

**OCTOPUS RESEARCH IN PRINCE WILLIAM SOUND ALASKA:
THE BIRTHING OF A SCIENTIFIC DIVING PROGRAM AND THE ROLE OF THE AAUS.**

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A scientific diving program was recently started at the Prince William Sound Science Center, a private, non-profit research and educational organization located in Cordova, Alaska in order to facilitate Center projects involving the use of scuba diving. The American Academy of Underwater Sciences (AAUS) standards for scientific diving provided a key component in establishing a program acceptable to an insurance carrier that provides workman's compensation to employees. Participation in the AAUS by persons who are not diving officers is recommended as a means of facilitating development of new diving programs by involving new individuals.

INTRODUCTION

The Prince William Sound Science Center was founded in 1989 as an independent research and educational facility and non-profit Alaska corporation, which seeks to contribute to the comprehensive description, sustained monitoring and ecological understanding of Prince William Sound (PWS), the Copper River, and their wetlands, river systems, and drainage basin. Because the Center is located in Cordova on the eastern shore of PWS, is connected by road (10 km) to the Copper River Delta, and has daily jet service to and from Anchorage and Seattle, it provides an ideal setting for regional research. Projects based out of the Center have included those from other institutions as well those originating in the Center itself. For the former, the Center provides local knowledge and logistical support .

FIRST DIVING PROJECT

It was only a matter of time before a project involving the use of scuba diving would come about. This happened in 1995, when D. Scheel, a Center scientist, was funded by the Exxon Valdez Oil Spill Trustee Council to conduct the study "survey of octopuses in intertidal habitats" that involves scuba diving to locate octopuses near and in dens in the intertidal during high tide, as well as dens in the shallow subtidal. Prior to this project, workman's compensation including maritime insurance had been in force with the Center's insurance carrier. This is accomplished by a stepped workman's compensation rate for actual maritime days which is charged to projects.

The carrier was willing to cover scuba diving in 1995 only if the policy was rewritten. This would have required paying an unacceptably high amount given the funding for the diving project. Furthermore, the carrier refused to cover Center personnel if they were scuba diving without a new policy. This was in spite of an offer to have all Center divers certified as scientific divers in the University of Alaska Scientific Diving Program. The Center was thus forced to prohibit employees from scuba diving as part of their work. In 1995, no scuba diving was performed as part of any research project by Center employees. The diving work for the octopus project was sub-contracted out. Fortunately scientific diving personnel with local expertise were found as well as a Seattle diver

knowledgeable in Pacific octopus. Local scientifically-trained divers included a diver from the U.S. Forest Service, the Alaska Department of Fish and Game, and a marine biology teacher at Cordova High School who is a dive instructor. The captain of the chartered vessel also participated as a diver. Involvement by D. Scheel, the Principal Investigator, was restricted to interaction with divers during surface intervals. The diving portion of the project thus lacked direct involvement of D. Scheel and suffered as a result. The non-diving portions of the project were far more successful in terms of meeting program objectives that consisted of determining characteristics of primary octopus habitat in PWS.

A NEW AAUS-BASED SCIENTIFIC DIVING PROGRAM

The impasse created by the insurance situation in 1995 was unacceptable to the Center. The Centers' president, G. Thomas, appointed T. Kline as diving safety officer (DSO) who was tasked to form a formal scientific diving program. Meanwhile the vice-president, N. Bird, continued negotiations with insurance companies. The appointment of T. Kline as DSO was based on: 1) his recent scientific diving experience, based in Alaska, and 2) his involvement and familiarity with the AAUS. T. Kline sought out advice from AAUS members involved in Alaska diving. Advice included strong recommendations to form an independent diving program under the auspices of the AAUS. T. Kline attended the 1995 AAUS Scientific Diving Symposium including the DSO and organizational members meetings to gain further familiarity with AAUS-sanctioned diving programs. From the meetings insight was gained of the emerging roles of new diving technologies in scientific diving and possible conflicts with the accepted definitions of scientific diving. It was also learned that there was an imminent release of new AAUS scientific diving standards. The recommendation was to delay development of the Center's dive manual until the new standards were available.

In early, 1996, an insurance carrier was found that was affordable. The 1996 AAUS standards became available and were used to develop a draft dive manual for the Center. As the dive manual needed to be developed as expeditiously as possible (because of the ongoing octopus project), it was decided to use the AAUS dive standards as written. They were supplemented with an appendix listing emergency service contacts in Alaska based on a similar appendix from the University of Alaska Scientific Diving Manual. The manual is presently under review by AAUS. This manual was completed just in time for the first research diving cruise of 1996. Additionally, the necessary forms for dive planning and logging were developed. This was done so as to insure that all dive data needed for reporting to the AAUS and for Center records would be obtained starting with the initial dives taken by Center personnel. These forms have now been used on three research diving cruises and have worked satisfactorily following slight revisions.

THE ALASKA DIVING ENVIRONMENT

Safety concerns for diving at the Center are based on the Alaska diving environment and cogent difficulties presented to the diver. The Alaska diving regime consists of both cold water and low visibility. Because of the former, only drysuit diving is practical. Thus, all divers must be drysuit trained and have substantial drysuit diving experience before underwater research tasks can be performed. Limited visibility (often <5 m) increases the demands on diver skill levels as buddy pairs may be at the margin of visible contact during dives while performing scientific diving tasks. Thus divers need a higher degree of self-sufficiency than otherwise.

Given the nature of these demands, divers are not immediately qualified to conduct demanding scientific diving tasks upon completion of their scientific diver certification; they must play a secondary role until full diving status is warranted by their experience level. As many Center staff, including certified scuba divers, are recent immigrants to Alaska, they have very limited cold water diving experience. Fortunately, local experienced divers were available for participation in the ongoing octopus project, and less experienced divers were placed to work along side them to gain experience needed for attaining full scientific diving status. Presently, D. Scheel is the only Ph.D. in the Center staff in progress towards full scientific diving certification. Four other Center staff,

including one with a Ph.D. and three with M.S. degrees, with scuba diving experience have shown an interest in becoming scientific divers. Only two of these individuals have had any dry suit diving experience. For example, one staffer is a PADI divemaster with experience limited to warm water diving.

1996 OCTOPUS STUDY

In 1996 the Center's scientific diving program commenced diving operations using a draft scientific diving manual based on the AAUS diving standards. Center divers consisted of D. Scheel and T. Kline. All other Center project personnel participated in topside and shore activities only. Topside activities included tending the divers, and tracking octopuses equipped with sonic tags. The lead diver for the project was D. Logan of the U.S. Forest Service who is active in their AAUS-sanctioned scientific diving program and is also very experienced in Alaska diving. Diving activities included determining quantitatively the horizontal visibility that was important for determining bias in the search activities as measured visibility ranged from 4.4 to 11 m.

Searches for octopus dens took place on 100 m transects. One diver ran the measured transect line while two others each zigzagged 4 m to the right or left of the transect line. Once a den was located, an attempt was made to extricate the octopus by the two zigzagging divers working together. Each den was marked by a surface buoy so that the surface crew could determine its location in relation to the shore and other dens. Additionally, octopus were found outside dens.

Captured octopuses were brought to the surface in bags and tagged with spaghetti tags after being measured for size and sex. Select individuals were also fitted with sonic tags used for tracking. Return visits to sites were used to relocate tagged octopus (both spaghetti and sonic tags). Tagged octopuses included those captured intertidally from dens when the dens were exposed at low tide as well those captured while diving. It has been possible to follow sonically tagged octopuses from the surface. Recently, a diver-held receiver has been developed that could also enable *in situ* relocation of tagged octopuses.

The octopus project is anticipated to be the first of many projects to be carried out at the Center using scuba diving. Presently, a project investigating the subtidal area near Cordova is getting underway and a proposal to use rebreathers to study fish predation is being prepared. Center scientists are seeking collaborations with other AAUS diving programs in the state and elsewhere. An expansion of the Center is anticipated that will include a dive locker with Center-owned compressors and other scuba equipment.

LESSONS TO BE LEARNED AND THE ROLE OF THE AAUS

Perseverance was the key to efforts at the Center in establishing a scientific diving program. Given time and effort, the hurdles were overcome. The AAUS can be important in facilitating new programs because the AAUS provides a collective umbrella under which a new program can gain clout. In particular, the risks of diving as perceived by insurance carriers can be reduced when nationally recognized standards are used. The AAUS has a role in nurturing scientific diving as well as maintaining national standards.

Prior involvement by T. Kline as a non-DSO in the AAUS was important because his familiarity with the system expedited the process of establishing a functional program once the insurance problem was overcome. It should be pointed out that T. Kline's involvement in the AAUS and scientific diving originated while a graduate student. Thus, the active participation by students and other divers in a diving program should be encouraged.

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