California Department of Fish and Wildlife

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www.dfg.ca.gov/marine/fir/divingsafety

Background

The Diving Safety Program (DSP) administers the compressed gas diving activities of the California Department of Fish and Wildlife (DFW; formerly the Department of Fish and Game). The DSP oversees dive planning, supports projects in the field, and provides ongoing training for more than 70 active divers statewide. Administered by the Department's Marine Region, the DSP has been an AAUS Organizational Member since 2000.

Glen Bickford, DFG biologist, aboard *RV Mollusk*, ca. 1940. A former commercial abalone diver, Glen conducted abalone surveys along the central CA coast and taught other DFG staff to dive.

Jack Carlisle and Jack Schott of the Southern CA Sportfish Investigation Unit at Catalina Island, ca.1958. Scuba was a novel research tool and first used by the Department to study surfperch behavior and the effectiveness of beach seines.

With available Department training, scuba quickly replaced heavy gear for red abalone surveys on the central coast, ca. 1960.

A biologist on the artificial reef project in southern California searches for rocky habitat beyond the limit of visibility using a diver-held fathometer (sonar device), ca. 1963.

DFG Biologists inspect materials placed on the seafloor as part of artificial reef construction in southern California, ca. 1960.

Program History

Early Diving

In 1939 commercial hard-hat divers were hired to conduct abalone surveys on the central coast. Department staff also received training, and later that year made their first research dives (Bonnot 1940). Use of "heavy gear" by Department staff continued until the introduction of scuba in the 1950s (Cox 1962).

Early Training and Safety Program

With assistance from the U.S. Navy and Conrad Limbaugh of Scripps Institution of Oceanography, DFG held its first scuba training in 1958. By 1960 a diving safety manual was in place and the first DFG scuba certification school was held at Avalon, Catalina Island in 1962. The "Dept. Diving Certification Board" was organized shortly thereafter to administer the program and ensure safe diving practices.

Early Scuba Projects

In the late 1950s and early 1960s scuba proliferated as a tool for underwater research. The first DFG users were members of the southern California Sportfish Investigation Unit. Other early adopters included kelp forest research projects, the artificial reef project, and abalone project.

Diving Safety Board

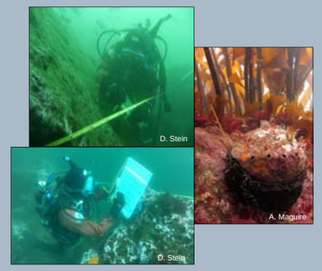
The Department's Diving Safety Board (DSB) helps guide a dive program with an excellent safety record. DSB members serve as technical and policy advisors, act as interagency liaisons, and consult on compliance issues. Several DSB members are active scuba instructors and play a key role in DSP training and safety programs.

- Allen Dekelboum, M. D.
  Medical Advisor, Board Member
- Spencer Gilbert, Warden
  Board Member
- Peter Haaker, Senior Biologist, Ret.
  Board Member
- Sönke Mastrup, Exec. Director, FGC
  Diving Safety Manager, Board Member
- Jonathan Nelson, Senior Environmental Scientist
  Board Member
- David Osorio, Environmental Scientist
  Diving Safety Officer, Board Member
- Ian Taniguchi, Senior Environmental Scientist
  Board Chair
- John Ugoretz, Ecologist, U.S. Navy
  Board Member
- Mark Windham, Lt., Ret.; Training Officer
  Board Member

Projects

Department divers- more than 70 Scientific Aides, Environmental Scientists, Law Enforcement staff, Engineers, and select Volunteers- are based in more than 15 locations statewide and are engaged in diving projects in the ocean, rivers, lakes and reservoirs. Many projects are collaborative efforts involving divers from other AAUS Organizational Members and Federal agency dive programs.

DFW field offices and dive sites. Dive sites are generalized locations of active diving projects 2011-2012.



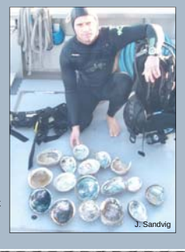
Management of the northern CA recreational red abalone fishery relies in large part on annual fishery-independent density and recruitment surveys. These dives in challenging north coast conditions are a collaborative effort with UC Davis scientific divers, among others, with vessel support provided by DFW's Law Enforcement Division.

Invasive Species Program divers conduct regular surveys for invasive Dreissenid mussels in inland waterways. A single zebra mussel (*Dreissena polymorpha*), found by divers on the lower Colorado River, 2009. A single, smaller mussel found attached to dive gear after a survey stresses the need for thorough decontamination procedures.

Environmental Scientist Kai Lampson scans a RFID-tagged pink abalone (*H. corrugata*). Small scale movement patterns and aggregation habits inform abalone restoration efforts on select southern CA reefs (Taniguchi, et al. 2013).

Program Statistics

Divers log an average of 2,200 dives annually. Scientific and Training dive activity is reported to the Academy. Open circuit mode is used for 90% of dives, and closed-circuit rebreather for 10%. Approximately 15% of open circuit dives utilize nitrox as breathing gas.



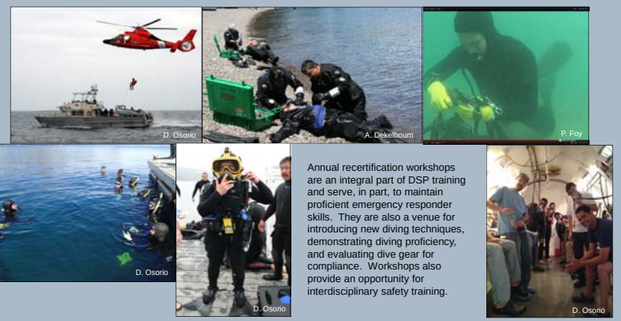
Lt. Eric Kord aboard *PV Thresher* displays shells of green and pink abalone (*Haliotis fulgens* and *H. corrugata),* poached from San Clemente Island. It is evidence that recovering populations of abalone remain at risk in remote locations.

Senior Environmental Scientist Ian Taniguchi conducts a resource damage assessment dive. This 56 ft. purse seine vessel sank in 170 fsw during fishing operations (the crew escaped unharmed). The large net was eventually removed by community volunteers and contractors.

Training and Education

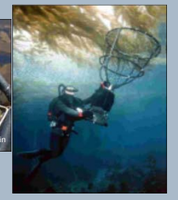
Since the 1960s more than 300 staff have been trained and have received authorization to dive under DFW auspices. In order to maintain active status divers must log at least 20 dives annually and requalify swimming skills, emergency responder skills, and diving proficiency each year at recertification workshops. In addition to the 100 hour Scientific Diver course offered annually, specialty training offered by the DSP includes:

- Altitude
- Blackwater
- Fill Station Operator
- Full Face Mask
- Dry Suit
- Nitrox
- Rebreather (100% O_2)
- Staged Deco, <190 fsw
- Swiftwater
- Tended / Tethered



Annual recertification workshops are an integral part of DSP training and serve, in part, to maintain proficient emergency responder skills. They are also a venue for introducing new diving techniques, demonstrating diving proficiency, and evaluating dive gear for compliance. Workshops also provide an opportunity for interdisciplinary safety training.

Near shore dive sites at San Miguel Island. From 2006-2008 more than 1,050 dives were completed here by DFW divers and collaborators in an effort to assess red abalone abundance, size frequency, and habitat associations (Stein, et al. 2012).



Scientists from DFW-OSPR, USGS, UC Santa Cruz, and the Monterey Bay Aquarium collaborate on southern sea otter health and ecology studies. Divers use 100% oxygen closed-circuit rebreathers, propulsion vehicles, and "Wilson" traps to capture otters in kelp beds (Tomoleoni, et al. 2012). Capture operations often require underwater transits up to 500 m during which divers receive directional information and target updates via submersible radio. Olive the otter after a successful capture (facebook.com/OlivetheOiledOtter).

Management Applications

Diving projects provide information for fishery management (e.g., species abundance, recruitment, size frequency). Diving staff also conduct regular monitoring, sampling, and other myriad tasks mandated by statue, management plans, and regulatory documents.

Research and Monitoring

- Marine Protected Areas
- Nearshore finfish
- Abalone
- Spiny lobster
- Pacific herring
- Market squid
- Southern sea otter
- Salmonids- ESA listed

Habitat Protection and Pollution

- Fish passageways
- Invasive Dressenid mussels
- Water quality (Mussel Watch Program)
- Resource damage assessment

Laws and Regulatory Compliance

- Pollution discharge
- Calif. Code Regulations Title 14, Natural Resources
- Fish and Game Code

REFERENCES

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