

Additional Cold Stun Information

Basic weather conditions, such as air temperature and precipitation, influence the occurrence and survivability of fish in coastal North Carolina waters. Many of our estuarine fish can be affected by periodic cold stun events.

A cold stun is when the environment becomes so cold that aquatic wildlife in the area are physically affected and become lethargic or appear “stunned.” In North Carolina, these periodic events are triggered either by 1) quick and sudden drops in water temperatures associated with strong cold fronts and/or snow and ice run-off or 2) prolonged periods of cold air temperatures which gradually drop water temperatures below a point that fish cannot withstand.

Weather conditions that produce cold stuns are not the norm in North Carolina’s mild climate, but periodically occur. The effect of cold stuns on a given species varies and depends on its biology and seasonal habits. Some species are more tolerant of sudden changes in water temperature than others. Also, more temperate species that inhabit North Carolina’s shallow water habitats, particularly inland bays and estuaries, in the winter are far more likely to encounter extreme cold temperatures that can lead to a cold stun event. The size of fish or life stage affected by a cold stun may differ by species, as well. For some species, all sizes and life stages are observed during events, while for others, only juveniles may be affected. Tolerances to temperature varies by life stage and are well documented. Larger fish typically have more energy reserves and can withstand the cold water longer.

Additional factors that affect survival of fish include the location where adults overwinter, other environmental stresses like water quality, disease and pathogens and stress due to starvation. If juveniles and adults all overwinter together in estuarine waters, then all sizes are typically observed during a cold stun event. But, if adults overwinter in ocean waters while juveniles stay in estuarine waters, then mostly juveniles are observed.

When water temperatures drop to a point that fish become stunned, it is often fatal. In controlled temperature experiments, fish have recovered after being stunned if they are immediately placed in warmer water. However, in nature, these conditions are rarely encountered and most fish seen floating ‘belly-up’ or stunned typically do not survive.

The extent of the cold stun on populations of fish depends on cumulative impacts across the range of the stock. The impact can be minimal if only sub-adults are stunned, it is localized to a few areas, or the event is short lived. It may be substantial with a greater number killed when all size classes are affected or many areas are involved for an extended duration

Mortality due to cold stuns is recognized in the Spotted Seatrout Fishery Management Plan as a factor contributing to the abundance of spotted seatrout in North Carolina. Trout of all sizes overwinter in the coastal bays and rivers and are often the first and most wide spread fish to be observed in a cold stun. These fish typically find refuge from cold water temperatures in deep water holes and sloughs in coastal creeks and rivers. When water temperatures suddenly drop due to low air temperatures or cold-water runoff, these fish become trapped and succumb to the freezing temperatures. Larger adults may have better tolerance to low temperatures than smaller fish. Typically, by the time water temperatures in the deeper water drops to lethal limits, these larger fish have too far to swim to reach warmer water and are stunned as well. Population abundance of the species can be affected the following year and subsequent years due to the loss of these breeding adults. The Spotted Seatrout Fishery Management Plan http://portal.ncdenr.org/c/document_library/get_file?uuid=397d62e0-3c8b-4458-80c6-6ae9d892e782&groupId=38337 calls for the mitigation of this decline by eliminating fishing harvest after a stun occurs to ensure that surviving adults have a chance to spawn the following spring.

In contrast, adult red drum rarely are impacted as heavily by cold stuns as spotted seatrout because they do not typically occupy the estuarine habitat during the winter. Adults typically migrate into the ocean during the winter where water temperatures remain more moderate. Sub-adults and juveniles do, however remain in the estuary and typically occupy similar areas as spotted seatrout. Because of this, sub-adult red drum may also be observed during cold stuns, though the number impacted tends to be noticeably less than trout. Red drum that over winter in the estuaries are typically larger and may be able to tolerate cold temperatures better than trout. If a red drum cold stun event was significant it could potentially impact the availability of sub-adult red drum for a couple of years, but the overall adult stock size would be less impacted than a species like spotted seatrout given the large number of year classes in the red drum adult stock and their tendency to be in the ocean offshore in the winter.