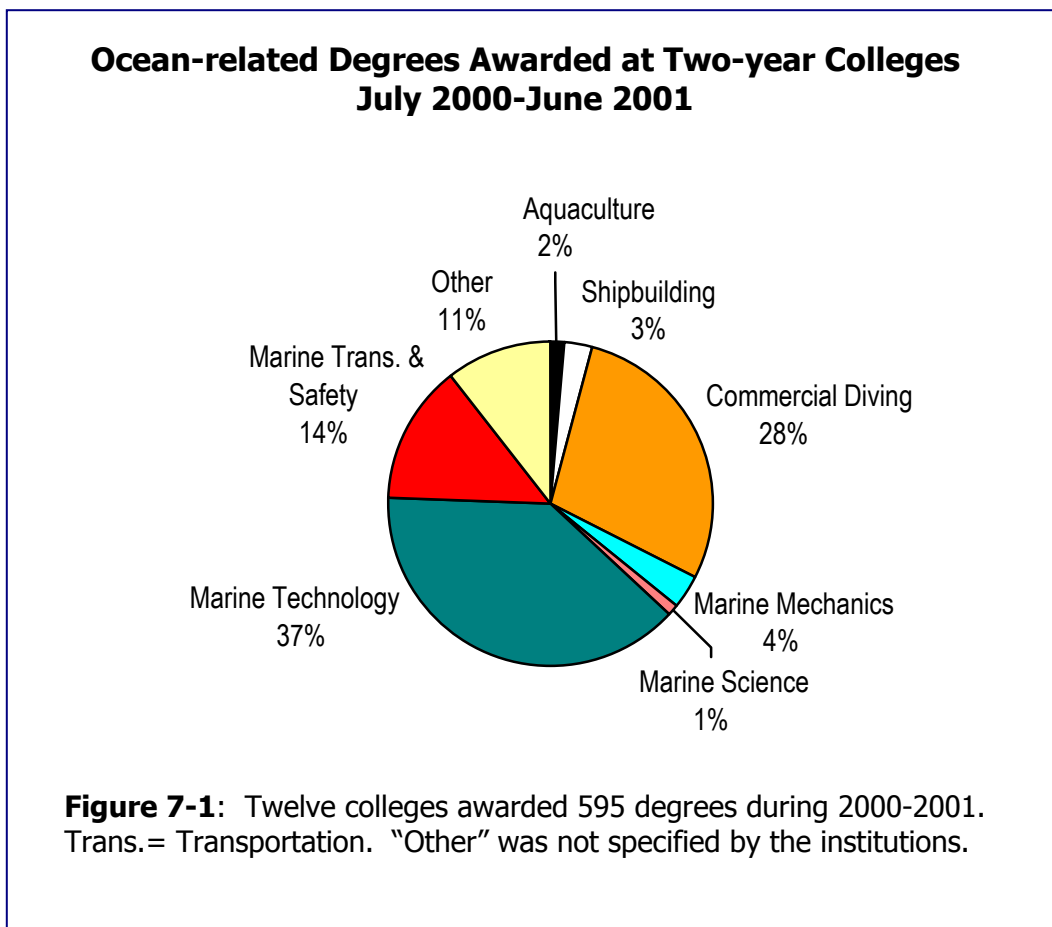
<b>Post-baccalaureate plans of 2001-2002 graduates</b>	<b>Percent of total degree recipients:</b>
Department/Program staff don't know	46
Enrolled in graduate program in ocean science-related field	9
Enrolled in graduate program in non-ocean science-related field	3
Employed as a K-12 teacher	1
Employed in the private sector	18
Active military	13
Civilian government: federal	2
Civilian government: state or local	1
Civilian government: unspecified	2
Other sector	5

## CHAPTER SEVEN: UNDERGRADUATE PROGRAMS AT TWO-YEAR COLLEGES

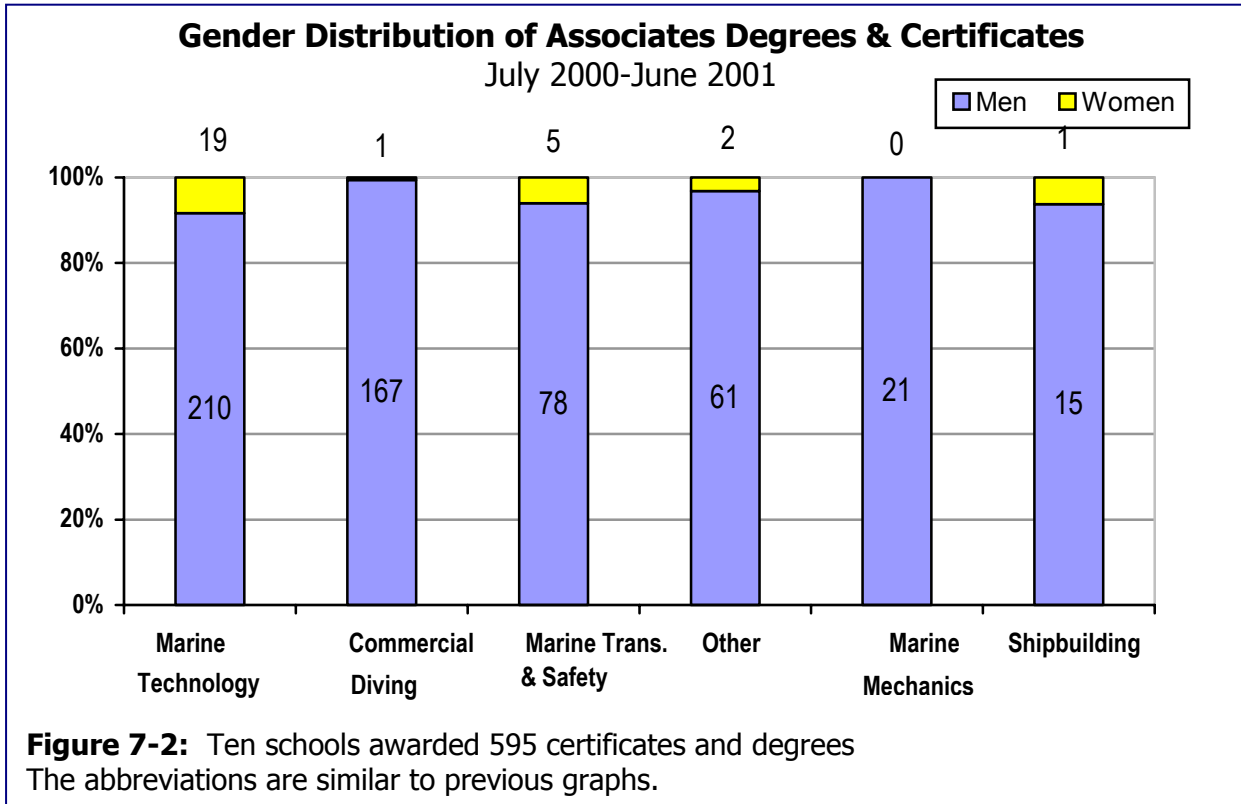
Twenty-five institutions offering certificates and associates degrees in marine-related fields were contacted for this study and thirteen responded (52%). Because these institutions tend to focus on vocational and technical training, CORE designed a separate comprehensive survey for two-year colleges that incorporated many questions similar in form and content to those on the faculty and funding surveys (Appendix B, pp. 66-71). This approach allowed information on community college faculty and research support to be included and analyzed in chapters 8 and 3 respectively. This chapter examines the unique aspects of two-year colleges that distinguish them from other types of marine science institutions.

### Associates Degrees and Certificates Awarded

The fields for associates degrees and certificates varies from those offered at four-year colleges and universities and graduate programs. Marine technology and commercial



diving were the most popular fields comprising 65% of the degrees awarded between July 1, 2000 and June 30, 2001 (Figure 7-1). Marine transportation and safety was the next largest segment (14%) followed by "other" (11%) which was not defined. Aquaculture, marine science, shipbuilding and marine mechanics accounted for the remaining 10% of the associates degrees and certificates. There were no graduates in marine biology, fisheries science and management, or ocean engineering in AY2001,



although there may have been no students were enrolled in those fields.

Of this group of graduates, 95% of the associates degrees and certificates were awarded to men and 5% were awarded to women. These data are consistent with those collected for the 1999-2000 academic year (AY2000) through the U.S. Department of Education's Integrated Postsecondary Educational Data System (IPEDS). The distribution of the associates degrees and certificates awarded by gender and field is shown in Figure 7-2.

Citizenship was reported for 568 of the 595 degree recipients. Ninety-four percent were U.S. citizens. Too few data on ethnicity and race of these students were reported to produce a robust analysis. Because the IPEDS data is comparable to this survey's with respect to gender, the same source of data was employed for an analysis of ethnicity and race of the graduates of two-year college programs. The IPEDS data

show a racial/ethnic breakdown of 84% white, 6% Native American, 6% Hispanic American, 2.2% African American for students awarded associates degrees or certificates during AY2000.

**Initial Employment from Two-year Colleges**

As with the other surveys the community colleges were asked where their students went after graduation. Nine programs were able to provide information on a total of 429 degree or certificate recipients. The responses are summarized in the table below.

**Table 7-1:** Post-graduation plans for those who received an Associates degree or certificate in a marine field.

Post-graduation plans of community college students	Percent of Total (Total =429)
Transferred to a four-year college	4
Went into general workforce	67
Went into an ocean sciences-related job	9
Other ( <i>not specified</i> )	17
Don't know	3

In contrast with many of the other institutions who participated in the survey, these programs keep track of where their graduates go. However, the overwhelming majority were listed as going into the general workforce, which is a higher figure than expected. Perhaps the person answering the survey did not define “ocean science-related” as broadly as the authors of this study have. Another explanation is that the survey respondent did not know specifically where their students went after graduation, but had a general idea that they went into the workforce. Because these schools tend to be vocational and technical colleges, one motivation for keeping good records of the post-graduation employment of their students is that is a major marketing tool for the programs.

**Comparison of CORE study with IPEDS**

The small number of participants in this survey limited the analysis which could be done so, an analysis of the composition of programs in the IPEDS was undertaken. A comparisons showed that the CORE survey respondents had only a moderate overlap with the schools in the IPEDS, i.e., only 9 of the 13 from this study were included in IPEDS. More importantly, IPEDS listings included 83 departments or programs that might have a marine focus, but it will require further investigation to determine which are primarily marine and which are predominately freshwater-focused. The table below summarizes the distribution of fields among institutions within the IPEDS that should be considered in future studies on community college programs in the ocean sciences.

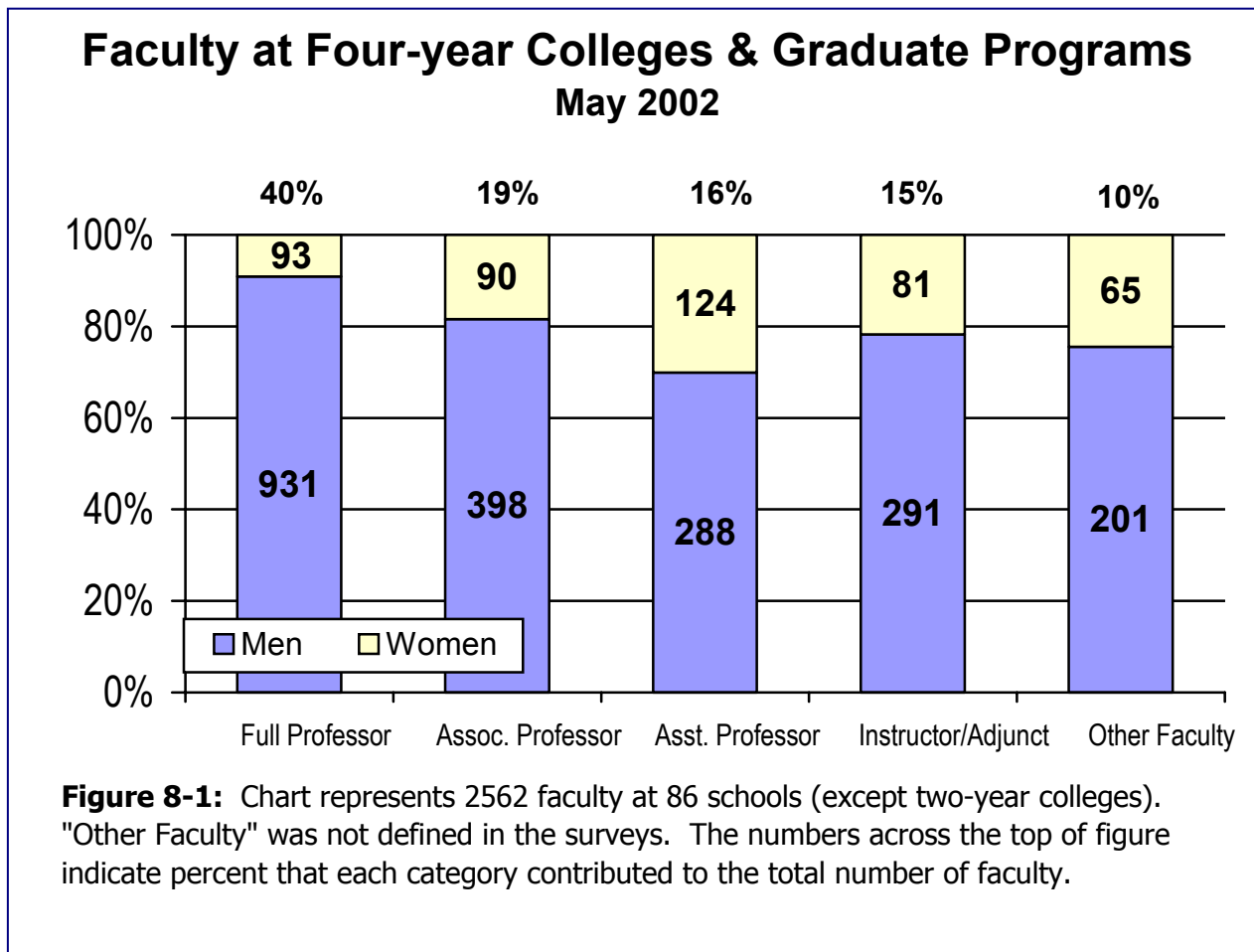
**Table 7-2:** Number and percent of marine and aquatic programs in IPEDS

<b>Field of Study at IPEDS schools</b> <i>(9 of the 12 schools in this study are included in the numbers below right.)</i>	<b># of programs</b>	<b>% of total</b>
Aquaculture Operations and Production Mgmt.	13	16%
Diver (Professional)	7	8%
Fishing and Fisheries Sciences and Mgmt.	8	10%
Marine Maintenance And Ship Repairer	37	45%
Marine Science/Merchant Marine Officer	7	8%
Marine/Aquatic Biology	2	2%
Naval Architecture & Marine Engineering	1	1%
Oceanography	8	10%
<b>Total</b>	<b>83</b>	<b>100%</b>

## CHAPTER EIGHT: FACULTY AND POSTDOCTORATES

### Undergraduate and Graduate Programs

A total of 2562 faculty were reported to be involved in baccalaureate and graduate programs at 86 schools. Figure 8-1 illustrates the faculty classification and gender distribution. At first glance, the graph could be read to infer that there are barriers to female success in senior faculty positions. However, a more appropriate explanation would be based on the percentage of doctorates awarded to women in ocean sciences during the past 25 years. For example, less than 10% of the doctorates were awarded to women in the age group for full professors, but the percentage for assistant



professors is on par with the gender ratio of doctorates awarded five to eight years ago in ocean sciences (approximately 25-30% women). Because of the format of the questions on this survey, CORE was unable to cross tabulate these numbers with field of study.

Ethnicity or race was reported for 2322 faculty members from 83 four-year baccalaureate and graduate departments and programs. Of this number, 2033 (88%) were white while the ethnicity of the other 289 faculty broke down as follows: 78 Hispanic, 141 Asian American, 16.5 African American, 6.5 Native American, and 47 Other.

CORE asked each department not only to provide the numbers of people employed as faculty, but also the full-time equivalents (FTE) allotted to their department or program. Overall, 2227 FTEs were allotted to 86 programs. Most of those (72%) were in tenured or tenure-track positions.

Survey respondents indicated that they have hired 181 new faculty during the 2001-2002 school year. Fifty-three percent of these positions are tenure-track appointments. In addition, 52 programs are recruiting 134 new faculty members for the 2002-2003 academic year. The majority (75%) of those openings are for tenure-track positions.

**Table 8-1:** Summary of the distribution of faculty among types of programs surveyed for our study.

Highest Degree Offered by Program	# Dept. & Programs	# Faculty
Associate or Certificate	11	93
Baccalaureate Courses	7	83
Baccalaureate Degrees	17	355
Baccalaureate courses and graduate degrees	10	284
Both baccalaureate and graduate degrees	25	1007
Graduate Degrees	23	765
Column totals:	93	2587

Table 8-1 classifies institutions based on the highest degree offered and provides the numbers of programs and faculty in each classification. Data from eight institutions were not included in this table because they did not also answer the surveys on undergraduate and/or graduate programs. Of the 93 programs included in the table above, 15 do not offer tenure to their faculty. About half the schools without tenure are two-year (community) colleges.

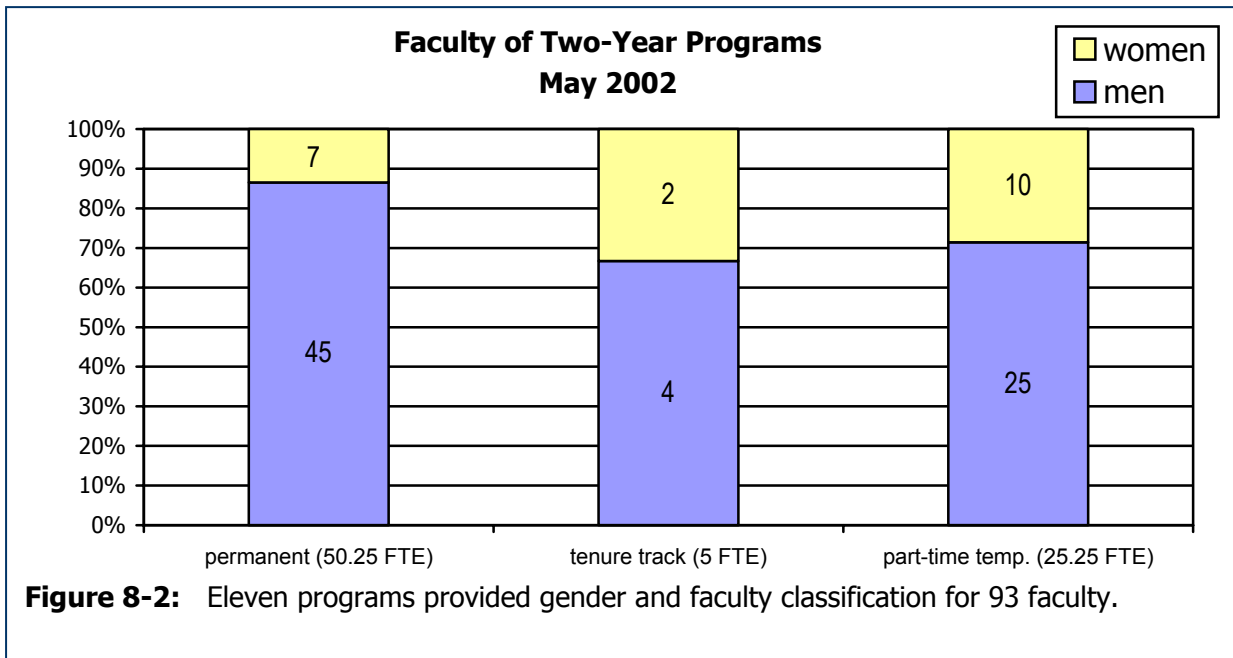


One commonly held belief in the ocean sciences community is that the ocean sciences are primarily graduate fields of study. However, this study found there are almost as many programs offering baccalaureate degrees as graduate degrees (Table 8-1). In addition, 1,200 students received baccalaureate degrees in ocean sciences or related fields in the 2001-2002 school year compared to 800 graduate degrees awarded (Chapter 5 & 6). Therefore, undergraduate students and the faculty that teach them are a significant part of the academic ocean sciences.

In spite of this contradiction with respect to the broadly defined community, it should be noted that certain sub-fields dominate one educational level and not the other. For example, physical oceanography and marine geology and geophysics are studied primarily in graduate school while marine transportation and safety is an undergraduate major.

**Faculty at Two-Year Programs**

Because two-year programs have a different structure than baccalaureate and graduate programs, their faculty categories were defined differently. Tenure was available at a few institutions and tenured faculty comprised less than one-tenth of the permanent positions (Figure 8-2). Many faculty were classified as part-time temporary although the majority were in full-time, permanent positions that were not tenured (Figure 8-2). Gender of the two-year faculty was 20% women, 80% men. Unfortunately, the response rate on the question about ethnicity and race of the faculty from these programs was too low to provide reliable information.



With respect to part-time, temporary faculty the ratio of the number of these positions (35) to the number of full-time equivalents (25) is almost 1:1. Because of the part-time nature of the position, we would ordinarily expect to see a ratio of 2:1 or 3:1. Temporary, part-time faculty positions accounted for half (15 out of 29) new hires for the 2000-2001 school year. The remainder were primarily for tenure-track positions.

### **Postdoctorates**

The faculty survey also requested information on postdoctoral positions. Fifty-nine programs reported 561 postdoctoral researchers in residence as of May 2002. This group of researchers can be characterized as follows:

- ◆ Fifty-nine programs reported 374 (67.3%) of their postdoctorates were men; 185 (33.1%) were women. This ratio of men to women is approximately equal to the ratio found among assistant professors. In addition, recently released data from the National Science Foundation on earned doctorates during 2000-2001 show a similar figure (32.7%) for women earning ocean science-related degrees.
- ◆ Fifty-eight programs provided citizenship data on their postdoctoral researchers. Individuals were almost evenly split with 298 foreign citizens and 256 U.S. citizens.
- ◆ Thirty-one programs provided data on the ethnicity and race of the postdoctorates who were U.S. citizens (155). Of those positions, 6% (9) were not white.

## CHAPTER NINE: CONCLUSION

This study clearly supports the premise that there is an exceptionally high level of diversity within the academic ocean sciences community. The community is broad, encompassing the fields of biology, chemistry, physics, geology, ocean and coastal engineering, marine policy, and resource management; and it is diverse in its depth, educating students at all levels of higher education from community college to graduate school.

There is strength in that diversity. The academic ocean sciences community has built a strong base capable of reaching out to other disciplines, forging unique partnerships, and adapting to address emerging national issues. Whether it is ocean engineers who will design the next generation of naval vessels, physical oceanographers who will increase our understanding of global climate change, marine biologists who will use sound science to better manage our nation's fisheries, or marine technicians who will operate and maintain an integrated ocean observing system, graduates in the ocean sciences are poised to provide the scientific information and support necessary to form the basis of sound public policy.

Despite the diversity of marine disciplines, large segments of the U.S. population are under-represented in the ocean sciences. The majority of undergraduate and advanced degrees awarded in the ocean sciences and related fields go to men. Men received 95% of the associates degrees and certificates, 57% of the masters degrees and 63% of the doctoral degrees awarded during the 2000-2001 academic year. In addition, the survey reveals a lack of racial and ethnic diversity among degree recipients. A disproportionate share of advanced degrees are awarded to white U.S. citizens. In fact, of the advanced degrees awarded to U.S. citizens, only about 12% are awarded to ethnic or racial minorities. U.S. citizens are the majority of the degree recipients in ocean-related fields at community college programs and graduate programs. The community college graduates had the lowest proportion (6%) of foreign students while doctoral graduates had the highest level (33%).

With respect to research funding and personnel, the national investment in the ocean sciences is substantial, reflecting their important role in national security, environmental prediction and marine resource management. The institutions that participated in this study received almost \$932 million in the 2002 academic year.

The federal government is the primary source of research support, providing almost two-thirds of the funds received. About a dozen federal agencies are involved in supporting marine research, but the National Science Foundation is the principal source, followed by the U.S. Navy and the National Oceanic and Atmospheric Administration. A comparison of the budgets of a subset of large institutions for the 1997 and 2002 academic years suggests that this critical federal support may have eroded over that

five-year period. The 2001-2002 numbers are about \$23 million or about 6.8% lower than in 1996-1997, despite a slight increase in NSF's funding<sup>9</sup>. While the ocean sciences budgets of a number of agencies drop from the 1996-1997 academic year to 2001-2002, the largest decrease, almost 26%, was in the budget of the U.S. Navy. Despite the concerns raised by this analysis, there also are some positive indications. A closer examination of the growth in funds that did not fit into a single agency category suggests growth in the use of partnerships to make the most efficient use of available dollars and a possible broadening of the funding base to include non-traditional sources.

Findings such as these provide an important snapshot of the ocean sciences community today; illustrating the community's strengths and highlighting areas where efforts must be concentrated in order to address current shortcomings. This survey will in fact become a useful basis of comparison on which to measure the continuing health of community. Therefore, collection of statistics similar to those covered by this study should continue with a few adjustments to the current format of questions.

In addition, there is one critical component to the U.S. infrastructure supporting marine research, management and education that bears closer inspection through future studies—the U.S. ocean-related workforce.

Some questions that might be studied within this broad area include:

- What degrees are required for various jobs and what level of education is desired?
- Is holding degree in ocean sciences an impediment to finding jobs in other fields?
- Are we educating our students for the diversity of jobs that are available?  
Furthermore, are our formal educational programs flexible enough to meet the changing workforce needs in the ocean sciences and related fields?

Finally, it will be important to begin tracking retirement and hiring in ocean science-related job sectors. No reliable numbers on this segment of the U.S. workforce exist and the ocean sciences community, broadly defined, is small enough that the estimates which do exist are probably spurious because they are based on small sample sizes within a subset of the entire U.S. science and engineering workforce.

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<sup>9</sup> Funding numbers are nominal and do not reflect changes due to inflation.

## APPENDIX A: Institutions and Programs Surveyed in Study

A total of 148 departments at 139 institutions were solicited to provide their information on various aspects of undergraduate and graduate education, research and research facilities. The overall response rate was determined from the number of surveys distributed (489) and the number returned (336). Shading within each row indicates which surveys were returned by each department or program. If an entire row is shaded, no surveys were returned to CORE.

Institution	Program	Sent=S	Survey(s) Sent to Program			
		Received=R				
Alaska Vocational Technical Center		S	2 Year College Survey			
Alexandria Technical College		S	2 Year College Survey			
Auburn University	Fisheries and Allied Aquaculture Department	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
Battelle		S	Funding and Facilities			
Bellingham Technical College	Fisheries Technology Program	S	2 Year College Survey			
Bigelow Laboratory for Ocean Sciences		SR	Funding and Facilities			
Boston University	Marine Biological Laboratory	S	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
Brown University	Geological Sciences Department	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
California Maritime Academy		SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
California State University	Moss Landing Marine Laboratories	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	
California State University, Monterey Bay	Earth Systems Sciences Department	SR	Faculty Workforce	Funding and Facilities	Undergraduate Programs	
Cape Fear Community College	Department of Marine Technology and Environmental Science Technology	SR	2 Year College Survey			
Chapman School of Seamanship		SR	2 Year College Survey			
Clatsop Community College	Maritime Science Department	SR	2 Year College Survey			

U.S. Academic Infrastructure in Support of Research and Education in Ocean Sciences and Related Fields

Institution	Program	Sent=S	Survey(s) Sent to Program			
		Received=R				
College of Charleston	Grice Marine Laboratory	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
College of Oceaneering		SR	2 Year College Survey			
College of the Atlantic		SR	Faculty Workforce	Funding and Facilities	Undergraduate Programs	
College of William and Mary	Virginia Institute of Marine Science	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
Columbia University	Lamont-Doherty Earth Observatory	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	
Cornell University	Shoals Marine Laboratory	S	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
Dauphin Island Sea Lab	Marine Environmental Sciences Consortium	SR	Funding and Facilities			
Divers Institute of Technology		SR	2 Year College Survey			
Duke University	Division of Earth and Ocean Sciences	SR	Undergraduate Programs	Faculty Workforce	Graduate Programs	
Duke University	Marine Laboratory	S	Funding and Facilities	Faculty Workforce	Graduate Programs	
East Carolina University	Diving & Water Safety	SR	Funding and Facilities			
East Carolina University	Ph.D. Program in Coastal Resources Management	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	
Eckerd College		S	Funding and Facilities	Undergraduate Programs		
Florida Atlantic University	Department of Ocean Engineering	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
Florida Institute of Oceanography		SR	Funding and Facilities			
Florida Institute of Technology	Department of Marine & Environmental Systems, College of Engineering	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
Florida Keys Community College	Marine Biology Technology Program	S	2 Year College Survey			
Florida State University	Department of Oceanography	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
Fullerton College		SR	2 Year College Survey			
Georgia Institute of Technology	School of Earth and Atmospheric Sciences	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs

U.S. Academic Infrastructure in Support of Research and Education in Ocean Sciences and Related Fields

Institution	Program	Sent=S Received=R	Survey(s) Sent to Program			
Gray's Harbor College		S	2 Year College Survey			
Harbor Branch Oceanographic Institution		SR	Funding and Facilities			
Harvard University	Division of Engineering and Applied Sciences (DEAS)	S	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
Hillsborough Community College	Aquaculture Program	SR	2 Year College Survey			
Hofstra University	Biology Department	SR	Faculty Workforce	Graduate Programs	Undergraduate Programs	
Hofstra University	Hofstra University Marine Laboratory	S	Funding and Facilities			
Honolulu Community College		SR	2 Year College Survey			
Hubbs Sea World Research Institute		S	Funding and Facilities			
Humboldt State University	Department of Fisheries Biology	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
Indian River Community College		SR	2 Year College Survey			
Johns Hopkins University	Applied Physics Laboratory	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	We received a letter explaining they offer Ocean Physics option only which no one is pursuing at this time.
Johns Hopkins University	Department of Earth and Planetary Sciences	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
Long Island University	Southampton College	S	Faculty Workforce	Funding and Facilities	Undergraduate Programs	
Louisiana State University	Dept. of Oceanography and Coastal Studies (includes: Coastal Studies Institute, Coastal Ecology Institute, Coastal Fisheries Institute, and Wetlands Institute)	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
Louisiana Universities Marine Consortium		SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs

U.S. Academic Infrastructure in Support of Research and Education in Ocean Sciences and Related Fields

Institution	Program	Sent=S	Survey(s) Sent to Program			
		Received=R				
Maine Maritime Academy	Corning School of Ocean Studies	R	Faculty Workforce	Funding and Facilities	Undergraduate Programs	
Maine Maritime Academy	Engineering Department	S	Faculty Workforce	Funding and Facilities	Undergraduate Programs	
Maine Maritime Academy	Graduate Studies	S	Graduate Programs	Faculty Workforce	Funding and Facilities	
Massachusetts Institute of Technology	Earth, Atmospheric & Planetary Sciences	SR	Faculty Workforce	Funding and Facilities		
Massachusetts Institute of Technology	MIT/WHOI Joint Program on Oceanography	SR	Graduate Programs			
Massachusetts Institute of Technology	Ocean Engineering	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	
Massachusetts Maritime Academy		S	Faculty Workforce	Funding and Facilities	Undergraduate Programs	
Medial University of South Carolina	Marine Biomedicine & Environmental Sciences	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
Miami Dade Community College	South Florida Marine Institute	S	2 Year College Survey			
Millersville University	School of Science and Mathematics	SR	Faculty Workforce	Undergraduate Programs	Funding and Facilities	
Mississippi State University	NSF Engineering Research Center at Stennis Space Center	S	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
Monterey Bay Aquarium Research Institute		SR	Funding and Facilities			
Monterey Peninsula College		SR	2 Year College Survey			
Mote Marine Laboratory		R	Funding and Facilities			
Mount Holyoke College	Department of Earth and Environmental Studies	SR	Undergraduate Programs	Faculty Workforce		
Naval Postgraduate School	Department of Oceanography	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	
North Carolina State University	Department of Marine, Earth, & Atmospheric Sciences	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
Northeastern Illinois University	Department of Earth Science	S	Faculty Workforce	Graduate Programs	Undergraduate Programs	
Northwestern Michigan College	Great Lakes Maritime Academy	S	2 Year College Survey	Funding and Facilities	Graduate Programs	Undergraduate Programs



U.S. Academic Infrastructure in Support of Research and Education in Ocean Sciences and Related Fields

Institution	Program	Sent=S	Survey(s) Sent to Program			
		Received=R				
Nova Southeastern University Oceanographic Center	Institute of Marine & Coastal Studies	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
Ohio State University	F.T. Stone Laboratory	SR	Faculty Workforce		Graduate Programs	Undergraduate Programs
Old Dominion University	Department of Ocean, Earth and Atmospheric Science	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
Oregon State University	College of Oceanic & Atmospheric Sciences	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
Peninsula College	Center for Aquaculture Training	S	2 Year College Survey			
Peninsula College	Department of Fisheries Technology	SR	2 Year College Survey			
Pennsylvania State University	College of Earth and Mineral Sciences	S	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
Pennsylvania State University	Graduate Program in Acoustics	S	Graduate Programs	Funding and Facilities	Faculty Workforce	
Princeton University	Department of Geosciences	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
Queens College	School of Earth & Environmental Sciences	S	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
Richard Stockton College of New Jersey	Natural Sciences and Math Department	SR	Faculty Workforce	Funding and Facilities	Undergraduate Programs	
Roger Williams University	Feinstein College of Arts and Science	SR	Faculty Workforce	Funding and Facilities	Undergraduate Programs	
Rutgers, The State University of New Jersey	Institute of Marine & Coastal Sciences	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
Salem State College	Biology Department	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
San Francisco State University	Romberg Tiburon Center for Environmental Studies	SR	Funding and Facilities	Faculty Workforce	Graduate Programs	Undergraduate Programs
Santa Barbara City College	Marine Diving Technology Department	S	2 Year College Survey			
Savannah State University	Natural Sciences and Mathematics	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
Sea Education Association		SR	Faculty Workforce	Funding and Facilities	Undergraduate Programs	
Seattle Central Community College	Seattle Maritime Academy	SR	2 Year College Survey			

U.S. Academic Infrastructure in Support of Research and Education in Ocean Sciences and Related Fields

Institution	Program	Sent=S	Survey(s) Sent to Program			
		Received=R				
Shippensburg University	Department of Geography and Earth Science	SR	Faculty Workforce	Undergraduate Programs	Funding and Facilities	
Skidaway Institute of Oceanography		SR	Funding and Facilities			
Southern California Marine Institute		SR	Funding and Facilities			
Southern Maine Technical College	Department of Applied Marine Biology & Oceanography and Environmental Technology	SR	2 Year College Survey			
Stanford University	Hopkins Marine Station	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
State University of New York	Maritime College	S	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
State University of New York - Morrisville	Department of Aquaculture and Aquatic Science	S	2 Year College Survey	Faculty Workforce	Funding and Facilities	Graduate Programs and Undergraduate Programs
State University of New York, Stony Brook	Marine Sciences Research Center	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
Stevens Institute of Technology	Davidson Laboratory	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
Texas A&M University at Galveston	Marine Engineering Technology, Texas A&M Maritime Academy	SR	Faculty Workforce		Undergraduate Programs	
Texas A&M University at Galveston	Marine Transportation, Texas A&M Maritime Academy	SR	Faculty Workforce	Funding and Facilities	Undergraduate Programs	
Texas A&M University, College Station	Department of Oceanography	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
Texas A&M University-Corpus Christi	Center for Coastal Studies	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
Texas A&M-Corpus Christi	Mariculture Program	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
U.S. Coast Guard Academy		SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
U.S. Merchant Marine Academy		SR	Faculty Workforce	Funding and Facilities	Undergraduate Programs	
U.S. Naval Academy	Department of Oceanography	SR	Faculty Workforce	Funding and Facilities	Undergraduate Programs	
U.S. Naval Academy	Naval Architecture and Ocean Engineering Department	SR	Faculty Workforce	Funding and Facilities	Undergraduate Programs	

U.S. Academic Infrastructure in Support of Research and Education in Ocean Sciences and Related Fields

Institution	Program	Sent=S	Survey(s) Sent to Program			
		Received=R				
University of Alaska Fairbanks	School of Fisheries and Ocean Sciences	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
University of Arizona	Department of Ecology and Evolutionary Biology	S	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
University of California, Berkeley	College of Engineering	S	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
University of California, Davis	Animal Science Department	S	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
University of California, Davis	Bodega Marine Laboratory	SR	Faculty Workforce	Funding and Facilities	Undergraduate Programs	
University of California, Irvine	Earth System Science	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
University of California, Los Angeles	Marine Science Center, Department of Organismic Biology, Ecology and Evolution	S	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
University of California, San Diego	Scripps Institution of Oceanography	SR	Funding and Facilities	Faculty Workforce	Graduate Programs	Undergraduate Programs
University of California, Santa Barbara	Marine Science Institute	S	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
University of California, Santa Cruz	Institute of Marine Sciences	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
University of Chicago	Department of Geophysical Sciences	S	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
University of Connecticut-Avery Point, Marine Sciences Program	Marine Sciences Program	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
University of Delaware	Graduate College of Marine Studies	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
University of Florida	Civil and Coastal Engineering Department	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
University of Georgia	Department of Marine Sciences	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
University of Guam	Marine Laboratory/ Water and Energy Research Inst.	S	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
University of Hawaii	School of Ocean and Earth Science and Technology	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
University of Maine	School of Marine Science	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs

U.S. Academic Infrastructure in Support of Research and Education in Ocean Sciences and Related Fields

Institution	Program	Sent=S Received=R	Survey(s) Sent to Program			
University of Maryland	Aquatic Pathobiology Center, Department of Veterinary Medicine	S	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
University of Maryland	Center for Environmental Science	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
University of Massachusetts-Dartmouth	Graduate School of Marine Sciences and Technology, University of Massachusetts-Dartmouth	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	
University of Miami	Marine and Atmospheric Science Program	SR	Undergraduate Programs			
University of Miami	Rosenstiel School of Marine and Atmospheric Science	SR	Funding and Facilities	Faculty Workforce	Graduate Programs	
University of New England	Department of Biological Sciences	S	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
University of New England	Department of Environmental Studies	S	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
University of New Hampshire	Marine Program	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
University of New Orleans	School of Naval Architecture and Marine Engineering	S	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
University of North Carolina at Chapel Hill	Department of Marine Sciences	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
University of North Carolina at Wilmington	Department of Physics and Physical Oceanography	SR	Undergraduate Programs			
University of North Carolina at Wilmington	Education Center for Marine Studies	SR	Graduate Programs			
University of North Carolina, Wilmington	Center for Marine Science	SR	Faculty Workforce	Funding and Facilities		
University of Northern Colorado	Earth Science Department	S	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
University of Oregon	Oregon Institute of Marine Biology	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
University of Puerto Rico	Department of Marine Sciences (DMS),	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs

U.S. Academic Infrastructure in Support of Research and Education in Ocean Sciences and Related Fields

Institution	Program	Sent=S	Survey(s) Sent to Program			
		Received=R				
University of Rhode Island	Department of Fisheries, Animal, and Veterinary Science	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
University of Rhode Island	Department of Marine Affairs	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
University of Rhode Island	Department of Ocean Engineering	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
University of Rhode Island	Graduate School of Oceanography	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	
University of San Diego	Marine and Environmental Studies Program	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
University of South Carolina	Belle W. Baruch Institute	SR		Funding and Facilities		
University of South Carolina	The Marine Science Program	SR	Faculty Workforce	Graduate Programs	Undergraduate Programs	
University of South Florida	College of Marine Science	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
University of Southern California	Wrigley Institute for Environmental Studies	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
University of Southern Mississippi	College of Marine Sciences	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
University of Texas at Austin	Institute for Geophysics	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
University of Texas at Austin	Marine Science Institute and Department of Marine Science	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
University of the Virgin Islands	Marine Science Center	S	Faculty Workforce	Funding and Facilities	Undergraduate Programs	
University of Virginia	Center for Oceans Law and Policy	S	Faculty Workforce	Graduate Programs		
University of Washington	Applied Physics Lab	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
University of Washington	School of Aquatic & Fishery Sciences	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
University of Washington	School of Marine Affairs	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
University of Washington	School of Oceanography	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
University of Wisconsin	Milwaukee Great Lakes Wisconsin Aquatic Technology and Environmental Research (WATER) Institute	SR	Funding and Facilities			

U.S. Academic Infrastructure in Support of Research and Education in Ocean Sciences and Related Fields

Institution	Program	Sent=S	Survey(s) Sent to Program			
		Received=R				
University of Wisconsin-Madison	Department of Atmospheric & Oceanic Sciences, Center for Climate Research	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
University of Wisconsin-Madison	Limnology and Marine Science Program	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	
Webb Institute of Naval Architecture		SR	Faculty Workforce	Funding and Facilities	Undergraduate Programs	
Wesleyan University		S	Faculty Workforce	Funding and Facilities	Undergraduate Programs	
Western Washington University	Shannon Point Marine Center	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
Wilkes University	Marine Science Consortium	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
Williams College-Mystic Seaport	Marine Science Department	S	Faculty Workforce	Funding and Facilities	Graduate Programs	Undergraduate Programs
Woods Hole Oceanographic Institution	Academic Programs	SR	Faculty Workforce	Funding and Facilities	Graduate Programs	

## **Appendix B**

The following enclosed surveys were sent to all survey participants:

- Funding and Facilities Survey of Ocean Sciences Departments and Institutions
- Graduate Program Survey of Ocean Sciences Departments and Institutions
- Undergraduate Program Survey of Ocean Sciences Departments and Institutions
- Two-Year College Survey of Ocean Sciences Programs and Departments
- Faculty Workforce Survey of Ocean Sciences Programs

# Funding and Facilities Survey of Ocean Sciences Departments and Institutions

*Sponsored by the Consortium for Oceanographic Research and Education*

**1. Contact information**

**Name of institution:**

**Name of department:**

**Form completed by (your name):**

**Your title:**

**Your email address:**

**2. Does your institution own or operate any non-UNOLS vessels or facilities?**

Examples of vessels and facilities include: AUVs, boats and ships, clean rooms, field laboratories, hyperbaric chambers, mass spectrometers, ROVs, supercomputers, and manned submersibles.

*Note: Do not include facilities that students or faculty use at another institution or facility.*

No (if no non-UNOLS, please skip to Question 5)

Yes  
↓

**3. Please indicate who owns your institution's non-UNOLS vessel or facility, the age of each, and if there is planning underway to replace them:**

Vessel or Facility (please list type)	<u>Primary</u> Owner	Age of vessel or facility	Plan underway to replace? (select one)	Year when replacement planned
1.			Y N	
2.			Y N	
3.			Y N	
4.			Y N	
5.			Y N	



**4. If there is no plan to replace a current non-UNOLS vessel and/or facility that needs replacement, briefly explain why:**

**5. List the dollar amount of support that your department received in the academic year 2001-02 for research support from each of the following sources:**

Source of research support	Dollar amount of support (to nearest \$1000)
Internal support (e.g., from your institution)	\$ _____
State funds	\$ _____
Funds from Private Corporations	\$ _____
Funds from Private Foundations	\$ _____
<b>Federal:</b>	
Department of Energy	\$ _____
Department of Interior Total:	\$ _____
MMS	\$ _____
USGS	\$ _____
EPA	\$ _____
NASA	\$ _____
Navy	\$ _____
Other DoD	\$ _____
NOAA	\$ _____
NSF	\$ _____
Other Federal (please specify)	\$ _____
Other Federal (please specify)	\$ _____
Other (Non-Federal) (please specify)	\$ _____

**6. How many people in each of the following categories are supported in part or whole by the research dollars listed in Question 5?**

<b>Number supported</b>	<b>Position</b>
_____	<b>Professors</b>
_____	<b>Postdoctorates</b>
_____	<b>Research Staff</b>
_____	<b>Technicians (lab &amp; shipboard)</b>
_____	<b>Graduate students</b>
_____	<b>Other staff (non-clerical)</b>
_____	<i>(please specify)</i> _____

**7. If necessary, please describe any unique circumstances at your institution that would help us to better understand your responses.**

**Thank you for your participation!**

Please save a copy of this survey for your records and email it back to [sschoedinger@coreocean.org](mailto:sschoedinger@coreocean.org) or print and fax it to (202) 986-5072. Contact Sarah Schoedinger at CORE with any questions at (202) 332-0063, ext. 221.

# Graduate Program Survey of Ocean Sciences Departments and Institutions

*Sponsored by the Consortium for Oceanographic Research and Education*

## 1. Contact information

Name of institution:

Name of department:

Form completed by (*your name*):

Your title:

Your email address:

## 2. Does your department offer graduate degrees (Master's or Ph.D.)?

Yes

No (*if no graduate degrees offered, please stop here and return this form so that we may remove you from our mailing list.*)

## 3. Please indicate the number of graduate applications your department received and the number of offers made for fall enrollment over each of the last two academic years:

For enrollment in:	Number of graduate applications:	Number of admission offers:
Fall 2001		
Fall 2002		

**4. Please indicate the number of first-year graduate student enrollments (or offers accepted) for Fall 2001 in each of the following areas. Specify the total number, the number of men, and the number of women:**

	Number of 1 <sup>st</sup> year enrollments Fall 2001	Number of 1 <sup>st</sup> year enrollments who were <u>men</u>	Number of 1 <sup>st</sup> year enrollments who were <u>women</u>
Marine Biology and/or Biological Oceanography	=	+	
Marine Chemistry and/or Chemical Oceanography	=	+	
Marine Geology & Geophysics	=	+	
Physical Oceanography	=	+	
Ocean Engineering (incl. Applied Ocean Physics)	=	+	
Marine Policy (incl. Marine Affairs & Maritime/Admiralty Law)	=	+	
Fishery Sciences	=	+	
Aquaculture (incl. Mariculture)	=	+	
Coastal & Estuarine Studies	=	+	
Other Ocean Science (please specify)	=	+	

**TOTAL NUMBER**  
(Sum of Column)

**4a. How many of your total Fall 2001 first-year enrollments (response entered for total in box above, Question 4) were:**

U.S. Citizens:  Foreign Citizens:

▼ Report racial breakdown for US citizens only

White ____	Asian-American ____	African-American ____
Hispanic ____	Native American ____	Other ____

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5. Please indicate the number of graduate students currently in residence in each of the following areas as of last Fall 2001. Specify the total number, the number of men, and the number of women:

	<u>Total</u> number of grad students in residence	Number of grad students who are <u>men</u>	Number of grad students who are <u>women</u>
Marine Biology and/or Biological Oceanography	=		+
Marine Chemistry and/or Chemical Oceanography	=		+
Marine Geology & Geophysics	=		+
Physical Oceanography	=		+
Ocean Engineering (incl. Applied Ocean Physics)	=		+
Marine Policy (incl. Marine Affairs & Maritime/Admiralty Law)	=		+
Fishery Sciences	=		+
Aquaculture (incl. Mariculture)	=		+
Coastal & Estuarine Studies	=		+
Other Ocean Science (please specify)	=		+

**TOTAL NUMBER**  
(Sum of Column)



5a. How many of your total graduate students in residence (Fall 2001) (*response entered for total in box above, Question 5*) are:

U.S. Citizens:

Foreign Citizens:

▼ Report racial breakdown for US citizens only

White _____	Asian-American _____	African-American _____
Hispanic _____	Native American _____	Other _____

- 6. Please indicate the number of your total graduate students in residence (Fall 2001) who were primarily supported in each of the following ways.**  
*(Note: Every student should be counted one time. If a student is supported multiple ways, please count him/her only one time by his/her primary source of support)*

<u>Source of Support</u>	<u>Total number of graduate students receiving support</u>
Teaching Assistantship	
Research Assistantship	
Fellowship	
Traineeship	
Other sources of support	
Not receiving support	

- 6a. What is the most common full-time equivalent (FTE) for graduate students with Teaching Assistantships?**

\_\_\_\_\_ FTE for Teaching Assistantships

- 6b. What is the average annual salary for Teaching Assistants referenced in item 6a?**

\$\_\_\_\_\_ per year for Teaching Assistants

- 6c. What is the most common full-time equivalent (FTE) for graduate students with Research Assistantships?**

\_\_\_\_\_ FTE for Research Assistantships

- 6d. What is the average annual salary for Research Assistants referenced in item 6c?**

\$\_\_\_\_\_ per year for Research Assistants

- 7. Please check all that apply about your department's graduate program**

- \_\_\_ Master's is the highest degree offered  
 \_\_\_ Master's is required en route to a PhD  
 \_\_\_ Master's is optional en route to a PhD  
 \_\_\_ We have a separate Master's program parallel to our PhD program

**8. How many total Master’s degrees were granted in each of the following areas between July 1, 2000 and June 30, 2001? Specify the total number, the number of men, and the number of women graduates.**

	<u>Total number of Master’s awarded July 00-June 01</u>	<u>Number of Master’s awarded to <b>men</b></u>	<u>Number of Master’s awarded to <b>women</b></u>
<b>Marine Biology and/or Biological Oceanography</b>	=		+
<b>Marine Chemistry and/or Chemical Oceanography</b>	=		+
<b>Marine Geology &amp; Geophysics</b>	=		+
<b>Physical Oceanography</b>	=		+
<b>Ocean Engineering (incl. Applied Ocean Physics)</b>	=		+
<b>Marine Policy (incl. Marine Affairs &amp; Maritime/Admiralty Law)</b>	=		+
<b>Fishery Sciences</b>	=		+
<b>Aquaculture (incl. Mariculture)</b>	=		+
<b>Coastal &amp; Estuarine Studies</b>	=		+
<b>Other Ocean Science (please specify)</b>	=		+
<b>TOTAL NUMBER (Sum of Column)</b>			

**8a. How many of your total Master’s recipients (July 1, 2000 to June 30, 2001) (response entered for total in box above, Question 8) were:**

**U.S. Citizens:**       **Foreign Citizens:**

↓ Report racial breakdown for US citizens only

White ____	Asian-American ____	African-American ____
Hispanic ____	Native American ____	Other ____

**9. Of those Master’s recipients who left your department in between July 1, 2000 and June 30, 2001, how many did the following?**

	<b>Number of Master’s recipients</b>
<b>Enrolled in another university (regardless of field of study)</b>	
<b>Foreign students who left the USA</b>	
<b>Employed in Four-year college or university</b>	
<b>Employed in University-Affiliated Research Center</b>	
<b>Employed in Federal Agency</b>	
<b>Employed in State Agency</b>	
<b>Employed in Non-Profit</b>	
<b>Employed in Private For-Profit Sector</b>	
<b>Other</b>	
<b>Don’t know</b>	

**Note:** If your department does not grant Ph.D.s, please stop here and return the questionnaire. Thank you.

**10. How many total Ph.D.s were granted in each of the following areas between July 1, 2000 and June 30, 2001? Specify the total number, the number of men, and the number of women graduates.**

	<u>Total number of Ph.D.s awarded July 00 to June 01</u>	<u>Number of Ph.D.s awarded to <b>men</b></u>	<u>Number of Ph.D.s awarded to <b>women</b></u>
<b>Marine Biology and/or Biological Oceanography</b>	=	+	
<b>Marine Chemistry and/or Chemical Oceanography</b>	=	+	
<b>Marine Geology &amp; Geophysics</b>	=	+	
<b>Physical Oceanography</b>	=	+	
<b>Ocean Engineering (incl. Applied Ocean Physics)</b>	=	+	
<b>Marine Policy (incl. Marine Affairs &amp; Maritime/Admiralty Law)</b>	=	+	
<b>Fishery Sciences</b>	=	+	
<b>Aquaculture (incl. Mariculture)</b>	=	+	
<b>Coastal &amp; Estuarine Studies</b>	=	+	
<b>Other Ocean Science (please specify)</b>	=	+	
<b>TOTAL NUMBER (Sum of Column)</b>			

↓ Use this number to respond to next item.



**10a. How many of your total Ph.D. recipients (July 1, 2000 to June 30, 2001) (response entered for total in box on previous page, Question 10) were:**

U.S. Citizens:  Foreign Citizens:

↓ Report racial breakdown for US citizens only

White _____	Asian-American _____	African-American _____
Hispanic _____	Native American _____	Other _____

**11. Of those Ph.D. recipients who left your department in between July 1, 2000 and June 30, 2001, how many did the following?**

	Number of Ph.D. recipients
Foreign students who left the USA	
Employed in Four-year college or university	
Employed in University-Affiliated Research Center	
Employed in Federal Agency	
Employed in State Agency	
Employed in Non-Profit	
Employed in Private For-Profit Sector	
Other	
Don't know	

**Thank you for your participation!**

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Contact Sarah Schoedinger at CORE with any questions at (202) 332-0063, ext. 221.

# Undergraduate Program Survey of Ocean Sciences Departments and Institutions

*Sponsored by the Consortium for Oceanographic Research and Education*

**1. Contact information**

**Name of institution:**

**Name of department:**

**Form completed by** *(your name)*:

**Your title:**

**Your email address:**

**2. Does your department offer undergraduate courses?**

- Yes, we offer undergraduate courses and a bachelor's degree
- Yes, we offer undergraduate courses but no bachelor's degree *(skip to item 4)*
- No *(if no undergraduate courses offered, please stop here and return this form so that we may remove you from our undergraduate program mailing list.)*

**3. Please indicate the number of bachelor's degrees awarded in each of the following areas last year (July 1, 2000 to June 30, 2001). Specify the total number, the number awarded to men, and the number awarded to women:**

Subject area	<u>Total</u> number of bachelor's awarded Jul 00 - Jun 01	Number of bachelor's awarded to <u>men</u>	Number of bachelor's awarded to <u>women</u>
<b>Aquaculture</b> (incl. Fisheries Tech & Mariculture)	=	+	
<b>Fishery Science &amp; Management</b>	=	+	
<b>Marine &amp; Coastal Zone Management</b>	=	+	
<b>Marine Biology</b> (incl. Marine Zoology)	=	+	
<b>Marine/Ocean Engineering</b>	=	+	
<b>Marine Mechanics</b>	=	+	
<b>Marine Science</b> (incl. Oceanography & Ocean Studies)	=	+	
<b>Marine Technology</b>	=	+	
<b>Marine Transportation &amp; Safety</b>	=	+	
<b>Other</b> <i>(please specify)</i> _____	=	+	
<b>TOTAL NUMBER</b> <b>(Sum of Column)</b>			

**4. Does your department offer a marine-related minor?**

No *(If no, please skip to Question 5)*

Yes



**4a. How many marine-related minors did your department award during the last academic year, July 1, 2000 to June 30, 2001?**

Number of undergraduate minors,  
July 1, 2000 to June 30, 2001: \_\_\_\_\_

**5. Please tell us how many students took their first term of introductory level Ocean Science (Oceanography 101 or equivalent) in your department in the past academic year, 2001 to 2002.**

*(To avoid double counting students, please indicate the number of students enrolled in the fall semester if the course is more than one semester in length)*

Number enrolled in year-long course \_\_\_\_\_

Fall semester one-term course \_\_\_\_\_

Spring semester one-term course \_\_\_\_\_

**6. Of the students who received bachelor's degrees from your department or institution between July 1, 2000 and June 30, 2001, how many did each of the following immediately after graduation:**

	Number of bachelor's recipients
Graduate school in Ocean Science-related field	
Graduate school in non-Ocean Science-related field	
Employed as K-12 teacher	
Employed in the private sector	
Active military	
Civilian government total:	
Federal government	
State/local government	
Other	
Don't know	

**Thank you for your participation!**

Please save a copy of this survey for your records and email it back to [sschoedinger@coreocean.org](mailto:sschoedinger@coreocean.org) or print and fax it to (202) 986-5072.

Contact Sarah Schoedinger at CORE with any questions at (202) 332-0063, ext. 221.

# Two-Year College Survey of Ocean Sciences Programs and Departments

*Sponsored by the Consortium for Oceanographic Research and Education*

## 1. Contact information

Name of institution: \_\_\_\_\_

Name of department or program: \_\_\_\_\_

Form completed by (*your name*): \_\_\_\_\_

Your title: \_\_\_\_\_

Your email address: \_\_\_\_\_

## 2. How many students took their first term of introductory-level ocean science (Oceanography 101 or equivalent) in your program during the academic year 2001-02?

*(To avoid double counting students, please indicate the number of students enrolled in the fall semester if the course is more than one semester in length)*

Number enrolled in year-long course \_\_\_\_\_

Fall semester one-term course \_\_\_\_\_

Spring semester one-term course \_\_\_\_\_

## 3. Between July 1, 2001 and June 30, 2002, how many students were enrolled in ocean science or marine-related courses offered by your program/department?

Number enrolled in year-long course \_\_\_\_\_

Fall semester one-term course \_\_\_\_\_

Spring semester one-term course \_\_\_\_\_

## 4. Of those students enrolled (*response to item 3*), how many were employed and taking courses for professional development?

*Please indicate the number of students and not the percent of total students.*

Number of students taking one or more ocean science or marine-related courses for professional development between July 1, 2001 and June 30, 2002: \_\_\_\_\_

**5. Does your department or program offer an Associate's degree or Certificate in any marine, ocean, or maritime-related field?**

\_\_\_ Yes

\_\_\_ No (if no Associates degrees or Certificates are offered, please stop here and return the form so that we may remove you from our Two-Year College mailing list.)

**6. Please indicate the number of associate's degrees or certificates awarded in each of the following areas last year (July 1, 2000 to June 30, 2001). Specify the total number, the number awarded to men, and the number awarded to women:**

	<u>Total number of graduates</u> Jul 00 - Jun 01	<u>Number of men graduates</u>	<u>Number of women graduates</u>
<b>Aquaculture</b> (incl. Fisheries Technology and Mariculture)	=	+	
<b>Boatbuilding/Shipbuilding</b>	=	+	
<b>Commercial Diving</b>	=	+	
<b>Fishery Science and Management</b>	=	+	
<b>Marine Biology</b> (incl. Marine Zoology)	=	+	
<b>Marine/Ocean Engineering</b>	=	+	
<b>Marine Mechanics</b>	=	+	
<b>Marine Science</b> (incl. Oceanography and Ocean Studies)	=	+	
<b>Marine Technology</b>	=	+	
<b>Marine Transportation and Safety</b>	=	+	
<b>Other</b> (please specify) _____	=	+	
<b>TOTAL NUMBER (Sum of Column)</b>			

**6a. How many of your total 2000-01 graduates (response entered for total in box above, Question 10) were:**

U.S. Citizens:

Foreign Citizens:

Report racial breakdown for US citizens only

White ___	Asian-American ___	African-American ___
Hispanic ___	Native American ___	Other ___

**7. Of the students who graduated from your department between July 1, 2000 and June 30, 2001, how many:**

	Number of students
Transferred to a 4-year college or university	
Went directly into the workforce	
How many work in Ocean Science-related job?	
Other	
Don't know	

**8. Please indicate the number of full-time equivalent (FTE) faculty that your department has allotted in each of the following positions as of May 1, 2002.**

	Total FTE allotted to your department (May 1, 2002)
Tenured or Permanent Positions	
Tenure-Track Positions	
Temporary Positions, Full-Time	
Temporary Positions, Part-Time	

**9. Please indicate the number of faculty in your department on May 1, 2002. Specify the number of men and the number of women.**

*Please count the number of people, not the FTE*

	Number of faculty who are <u>men</u>	Number of faculty who are <u>women</u>
Tenured or Permanent Positions		
Tenure-Track Positions		
Temporary Positions, Full-Time		
Temporary Positions, Part-Time		

**9a. How many of your faculty are:**

↓

White _____	Asian-American _____	African-American _____
Hispanic _____	Native American _____	Other _____

**10. Not counting routine contract renewals, did you hire any new faculty members (tenured, tenure-track, temporary, part-time, or non-tenure-track permanent) starting in the academic year 2001-02?**

No

Yes



	<b>Number Hired</b>
Number of Tenured or Tenure-Track Faculty	_____
Number of Temporary Full-Time Faculty	_____
Number of Permanent, Non-Tenure-Track Faculty	_____
Number of Part-Time Faculty	_____
Number of other faculty positions (non-clerical)	_____

**11. Have you recruited or are you recruiting for faculty positions (not part-time) for the 2002-03 academic year?**

No

Yes



	<b>Number Recruited</b>
Number of Tenured or Tenure-Track Faculty	_____
Number of Temporary Full-Time Faculty	_____
Number of Permanent, Non-Tenure-Track Faculty	_____

**12. Has your program received any scientific research support in the academic year 2001-02?**

No *(if no, please stop here and return the questionnaire)*

Yes



**12a. If so, what was the total dollar amount of scientific research support (rounded to the nearest \$1000)?**

\$ \_\_\_\_\_

**12b. List the dollar amount of support that your department received in the academic year 2001-02 for scientific research support from each of the following sources:**

<b>Source of research support</b>	<b>Dollar amount of support (to nearest \$1000)</b>
<b>Internal support</b> (e.g., from your institution)	\$ _____
<b>State funds</b>	\$ _____
<b>Funds from private corporations</b>	\$ _____
<b>Funds from private foundations</b>	\$ _____
<b>Federal:</b>	
<b>Department of Energy</b>	\$ _____
<b>Department of Interior Total:</b>	\$ _____
<b>MMS</b>	\$ _____
<b>USGS</b>	\$ _____
<b>EPA</b>	\$ _____
<b>NASA</b>	\$ _____
<b>Navy</b>	\$ _____
<b>Other DoD</b>	\$ _____
<b>NOAA</b>	\$ _____
<b>NSF</b>	\$ _____
<b>Other Federal</b> ( <i>please specify</i> )	\$ _____
_____	
<b>Other Federal</b> ( <i>please specify</i> )	\$ _____
_____	
<b>Other (Non-Federal)</b> ( <i>please specify</i> )	\$ _____
_____	



**13. How many people in each of the following categories are supported in part or whole by the research dollars listed in Question 5?**

<b>Number supported</b>	<b>Position</b>
_____	<b>Instructors</b>
_____	<b>Other non-clerical staff</b> <i>(please specify)</i> _____
_____	<b>Students</b>

**Thank you for your participation!**

Please save a copy of this survey for your records and email it back to [sschoedinger@coreocean.org](mailto:sschoedinger@coreocean.org) or print and fax it to (202) 986-5072. Contact Sarah Schoedinger at CORE with any questions at (202) 332-0063, ext. 221.

# Faculty Workforce Survey of Ocean Sciences Programs

*Sponsored by the Consortium for Oceanographic Research and Education*

## 1. Contact information

Name of institution:

Name of department:

Form completed by (*your name*):

Your title:

Your email address:

## 2. Which category best describes your institution?

Non-Academic Research Institution

University or Four-Year College

Other (*please explain*) \_\_\_\_\_

## 3. Does your institution have a tenure system?

No

Yes

## 4. Please indicate the number of full-time equivalent (FTE) faculty that your department has allotted in each of the following positions as of May 1, 2002.

	Total FTE allotted to your department (May 1, 2002)
Tenured Positions	
Tenure-Track Positions	
Non-Tenure-Track, Permanent Positions	
Temporary Positions	

**5. Excluding postdocs, please indicate the number of faculty in your department on May 1, 2002. Specify the number of men and the number of women faculty in each of the following positions.**

*Please count the number of people, not FTE.*

	Number of faculty who are <u>men</u>	Number of faculty who are <u>women</u>
Full Professor		
Associate Professor		
Assistant Professor		
Instructor/Adjunct		
Other faculty		

**5b. How many of your faculty are:**

White \_\_\_\_ Asian-American \_\_\_\_ African-American \_\_\_\_  
 Hispanic \_\_\_\_ Native American \_\_\_\_ Other \_\_\_\_

**6. Not counting routine contract renewals, did you hire any new faculty members (tenured, tenure-track, temporary, part-time, or non-tenure-track permanent) starting in the academic year 2001-02?**

\_\_\_\_ No

\_\_\_\_ Yes

	Number Hired
Number of Tenured or Tenure-Track Faculty	_____
Number of Temporary Full-Time Faculty	_____
Number of Permanent, Non-Tenure-Track Faculty	_____
Number of Part-Time Faculty	_____
Number of other positions Faculty	_____

**7. Have you recruited or are you recruiting for faculty positions (not part-time) for the 2002-03 academic year?**

\_\_\_ No

\_\_\_ Yes



	<b>Number Recruited</b>
Number of Tenured or Tenure-Track Faculty	___
Number of Temporary Full-Time Faculty	___
Number of Permanent, Non-Tenure-Track Faculty	___

**8. How many postdoctorates were working for your department (or for faculty in your department) on May 1, 2002? Specify the total number, the number of men, and the number of women postdocs. If there were no postdocs, please enter "0"**

	<u>Total</u> number of postdoctorates (May 1, 2002)	=	Number of postdocs who are <u>men</u>	+	Number of postdocs who are <u>women</u>
Number of postdoctorates					



**8a. How many of your total postdoctorates are:**

U.S. Citizens:

Foreign Citizens:



Report racial breakdown for US citizens only

White ___	Asian-American ___	African-American ___
Hispanic ___	Native American ___	Other ___

**9. If necessary, please describe any unique circumstances at your institution that would help us to better understand your responses.**

**Thank you for your participation!**

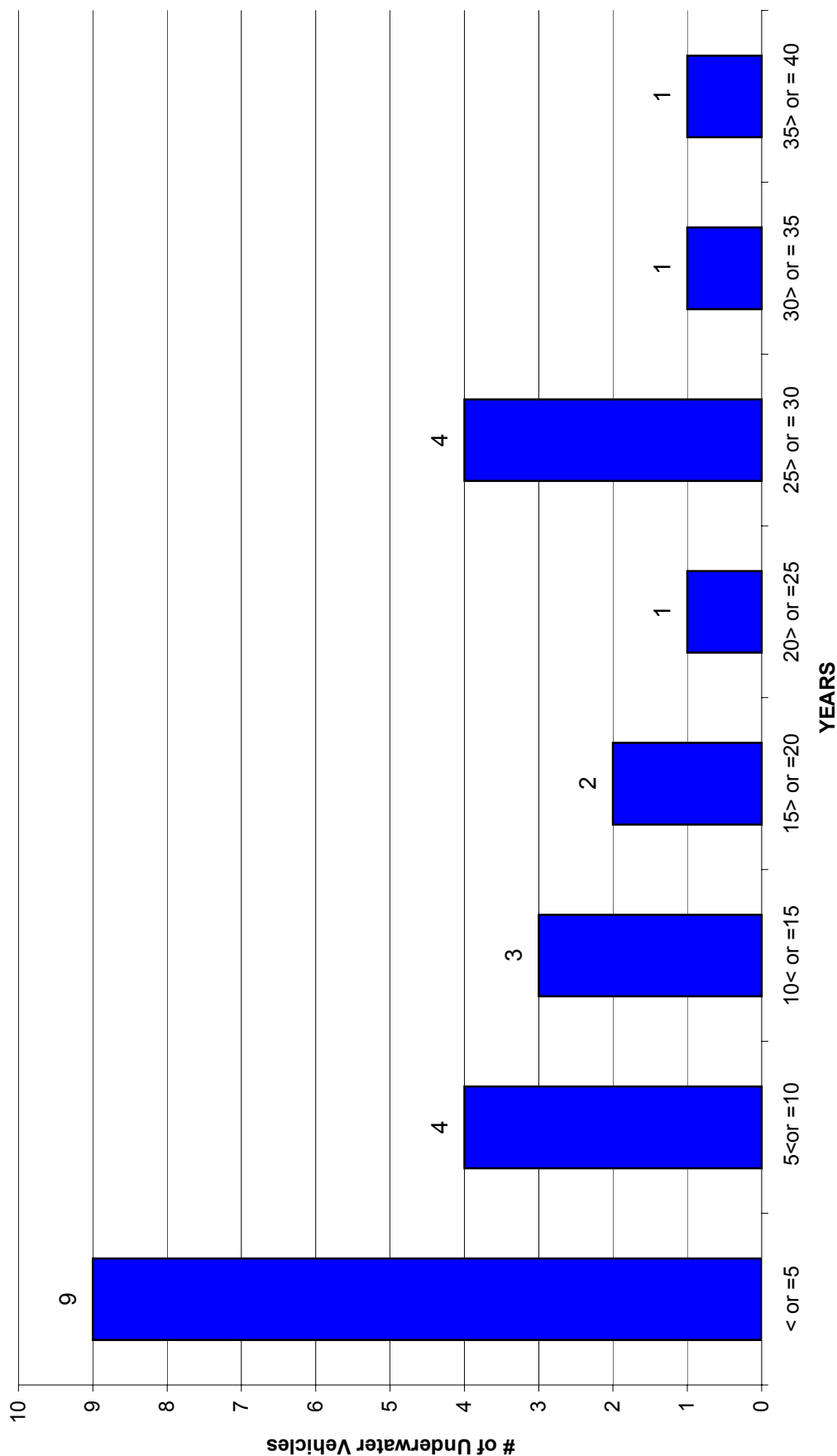
Please save a copy of this survey for your records and email it back to

[sschoedinger@coreocean.org](mailto:sschoedinger@coreocean.org) or print and fax it to (202) 986-5072.

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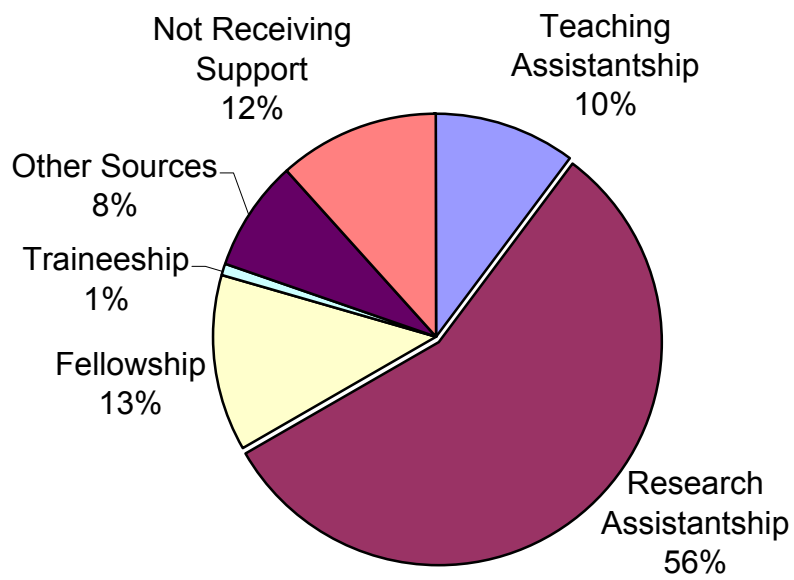
<b>Appendix C</b>
<b>Additional Tables and Graphs</b>
<b>Facilities</b>
Age of Non-UNOLS Underwater Vehicles at 16 Academic Institutions
<b>Graduate Programs</b>
Graduate Student Support FY 2002
<b>Two-Year Colleges</b>
Ocean-related Degrees Awarded at Two-Year Colleges
Gender Distribution of Degrees/Certificates at Two-Year Colleges
Where Two-Year College Graduates Went After Graduation
<b>Faculty</b>
Ethnicity/Race of Faculty at Baccalaureate and Graduate Schools
New Faculty Hires for Baccalaureate & Graduate Programs during 2001-2002

### Age of Non-UNOLS Underwater Vehicles at 16 Academic Institutions

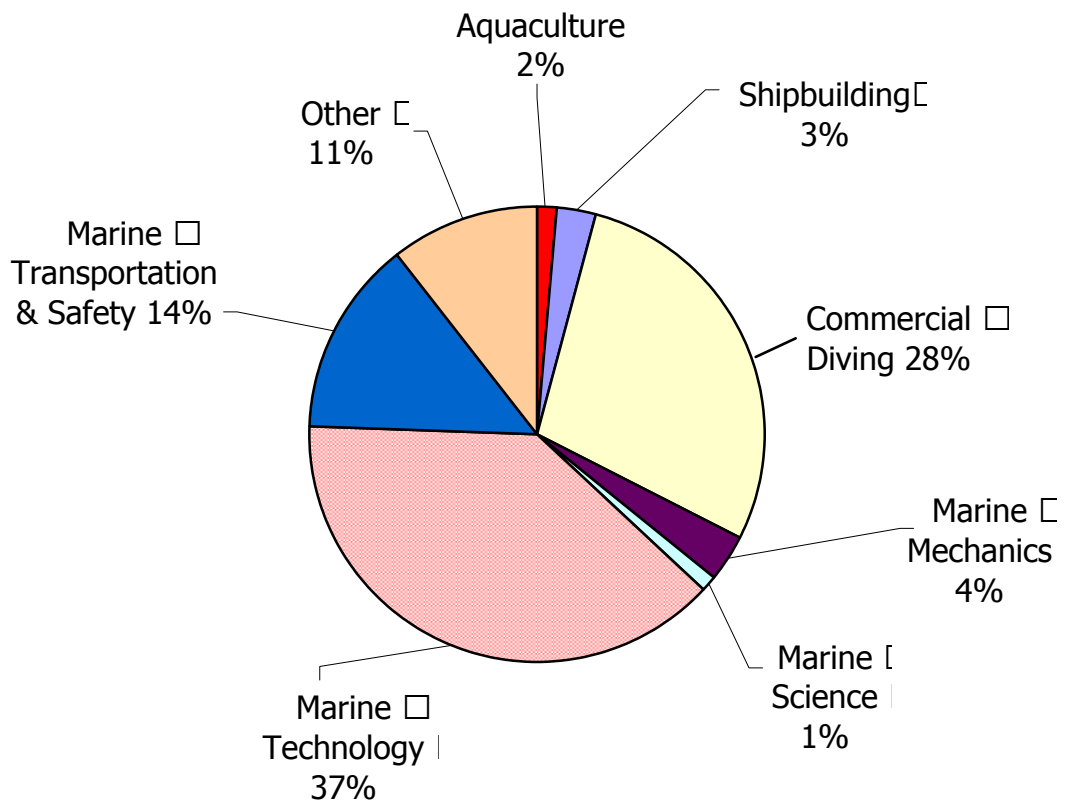


Note-Underwater vehicles includes: AUVs, ATVs, ROVs, and all types of submersibles

### Graduate Student Support during Fall 2001 (2673 reported by 46 programs)



**Ocean-related Degrees Awarded at Two-Year Colleges  
July 2000-June 2001  
n=12 institutions; 595 degrees/certificates**

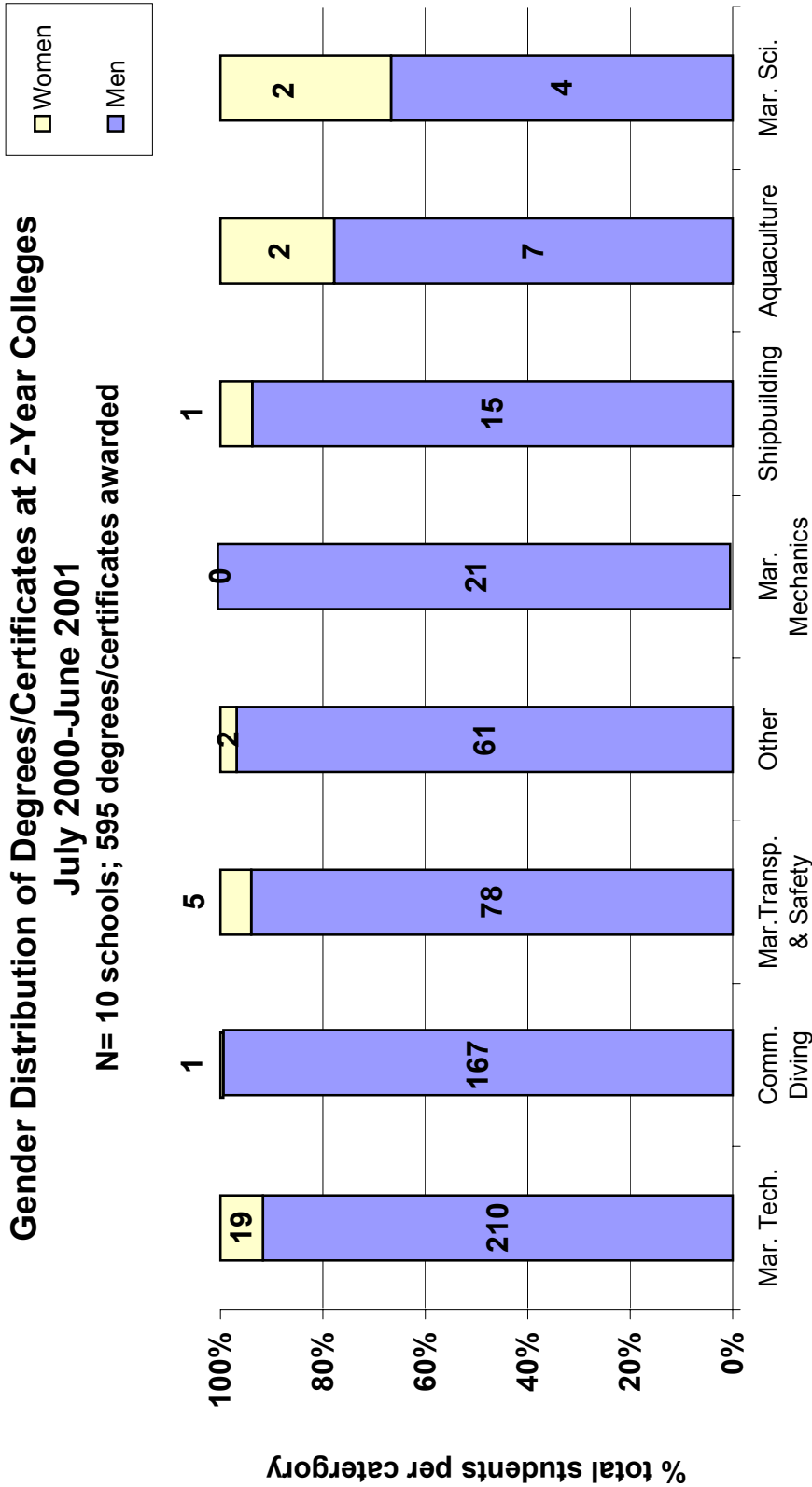




### Gender Distribution of Degrees/Certificates at 2-Year Colleges

July 2000-June 2001

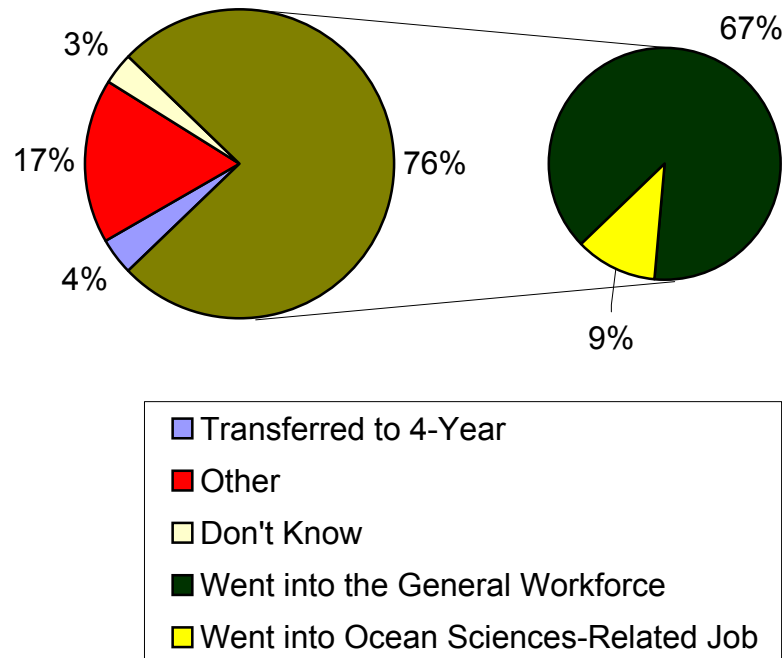
N= 10 schools; 595 degrees/certificates awarded



During 2001-2002 school year, there were no graduates in Marine Biology, Ocean Engineering or Fisheries Science & Management, but that is not an indication that there were no students who were enrolled in those fields at 2-year colleges. Numbers in columns indicate numbers of students receiving degrees that year.

**Within this cohort, 95% of the degrees were awarded to men and 5% were awarded to women. These figures are consistent with IPEDS data. (IPEDS=Integrated Postsecondary Education Data System).**

**Where 2-Year College Graduates Went After Graduation  
July 2000-June 2001  
N=9 schools responding**



**Notes:**

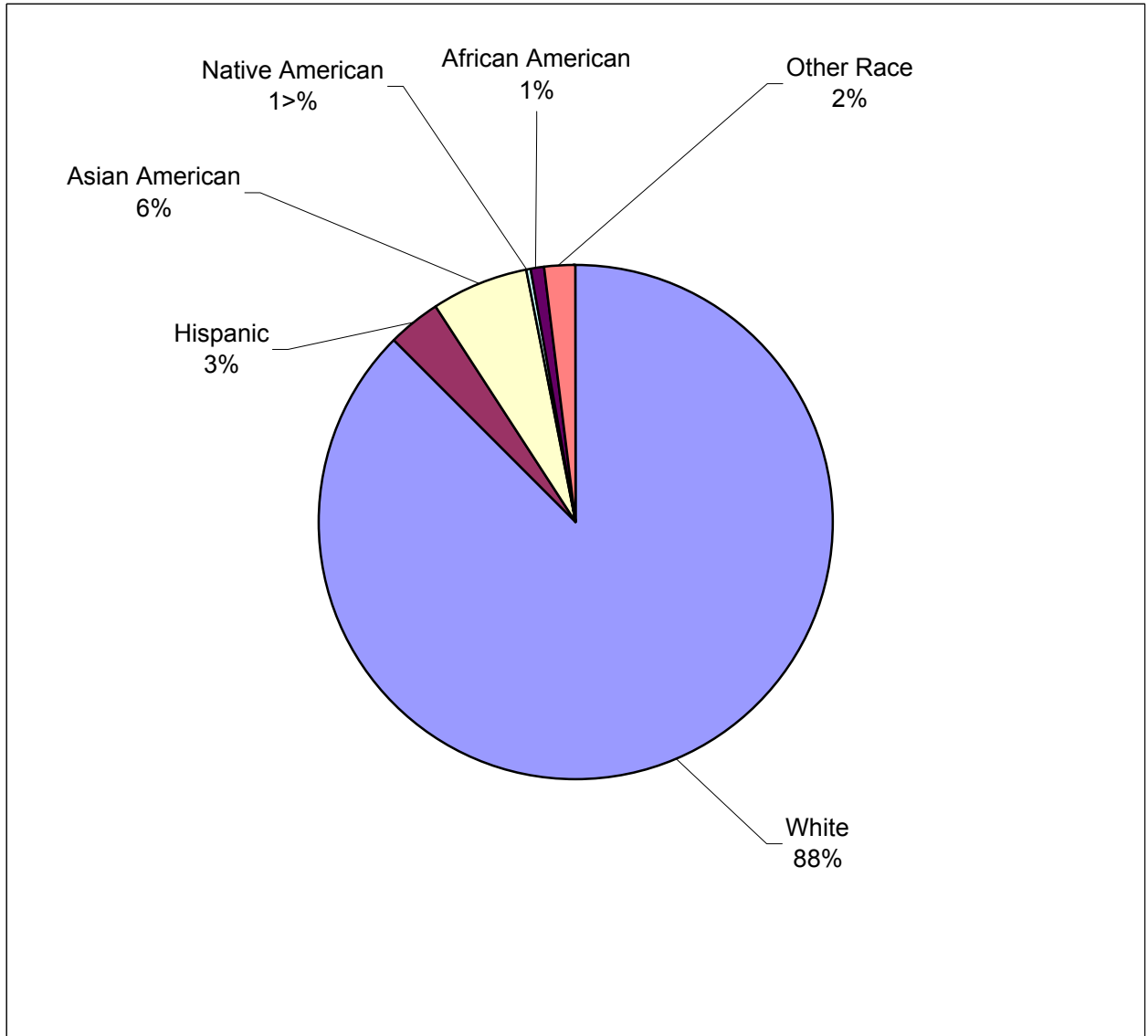
Total number of students included in the calculation of percentages equals 429.

There are concerns that the survey respondent misunderstood the question because given the technical nature of the degrees and the fact that the data are on marine fields, it is surprising to find that so many students "went into the general workforce" as opposed to "ocean sciences-related" job. Two possible explanations for this are that the survey recipient did not apply "ocean sciences-related" as broadly as we expected, or most just don't know specifically where their students head after school. Given that the general selling point for an associates degree or certificate (aside from low cost) is high rate of job placement upon completion of degree, most institutions do a pretty good job of keeping track of where their graduates go. Therefore, it is more likely that the person filling out the survey did not define "ocean-related" as broadly as we would.

## Ethnicity/Race of Faculty at Baccalaureate and Graduate Schools

N= 83 Programs

2322 Total Faculty for which race was reported



### New Faculty Hires for Baccalaureate & Graduate Programs during 2001-2002

N=57 programs; Total number of New Hires=180.5

