A SURVEY OF MARINE EDUCATION NEEDS IN THE STATE OF HAWAII

ANN HAYWARD ROONEY

WORKING PAPER NO. 12

June 1975

SEA GRANT COLLEGE PROGRAM

University of Hawaii
Honolulu, Hawaii

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INTRODUCTION

"In the days of old Hawaii, some Hawaiians referred to their homeland as 'Homi o ka Pakipika,' which means the 'Pearl of the Pacific.' Then just as now, the ocean significantly influenced their lives."

"From the sea, the Hawaiians gathered much of their food, including fish, shellfish, crustacea, salt, seaweed and other naturally nutritious foodstuffs. It was also in this familiar element that they spent much of their recreational time. The sea was both loved and respected by the people. Ancient Hawaiians had come to Hawaii over the sea and lived near it. They developed an amazing expertise in the art of fishing, displaying elaborate techniques and skills, as well as establishing kapus which operated to protect fish during seasons (thereby conserving the supply)."

Bina Chun
A Window to the Sea: A study of the Waikiki Aquarium

The Hawaiian Islands were the last Pacific island group to be discovered by the Westerners. Consequently, until the 1700's the Hawaiians lived in harmony with their environment much in the manner described by the above quotation. The arrival of Captain Cook in 1778, however, signaled the approach of a new and changing era in Hawaiian history. Henceforth, the role of the ocean, which until that time significantly influenced the lives of the Hawaiian people, would progressively become less important.

In the early 1800's the settling of the missionaries and development of the whaling industry established a strong link between the United States and Hawaii. Following shortly therefore, American shipping entrepreneurs and descendents of the missionaries began educating and making recommendations to the Hawaiian monarchs on the intricacies of governmental and economic systems. Under Kamehameha III in the mid 1840's a "land commission" supervised a series of contract arrangements known as the Great Mahele or the Great Division which reapportioned land among the crown, government chiefs,

and commoners bringing in for the first time the Western principle of private land ownership.[1] This marked a formal end to the Hawaiian land system, the ahu pua'a.[2]

The Great Mahele soon afforded foreigners and especially Caucasians, or *haoles*, lucrative opportunities of purchasing land in fee simple. As a result many Americans came to Hawaii, purchased land and began farming the pioneer crop of Hawaii's agricultural industry, sugar.

The arrival of Americans brought disease to the islands which had previously never known such sickness. Their bodies lacking the means to combat Western illness, the Hawaiian population was quickly decimated by VD, the measles, small pox and other fatal maladies. To replenish and improve the Hawaiian bloodline, Americans began importing laborers from China, Japan and the Philippines to work as laborers on the plantations. The remaining Hawaiians were thus forced to relocate and adopt a new landbased life style and the sea gradually became a minor consideration for the "new" people of the Hawaiian Islands.

Recently, the state's smouldering interest in the sea was ignited by a committee of marine experts whose evaluations of marine related activities in Hawaii were documented in the *Hawaii and the Sea* reports of 1967 and 1974. Among the many marine-related activities discussed by the committee, Chapter 9 of *Hawaii and the Sea, 1974*, recommends the establishment of a "statewide community education program to carry the (marine) message from government to the people (and) a game plan for the marine education of Hawaii's youth."[3]

[1]Bushnell, O.A., *The Illustrated Atlas of Hawaii*, p. 22.

[2]The ahu pua'a is a Hawaiian division of land usually containing the land in a valley, running from the mountains to the sea, and the adjacent ocean and reef.

[3]*Hawaii and the Sea*, DPED, p. 97.

Further, the report points out that "the execution of many (marine) plans and projects...will require public understanding of the State's dependence on the sea."[4] Since the 1969 and 1974 reports, marine education has progressed to the point of becoming a viable though still segmented process.

A conference in marine education, coordinated by the Sea Grant College Program of the University of Hawaii, was held on July 2, 1974. Participants included representatives from various groups who had an active interest in marine education such as the Department of Education, Marine Programs, Sea Grant, Marine Option Program, Blue-Water Marine Laboratory, and the Hawaii Council of Marine Science Teachers. The purpose of the conference stressed the development of statements of goals and objectives of marine education in the islands. The goal of marine education in the State of Hawaii as specified by the participants of the conference is: *to develop an awareness, interreaction, understanding of the marine environment as it relates to and affects the land and man's use of both land and sea, that is to develop a responsible marine-oriented citizenry.*

Education of any kind is a cumulative and transitive process: it involves certain "tools" for the communication of ideas, methods, and skills from one individual to another. When one speaks of marine education of the citizenry, a mass of individuals, one speaks of programs of communicative tools that are, most likely, different from those used in other levels of conventional mass education, that is, K-12 and college education. Marine education programs then have special needs because of its non-traditional, marine nature.

[4] *Hawaii and the Sea*, DPED, p. 97.

The purpose of this report will be to survey Hawaii's existing resources and determine its needs in marine education. The objectives of A Survey of Marine Education Needs will be to provide specific, timely and pertinent information for use by the marine education policymaking entities in the State of Hawaii.

I: MARINE EDUCATION RESOURCE SURVEY

BACKGROUND

The word "education" usually brings to mind memories of the classic schoolroom which is generally composed of: a teacher, students, desks, blackboards, bulletin boards, and books, books, books. When the phrase "marine education" arises, the mind's eye in most cases will draw a blank or, occasionally, an image of fish on a dissecting plate. How then does one educate people on marine-related topics? What is marine education?

Marine education is more then a science lesson on marine fish. Especially in Hawaii where the sea plays such an active role in shaping the climate, geography, and the environment of the islands, marine education should be a comprehensive, continuous process that doesn't cease with the completion of a course or one's formal education. Marine education may be defined as the development and cultivation of an individual's mental and moral powers so as to render them efficient in living with an awareness of "things marine."

A person's basic education, the development of one's mental and moral powers, is achieved during one's youth when he or she becomes indoctrinated into the social system through school (formal) and the surrounding environment, e.g., the home, church, recreation, etc. (informal). Although the sea has always played a part in the lives of Hawaii's citizens (witness the number of people seeking recreation and livelihoods in the sea), ocean-related topics have actually played a very small role in the general education process of Hawaii's youth.

This lack of marine education in the population has in recent years become visible: our marine environment has begun to show signs of neglect. Primarily because of fishing pressure and consequent depletion of the fish population,

Hanauma Bay, as an after-the-fact measure, was created a marine conservation district. Water pollution and land run-off have caused poor water quality in Waikiki, Pearl Harbor and Kaneohe Bay resulting in the destruction of coral reefs and the reef population. These are just a few examples of man's lack of understanding of the implication of his actions upon the marine environment. Perhaps if we had been raised and educated not to "litter" the ocean, as we have been taught not to litter and thus help preserve our lands, the ocean would be in a better state than it is today.

Marine education of the public of the State of Hawaii means reaching residents, young and old, students and non-students. Table 1 illustrates the number and kinds of people to which marine education can be directed. Table 1-A indictates that the present population of the State of Hawaii is 947,000. By the year 2000, only 25 years into the future, the state population will have increased by 70%. If marine education is to be truly comprehensive, all these people, particularly non-students, should be reached by any number of effective, well-designed public educational programs. Students, or 24.4% of the present population, may be more easily reached through curriculum alterations in the State Department of Education.

TABLE 1: STUDENT AND NON-STUDENT TARGET GROUPS FOR MARINE EDUCATION

Table 1-A State Residents[5]

Kauai (Niihau)	31,600
Oahu	691,200
Maui (Molokai, Lanai, Kahoolawe)	52,900
Hawaii	72,300
Total	847,000

[5]July 1974, DPED, Data Book.

Table 1-B Projected Population Growth: State of Hawaii[6]

Year	Number	% Increase
1980	894,000	5.9
1990	1,049,000	23.8
2000	1,209,000	42.7

Table 1-C K-12 Student Population[7]

County	K-6	7-8	9-12	Sp*	Total
Kauai	3,035	1,208	2,468	291	7,002
Oahu	63,179	21,762	40,772	2,834	128,547
Maui	5,195	2,078	3,729	382	11,384
Hawaii	7,747	2,737	5,246	671	16,401
Total	79,156	27,785	52,215	4,178	163,334

*Sp = Special, e.g., Handicapped Students

Table 1-D University Student Population[8]

College	4-Year Students
Manoa	21,439
Hilo and HCC	2,941
Oahu Community College	13,551
Maui Community College	1,278
Kauai Community College	965
	40,174
Private Colleges (all islands)	3,894
Total	44,068

[6] 1970, Census Tracts.

[7] 1970, Census Tracts.

[8] University of Hawaii, Office of Academic Affairs.

As if in response to the call for expanded public awareness of the ocean environment by the *Hawaii and the Sea* reports, many new efforts have been initiated by various groups. Basically, these efforts have been sponsored, directly or indirectly, by mostly governmental agencies and some private interests, such as the Hawaii Council of Marine Science Teachers, within the community. For the purposes of this report marine education will be referred to as being executed on a formal (structured) or informal (unstructured or casual interaction) basis. A summary of a literature survey of existing and proposed activities and resources in marine education is presented in the following pages (see APP. 1).

Formal Marine Education Resources

1. Sea Grant College Program - In 1972, University of Hawaii became a Sea Grant College under the directorship of Dr. Jack Davidson. Under NOAA, a component of the Department of Commerce, the mission of Sea Grant has been directed toward multi-faceted aspects, e.g., research and development, education and training, related to the marine environment. (See Figure 1.)
2. Marine Programs - Headed by Dean John P. Craven, Marine Program was created in 1971 to satisfy the need coordination among the many marine-related entities, e.g., HIG (Hawaii Institute of Geophysics), HIMB (Hawaii Institute of Marine Biology), O.E. (Ocean Engineering), Look Lab, PBRC (Pacific Biomedical Research Center), etc., at the University of Hawaii. (See Figure 2.)
3. Waikiki Aquarium - A docent (student-teacher) program was initiated in the fall of 1974 by Dr. E. Chave. Modelled after similar programs at the Vancouver and Steinhart Aquariums, the docent program serves four levels of K-12 students.

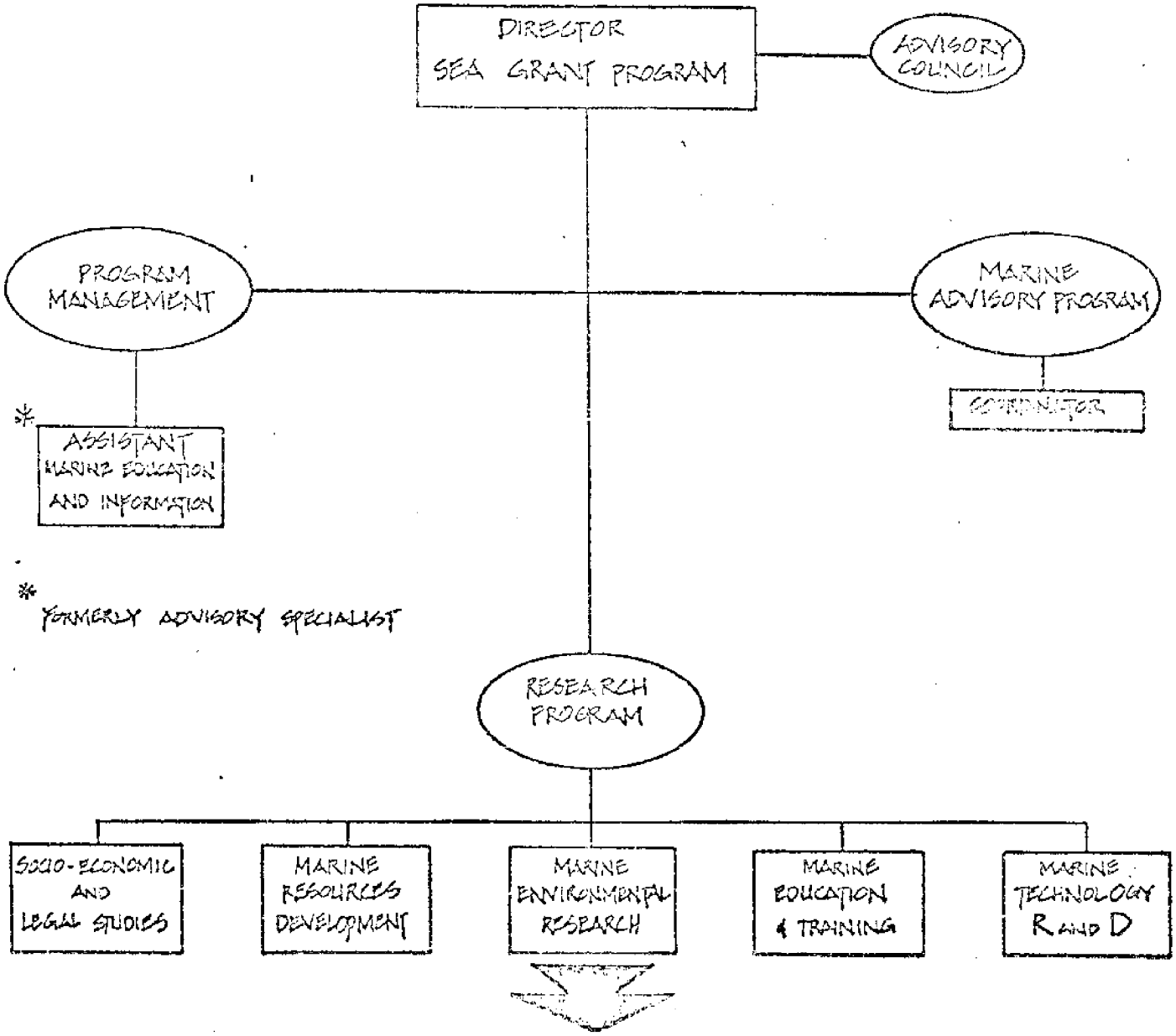

Figure 1: Sea Grant Research Program Source: Kelvin K.Y. Char

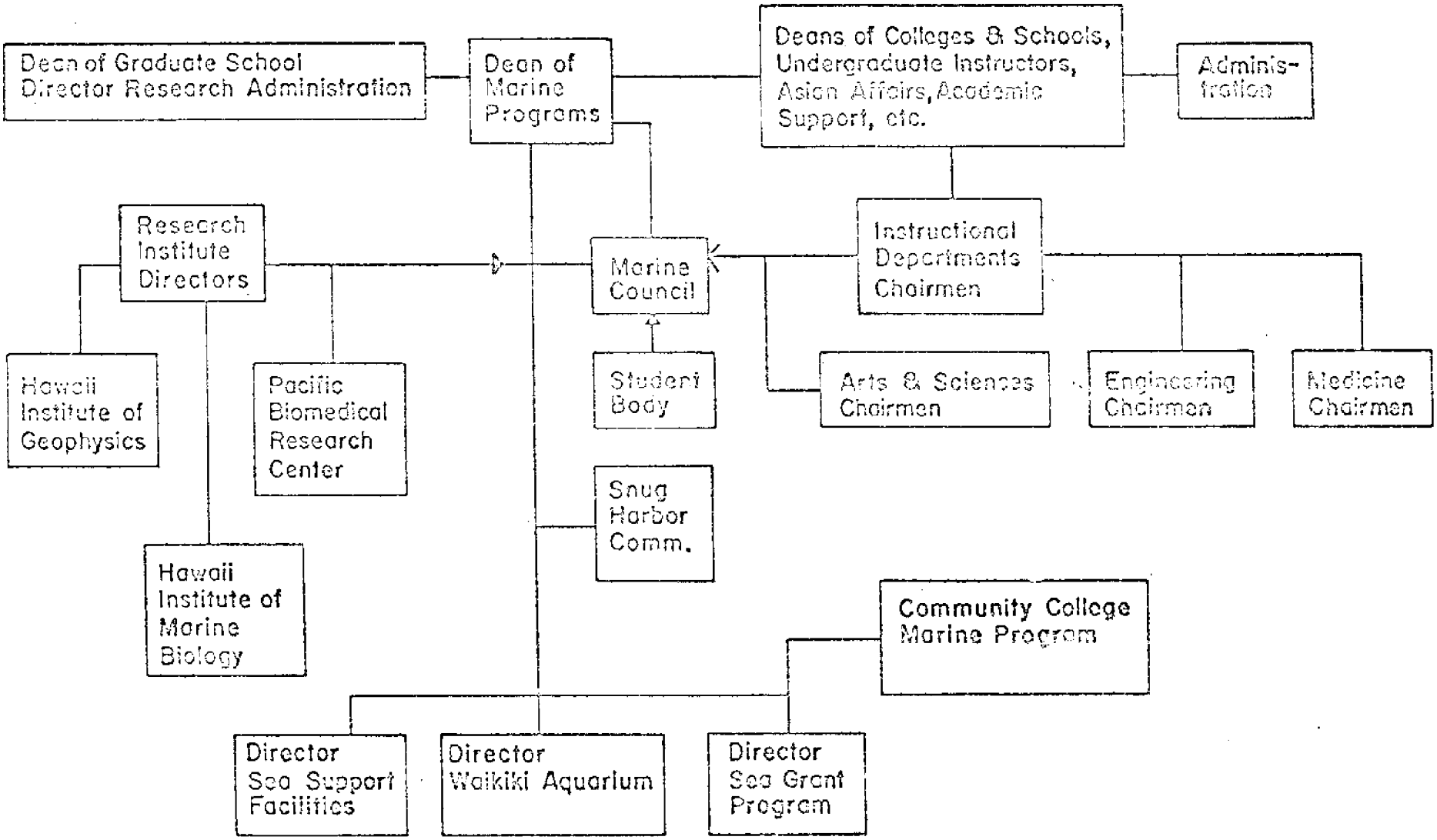

Figure 2: Organizational Chart of Marine Programs

Source: Bina Chun, A Window to the Sea: A Study of the Waikiki Aquarium

4. Marine Option Program (MOP) - Begun in 1971, MOP is designed to permit any undergraduate student in any major to acquire a marine orientation and skill. Students must complete a 12 hour minimum requirement in marine-related courses and an internship to obtain an MOP certificate. There are programs both at the Manoa and Hilo campuses. MOP is funded by Sea Grant.
5. Blue-Water Marine Laboratory (BML) - Funded by Sea Grant and the Marine Affairs Coordinator and supported by the DOE (Department of Education), BML is a hands-on, ocean-going laboratory for students in grades 6-12. Basic oceanographic methods are taught at sea.
6. Leeward Technician Training Program (LTTP) - The present curriculum at Leeward Community College provides most of the instruction recommended by the local industry to meet the requirements of all newly developing or expanding manpower needs as well as a diversity of student interests and vocation aspirations. Sample courses taught are in seamanship, piloting, navigation, diving, ocean instruments and marine biology. LTTP is funded by Sea Grant.
7. College level courses - Private colleges do offer some marine-oriented courses, but, by and large, most of the college level courses in marine studies are offered at the University of Hawaii through various departments, e.g., Zoology, Botany, Physiology, Oceanography. The Ocean Science Information Center of Hamilton Library prepared a list of all marine-related courses offered at the U.H. (See APP. 2). Included in that list are courses under Interdisciplinary Studies, administered by the Honors Program, and these are open to any qualified student.
8. K-12 courses - At the elementary and intermediate levels, some schools offer marine studies through Hawaiiana and science classes. Currently the high schools have more to offer -- 13 schools offer courses in marine-oriented

subjects. In addition marine students at Pearl City High School have organized, originally under the direction of MOP, a project-oriented marine science club called Kamalii o 'Kai (Children of the Sea).

9. Sea Life Park -- Although no regularly scheduled educational programs are available, Sea Life Park will dispatch guest speakers upon request. Lectures are also given at the Park, e.g., a talk on mammal training was given to a visiting psychology class from U.H. Sea Life Park also works with the Community Quest Program at Kailua High School whereby students work-and-learn at the Park.

10. Planning for a Coordinated K-12 Marine Education Program - A project funded by Sea Grant, a local advisory council was formed to develop a statewide comprehensive plan in marine education for grades K-12. The council included members of the Hawaii Council of Marine Science Teachers, originally formed to generate classroom materials, the Department of Education and other actively interested persons. A report from the council should be available by May 1975.

11. Slide Show - Under the guidance of Dr. John Bardach, Director, HIMB, several MOP students are producing a slide show on important marine concepts consisting of four parts: (1) conservation, (2) physical and chemical oceanography, (3) "what you'd like to see live in the water," and (4) fishing. The completion of the show is scheduled for summer 1975. It is Dr. Bardach's intention to present the show to the DOE to develop and distribute to the State's K-12 schools.

12. Hawaii Ocean Center - First proposed as an oceanographic park by the 1969 *Hawaii and the Sea*, the concept was expanded by *Hawaii and the Sea 1974* to include functions of education, information exchange, exhibits and planning

facilities for mission-oriented, sea-related research developments. Presently, the 1978 Bicentennial Exposition Committee is requesting planning monies through the MAC office.

Informal Marine Education Resources

1. Waikiki Aquarium - Constructed in 1952 and presently administered by Marine Programs, the Aquarium contains a variety of Hawaiian aquatic exhibits including static displays, fish tanks, and a seal and turtle pond. In addition, the Aquarium sponsors public lecture series on marine topics such as sharks and shells.
2. Makahiki Kai (Festival of the Ocean) - An annual ocean festival sponsored by Sea Grant for Oahu K-12 students, Makahiki Kai exhibits marine-related groups such as Maui Divers, National Marine Fisheries Service, Malacological Society, U.S. Coast Guard, and Look Lab.
3. Sea Life Park - Located on the windward side of Oahu, it is a privately owned marine entertainment park composed of a Hawaiian reef tank approximately 25' deep, porpoise and whale shows, Pacific sea birds, seals, gift shops and restaurant.
4. United States Navy - The Navy has a few activities which are both marine and educational and open to the public. At the Pearl Harbor Submarine Base, open house is held every Saturday for those who wish to view the workings of a destroyer and once a month a submarine is opened up to the public. Also at the Sub Base is the Navy's Pacific Submarine Museum. Although not open to the general public, the Naval Undersea Center (NUC) at the Kaneohe Marine Corps Air Station has proven to be educational for a few MOP students who took their internships there.

5. Coast Guard - Functioning in the public eye as primarily a boating safety and enforcement agency, the Coast Guard makes water safety displays available to the public upon request and frequently offers classes in boating safety and regulations.
6. Bishop Museum - Administered by the Bishop Trust Foundation, a private non-profit organization, the Bishop Museum displays marine exhibits generally with a Hawaiian theme, e.g., Hawaiian fishing techniques, jewelry made from ocean materials, and the whaling industry.
7. Lyman Museum - Located in Hilo on Hawaii and managed by the Lyman family, the theme of this museum is Hawaiian natural history in which is displayed the role of the ocean.
8. Ulumau Village - Located on Kaneohe Bay, Oahu, Ulumau Village is a replica of a Hawaiian fishing village and displays a variety of authentic tools of Hawaiian fishing technology.
9. Ota Estate - Presently run by the City and County of Honolulu, Department of Parks and Recreation, the Ota Estate located near Diamond Head displays a Hawaiiana collection of fishing techniques and a static collection of shells, corals, crustacea, and some fish.
10. Hanauma Bay - Hawaii's foremost marine conservation area is located on Oahu. Parks and Recreation with the help of MOP students has installed a permanent display at the food concession identifying and explaining the biological components and geographical sections of the bay. Snorkeling tours on an underwater trail are operated by several local dive shops. The primary users of the tour are tourists and the non-resident population.
11. Swimming lessons - Swimming and water safety classes are taught throughout the state by various organizations such as Parks and Recreation, the Red Cross, and the YMCA and YWCA.

12. SCUBA (Self-Contained Underwater Breathing Apparatus) lessons - Sponsored by individual instructors, dive shops, dive clubs and the YMCA, one of the primary objectives of SCUBA classes is to educate the potential diver in water safety. In addition to instruction on the proper use of equipment, divers learn about dangerous currents and marine animals. If the classroom and water tests are passed, the diver is given a NAUI or PADI certification.
13. Sea Transit - Hawaii's existing form of marine transit, the Sea Transit monohull vessel operates a run from Kewalo Basin to Iroquois Point on Oahu.
13. Hydrofoil Transportation - A hydrofoil transit system called SEAFLITE and operated by Pacific Sea Transportation is scheduled to begin inter-island service sometime during June 1975.
15. Glass bottom boats - Used mostly by tourists, glass bottom boats run out of Kewalo Basin and Kaneohe Bay. These tour vessels provide spectators with a bird's eye view and narrated explanation of nearshore marine life.
16. Fishing charters - Fishing charters on the major islands provide the users, mostly tourists, with a hands-on experience of fishing in Hawaiian waters. Moreover, the users learn the types of Hawaiian game fish, their habitat and the deep and turbulent nature of waters surrounding the islands.
17. Fish markets - Perhaps one of the most fun and inexpensive educational activities available to all, the many fish markets in the state and the auction at Aala Market in Honolulu can serve to familiarize one with all kinds of edible marine life, e.g., fish, seaweed, octopus, crabs and lobsters, clams and oysters and even sea cucumbers. In addition to the sale of raw seafood, it is possible to purchase seafood prepared in various cultural manners, i.e., ogo (Korean-style seaweed), poki (Hawaiian-style akule and seaweed), hammhar (Chinese-style salty dried fish), misozuke (Japanese-style fish-in-sauce).

II: SURVEY OF MARINE EDUCATION NEEDS AND PRIORITIES

INTRODUCTION

In the previous section it was noted that the *Hawaii and the Sea* reports have proved to play an influential role in recommending directions in which the State should aim its efforts in marine affairs. Included in the 1974 list of the 14 most critical of 1974 is the recommendation that funds be used to plan a Hawaii Ocean Center which would include educational, expositional, research and light industrial functions. The fact that education was given such a high priority rating by the team of marine experts is significant.

To date no research efforts have revealed statistical information defining the role of marine education in relation to other marine activities, particularly as components of an ocean center, in other words, no activity priorities have been established statistically.

A major purpose of this report is to determine State needs in marine education. To accomplish this task one must first (1) state a desired goal, (2) assess what resources are already available that may be applied to attaining the goal and then (3) determine what resources are needed to complete the process of goal achievement. The first two steps were completed as presented in the previous pages of this report. Step (3) will be in part fulfilled with the aid of a *general* survey of priorities and needs to determine what the State needs, in addition to what it has, to satisfy its goal in marine education.

PROCEDURE

A two-part questionnaire was prepared with the help of the Academic Evaluation Office at the University of Hawaii. Due to the need for informed,

cognitive responses on specific questions, the respondents for both parts of the questionnaire were not randomly selected from the general public but rather from the State's ranks of marine specialists. The specialists, many of whom were members of the Task Force for *Hawaii and the Sea*, were selected from a wide variety of marine fields all of which have the potential to influence future planning in marine education. The agencies and fields represented by response to the survey are: Sea Grant College Program, Marine Programs, Waikiki Aquarium, MAC (Marine Affairs Coordinator), DPED (Department of Planning and Economic Development), DOE, HCMST[9], fisheries, marine biology, ocean engineering, oceanography, naval and private marine technology, and marine recreation.

The objective of the first part of the survey was to determine what marine activity should comprise the major component of a hypothetical ocean center, a concept initiated to organize and coordinate the State's marine activities, that has become relatively familiar to marine specialists during recent years. The respondents were asked one question over the telephone:

> *If the State of Hawaii were to build an ocean center, in addition to many existing facilities, e.g., those at U.H. and Sea Life Park, what percentage of the total program budget should be devoted to operating funds for:*
>
> 1. *Entertainment (exhibition and performance, e.g., porpoise and whale shows)*
> 2. *Education (formal mainly, and informal)*
> 3. *Research (e.g., aquaculture, light industry: manganese nodule mining)*
> 4. *Information exchange*

This question was formulated with certain assumptions in mind: that requesting information based on economic desirability might cause responses

[9] Hawaii Council of Marine Science Teachers

to be considered in a more realistic and feasible, as opposed to idealistic, light. The four components in question of the center were selected by the Marine Advisory Program on the basis of information contained in *Hawaii and the Sea* and in proposals for the HOC (Hawaii Ocean Center), that these components would be probable competitors for funding should a center ever be realized.

The purpose of the second part of the survey, a questionnaire (APP. 3) mailed to respondents, was to better define needs in, specifically, the area of marine education. The questionnaire was composed of five sections which dealt with the following topics:

1. demographic background
2) program[10] needs
3) curriculum[11] needs
4) facilities[12] needs
5) bonus section

Instructions explaining the manner in which questions were to be answered differed for section 1, sections 2-4, and section 5. The demographic section contained multiple choice questions whose answers were selected by circling the appropriate letter. Sections 2-4 required the respondent to rate the desirability of the needs described in each question on a scale of 1-10, 10 being of the highest value or priority. Part 5, the "bonus" section, so called because the respondents were given the option to express their opinions on the preceding sections, included space in which the respondents could write their answers.

[10]Defined as a comprehensive scheme.

[11]Defined as a course of study.

[12]Defined as something built, installed or established to serve a program or curriculum.

To establish priorities within sections 2-4, questions were frequently raised on a comparative basis. For example, questions 12-14 ask at which student groups should curriculum development be aimed: elementary (question 12), intermediate (13) or high school (14). The results will be evaluated on the basis of these comparative question groups.

RESULTS

Part I of the survey revealed that education received the greatest percentage of operating funds (46%). Research, in living and non-living ocean resources and including some light industry, received the next priority with 25%. The third most important marine activity in an ocean center was voted to be information exchange and was given 22%. Entertainment and/or exhibition functions lacking an expressed educational function was rated as a low priority in a center as indicated by its 8%.

In addition to the percentages assigned to each activity, some individuals offered their opinions on their organization preferences. All of the respondents felt that the educational component was most important because of the need for informed public involvement in and support of marine affairs at the governmental level. Also, the reasons supporting a strong educational component that were listed in chapter 9 of *Hawaii and the Sea* were re-emphasized by most of the respondents.

In the area of research, the respondents offered a variety of comments. Some believed that existing University facilities and the U.S. Navy can satisfactorily accommodate research present needs within their existing systems. Other respondents felt that if research efforts were to be accelerated, the private sector should bear most of the development burden. One respondent

suggested that all research activities should schedule open-house activities for the public and another recommended that all student research be included in the research component of an ocean center to expose students to real-life problem solving techniques.

All respondents indicated that the State is very much in need of an information exchange office. One respondent pointed out that this operation could very easily be incorporated into the education component in that the exchange of information is a function of education. At present, the respondent said there is no one office where individuals may inquire and expect to receive an immediate answer to a "current events" question marine in nature. Another respondent specified that there is a tremendous need for an office that would keep up-to-date literature research files, that is, a place where all current pertinent journal and newspaper articles would be kept.

Entertainment refers to the component whose function would be primarily to divert or amuse the public through performance and exhibits. Education could be part of the entertainment component but the educational function for the purpose of the report would take second priority to the aspect of amusement. Many respondents believe that Sea Life Park should retain control over the entertainment aspect of marine activities and that competition of this nature would not be considered healthy. Respondents also indicated that entertainment, information exchange and research should be displayed in as interesting and informative a manner as possible and therefore education should be a primary concern of the other major components.

The results of Part II will be discussed section by section. In the demographic section, results indicated that 29% of the respondents have lived in Hawaii since birth, 29% at least ten years, 23% from 5-10 years and 17%

2-4 years. Based on the fact that 81% of the respondents have lived in Hawaii for longer than 5 years and that all respondents were actively involved, either by choice of employment or hobby or both, in a marine activity, it may be assumed that the respondents are capable of giving an acclimatized, in terms of things Hawaiian and marine, response.

The overall average of questions in sections 2-4 was 7.2. Of the averages of the number of questions (24) in these sections, 10 fell below the overall average, 10 above the average and 3 equalled the average. Sections 2 and 3 each received a 7.6 average while the average of questions in section 4 was 6.8.

The averages of each of the 24 questions ranged from 5.0 to 8.6 indicating that most respondents believed the needs in questions to be of a medium to high priority if, on the specified scale of 1-10, 1 is considered low, 5 medium and 10 high priority as the instructions state. (See APP. 4 for survey evaluations.)

At the beginning of each section questions of a broad goal-oriented nature were asked. These questions, 6, 11, and 25, are the most singularly important issues of the questionnaire because of the complex nature and high cost that any of these issues involve. Of these three questions the respondents indicated that the State has the greater need for a marine education curriculum (11) than for either a marine education center (6) or a large-scale aquarium (25).

A marine education center (6) is considered to be the State's greatest need in the area of Program Needs, section 2. Questions 7, the need for improved communication channels between the DOE and other educational agencies, and 8, the need for better trained marine K-12 teachers, did receive ratings of 8 or above and thus these needs may also be considered important.

Section 3, Curriculum Needs, indicated that the development of a statewide, comprehensive marine education curriculum is most important and question 11 received the highest average (8.6) of all questions. In section 3, questions 19, the need for development of hands-on marine studies, and 24, the need for curriculum with ecological themes, both received ratings of 8 or above consequently signifying a degree of high priority.

In section 3, there were a number of groups of questions that should be evaluated. Questions 12, 13, and 14 refer to three target groups for curriculum development and of these, the respondents believed the elementary students to be most in need of a marine education curriculum. Program electives, e.g., vocational studies, should be made available to students at the high school level (16) rather than at the intermediate level (15). Hands-on marine studies (19) should be developed more than academic studies (18). Of the four types of curriculum (21-24), respondents felt that the most considerations should be given first to ecological studies, next coastal zone management, and lastly Hawaiiana and oceanographical curriculum. Apparently respondents feel that an adequate amount of Hawaiiana and oceanographical materials already exist.

In the Facilities Needs section (3), all questions were given near and below average ratings. Of questions 25-29, respondents assigned the following priority: (1) classrooms with labs specially equipped for marine studies (26), (2) development of a marine audio visual center (29), (3) marine library (28), and (4) a large-scale aquarium (25) and K-12 marine support vessels (27).

III: CONCLUSION

If the State is to ever realize its goals in marine education as stated earlier in this report by the participants of the Sea Grant sponsored conference, it would be wise to recognize at this time and address a problem that became readily apparent during the resource survey period. This problem, a tremendous lack of coordination among existing and proposed marine programs, is significantly prohibiting the effectiveness of present efforts in the education of Hawaii's public in marine related areas.

Present efforts of the various entities in the State as discussed in Part I result in a disjointed and incomprehensive, and therefore, ineffective, system that cannot, without revision, hope to attain the specified goals in marine education. To date the State education policymaking entity, the Department of Education (DOE), has not provided the government and private agencies who sponsor programs in marine education with the incentives necessary for coordination and the direction of individual efforts toward the development of a comprehensive, statewide program in marine education. Rather, marine education programs have been implemented in a fragmented manner, that is, to satisfy only the needs of particular target groups and the objectives of the sponsoring agency.

The repercussions of this deficiency in comprehensive planning of a statewide marine education program become particularly visible in certain areas: existing K-12 programs are sporadic and quantitatively inadequate, the outer islands at all academic and public levels are, compared to Oahu, poor in formal marine education resources and the citizenry of the State has consistently been the low priority target group of current marine education effort.

As future citizens of a State that possesses very limited natural resources of which the ocean is an important component, students should at an early age learn about the possible implications of decisions made during their adult careers on the non-renewable natural environment. At present schools lack the planned curriculum, teaching materials and facilities to effectively communicate marine concepts to the State's 163,334 students.

Today, most marine courses are being taught by science teachers. There is perhaps a need for more teachers, not only science teachers, qualified to teach marine-related subjects. To prepare teachers properly a training program may prove to be necessary.

As of yet no formal programs have been designed specifically for the purpose of increasing public awareness of Hawaii's marine environment. There are only a few ongoing marine activities, i.e., the Waikiki Aquarium, Sea Life Park and the annual Makahiki Kai, in the State that are geared for the communication of non-technical, ocean-related information to the public. Unfortunately, the existing manner (taxonomic) in which information is conveyed is outdated according to current trends (ecological function) in museum techniques of information selection and presentation.

The high number of water accidents that all too frequently have resulted in fatalities indicates that existing water safety programs, whether they take the form of safety lectures, swimming or diving lessons, do not constitute successful preventative measures.

To briefly summarize the survey of marine education needs, respondents indeed believe marine education to constitute an important consideration for development and funding in the State of Hawaii. It was indicated that 46%

of the total program budget of a hypothetical ocean center should be devoted to marine education. Respondents clearly defined the highest priority need to be the development of a statewide marine education curriculum which included an emphasis on ecological concepts and to be aimed primarily at educating the State's elementary students.

In addition to the actual survey results, certain areas for concern appeared as the survey of marine education needs progressed. Because of insufficient time and resources, this survey was unable to justify specific types and corresponding scopes of detailed needs in marine education. It would be wise, however, to complete the background research phase, that is, the collection and analysis of pertinent information, before attempting to design a well organized, effective system which satisfies the marine education needs of Hawaii.

The following section recommends alternate avenues of supplementary research and developmental action that may be applied to the attainment of marine education goals in the State of Hawaii.

IV. RECOMMENDATIONS

The following recommendations on the development of a statewide marine education program are made in outline form for the purposes of clarity and ease in presentation:

I. Supplemental Research

1. actual need for a marine teacher training program
2. actual need for curriculum development aimed at educating the public
3. actual need for community involvement with sponsoring agencies in marine-related activities.
4. actual market potential for graduates of marine-related vocational programs
5. clarification of types of field and classroom marine studies (this may be best accomplished through cooperation with the Marine Education Curriculum Steering Committee)
6. a thorough assessment of government and private, and potential combinations thereof, financial resources in light of the maximum development in marine education those resources could be expected to support

II. Program

1. formulate a statewide "master plan" in marine education that includes an incrementally linked program with public and grade specific objectives
2. investigate possibility of including existing marine facilities, i.e., Sea Life Park and Waikiki Aquarium, as an integral component of "master plan"

3. conduct "public hearings" at pertinent intervals during developmental process of the "master plan"

III. Curriculum

1. develop grade-specific ecological curricula including the necessary teaching materials and aides
2. consider the development of topics such as pollution hazards, living resource development and seafood preparation, ocean mining and ocean law that are current areas of interest in marine affairs
3. consider accessibility of field trip locations by schools during curriculum planning stage
4. consider a firm arrangement of instructional programs for K-university students at Sea Life Park
5. consider a seamanship internship program on board Matson shipping vessels for university, especially LTTP, students
6. develop curricula alternatives for outer island students
7. develop a compulsory curriculum in water safety including both classroom and pool work

IV. Facilities

1. consider renovating facilities and strengthening at programs, Sea Life Park and the Waikiki Aquarium, rather than building a new aquarium or education center, to meet informal and formal needs of the State
2. consider the construction of an undersea observatory near Sea Life Park as an important public educational facility

3. build a demonstration laboratory at the Waikiki Aquarium for use by students enrolled in a formal education program
4. organize a supply house for marine studies equipment

V. *Organization*

1. organize a task force, preferably in the very near future, to further define specific marine education needs and propose alternative comprehensive plans for a statewide program in marine education
   A. in the early stages of formulating the "master plan" clearly define the organizational roles and scope of all participating agencies and specify the responsibilities, i.e., administrative, fiscal, instructional, support, etc., of each
   B. investigate the possibility of government subsidy of public-serving, privately-owned facilities such as Sea Life Park if firm instructional or internship programs are implemented to become an integral part of the statewide marine education system
   C. consider during the initial planning stages a realistic time frame, either a "phase in" or "all at once" scheme, for implementation of the system
   D. consider the initial outlay/long-range cost benefits, e.g., increased quality of education/cost/pupil and other computable benefits as well as long-term intangible spinoff benefits such as a wiser public use of the marine environment

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APPENDICES

APPENDIX 1: A LISTING OF EXISTING AND PROPOSED MARINE EDUCATIONAL ACTIVITIES AND RESOURCES

FORMAL

Sea Grant
Marine Programs
Waikiki Aquarium
Marine Option Program
Blue-Water Marine Laboratory
LTTP
College Level Courses in Various Departments
- Dept. of Biochemistry and Biophysics
- Dept. of Botany
- Dept. of Oceanography
- Dept. of Political Science
- Dept. of Zoology
- Dept. of Civil Engineering
- Dept. of Electrical Engineering
- Dept. of Ocean Engineering
- Dept. of Physiology
- Coll. of Continuing Education
- Dept. of Tropical Agriculture and Resource Economics

K-12 Courses
Sea Life Park
Planning for K-12
Marine Education Program*
Slide Show*
Hawaii Ocean Center*

INFORMAL

Waikiki Aquarium
Makahiki Kai
Sea Life Park
USN
Coast Guard
Bishop Museum
Lyman Museum
Ulumalu Village
Ota Estate
Hanauma Bay
Swimming Lessons
SCUBA Lessons
Sea Transit
Hydrofoil* Inter-Island Transportation
Glass Bottom Boats
Fishing Charters
Fish Markets

*Proposed

APPENDIX 2: SAMPLE QUESTIONNAIRE OF A SURVEY OF MARINE EDUCATION NEEDS

SURVEY OF MARINE EDUCATION NEEDS

The Sea Grant College Program of the University of Hawaii is conducting a survey to determine fundamental statewide marine education needs. The information will be used in developing an effective marine education center for the State of Hawaii.

Please kokua by returning this questionnaire to Kula o Kai, Sea Grant College Program, 2540 Maile Way, Spalding Hall 255, Honolulu, Hawaii 96822 no later than 2 December 1974.

(Circle the letter that best corresponds to your answer)

PART I: BACKGROUND

1. Age:
   a. under 20
   b. 20-24
   c. 25-29
   d. 30-34
   e. 35-39
   f. 40-44
   g. 45-49
   h. 50 and over

2. Sex:
   a. Male
   b. Female

3. Ethnic background:
   a. Caucasian
   b. Japanese
   c. Chinese
   d. Filipino
   e. Samoan
   f. Hawaiian or part-Hawaiian
   g. Mixed (without Hawaiian)
   h. Other: _____

4. Resident of Hawaii:
   a. since birth
   b. last 10 or more years
   c. last 5-9 years
   d. last 2-4 years
   e. less than 1 year

5. Background (interest/employment) in marine-related areas: _____

_____

_____

PARTS 2-4: On a scale of 1-10, 10 being of the greatest value or highest priority, rate the following needs according to their degree of desirability.

PART II: PROGRAM NEEDS

_____ 6. The State needs a dynamic, that is, one sufficiently flexible to adapt to changing needs, marine education center.

_____ 7. Administrative communication channels between the DOE and marine components of the education system, i.e., the various schools, the Hawaii Council of Marine Science Teachers, etc., need to be considerably improved.

_____ 8. There is a need for better trained, and thus a better training program, (marine) K-12 teachers.

_____ 9. There should be greater coordination between existing City & County, State, Federal, and private marine-related programs.

_____10. There is a need for University of Hawaii marine educational programs, i.e., MOP and BML, to participate more in pertinent, marine community activities.

PART III: CURRICULUM NEEDS

_____11. The State needs a statewide comprehensive, i.e., at all scholastic and non-scholastic levels, curriculum in marine education.

_____12. The primary target group for curriculum development should be the elementary grades.

_____13. The primary target group for curriculum development should be the intermediate grades.

_____14. The primary target group for curriculum development should be the high school grades.

_____15. Provisions for program electives, i.e., vocational studies, should be made available at the intermediate level.

_____16. Provisions for program electives, i.e., vocational studies, should be made available at the high school level.

_____17. Educational materials, i.e., texts, audio-video aides, etc., should reflect "local", that is, Hawaiian, themes.

_____18. There should be intense development of academic or classroom marine studies.

_____19. There should be intense development of "hands-on" or field marine studies.

_____20. There is a need for vocational training programs in marine-related fields.

_____21. Coastal Zone Management curriculum, i.e., classes, seminars, audio-video aides, conferences, should be developed.

_____22. Hawaiiana curriculum, i.e., classes, seminars, audio-video aides, conferences, should be developed.

_____23. Oceanographical curriculum, i.e., classes, seminars, audio-video aides, conferences, should be developed.

_____24. Curriculum, i.e., classes, seminars, audio-video aides, conferences, with ecological themes should be developed.

PART IV: FACILITY NEEDS

_____25. A large scale aquarium, such as Sea World and the Steinhart and Vancouver Aquariums, should be developed for Hawaii.

_____26. There is a need for classrooms with labs specially equipped for marine studies.

_____27. There is a need for marine vessels to support K-12 field activities.

_____28. A library with an emphasis on marine-related topics should be developed.

_____29. There is a need for the development of an audio-video educational facility to produce materials to help promote marine awareness in the citizenry.

PART V: "BONUS"

30. In the area of marine education what other "program needs" should be considered in the development of a marine education center?

_____

_____

_____

_____

_____

31. In the area of marine education, what other "curriculum needs" should be considered in the development of a marine education center?

32. In the area of marine education, what other "facility needs" should be considered in the development of a marine education center?

33. What kind of relationships, if any, do you envision between the proposed Hawaii Marine Expo of 1978 and a marine education center? Can they be successfully coordinated? Comments.

34. Do you envision the role of a marine education center as being primarily passive, i.e., resource center, or active, i.e., teaching/learning "factory"?

PROFILE OF MARINE EDUCATION NEEDS AND PRIORITIES

DATE: 11/74 - 1/75
PROGRAM: SEA GRANT

SECTION 2: PROGRAM NEEDS

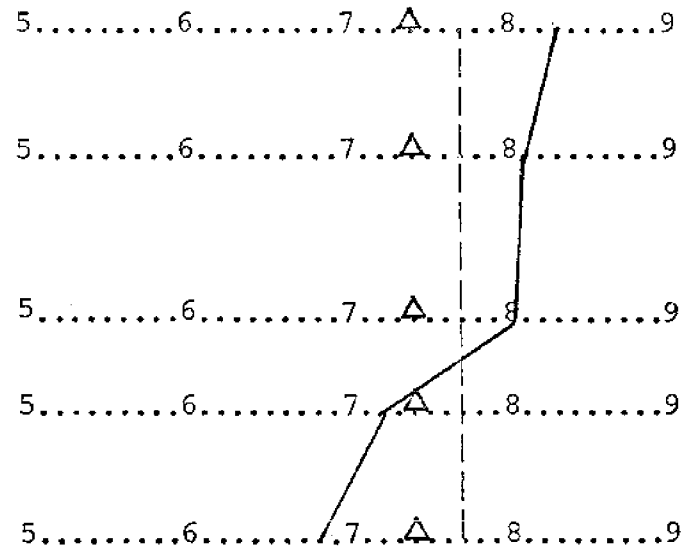
6. The State needs a dynamic, that is, one sufficiently flexible to adapt to changing needs, marine education center.

7. Administrative communication channels betweeen the DOE and marine components of the education system, i.e., the various schools, the Hawaii Council of Marine Science Teachers, etc., need to be considerably improved.

8. There is a need for better trained, and thus a better training program, (marine) K-12 teachers.

9. There should be greater coordination between existing City and County, State, Federal, and private marine-related program.

10. There is a need for University of Hawaii marine educational programs, i.e., MOP and BML, to participate more in pertinent, marine community activities.



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APPENDIX 3: SURVEY EVALUATION PROFILE

SECTION 3: CURRICULUM NEEDS

11. The State needs a statewide comprehensive, i.e., at all scholastic and non-scholastic levels, curriculum in marine education.

12. The primary target group for curriculum development should be the elementary grades.

13. The primary target group for curriculum development should be the intermediate grades.

14. The primary target group for curriculum development should be the high school grades.

15. Provisions for program electives, i.e., vocational studies, should be made available at the intermediate level.

16. Provision for program electives, i.e., vocational studies, should be made available at the high school level.

17. Educational materials, i.e., texts, audio-video aides, etc., should reflect "local", that is, Hawaiian, themes.

18. There should be intense development of academic or classroom marine studies.

19. There should be intense development of "hands-on" or field marine studies.

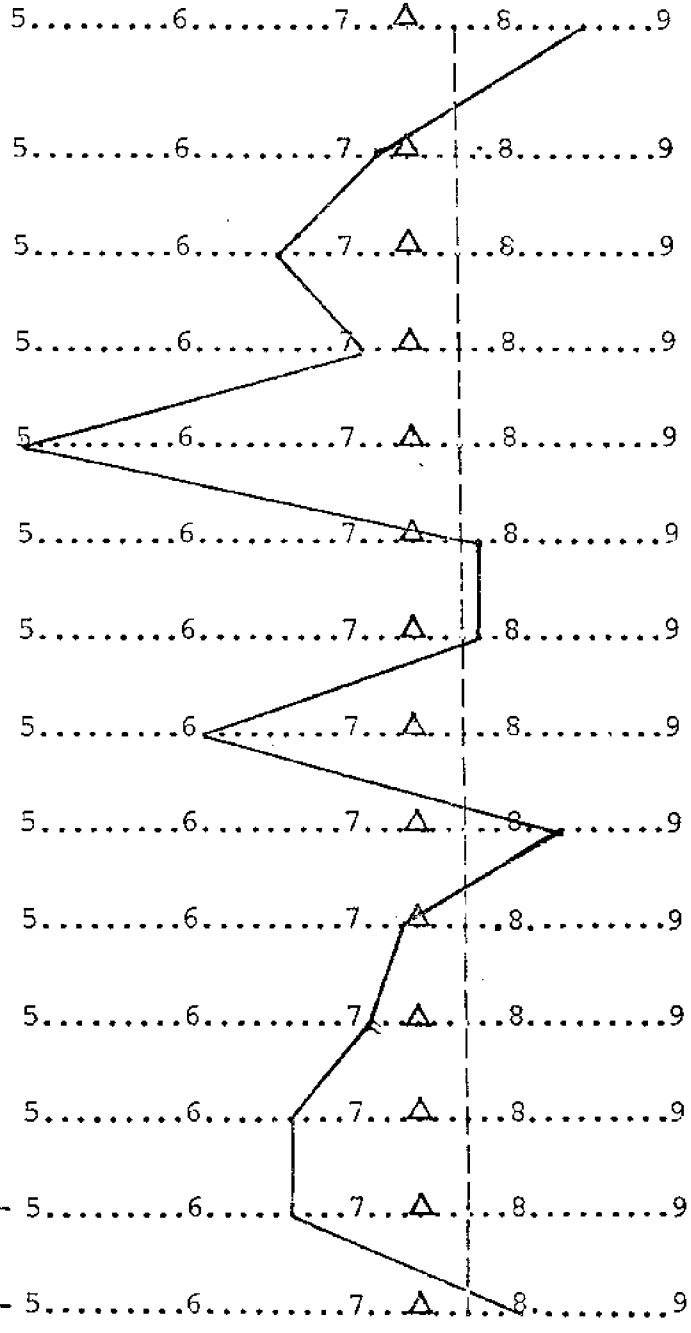
20. Thereis a need for vocational training programs in marine-related fields.

21. Coastal Zone Management curriculum, i.e., classes, seminars, audio-video aides, conferences, should be developed.

22. Hawaiiana curriculum, i.e., classes, seminars, audio-video aides, conferences, should be developed.

23. Oceanographical curriculum, i.e., classes, seminars, audio-video aides, conferences, should be developed.

24. Curriculum,i.e., classes, seminars, audio-video aides, conferences, with ecological themes should be developed.



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SECTION 4: FACILITIES NEEDS

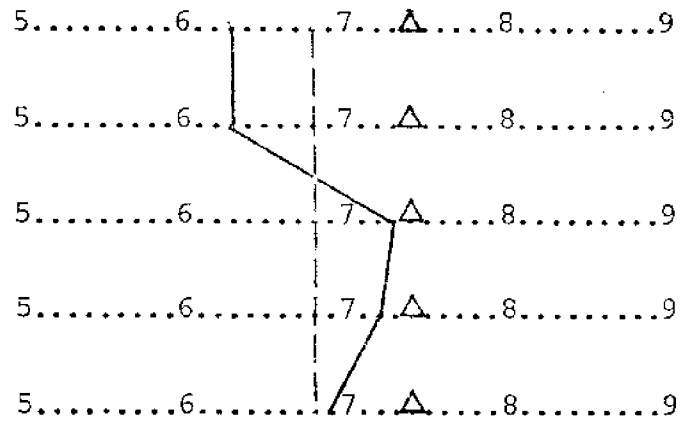
25. A large scale aquarium such as Sea World and the Steinhart and Vancouver Aquariums, should be developed for Hawaii.

26. There is a need for classrooms with labs specially equipped for marine studies.

27. There is a need for marine vessels to support K-12 field activities.

28. A library with an emphasis on marine-related topics should be developed.

29. There is a need for the development of an audio-video educational facility to produce materials to help promote marine awareness in the citizenry.



| = Location of Section Norm: based on 5 questions

Δ = Location of Survey Norm: Sections 2 - 4, Based on 24 questions

Form Prepared by: Academic Evaluation Office
Hawaii Hall 236, UHM

APPENDIX 4: DEPARTMENT OF EDUCATION'S REACTION AND RECOMMENDATIONS

STATE OF HAWAII

DEPARTMENT OF EDUCATION
P.O. BOX 2360
HONOLULU, HAWAII 96804

OFFICE OF INSTRUCTIONAL SERVICES

GENERAL EDUCATION
BRANCH

September 8, 1975

Subject: Reactions and Recommendations to Your Summary of the Working Paper Report on Mini-Sea Grant Research Project

It is difficult to respond only to the conclusions portion of your working paper, inasmuch as we are not cognizant of what is contained in the body of the report.

However, I have asked our program specialist to react to the portion sent us. Attached is his comments.

In addition, may I make the following observation. I am assuming that the working paper is a justification and evidence for need for a marine education curriculum. As such the following comments are in order:

Page 23, paragraph 2: The second sentence, fourth line is in error. The Department of Education, in its Foundation Program and policies as adopted in 1970, recognizes the Environmental Studies as the third broad base of studies. What needed to be developed beyond the policies level is an operational definition and program. Since then, the Department in consort with the University has developed a model which shows the relationship of environmental education to its component, marine education, and environmental education to outdoor education. The model also shows relationship of environmental education to the various disciplines.

The Department has been working with OEQC and the Citizen's Committee on Environmental Education since 1971 to develop an environmental education framework. It has been working with the University in the assessment of need and development of a Marine Education Curriculum as component of the broader Environmental Education.

As a follow-up of this statement in correction of page 23 statement, the following specifics on marine education is in order.

Teachers and students are cognizant of need for a comprehensive marine education program. Hawaii is unique as a state because the seven islands which make up the State are surrounded by water and separated with the greater U.S. by a major ocean. Thus, Marine Education is an important part of education for populace in Hawaii. This includes awareness of aquatic life, water safety, understanding and preservation of aquatic life, and enhancement of man's living in the islands by protecting the balance of land and air marine environment.

I would like to discuss this background information with you. In addition, I would appreciate a review of the body of this working paper so that we will have a better understanding of the statements made in this section's conclusions.

I apologize for being late in sending this material to you.

MYO:enm
Encl.

INTRA-DEPARTMENT CORRESPONDENCE
Department of Education
State of Hawaii

JUL 31 1975

DATE: July 31, 1975

TO: Mrs. Margaret Oda

FROM: Miles
School or Division — Writer

SUBJECT: Review of Sea Grant Program Working Paper

GENERAL COMMENTS

Although the overall objective is Marine Education, what is the ultimate goal? Ecology? Conservation? Environmental Education? A separate curriculum area? Environmental Economics? Environmental Quality Control? Organization of another type of educational agency to present the non-taxonomic study program of the environment? Man and the Ecotone? Development of a corps for community service? Future support for more "restrictive" legislation? Aware public? Committed public? Experienced public? Subsidizing private enterprise for public service? State and County economics (tourism, generating primary income, land use reform, etc.)?
Each area incurs a uniquely different community cost, and requires uniquely different approach strategy and attitude.

Why separate Marine Education from Environmental Education efforts? Is this counter productive in reference to the unified curriculum? Duplication?

I get the feeling that this part of the working paper is fault finding and overly emotional. As important as the educational goals are, a more objective approach clarifying how to weave appropriately existing programs together with proposed programs into a comprehensive plan--however sketchy at this time--would be more effective, constructive, and informative in presentation. Also, the scope--level of services to various target groups--of the proposal should be better presented and University-Community College efforts, DOE efforts, other private and public agency efforts should be better delineated and categorized.

SPECIFIC COMMENTS BY PARAGRAPHS

Paragraph 1

Are these entities willing to modify their programs in toto or in parts to dovetail into the overall Marine Education "master plan"? They have their own resources, reasons, etc., for doing what they are doing. Can a "educational purpose" be mandated or even cooperatively ventured into, if it is left at the voluntary level, without evidence of economic returns? The desirability of this approach should contain some cautions.

Paragraph 2

What incentives for coordination and direction do we provide or can provide? Those incentives that are applicable are also very limited.

Paragraph 3

There was no responsibility assigned to the DOE for Marine Education as envisioned by Sea Grant. Course work, yes; integration into subject areas, yes; programs, no. Community education was not, until recently, an active effort of the DOE.

Paragraph 4

Schools do lack materials mainly because commercially available materials are not abundant, although the situation is improving. Highly motivated, creative, and committed teachers have developed materials in spite of their limited time, resources, and energies. Sea Grant and the Marine Education Curriculum Steering Committee in their efforts to put together appropriate curriculum materials are in essence early innovators in this particular area.

163,334 students ought to know marine concepts, but must know is open to debate.

Paragraph 5

Marine Education concepts are taught by many teachers other than science teachers. What is taught has never been labeled Marine Education before. A training program for Marine Education is a must, but appropriate materials development should precede the training. The teacher's situation and psychology should be considered seriously at this point.

Paragraph 6 No comments.

Paragraph 7

Non-technical facilities are usually commercial enterprises.

Paragraph 8

Safety is everyone's business.

Paragraph 9

Ecological concepts may not be the best fit for elementary students.

Recommendations Section

I 2 General public or students or both?

I 3 ????

I 5 Part of I 2, under curriculum

I 6 Again, goals and objections of each group must fall in line with major effort.

II 1 "Master plan" must fit the overall educational plans because it will end up being a component of the larger plan(s).

III 1 Should include the "general public" in this statement.

IV 1 The public's image of these facilities are set. What will it take to change the image to fit the new thrust?

IV 2 Isn't Sea Life Park a simulated observatory? Is this a feasible location from the engineering, education, transportation, etc., standpoint?

IV 3 Instead of a demonstration laboratory for students, perhaps this facility should be designed to be a teacher center, an information dissemination center, a training facility, a materials development center, or the nerve center for Marine Education in Hawaii. If a student demonstration center, what environmental impacts need to be considered?

IV 4 A supply center alone is too costly to operate. See IV 3.

V 1 A Sounds like a new agency is being developed that cuts across currently existing lines and structures.

V1 B Subsidizing for public service sounds like a good idea.

APPENDIX 5: REACTIONS AND RECOMMENDATIONS BY FRANCIS M. POTENGER, CURRICULUM RESEARCH AND DEVELOPMENT GROUP, COLLEGE OF EDUCATION, UNIVERSITY OF HAWAII

Sept. 10, 1975

Summary of mini-Sea Grant research project

I received your memo with the attached memo to myself and Mrs. Oda dated July 18, 1975. Somehow this earlier letter seems to have been mislaid since I do not recollect having processed it earlier. I continue to search on this end for earlier correspondence.

As to my evaluation, I would suggest that the document be greatly modified to reflect the outcomes of the Marine Conference of February 1975. I am enclosing both Hal Goodwin's report of the conference[1] and the Prospectus of Marine Studies education committee[2]. As the present Sea Grant document is written, it implies on page 23 that marine education is in disarray and that the policy-making role is one which the Department of Education has already accepted.

First, I believe that substantial efforts have been made to coordinate marine education activities. Second, I believe that it will also be found that the DOE has no mandate to produce a marine education plan. They have a mandate to produce an environmental educaion plan which will, of course, incorporate studies of the marine environment. I feel it somewhat unfair to imply that the Department has been resting on its oars in this matter, since the mandate to produce the environmental education plan is of relatively recent vintage.

Without specifically detailing the problems in the recommendations, I suggest that you look at the Prospectus which will give you some insight into the current stage of evolution of marine education and will show many of the recommendations in the Sea Grant document to be already in an active state of implementation.

---

[1]Harold L. Goodwin. 1975. *Marine Affairs Education in Hawaii's Future.* Report of the Chairman. Hawaii Marine Education Conference, University of Hawaii, Honolulu.

[2]*Marine Education for Hawaii: A Prospectus.* A report for the Hawaii Marine Education Council. February 1975.