Waves Across New Hampshire

Evaluation: 10 Years Of Sea Grant Sponsored Marine Education

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by

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Marine Education

INTRODUCTION AND HISTORY.

In the early 1970's responding to growing pressures on aquatic and marine resources of the nation, the national Sea Grant program moved toward developing a marine literate society through educational programs aimed at the general public, educators and students. In its turn, New Hampshire, one of the fastest growing coastal states, began with informal meetings and surveys to determine needs and interests in marine topics among the state's educators. In 1976 a survey of 199 educators confirmed the need for formal programs to train educators and provide curriculum materials and support for marine education in the state's schools. An interdisciplinary approach was stressed by the teachers and the term "marinating the curriculum" was born to underscore the need to establish marine education components within all parts of the traditional school subjects. The teachers enthusiastically supported the establishment of seacoast workshops for their students and day-long "marine awareness days" of films, lectures and demonstrations at their schools. These needs and concerns of New Hampshire's teachers were not unique to them for in that same year the National Sea Grant Program, with a budget of $1.25 million, funded 28 separate marine education projects.

Given such expressed needs in a state with low teacher salaries, a high turn-over rate of school teaching personnel, a rapidly expanding population, and schools which vary widely in quality as a result of their almost total reliance on local funding; the New Hampshire marine education program has sought to:

1. provide on-the-job and pre-service training for educators in order to give them the confidence and ability to initiate and/or expand existing programs in marine education.

2. provide high quality programming, both for school and general public audiences, that has a lasting effect on the public consciousness.

3. provide resources in terms of curricula and volunteer personnel to support and enhance these aims.

To accomplish these goals, two marine education specialists were hired and several programs were initiated in the late 70's and early 80's. Present marine education components include the "Through the Looking Glass" program held at the Visitor's Center at Odiorne State Park, the UNH Marine Docent (volunteer) group based at Sea Grant Extension Office at the University of New Hampshire, outreach programs such as SEATREK lectures and tours, the Day of the Coast Celebrations held at local schools and the UNH Floating Lab based in Seabrook, N.H. In accordance with the overall goals of the marine education effort, most of these programs feature educator training, provide curriculum materials adapted to highlight local and regional marine resources, and encourage the educators to move toward independence in initiating or expanding existing programs in their schools or organizations.

A number of factors speak to the success of these activities in addressing the goals of the program. Over the years there has been a continuous assessment of individual programs through written and observational evaluations provided by recipients, participants and volunteer staff. In addition, demand for almost all offerings of the program have shown such growth that, without staff for further expansion, many have waiting lists of requests. For example, at the Visitor's Center at Odiorne State Park, visitations have been increasing at a rate of 20% each year over the past five years. Despite the fact that the UNH Floating Lab increased its two week program to three weeks, it was still unable to accomodate all requests for participation. Since its inception, the UNH Marine Docent (volunteer) program has grown from eight to its present 55 participants, who now provide about 90% of the actual instruction across all the Sea Grant-sponsored marine education programs,

After ten years of expansion, it was judged time to take an overall look at Sea Grant's educational programs in New Hampshire to see what cumulative effects they have had upon their primary user populations, the K - 12 classroom teachers, and to see how those effects manifest themselves in terms of quality and duration of instructional time spent on marine topics. Toward this end, a survey of the users of the various components of the educational program was planned. In addition to the aims above, the survey was intended to investigate the visibility of the components as a coordinated "whole" to this important population and to assess the degree to which the needs expressed in the 1976 survey were being addressed.

METHODOLOGY.

Although discussions had been held with other Sea Grant Extension personnel for several months previously, the actual decision to undertake this survey was made in early February, 1987. It was decided that users of three major programs: Through the Looking Glass, UNH Floating Lab, and SEATREK outreach lectures and tours, would be surveyed. In addition, since the list of respondents and compiled results of the 1976 Needs Survey were available, there was the opportunity to assess progress longitudinally over the past ten years by a resurvey of currently available past respondents.

Advice from the chairperson of the Department of Education at the University of New Hampshire was sought concerning the type of survey to be developed, the phrasing of specific questions and the response to be expected. He advised that the Department was teaching a graduate course in the evaluation of educational programs and that both the marine education survey and students of the class might benefit from a collaboration. In response to a proposal to the class three students (local teachers) joined the evaluation team. They met with the researcher fairly frequently, and developed some of the questions for individual programs, assisted with mailings and some analysis of the results.

Generic questions to be given to all four groups were developed. These questions concerned personal activities of the subject within marine education, a comparison of total instructional time involved in marine-related curricula or activities, a comparision of numbers of students actively involved in marine-related instruction over the past ten years and the factors, if any, which control or limit the teaching of marine topics. Another question concerned the subject's personal awareness and use of the various programs, projects and materials provided by New Hampshire Sea Grant Extension. In addition, a six-question profile of the respondent, identifying subjects and grade level taught, educational background, age, and distance from the coast to the school at which he or she was teaching was included.

While questionaires were being prepared, mailing lists of user groups were obtained and checked for duplication. Then every fourth person on each list was selected up to a total of 125 for the Through the Looking Glass Survey, the SEATREK Survey and the 1976 Re-Survey. To meet the goal of 125 subjects in the last case, because current addresses of some of the teachers polled in 1976 were unavailable and others were no longer teaching in the area, the teacher-assistant to the project decided to include 40

teachers randomly selected from the list of members of the New Hampshire Science Teachers Association. The list of users in the early years of the smaller Floating Lab Program was incomplete. Consequently a sample of 33 users from the last five years of the program was selected for the Floating Lab Survey.

The three teacher researchers wrote their own cover letters stressing the need to respond to the survey and assisted with the mailing. While the original mailing in early April resulted in a reasonable 41% overall rate of response, time permitted a second "reminder" mailing on May 7 with a response deadline of May 25. The response to the second mailing increased the overall return rate by 26%. As is typical of surveys of this type, a number of the returned surveys were, for various reasons, not usable. Table 1 provides a summary of the returns.

TABLE 1

Survey	Num Sent	Num. Ret.	Pct. Ret.	Num. Val. Ret.	Percent Val. Ret.
Through Look. Glass	125	80	65	65	52
SeaTrek	125	75	64	64	51
1976 Re-Survey	125	101	81	76	61
Floating Lab	33	18	55	16	48

Faced with the end of the semester, the teacher-research assistants were forced to limit their analyses to the responses to the first mailing. As a consequence their incomplete analyses are not included in this report.

RESULTS

Respondent Profiles:

The various surveys included a short series of questions eliciting some information concerning the respondents' personal characteristics and background and a question concerning the location of their school relative to the coast.

Grade level- Overall 52% of the respondents teach in grade l-5, 27% teach predominantly grades 6-8 and 19% teach at the high school level. The responses to the individual responses indicate, as is to be expected, that the Floating Lab respondents and the 1976 Re-survey population include higher percentages of middle school and high school teachers (approximately 75% of these teachers teach 6 grade or above).

Subjects taught Approximately l/3 of the respondents teach only science courses in their present assignment. As is to be expected from the results of the grade level response, the Floating Lab and the 1976-Resurvey respondents, having a higher percentage of high school teachers, were more specialized with more than 50% of them teaching only science courses.

Teacher educational level, Of the teachers responding to the surveys, over 80% had completed course work beyond the BS level and nearly 30% had completed courses beyond the MS level. Not unexpectedly, the teachers who participated in the 1976 survey, as a group biased toward older teachers in high schools, had the highest percentage of MS+ respondents (43%).

School location The schools at which the responding teachers teach lie, primarily, outside the immediate coastal zone. Only 14% of the schools lie within 10 miles of the coast while nearly 70% are situated more than 25 miles from the sea. In this respect, there is no appreciable difference among the schools sampled by the four surveys. Those nearest the coast composed between 12% and 19% and those most distant, between 60% and 77% of the various survey responses.

Effects on Marine Education In the User Population:

As noted above, one of the primary goals of the New Hampshire Marine Education Program is to provide teachers with training and material support which will give them the ability, confidence and resources to either initiate or expand a program in marine education at their schools and for their students. In order to assess the degree to which this objective has been met among the user populations, questions were devised which focused on: (a) the respondents personnal

response to contact with the program, (b) changes in student contact hours devoted to marine topics, and (c) changes in the number of students actually exposed to marine related topics in their schools.

QUESTION 1: As a result of participating in UNH Sea Grant sponsored marine educational programs have you (yes or no):

--sought further training on a personal/professional basis in marine areas.

--been able to more effectively teach students in marine related topics.

--added a marine component to personal teaching plans.

--expanded an existing program in marine education.

--influenced colleagues to use marine topics in their classrooms.

--sought funding to support marine education projects.

--sought information independently to support marine education projects.

--participated in a school or community-based environmental activity.

TABLE 2, which summarizes the response to this question, indicates a substantial change in the professional activities of the teacher-participants in UNH Sea Grant-sponsered marine education program. Nearly 80 percent of those responding feel that they have become more effective teachers as a result of their participation. Over 60 percent of them have added a marine-related component to their curriculum and influenced their colleagues to do likewise. Fifty percent of the respondents report that they were stimulated to pursue more training in marine areas, to seek more information on marine topics or to expand an existing marine component in their school curriculum. Surprisingly, sixteen percent (about 27 individuals) reported that they had sought increased financial support for their marine education efforts.

TABLE 2.
Teacher Reactions

Reaction	No (%)	Yes(%)	Number
Sought more training.....	52	48	170
More effective teaching.....	23	77	171
Added a marine component.....	37	63	171
Expanded an existing component.....	46	54	169
Influenced colleagues.....	43	57	170
Sought financial support.....	84	16	170
Sought more information.....	48	52	118
Partic. in environmental activity .	67	33	169

QUESTION 2: What was the total instructional time used (contact hours) in presentation of marine related curricula materials or activities to students on an estimated annual basis?

pre 1976	0	l-3	4-7	8-10	11-15	15+
1976-1979	0	l-3	4-7	8-10	11-15	15+
1980-1983	0	l-3	4-7	8-10	11-15	15+
1984-present	0	l-3	4-7	8-10	11-15	15+

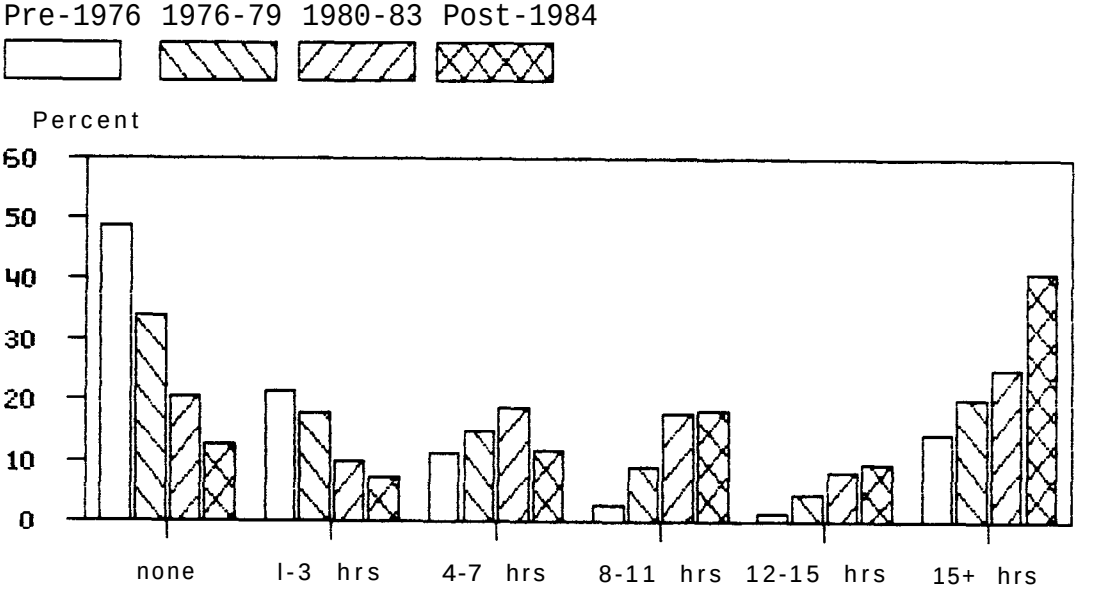
TABLE 3 and FIGURE 1 provide a summary of the responses to this question and strikingly describe the growth of marine education in the target schools since 1976. The table presents the percentage occurrence of each response for each time period. Note that prior to 1976 over 70% of responses indicated less than 4 contact hours per year on marine related topics. Over time, this percentage shows a dramatic decrease with a concomitant increase in those indicating an excess of 15 contact hours per year in their classes (see FIGURE 1). More than 80% of the responses indicated that by 1984 their students were receiving more than 3 contact hours per year of marine education. It is interesting to note the percentages reported for the response "4-7 hours". In contrast to those reporting fewer contact hours (which show a constant decrease over time) and those reporting more contact hours (which show a constant increase over time), this category shows almost a constant percentage of between 11 and 19% of total responses. The basis for this result is unknown and, perhaps, is worth additional study. It is possible to conjecture that 4 to 7 contact hours constitutes a traditional or minimal feasible

marine educational experience among the schools served by this program. If so, a more detailed study of the topics composing the various study units might be of interest.

TABLE 3
Annual Student Contact Hours
(As percent of teacher responses: by time period.)

Period	none	l-3hrs	4-7hrs	8-10hrs	ll-15hrs	15+ hrs.
pre-1976	48.7	21.4	11.1	2.6	1.7	14.5
1976-79	**33.9**	17.7	14.6	9.2	4.6	20.0
1980-84	**20.7**	9.7	18.6	17.9	8.3	24.8
post-1984	12.4	7.1	11.8	18.3	9.5	40.8

FIGURE 1
Annual Student Contact Hours
(Percent of Responses: By Contact Hours)



STUDENT CONTACT HOURS

TABLE 4 provides another perspective on the growth of marine education in the participating schools. It focuses on those 117 individuals who responded to both the "pre-1976" and the "post-1984" parts of QUESTION 2 in an effort to analyze, within this subpopulation of teachers, the changes over time presented in TABLE 3 and FIGURE 1. In this table the 117 responses are categorized by the "pre-1976" response, which determines the column, and the "post-1984" response, which determines the row of the table. Thus, for example, of the 57 teachers who responded "none" to the "pre-1976" question, 17 responded "none" to the "post-1984" question and were, evidently, still uninvolved in teaching marine subjects. However, 18 of those same 57 teachers responded "15+ hours" to the "post-1984" question and are now teaching in excess of 15 contact hours per year on marine topics.

TABLE 4.
Contact Hour Comparison: Pre-1976 and Post-1984

Post-1984 Cont. hrs	Pre-1976 Contact Hours: none	1-3hrs	4-7hrs	8-10hrs	11-15hrs	15+ hrs	Post-84 Totals
none	17	0	1	0	0	1	19
l-3 hrs	2	2	1	0	0	3	8
4-7 hrs	8	2	3	0	0	2	15
8-10 hrs	7	6	3	2	0	0	18
11-15 hrs)	5	2	1	0	1	0	9
15+ hrs	18	13	4	1	1	11	48
Pre-1976 Totals	57	25	13	3	2	17	117

This table provides a graphic description of the increase in contact hours of marine education occurring in the classrooms of the participating teachers since the inception of the NH Sea Grant Marine Education Program. The numbers appearing on the main diagonal of the table (17, 2,....11) indicate no change in classroom time spent on marine topics while those above or below the main diagonal indicate a decrease or increase, respectively. Thus, of the 117 teachers reporting; 36 (= 17+2+ ….+11), or 31%, spent the same; 8, or 7%, spent less; and 73, or 62%, spent more time instructing

their students on ocean-related subjects. Of those teachers who increased their commitment to marine education, nearly half (35 of 73) more than doubled the time spent on that component of their curriculum.

Another measure of growth in marine education among particapating schools was addressed in QUESTION 3.

QUESTION 3. How many students were actively involved in marine related instruction during the following periods (active involvement would include contact in class, field trips, and direct instructional interaction):

(a) Pre-1976? (b) 1976-1979? (c) 1980-1983? (d) Post-1984?

[Possible responses: None, l-25, 26-50, 51-75, 76+ students]

The responses to QUESTION 3 are summarized in TABLE 5 in which the same pattern of increase as described in TABLE 3 and FIGURE 1 is evident. There is a marked decrease in the percentage reporting "none" over the years; little change in those responding "26-50 students"; and a near, or more than, doubling in the percentage responding otherwise. Analysis of the change between the periods "pre-1976" to "post-1984" as in TABLE 4. (not included) shows, not unexpectedly, a pattern of change similar to the responses of QUESTION 2.

TABLE 5.
Number of Students Actively Involved.
(As percent of teacher responses: by time period.)

Period	Number of Students none	l-25	26-50	51-75	76+
pre-1976	52.3	13.5	14.8	3.4	15.9
1976-79	34.7	22.1	14.7	5.3	23.2
1980-83	23.0	25.0	12.0	12.0	28.0
post-l980	16.4	23.6	14.5	12.8	32.7

3. Knowledge and Use of NH Sea Grant Marine Education Programs.

In order to assess the surveyed teachers knowledge of the various NH Sea Grant Marine Education Programs, QUESTION 4 was included in the surveys.

QUESTION 4. Have you heard of the following UNH Sea Grant Programs? Indicate whether you are AWARE of the program; HAVE USED or ARE USING the program and the NUMBER of times used in the past 10 years.

--Marine docents/SEATREK lectures;
--SEATREK Mail-out Service;
--Through the Looking Glass - Odiorne Point Programs;
--UNH Floating Lab program;
--Day of the Coast - school-wide participation;
--Coast Week Activities (Oct. annually);
--UNH Tours/Visits to marine facilities;
--Teacher workshops - in-service;
--Teacher Workshops at Odiorne Point Visitor Center;
--Teacher Workshops - selected topics;
--Wave of Concern - coastal issues curriculum;
--Seafood Sampler program;
--Summer By The Sea - family programs at Odiorne Point.

A surprising result of the response to these questions, see TABLE 6, is that the teachers polled, who are each users of one or more specific marine educational programs, were uninformed as a group concerning the availability of many other parts of the overall program. When asked about their awareness of the specific offerings, the lowest percentage responding "unaware" was 24% concerning the Docent SEATREK programs; between 32% and 45% of the respondents were unaware of one, or more, of the program components: "Through the Looking Glass" (32%), "Odiorne Point Workshops"(36%), "Teacher In-service Training" (41%), and "Mail SEATREK Programs" (45%). Approximately half the respondents were unaware of: "The UNH Lab Tours", "The Floating Lab Program", and "The Day of the Coast" program while over half were unaware of the remaining programs mentioned in the questionaire: "Selected Workshops", "Coast Week", "The Seafood Sampler Program"and the "Summer by the Sea Program". About 80% of those surveyed were unaware of the coastal issues curriculum, "A Wave of Concern." This is understandable since it is still in the "pilot program" stage. There was little difference in the responses to this question among the four surveys.

TABLE 6.
Awareness and Use of Programs
(Percent of Total Responses)

Program Component	Not Aware	Aware Unused	Used Once	Used More	Total Num.
Docent/SEATREK	24	30	13	33	222
Mail/SEATREK	45	35	9	11	223
Through the Looking Glass	32	46	8	14	158
Day of the Coast	54	35	7	4	223
Coast Week	65	33	1	0	223
UNH Tours	54	34	6	6	223
Workshops (In-service)	41	33	15	11	223
Workshops (Odiorne Point)	36	43	14	7	157
Floating Lab	51	35	6	8	223
Workshops (Selected Topics)	65	28	4	3	142
Wave of Concern	84	14	1	1	207
Seafood Sampler	73	25	1	1	207
Summer By The Sea	69	28	2	1	207

NH/ME Sea Grant Marine Education Program provides curriculum and support materials for classroom use and teacher training. QUESTION 6 was designed to determine the degree to which these materials are known and used among the surveyed teacher population of users of one, or more, of the Program's offerings.

QUESTION 6. What UNH/UM Sea Grant curriculum and support materials are you AWARE of, have USED or are using, and NUMBER of times used?

--Marine Education Resource Center;
--Marine Education Resource List;
--Tidepool Times Marine Newsletter;
--Alone on the Shore: Survival Guide;
--Through the Looking Glass Teacher Guide;
--Floating Lab Resource Manual;
--Wave of Concern Curriculum Guide?

The response to QUESTION 6, summarized in TABLE 7 was much the same as that to QUESTION 5. Teachers surveyed are, in general, unaware of much of the support material available to help them in teaching marine related topics in their classrooms.

TABLE 7
Awareness and Use of Support Materials
(Percent of Total Responses)

Support Material	Not Aware	Aware Unused	Used Once	Used More	Total Num.
Marine Ed. Resource Center..	82	14	1	3	221
Marine Ed. Resource List....	83	14	1	3	221
Tidepool Times Newsletter...	59	16	6	19	218
Alone on the Shore.....	81	8	1	10	218
Through the Looking Glass...	68	13	4	15	155
Floating Lab Resource Man...	86	5	3	6	219
Wave of Concern	90	8	2	0	79

Limiting and Control Factors:

Question 7 was included in the survey in order to identify factors which inhibit teachers from teaching marine related topics in their classrooms.

QUESTION 7. In your present teaching of marine science or if you do not currently teach marine science to your students, what factors control or limit your lesson or curriculum choice decisions?

--school is too far from the coast;
--too much expense (budget);
--not enough time/unable to fit into current curriculum;
--not able to access or identify appropriate materials.

The polled teachers, who are, in general, teaching marine topics, do not feel particularly limited by any of the factors mentioned in QUESTION 7. Of the 176 teachers responding to this question, 23% felt that distance from the coast hampered their marine activities, 19% listed cost as a problem, 30% felt that they lacked time in their curriculum for marine topics and 16% felt handicapped by lack of training in the area. Only 7% of the responses listed lack of material as an important inhibiting factor.

Thus, from this question, it appears that the population sampled by this survey is being well-served by the existing program and any limits imposed on the teaching of marine-related topics in their schools are, primarily, due to factors over which the Marine Education Program has no control.

Program Specific Questions:

Three of the four surveys were sent to users of specific programs which have been in existance for 10 years (The Floating Lab, The SEATREK and the Through the Looking Glass Programs) and contained questions relating directly to these programs. The responses to these questions are discussed below.

UNH Floating Lab.

This program, which has been in operation for about 12 years, was started by Charles W. Eastman, Jr., a fisherman and high school teacher from Seabrook, New Hampshire. Originally funded by a federal grant obtained by Mr. Eastman, the program came under the support of the Sea Grant Marine Advisory Program at the University of New Hampshire when federal support ended. In 1979 the program was expanded to include a 200-page curriculum for junior and high school students. The program has attracted an increasing number of client schools, of which at least 6 now include the Floating Lab as a regular part of the curriculum funded by the school budget; has served close to 4000 junior and high school students and their teachers. Beginning as a one week session, it soon was expanded to two weeks to meet the increasing demand. In 1987 the program grew to three weeks and yet could not fulfill all requests for participation.

The program begins with a teacher workshop aimed at encouraging the junior and senior high school teachers to teach a 2-4 week unit with materials selected from the UNH Floating Lab Resource Manual. It culminates in a three-hour oceanographic sampling trip in which various pieces of simple oceanographic equipment are used to sample the marine environment at a number of stations within and outside Seabrook harbor. The Program seeks to instill in the students an appreciation for the interconnections between human society and the marine environment, to give them an applied science experience learning some simple oceanographic sampling techniques, and to introduce them to possible careers in the marine area.

Participation in the Floating Lab Program has stimulated some teachers to arrange similar programs on their own. One teacher from southern New Hampshire was awarded a federal grant to conduct his own Floating Lab with student instructors. He expanded the program to include a rocky intertidal component also led by student instructors. This innovative program permitted all science classes from his high school to take part in an experiential marine science curriculum.

Survey Results:

Although 75% of the respondents said that marine education was a part of their curriculum prior to their first Floating Lab trip, all indicated that the Floating Lab experience had made their student more aware of the ecological and economical importance of the marine environment. About 90% believed that their students expanded their knowledge of marine science and developed some new skills and techniques through participation in the program.

When asked if participation in the Floating Lab program had made any changes in their school, 10 of the 16 respondents replied that it had, with a little less than half reporting an expansion of their curriculum in marine studies. Most of this primary user group recognized the career experience aspect of the Floating Lab and 7 estimated that more than 5% of their students had been influenced by their Floating Lab program to do further marine related activities.

Using a scale of "good", "fair", and "poor", all teachers rated the Floating Lab Resource Manual as "good", and about 75% felt that the pre-trip workshop, the quality of the staff aboard the boat and the on-board program were "good". The same percent rated communications with the Sea Grant office as "good". However, only slightly more than half rated the equipment used by their students as "good". Some expressed dismay at coming aboard to find that something as vital as the fish net had been torn and had not been replaced due to lack of funds. A few high school teachers felt that the program should include more sophisticated equipment.

When asked if they or someone in their school would use the Floating Lab in future, all teachers responded "yes". When asked what they would do if the program did not exist, a little more than half indicated they would try to have some type of replacement program, but weren't sure what it could be. Some said they would turn to a fresh water program, or rent their own boat, but most said they had no idea how they would proceed.

In summary, it seems that the teachers surveyed are basically satified with the program and recognize its experiential learning focus as an important educational tool. Some would prefer a longer period of time on the boat; others, more sophisticated equipment; and one suggested that a shore component be added. (A shore component is suggested; but it is the teacher's responsibility to lead that portion of the day's experience and they often opt not to use the recommended beach survey activity.)

SEATREK Program.

SEATREK slide lecture and activity-oriented programs reach about 15,000 people annually. This program comprises the outreach component of the marine education effort in New Hampshire. Approximately half the 55-member UNH Marine Docents (volunteers) create new programs or learn one of 15 existing programs about the marine environment and deliver them to audiences throughout New England. The majority of those audiences are composed of students at various levels; however, about 20% of SEATREK programs are presented to adult clubs and organizations (who were not a part of this survey).

The SEATREK program also includes guided tours of the Jackson Estuarine Laboratory and the Shoals Marine Laboratory which include explanations of research and educational activities at these sites. Docent-led SEATREK programs on the rocky intertidal zone and the salt marsh environment are an integral part of the "Through the Looking Glass Program" at the Visitor's Center at Odiorne Point. These programs are used as a resource by educators presenting curricula on the marine environment to their classes.

Survey Results:

Most respondents to the survey were elementary school teachers, 23% were teaching in grades 6 - 8, and only 5% were teaching in high school. Most had training beyond a bachelor's degree with 50% having a Master's degree or a Master's plus additional hours.

Typically, the SEATREK programs are requested a number of times. Only 15% of the respondents reported using a program once, while 78% had used SEATREK programs two to four times and the remainder, at least five times. Thirty-five to forty percent of SEATREK presentations are part of a teacher-lead program, being used as either a component of a new marine studies curriculum or as preparation for a coastal field trip. About 30% used the programs to prepare students for the "Through the Looking Glass" programs at the Visitor's Center at Odiorne State Park. Twenty-two percent indicated that they used them as a part of an established marine studies curriculum. The remaining few used the presentations as part of special programs, some sponsored by Sea Grant, such as the "Day of the Coast Celebrations".

Ninety-one percent of the respondents felt the SEATREK programs to be of "high quality", while those remaining classified them as "average". One teacher stated: "SEATREK is wonderful... sea life in a classroan and at the shore . . . not just in a can." Another felt more knowledgeable herself

and better qualified to teach about the marine environment as a result of the SEATREK lectures.

Ninety-two percent of the teachers responding to the survey agree, or strongly agree, that they have seen evidence of cognitive growth in their students. Almost as high a percentage believe their students to have a more positive attitude toward the marine environment as a result of their contact with the program. A surprisingly large percent (71%) feel that their own knowledge of marine subjects has been expanded by participation in the SEATREK program and 72% feel that it has led their administrator to become more supportive of marine studies at their school.

THROUGH THE Looking Glass Program

Established in the late 1970's, "Through the Looking Glass" is a program that combines teacher and adult training with student participation in an on-site program studying the rocky intertidal marine environment. After a mandatory teacher-chaperone workshop at the Visitors Center at Odiorne State Park, teachers are given the "Odiorne Point Teachers Guide" to use as a curriculum for their students, and are encouraged to have a SEATREK lecture by a UNH Marine Docent before bringing their class to the Center for a three-hour program. The three-hour program consists of small group instruction indoors, tide-pooling, and a sharing of experiences, all under the tutelage of a Docent. (Docents (volunteers) do 90% of the teaching for this program.)

Teachers are encouraged to come to the workshops the following year, but to take their students tidepooling themselves. They can, also, sign up for half-hour programs in the Center if they wish. In their third year of participation, teachers are encouraged to hold workshops for their chaperones and to lead their own programs. Although there is demand for year-around activities, available funds only permit a spring program. The three-hour programs, with under thirty slots available, are in high demand.

Survey Results:

Educators responding to the survey are primarily involved with elementary-school aged children with 17% of them teaching in grades 6 - 8 and only five percent teaching high school-aged students. A majority of the respondents have a Bachelor's degree plus additional graduate credits while 19% have completed a Masters degree and 23% have only Bachelor degrees.

Forty-four percent of the responding teachers have participated in the program only once, while 55% have participated 2 to 4 times. Almost half of those polled use the program to prepare students for a coastal field trip subsequently led by the teacher, while 26% include the program as a part of an established marine studies curriculum. About 31% use it as a part of a new marine studies curriculum, while the remainder use it for summer camp programs, etc.

Ninety percent of the teachers report seeing evidence of cognitive growth in their students as a result of their participation in Through the Looking Glass programs. All indicated that their students have a more positive attitude toward the marine environment. Almost everyone felt their knowledge of marine subjects has expanded and 92% believe that their administrator has become more supportive of marine studies at their school.

There is considerable emphasis on training educators to lead their own programs after the initial 3-hour visit and accompanying workshop and some results of this survey show this to be a successful strategy. Most of those repeating the program participate in the half-hour rather than the 3-hour program. Further, 73% report having brought students to the shore for tidepool explorations on their own while more than half have offered pre-trip preparation to parent chaperones who accompanied the field trip. All of these are intended elements of the TTLG program. Additional self-develoment can be infered from the fact that l/3 of the respondents have attended other workshops on marine-related topics and 72% acknowledged interest in additional programs on different marine environments.

In answer to the question, "If no programs were offered through the Nature Center at Odiorne, what kind of a difference would it make in your curriculum?" phrases like "a great loss," "no resources ... no classes," "it would hurt future generations" are examples of opinions expressed.

CONCLUSIONS AND RECOMMENDATIONS

The marine education programs, whose performance over the past ten years has been the focus of this evaluation, developed out of specific needs identified by a large group of the State's teachers. In addressing these needs it was recognized that, in New Hampshire, schools are highly decentralized and almost all curricular and programmatic decisions are made at the local level. This situation mandated a direct approach focused on developing individual teacher interest, knowledge and, ultimately, independence supported by Sea Grant personnel, materials and capable volunteers. The results of this review provide strong support for the conclusion that the approach has been successful and that the needs of those surveyed are being met, in large part, by the New Hampshire Marine Education Program as it is presently constituted.

The evidence provided by the surveys clearly indicates that the efforts of the two full-time educators of the program, amplified by a large group of dedicated and well-trained volunteers, have had a substantial impact on marine education in the schools of the region. This impact has been shown to have positively influenced the curriculum, the students, and the teaching and adminstrative staffs of the schools. The most convincing view of this impact on marine education among the client schools is provided by TABLES 2 through 5 which document the influence the program has had on the teachers using the program and the growth of marine related education in the schools over the past ten years.

Despite this success, the program does have weaknesses and areas for growth and improvement. Most users were unaware of the true scope of the program available to them. This is surprising and strongly points to the need for improved and expanded efforts to inform the schools of the total program offered by New Hampshire Sea Grant Marine Education.

Some participants in the Floating Lab Program felt that the marine sampling equipment should be of better quality and, in some instances, more sophisticated and modern. This is, probably, a justifiable complaint and one that should be addressed as funds can be made available.

Despite modest growth in some areas, most of the program's major offerings are over-subscribed and unable to serve the needs of all those who want and could benefit from them. This need for growth can be addressed in two ways: by growth resulting from increased staff and budget support; and by "teaching more teachers" to amplify the efforts of the professional staff. Increased support can come from Sea Grant funding and/or outside sources through grants and user fees.

Both non-Sea Grant alternatives are already in use. A successful appeal to the state legislature led to support for the Visitor Center at Odiorne Point and an increase in the scope of its programs. Private and community support have also been elicited for programs at the Center.

The "teaching teachers" alternative is, also, already a part of an overall program in which teacher education leads to gradual independence of, or at least, reduced reliance upon the parent program's resources. However, given the continual turnover in New Hampshire's teachers, teaching of the primary "consumer",the student, and "teaching teachers" must each be an important and continuing part of NH Sea Grant's marine education effort. It is unlikely that even a cadre of trained and experienced teachers using the marine curriculum materials and the available "self-help" and "self-growth" assistance to full advantage will be able to satisfy the increasing demand for many parts of the marine education program.

Specific Recomendations:

1. A brochure should be developed and widely distributed which supplements the specific brochures now used and outlines the entire NH Sea Grant Marine Education Program.

2. An informational program should be aimed at school administrators in order to develop increased support for marine education at the community level.

3. Increased funding should be sought for most of the presently over-subscribed programs in order that they can adequately meet the increasing demand for quality marine education experiences.

4. A source of funds should be identified to purchase new and improved scientific equipment for the Floating Lab Program.

5. The fee structure for some parts of the program should be examined to see if they are in need of adjustment due to changing circumstances.