

# A FISH OUT OF WATER

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Marine and freshwater fish support important angling industries that provide substantial benefit to local economies. As the conservation strategy of catch and release angling grows in popularity, it is important to evaluate how different stressors associated with this type of fishing affect fish survival. What follows is a brief Question & Answer review on the effects of air exposure.

**How long can a fish live out of water?** This is going to depend greatly upon a number of factors including: fish species, life stage, body weight, activity level, environmental temperature, amount of dissolved oxygen in the water it is being removed from, and feeding. Conditions leading up to a fish being removed from the water are very important. For instance, warmer temperatures tend to be associated with a higher degree of hypoxia (low oxygen). Low oxygen is a stressor for fish. Although there are a lot of studies that have evaluated oxygen requirements and the effects of hypoxia on fish, there are far less on air exposure impacts. For instance fish eggs in general require very little oxygen until they hatch. Among juvenile and adult fishes, larger fish use more total oxygen per hour than smaller fish do because of the greater metabolic demands of having more tissue mass. Swimming fish use more oxygen than resting fish. Fish in warmer temperatures generally use more oxygen than fish in cooler environments.

**At what point do bad things happen? What happens first?** Removing a fish from the water causes the gills to collapse. This results in a greatly reduced surface area for respiration. Additionally, the extent of air exposure can impact cardiovascular recovery time, and blood and muscle functioning, resulting in impaired swimming. In a laboratory experiment involving rainbow trout, extended air exposure after exercise caused higher mortality than when air exposure was avoided. In a pond study of pikeperch, mortality was lowest for fish that were not exposed to air when compared to fish exposed to air for periods of one, two or four minutes. Though studies are limited in field settings, extended air exposure has been linked to loss of equilibrium and post-release predation. Some studies have also indicated that smaller fish have a harder time being out of water than larger fish.

**In particular how long can our inshore species like redfish, snook and trout live out of water?** This is a tough question. There are not many studies available on the tolerances of individual fish species to air exposure other than for those species that are adapted to it. Anecdotally however trout tend to be less hardy than redfish.



FSG Photo—Spotted sea trout

**What about other fish? What about air breather's like tarpon?** A study conducted recently on sub-adult tarpon in Tampa Bay and Charlotte Harbor evaluated a 60 second air exposure prior to release (roughly the time it would take to snap a photo) and compared that with no air exposure prior to release. In general, angling with minimal air exposure, such as might be required if taking a photograph on a fishing trip, did not appear detrimental to sub-adult tarpon recovery and survival under normal angling conditions. This same study found that fight time was a



FWC Photo—Tarpon

greater determinant in fish stress and survival than air exposure. The author concluded that sub-adult and adult tarpon can recover from routine angling stress when released in the absence of predators, and that anglers can play an important part in tarpon conservation by using

appropriate tackle and gear to reduce fight times and handling stress.

Another recent study on bonefish also concluded that bonefish could recover from limited air exposure; but because they tend to move very little while recovering they are very vulnerable to shark predation. The authors recommended that anglers land bonefish quickly, and that they be held in a live-well or water cooler for a minimum of 2-3 minutes prior to release to allow for recovery from angling stress and air exposure.

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**Are there any species that do extremely well out of water?** In general, fish species that do well out of water have evolved specialized respiratory adaptations. These include modification of gills; use of the skin; specialized respiratory structures in the mouth and gut; and true lungs. Walking catfish for example possess specialized gills that inhibit gill collapse and the associated loss of surface area. European eels have the ability to utilize air from the atmosphere by diffusing it through their well vascularized skin thus allowing them to migrate short distances on land. Electric eels have well vascularized mouths. They must surface approximately every minute for air. Without air they will drown.

**What about stress? Does that shorten 'out of water' time?** Yes, as previously mentioned, stress when combined with air exposure caused higher direct mortality in rainbow trout and higher predation mortality in bonefish.

High water temperature, when combined with stress and exercise, often leads to behavioral and physiological changes. These changes include a lack of movement or equilibrium loss, increased heart rate and stroke volume, and changes in blood and muscle biochemistry.

Research that examined the interaction between air exposure and high water temperature in bluegill showed behavioral disturbance, such as increased ventilation and equilibrium problems was greater when both stressors were combined as opposed to when these stressors were evaluated individually.

### Sources:

Cooke, S.J. and Philipp, D.P. 2004. Behavior and mortality of caught-and-released bonefish (*Albula* spp.) in Bahamian waters with implications for a sustainable recreational fishery. *Biological Conservation*, 114:599-607.

Guindon, K.Y. 2011. Evaluating Lethal and Sub-Lethal Effects of Catch and-Release Angling in Florida's Central Gulf Coast Recreational Atlantic Tarpon (*Megalops atlanticus*) Fishery. Ph.D. Dissertation. University of South Florida.

Gingerich, A.J., Cooke, S.J., Hanson, K.C., Donaldson, M.R., Hasler, K.T., Suski, C.D. and Arlinghaus, R. 2007. Evaluation of the interactive effects of air exposure duration and water temperature on the condition and survival of angled and released fish. *Fisheries Research*, 86:169-178.

Moyle, P.B and Cech, J.J. Jr. 2000. *Fishes: An Introduction to Ichthyology*, 4<sup>th</sup> ed., Prentice Hall, NJ. Pp 35-46.

Schreer, J.F., D.M. Resch, G.L Malachy and S.J. Cooke. 2005. Swimming Performance of Brook Trout after Simulated Catch and Release Angling: Looking for Air Exposure Thresholds. *North American Journal of Fisheries Management*, 25:1513-1517.

Primary factors that have been indicated as influencing stress and mortality associated with catch and release angling are angling duration, extent of air exposure, angling during periods of extreme water temperatures, angling during reproductive periods, gear type and hook location.

**Is there any 'out of water' difference between saltwater species vs. freshwater species?** Air exposure stress does seem to be better evaluated in freshwater fish species, but again a variety of factors are involved. Studies comparing saltwater species to freshwater species in regards to air tolerances are lacking.

### Tips for reducing air exposure and increasing survival chances when angling – (Adapted from [Catch & Release brochure - SGEF 202](#))

- Handle fish as little as possible and only with wet hands – never with a towel.
- It's best to take pictures of a fish being released while it is in the water.
- Avoid lifting a fish from the water by the line.
- If a fish must be lifted from the water, support the body of the fish with your hand.
- If a fish needs to be taken out of the water to measure it, vent it, or to remove the hook, this is the perfect opportunity to quickly take a picture of the fish.
- Avoid lifting a fish by its jaw, especially large fish. This can injure the fish so it can't feed normally and/or harm its internal organs.
- If a hook is deep in a fish's throat or stomach, cut the line as close as possible to the hook – the hook will eventually dissolve inside the fish.
- Never hold a fish by its gill cover.
- Never put anything in a fish's gills or eyes.
- Gently release a fish head first into the water.
- If a fish is exhausted, revive it before releasing it by passing water over its gills – move it forward in the water with its mouth open. Be cautious of predators while reviving fish.
- Only gaff a fish when you intend to keep it.



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