The growth of precollege, academic marine science programs has become a noticeable development in American education in the past few years. There is some difficulty in assessing the status of this development in quantitative terms for a number of reasons. First, the retrieval of information concerning what is being taught in the schools is more difficult than one might suppose. This is especially true of states which have hundreds and even thousands of school districts. Second, there is such an enormous variety in the quality, duration, and intensity of marine science programs currently in operation that what constitutes a marine science education program becomes a matter of personal definition.

Marine science education as discussed here is of an academic type and quite apart from the vocational, maritime training offered in a few schools. While American maritime training has a tradition older than the republic, precollege academic marine science is a very recent development.

There is in fact some opposition to teaching marine science at the high school level. Why, in effect, recruit more marine scientists, it is argued, at a time when there seems to be a surplus of marine biologists, geologists, and similar specialists? Oceanography, according to some, is such a difficult subject that its treatment at the high school level would be superficial at best. Students have been told that if they want to become marine scientists, they should concentrate first on the basic courses in sciences and mathematics. Such exotic specialization as oceanography should come later—much later.

Despite these objections, marine science has come to the high school. It is taught as a discrete course of one or two semesters in hundreds of high schools. It is taught as a "unit" lasting three, six, or nine weeks in thousands of high schools. In addition, marine science programs have been developed in a surprisingly large number of middle and elementary schools. There are a few schools, notably a junior high school in Florida and a new high school in New York, that have adopted marine science as the major emphasis of the curriculum, permeating all subjects taught in these schools.

The first of the academic programs in marine science appeared about 15 years ago. They occurred rather spontaneously in southern New England, Florida, and California. Later, they appeared in other states including those of the Pacific Northwest, Texas, and New York. As might seem natural, most of these programs were developed in the coastal states. A few, however, appeared in inland states that included Missouri, Colorado, Wisconsin, and Minnesota.

Many of the high school marine science programs owe their genesis to summer institute programs sponsored by the National Science Foundation. A few institutions, including Bowdoin College, Suffolk University, and Louisiana State University, assisted by NSF, provided the training and inspiration that teachers needed to develop their own programs.

The Title III program of the U.S. Office of Education has also supported projects that focused attention on the marine environment. Among the more notable of the Title III-funded projects is the Orange County (California) Marine Science Floating Laboratory Program. This project makes use of a 20-meter sport fishing vessel modified for use as a floating laboratory/classroom. The Orange County project annually provides at-sea, hands-on experience for thousands of students in southern California. Much of the success the project enjoys lies in the fact that it includes a well-planned and executed program in inservice training for teachers.

The Carteret County (North Carolina) Marine Science Project is another Title III project that has contributed measurably to the growth of precollege marine science education. This project produced a number of teaching aids...
and curricular materials that are in wide use by teachers in the eastern United States. The Milford School District in Delaware, the North Kitsap District in Washington, and the Kittery School District in Maine are among several school systems that have encouraged the growth of marine science education under Title III.

In more recent years the growth of precollege marine science has been encouraged and influenced by educational advisory services provided by several universities participating in the National Sea Grant Program. Among these are the University of Rhode Island, Oregon State University, the University of Washington, Louisiana State University, Texas A & M University, and the University of Southern California. These and other universities have provided consultation, conducted teacher workshops, and published teaching aids and curricular material that have benefited the growing community of precollege marine science teachers.

Although the arrival of marine science in the high school curriculum is not the major curricular departure of contemporary times, still it is flavored with much of the pioneering spirit that introduced geology as a high school subject in the 1880s and biology in the early 1920s. The marine environment has an intrinsic beauty and appeal that attracts both teachers and students. The success enjoyed by many marine science programs stems from this mutually felt fascination. Happily, there has been no national, concerted effort to install marine science as a high school subject. Programs have arisen spontaneously the result of teacher initiative and pupil acceptance.

A remarkable aspect of the earlier programs is that they have emerged in an almost total absence of appropriate, commercially produced texts, teaching materials, and curricular guides. The teachers who ventured into marine science were pioneers in a true sense. Out of necessity they devised, improvised, and invented their own approaches to a marine science program appropriate for their local area and student population. For this reason marine science programs then and now tend to be singular. Each one reflects the background of the teacher, the geographical location, and the interest and aspirations of the students.

Another aspect of the earlier precollege marine science programs is that they were developed by teachers who were somewhat isolated from other teachers similarly engaged. There was no organization of teachers which provided the medium of exchange of ideas and teaching materials. More recently, this problem has been somewhat ameliorated by the establishment of at least two regional organizations, the Florida Marine Science Education Association and the Massachusetts Marine Educators which serves the needs of teachers in southern New England. Many marine science teachers have expressed a felt need for the establishment of a national association. This need could be satisfied by the establishment of a marine science department or section in NSTA.

The number of precollege marine science programs has grown steadily during the past few years, with an annual increase of about 20 percent. As a high school marine science teacher in Florida more than a decade ago, and later as a marine science education specialist at the university level, I have attempted to remain abreast of the events and development of this growth. I have maintained a file which included the names and addresses of precollege marine science teachers in the various states. In time the file grew large enough to give consideration to publication of a much-needed directory.

Two years ago, when it was decided that the directory should indeed be published, an intensive effort was made to identify additional teachers whose names were not in our files. Hundreds of letters asking for the names of marine science teachers were sent to school districts, science supervisors, and individuals known to be active in precollege marine science education. In time the list of names grew to about 800 classroom teachers, K-12,
who were actually involved in marine science education programs.

It occurred to us that some teachers might not care to be listed in a directory without their prior knowledge and approval. A registration form was prepared and sent to the teachers listed in our files. The form called for certain information about the marine science activities of the teachers including the number of classes, the number and grade classification of the students, and the emphasis provided by the program. Because teaching materials have always been a critical factor in the success of marine science education programs, we asked the teachers to list some of the curricular materials they employed in their programs. Although the one-page form was somewhat complicated, the return approached 45 percent.

A directory of marine science education based on the results of the survey was published in June of 1973 (see references). The directory includes over 400 names and addresses of teachers, marine science education specialists, consultants, and others actively engaged in marine science education at the precollege level. Publication and dissemination of the directory will, we hope, help us to identify additional teachers for a projected second edition to be published in the spring of 1974. Marine science teachers who want to be listed in the 1974 edition should make their wishes known to the author.

Incomplete as the 1973 directory may be, it contains a sufficient number of listing and program descriptions to provide a good insight into the status of K-12 marine science education. More than 20,000 students are involved in the courses and programs in the 30 states listed in the directory.

While marine science programs abound at all grade levels, the more intensive programs seem to prevail at the upper high school levels. Figure 1 shows this. There is a progressive increase in the number of programs from grades 7 to 12.

Many marine science programs undergo a predictable evolution. While they begin as marine biology or marine ecology, they develop an increasing emphasis on the physical, chemical, and geological aspects of the marine environment. Figure 2 is a list of the terms used in the titles of the courses and programs listed in the directory. The figure propounds the lack of standardization of terminology in the community of marine science educators and in marine science in general as well.

Our survey indicates that for most teachers listed, marine science teaching is a sideline activity (Figure 3). Only 13 percent were fully engaged in marine-oriented instruction. Forty-two percent taught only one marine science class per day; 45 percent taught two, three, or four classes.

While the teaching aids and textual materials have become more available during the past few years, many teachers indicated that obtaining suitable curricular material was a major problem. Many programs depend on college texts in marine science. There are a dozen or so such texts available, but most are written at a level of comprehension well beyond the average high school student. The text most frequently named by teachers responding to the survey was the late R. E. Coker's *This Great and Wide Sea*, published nearly 30 years ago. Marine-oriented periodicals were also cited as being fundamental to a large number of programs.

In conclusion, it may be stated that marine science education has been established in the mosaic of precollege American education. It is growing from year to year. It has a transcendency which cuts across the purviews of traditional subject-matter boundaries in science. In the words of an Oregon teacher who responded to our survey: “Marine science provides a gathering place where all of the sciences can come together.”

**References**


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**Figure 1. Placement of marine science programs by grade.**

**Figure 2. Frequency of terms used in the titles of courses and programs in precollege marine science.**

**Figure 3. Number of marine science classes taught per teacher per day.**

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