SCUBA Diving Operations

North Carolina Zoological Park

Jeff Owen
Animal Management Supervisor
What we will Cover:

• Why we dive/tasks performed
• Where we dive
• Staff training
• Equipment overview
• Policies and Guidelines
• Safety and Best Practices
Diving Locations

- Polar Bear Exhibit Pool
- Pinniped Exhibit Pool
- Seabird Exhibit Pool
- Gamefish Tank
- Other
Polar Bear
Pinniped: Harbor Seals and California Sea Lions
Seabirds
Gamefish Tank
Benefits of Diving Exhibit Pools

- Important for animal health by helping to maintain good water quality for animal health.

- Ensures that pools look as good as possible for visitor viewing.

- Address various maintenance issues.

- Animal Enrichment
Diving Tasks: Vacuuming

- Removing Animal Waste
  - Improves the pool’s appearance.
  - Reduces the growth rate of algae.
  - Helps keep coliform levels at a safe and healthy level.
Diving Tasks: Scrubbing Algae

- Improves the pool’s appearance.
- Is more of a challenge during the hot season.
- Very time consuming
Diving Tasks: Enrichment

- Attaching and removing enrichment items to the bottom
- Removing non-floating enrichment
Policies and Procedures

• OSHA
• DENR and Zoo Policy
• Area/pool Specific Procedures
OSHA

- 1910.401
- Commercial Diving Operations
- Standards not written specifically in regards to zoo animal exhibit pools, but followed as closely as possible.
- Examples
- Current standards can be found at [www.osha.gov](http://www.osha.gov)
DENR and Zoo SCUBA Policy

• Written to follow OSHA regulations as well as follow DENR and North Carolina Zoo’s employee safety program.

• More information specific to North Carolina can found at: www.nclabor.com
Area Specific Procedures

- The 4 primary diving locations at NCZP have differences in their setup, thus some area specific procedures.

- Examples: Indoor vs. Outdoor pools, large and small pools, and type of diver access to the pools.
Staff Training

- All members of the diving team must be “Open Water Diver” certified.
- Open Water Diver is the minimum level of certification. Some staff have more advanced levels.
Staff Training (continued)

- Diving staff are required to receive and maintain a current certification in CPR.

- Certified divers must always be able to continue to demonstrate good diving skills to stay active with diving.
Diving Equipment

• Tanks
• Regulators
• Spare air canisters
• Buoyancy Control Device (BCD)
• Wetsuits; including hoods and gloves
• Weights
• Masks
Tanks

- Filled to 3000 psi and not depleted past 500 psi.
- Filled onsite at the zoo.
- Inspected and certified on a yearly basis by a local dive shop.
Wetsuits

- Semi-Dry (7mm) wetsuits are used due to cold water diving
- Includes use of hoods, gloves, and boots
- Wetsuits are soaked and rinsed in a detergent specifically made for wetsuits after each use.
Regulators

- Inspected and maintained regularly by zoo staff.
- Inspected and maintained with fresh parts yearly by a local dive shop.
- Mouthpiece disinfected in a mild (1:100) bleach solution after each dive.
Buoyancy Control Device (BCD)

- The nature of much of the diving work performed in zoo exhibit pools requires divers to be in a negative buoyancy condition.
- Therefore BCDs are important to ensure divers can ascend from the bottom readily without having to shed weight.
Diving Equipment Maintenance

- Any equipment not working correctly or in need of repair is taken immediately out of service and tagged.

- The area supervisor will perform repairs or send the equipment into the local dive shop.

- Equipment cannot be put back into service until the appropriate supervisor ensures repairs are complete and removes the tag.
Other Equipment

- Vacuum pumps and hoses
- Window washing
- Scrub brushes for algae
- Misc.
Diving Operations Team

- Diving Safety Officer
- Divers
- Standby Diver
- Monitor
- Dive supervisor
- Support Personnel
Diving Safety Officer

Senior staff who is responsible for managing the diving program

- Ensures that polices and safe practices are kept up to date and followed.
- Reviews operations as needed.
- Investigates problems or accidents.
- Provides necessary diving equipment.
Diver

- Dive team member who fully gears up with SCUBA equipment, enters the water, and performs the work.

- Most dive operations use 1-3 divers depending on the location, nature, and amount of work to be performed.
Standby Diver

- Dive team member whose responsibility is to provide any assistance needed by the diver.

- Standby diver is ready at all times to enter the water immediately if needed for a diver in distress.
Standby Diver (continued)

- Has the appropriate SCUBA gear set up and ready to use if needed during the dive.
- Assists the diver with gearing up, gearing down as well as entering and exiting the water.
- Provides other assistance as needed during the dive operation.
Monitor

- Primary role is observation and communication.
- Serves as second observer of the divers along with the standby diver.
- Communicates via radio with the appropriate parties regarding the start and end of dive as well as problems or emergencies.
Dive Operations Supervisor

- Designated person in charge of a dive operation.
- Usually the area supervisor when present.
- Oversee and ensures a smooth and safe dive operation.
- Makes critical decisions as needed to get the work done and address problems.
Support Personnel

• Animal Supervisor: Notified of start and end of dive, location of dive, and number of divers.

• Usually the supervisor of another diving area when available.

• Responsible for coordinating the response if a dive emergency takes place.
Support Personnel (continued)

- Emergency Medical Technicians (EMT) are part of the zoo’s security team.

- There must be an available EMT on grounds before a dive operation can be initiated.

- EMTs monitor radios and stand by to respond in the event of an emergency.

- Appropriate emergency equipment for responding to a dive emergency is kept near diving locations for quick access.
General Dive Procedure

- Dive operations are scheduled in advance to ensure supervisor and EMT availability.
- Dive team members are identified in advance so everybody can prepare for the dive appropriately.
- Gear is set up in advance so any problems can be taken care of before the start of diving.
Dive Procedure (continued)

- Just before diving: the standby diver, monitor and/or supervisor will check all gear.

- Standby diver and/or monitor will assist divers in gearing up as well as entering the water.
Dive Procedure (continued)

- The dive supervisor will call via radio to Zoo communications and the appropriate supervisor that a dive is beginning.

- The number of divers and the location of the dive are clearly communicated.
Dive Procedure (continued)

- When the diving operation is complete: the dive supervisor will call back to the supervisor and zoo communications. This time confirming that all divers are safety out of the water and the dive complete.

- Standby diver and/or monitor assists the divers in exiting the water and gearing down.
Before the divers leave the area, the dive supervisor will ask the diver for a verbal confirmation that they are feeling okay.

Divers leave the dive site to finish gearing down and get a shower.

Other personnel complete equipment breakdown.
Safety and Best Practices

- Diving does not take place in water colder than 45 F.

- 7mm Wetsuits are appropriate for this temperature diving and are used.

- Divers are called out of the water at the first signs of being cold.
Safety and Best Practices

• When tanks empty to 500 psi: divers must either end the dive or change to a fresh tank.

• ‘Spare air’ canisters are worn by divers in every dive.
Safety and Best Practices

• Dive operations are ended immediately if:
  - Thunderstorm or thunderstorm warning
  - Tornado warning
  - Animal escape or animal escape drill
  - Any other urgent or emergency situation that requires the attention of zoo EMTs preventing them from being available to respond to a diving emergency.
Safety and Best Practices

- Communication During a Dive
  - 2 Way radios
  - International hand signals
  - Underwater pinger or other noise makers
  - Dry erase board (underwater viewing glass)
  - Other
Safety and Best Practices

• For Dives in the polar bear and pinniped pools, the standby diver has the following equipment ready for diver assistance:

  - Pony tank, regulator and mask
  - Long handled extension pole
  - Life ring (buoy)
Safety and Best Practices

- Most dive operations have 2-3 divers.
- This is for safety and in general necessary to accomplish the work.
- Occasionally only one diver is used: in this case the diver is line tended to the standby diver at the surface. This is per OSHA standards.
Emergency Situations

- “Diver Down” is the designated phrase to communicate that a diver is in distress and needs assistance.

- When communicated, this announcement activates the area supervisor, EMTs, and other appropriate personnel to respond to the dive site.
Emergency Situations

- The standby diver likely will be the first to respond during an emergency, but always communicates the situation to the dive monitor before entering the water.

- The dive supervisor takes the lead in coordinating the emergency response unless this person is the standby diver entering the water.
Diving Emergency Drills

• The North Carolina Zoo has performed several diving emergency drills and plans to continue this practice.

• Emergency drills help all appropriate staff to understand their role in an emergency.

• Communication, response time, diver extraction, and initial first aid can be enhanced by the use of emergency drills.

• Involving local 911 services is recommended if possible.
Recordkeeping

- OSHA standards require that all diving operations be recorded. Information for each dive to record:
  - Date
  - Location
  - Names of divers
  - Nature of work
  - Dive times: in/out and total down time
  - Designated person in charge
• Jeff Owen
• jeff.owen@nczoo.org
• 336-879-7364