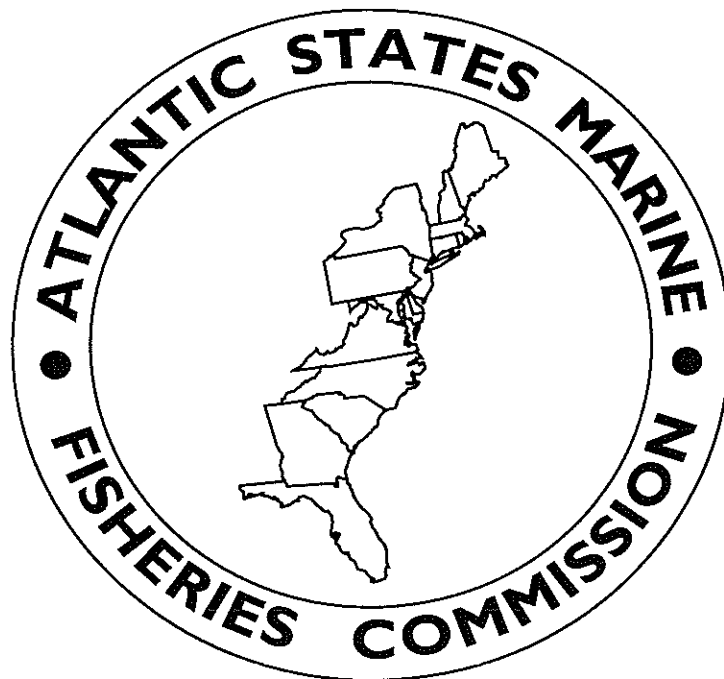


ASMFC
FILE COPY
DO NOT REMOVE

Special Report No. 57
of the

Atlantic States Marine Fisheries Commission



**Summary of a Workshop on Catch and Release Mortality in
Marine Recreational Fisheries**

December 1995

ASMFC
FILE COPY
DO NOT REMOVE

file copy
do-not-move.

Special Report No.

of the .

Atlantic States Marine Fisheries Commission

**Summary of a Workshop on
Catch and Release Mortality in Marine Recreational
Fisheries**

December 1995

**Summary of a Workshop on
Catch and Release Mortality in Marine Recreational
Fisheries**

Edited by

Richard T. Christian
Sport Fish Restoration Coordinator
Atlantic States Marine Fisheries Commission

Atlantic States Marine Fisheries Commission
1444 Eye Street, NW, Sixth Floor
Washington, DC 20005

December 1995

Acknowledgements

The Commission gratefully acknowledges the efforts of Mr. Jon Lucy of the Virginia Institute of Marine Science for bringing together key individuals in a three-day symposium to discuss and debate critical issues on catch and release programs. Mr. Lucy welcomed the Commission's participation in this timely event and provided a forum for Atlantic coastal State Directors and members of Commission's Marine Recreational Fisheries Committee to communicate issues and concerns for east coast sport fisheries. Funding for this project was provided through a cooperative agreement (grant no. 14-48-0009-95-1225) between the Atlantic States Marine Fisheries Commission and the U.S. Fish and Wildlife Service as part of the Federal Aid in Sport Fish Restoration Program (Wallop-Breaux).

**Summary of a Workshop on
Catch and Release Mortality in Marine Recreational Fisheries**

Richard T. Christian, Editor

Introduction

This report provides a summary of presentations and recommendations developed at a three-day conference convened by the Virginia Sea Grant Marine Advisory Program at the Virginia Institute of Marine Science in Virginia Beach on May 8-10, 1995. The conference, entitled "Release Mortality in Marine Recreational Fisheries: Current Research and Fishery Management Implications" was the first in the nation to focus specifically on marine and estuarine release mortality. The conference was well attended with participants from Washington State, Texas, Florida and Massachusetts. Cosponsors of this timely event included the mid-Atlantic Sea Grant Marine Advisory Programs, Atlantic States Marine Fisheries Commission and the Virginia Institute of Marine Science (VIMS).

This conference attracted a variety of fisheries managers, researchers, charter captains, and educators interested in sharing their experiences and perspectives on when and how fish die during catch and release (and tag and release) events, the significance of such mortalities, and how to reduce, if practical, release mortality rates. More specifically, the conference endeavored to discuss and assess current research and management issues relating to release mortality in marine recreational fisheries and to enhance communication among fishery researchers, resource managers, advisory/extension specialists, and angling community leaders on release mortality research results. Also on the conference schedule were discussions about what management and educational program changes may be warranted in the future.

This report contains summaries of papers presented at the conference.

Authors are noted at the beginning of each presentation. Additional information contained in this report is presented as excerpts from *Waterfront News*, Spring/Summer 1995: A quarterly newsletter for the commercial and recreational fishing industries produced by the Virginia Sea Grant Marine Advisory Program at the Virginia Institute of Marine Science.

Can fishermen practice more effective conservation efforts to help protect declining resources?

Fishermen are subject to size limits, bag limits and other management strategies to reduce pressure on stressed fish stocks. Through these measures, fewer fish are being landed, and greater numbers are being released to help replenish fish stocks. However, some fish that are returned to the water may never live to spawn—some die after being caught and released. Thus, estimates of release mortality rates recently have been factored into management decisions for marine fisheries. There is debate, however, about the release mortality rates being used. Anglers, researchers, and fisheries managers have all become interested in determining more accurate estimates of release mortality. In addition, scientists are studying the causes and impacts of release mortality. They are researching whether changes in angler techniques, gear types, or management strategies can effectively reduce release mortality rates and enhance fish stocks.

Review of Release Mortality Research

Hooking Mortality: A Review for Recreational Fisheries - Dr. Maurice Muoneke of the Texas Parks and Wildlife Department

Dr. Muoneke, the keynote speaker, began the conference with a paper included studies on 32 marine and freshwater species. His co-author is W. Michael Childress of the Center for Biosystems Modeling at Texas Agricultural and Mechanical University.

When Muoneke and Childress began the project they found great variances among the species researched, the methodologies used, and the geographical regions studied. They did, however, find commonalities in the variables affecting mortality from catch and release fishing. Common variables tested include bait type (natural vs. artificial), hook size and style (single vs. treble hook and barbed vs. barbless), location of the hook wound, size of the fish, the season/temperature (both water and air), fight time, and the depth at which the fish was caught.

Results of the studies Muoneke reviewed suggest implications for fisheries managers. He pointed out that, because the rates of release mortality vary among different species, fisheries managers need to consider what he terms “the biology of the species.” This includes the species' responses to various gear types and bait types, as well as their reactions to environmental factors such as water salinity and temperature. Several studies show that fish caught with natural bait are more likely to swallow the hook, increasing the severity of the wound, and compounding the risk of mortality. Muoneke cited a 1979 study by K. Warner which found the overall release mortality for Atlantic salmon to be 73% when worm-baited hooks were swallowed. Muoneke also cited Eric May's 1990 study (see below) which provides evidence that striped bass hooking mortality increases with decreasing salinity. Elevated temperatures also increase release mortality rates. R.G. Titus and C.D. Vanicek's 1988 study on cutthroat trout found the mortality of this species was less than 2% at temperatures less than 17° C, but increased to 49% as the temperature neared 21° C.

Muoneke suggested that to provide optimum fisheries resources and to reduce or maintain fishing mortalities, fisheries managers need to take into account the results of these studies when deciding on fishery management measures such as bag limits, size limits on species, closing seasons, restricting gears and imposing quotas.

Fishing tournaments also have an effect on release mortality. Muoneke

suggested that to limit the sometimes high release mortality in these situations, tournament organizers should keep the tournament small, limit the length of the tournament, choose cooler seasons and calm weather days, if possible, and weigh and release the fish as soon as possible. This will minimize the trauma experienced by the fish and reduce the chance that the fish will die after being released. Muoneke said that by returning healthy fish to the water, more anglers may enjoy the fishing resources.

Muoneke and Childress tried to address a gap that he saw needed to be filled in the area of catch and release mortality research, "but a lot of questions still need to be answered in this area; we've just begun to scratch the surface."

Using Field and Laboratory Approaches to Define Release Mortality

Field and Laboratory Investigations into Striped Bass Mortalities Following Angler Release - Dr. Eric May of the Maryland Department of Natural Resources

Field research was initiated to investigate striped bass found dead along the Susquehanna River, evidently caused by release of striped bass caught off the Conowingo Dam. Field trials found that an average of 70% release mortality could be expected at the dam, with mortalities lower at two other areas of Chesapeake Bay. May then undertook laboratory research to determine the impact of temperature, salinity, and fish size on mortality. He found the most significant factor effecting release mortality was temperature, with salinity and fish size less clear as to effect. May's findings were that, for striped bass in the regions studied, "larger fish (>21"), lower salinities (1.0 ppt), and high temperatures (>21° C) equal higher mortality rates." He noted that the reverse also seems to be true, "smaller fish, higher salinity and lower temperature equal lower mortality rates."

May stressed the importance of both field and experimental research in his study. In the laboratory, researchers try to isolate specific causes. But in the field

other factors come into play, including angler experience, predation, and fish behavior and stress. May believes that these other factors might cause higher delayed mortality--death occurring 24 or more hours after release. Thus, results from field trials, together with laboratory research provide useful data for fishery management decisions.

Rates and Causes of Mortality in Coho and Chinook Salmon Caught and Released with Sport Fishing Tackle - Douglas McNair of Natural Resources Consultants in Seattle, Washington.

In this study, salmon were caught and released with various gear types and unhooked by anglers of various skill levels. The fish were held in tanks, transferred to net pens and held for at least four days to observe immediate and short-term hooking mortality. Controllable variables addressed in this study included gear types, type of net, the fish's contact with the boat, and the hook removal technique. Statistically, however, the main factor contributing to release mortality was the location of the hook wound. Hooks lodged in the gill or heart were responsible for 70% of all of the deaths and 100% of the immediate deaths in this study. The study also found no statistical correlation between hook-removing skill level and release mortality. This result suggests de-hooking skill is a relatively small factor in release mortality for this species. McNair said this means "hook and release fishing is a good option for fishery management." His research estimated the overall release mortality rate for coho salmon to be 6.2% and for chinook salmon, 10.2%. That mortality rate is significantly lower than the 26% previously applied by salmon management agencies. Agencies have reassessed their regulations in light of these and similar findings from other studies.

Issues and Methods for Evaluating Release Mortality in Demersal Fishes

Survival Estimates for Demersal Reef Fishes Released by Anglers - Mark Collins of the South Carolina Marine Resources Institute

Collins sampled various fish species caught in three depth zones, 21m, 36m and 46-54m, off central South Carolina. The fish were immediately observed for survival in holding tanks, survivors placed in weighted mesh cages and again observed for survival 24 hours later. Immediate survival of the fish was determined by either their ability to swim to the bottom of the 1m-deep holding tank (possible survivors), or their floating on top of the water (probable mortalities).

Collins sampled more than 15 species and found the 'swim or float' method of predicting survival to be valid for all species and depths except black sea bass in 36m (119 ft.). When black sea bass caught in 36m (but not in the other depths) were released overboard, they sometimes swam deeper than 1m and then floated back to the surface.

Pooled estimates of survival for all species were approximately 88% at 21m, 81% at 36m, and 62% at 46-54m. Collins emphasized, however, that survival differs by species, but in general, release mortality increases with increased depth of catch, and can be substantial for some species. He suggested that future research should involve larger sample sizes and should address degassing¹ techniques in order to further explore the relationship between depth of catch and survival of released fish.

Current and Future Release Mortality Research

Factors Affecting Short and Long Term Hooking Mortality in Virginia's Recreational Fishery for Summer Flounder - Jon Lucy and Tracy Holton, VIMS Sea Grant Marine Advisory Program

Conference organizers on Lucy and Tracy Holton indicated that their current research aims to examine the 25% hooking mortality rate for summer flounder currently being used in fisheries regulatory decisions, to see whether that figure is accurate, or needs to be adjusted. Preliminary research on this study began in fall 1993, with actual experimentation beginning in spring 1994. As part of the

¹Degassing refers to the deflation of the gas bladder of a caught fish. The gas bladder or swim bladder equalizes with depth to adjust buoyancy, and can become distended when fish are pulled up from deeper water.

preliminary research, Holton and Lucy conducted a survey to discover the most popular gear combinations used by summer flounder anglers. Those gear types are used in the study.

The variables Holton and Lucy are addressing include hook type, leaving the hook in place in deeply hooked fish versus removing it, crimping or not crimping the hook barb, the location of the hook wound, the size of the fish, and the water temperature. To obtain summer flounder for the study, researchers use a 30-foot otter trawler near the VIMS Wachapreague Research Facility, transport them in aerated coolers to the lab at Wachapreague, and hold them in a 20-foot circular flow-through fiberglass tank. The flounder are acclimated to their surroundings, then caught with live bait and the various gear types being tested.

Holton said the results so far indicate an overall release mortality of 18% of all fish hooked. However, the variables: hook type, crimped or not crimped barbs, hooks left in place or removed, and fish size have yet to show a significant effect on release mortality. What does effect the release mortality rate is the location of the hook wound and water temperature. Of those fish that have been deeply hooked, or swallowed the hook, about 50% died. The study is also finding that release mortality rates seem to increase with water temperature for summer flounder.

The next step in Holton and Lucy's research is to test these theories in what Holton terms "controlled fishing situations." Anglers will fish for summer flounder and record information on gear type, the location of the hook wound and other relevant data. The fish will be observed in holding pens or cages in the area where they were caught to determine release mortality rates. Results from these field trials will be compared to the data from the tank tests to account for "real world" conditions.

Holton and Lucy hope to find what practical factors, if any, can be controlled or manipulated to lower the release mortality rate of summer flounder. Then perhaps such factors could be addressed in future fishery management strategies.

Discussion: Education, Media and Fisheries Management Outreach

The Release Mortality Conference also offered participants the chance to interact with other attendees in a roundtable or panel situation. Five panelists from educational/conservation foundations and media outlets addressed the effectiveness of catch and release information and educational efforts in changing the attitudes of the angling community and fishery managers. Panelists were Ken Hinman, Executive Director, National Coalition for Marine Conservation; Pete Barrett, Assistant Publisher, *The Fishermen* magazine; Albia Dugger, Editor, *Sport Fishing* magazine, and Technical Editor, *Marlin* magazine; Al Anderson, Charter Captain and author, *Gamefish Tag and Release*; and Brady Bounds, fishing guide and volunteer for the Chesapeake Bay Foundation's Careful Catch Program.

Ken Hinman focused on educational efforts. He said the basic message to get out to anglers is to release fish, tagging them when possible--but the most important lesson to teach is the correct way to tag and release. The targets for this lesson include experienced fishermen, novice anglers, fisheries managers and the public. Experienced fishermen are usually better at releasing fish, because they fish on a regular basis. Hinman said that in his experience novice anglers are less likely to release fish, and the fish they do release are less likely to survive, because of the anglers' lack of skill. Hinman contended that fisheries managers should include accurate assessments of fish mortalities due to catch and release in their regulations. He said they also need to be informed of ways to improve survival rates of fish involved in catch and release fisheries. The public, Hinman pointed out, is an important final link in the support of fisheries. He said their enthusiasm for the outdoors includes support for the release ethic. Hinman said that more education about fishermen's catch and release efforts could increase public support.

Hinman also proposed a variety of vehicles to deliver the catch and release message: magazines and newsletters, fisheries services and councils, fishing clubs and tournament organizers, boat captains, tackle shops, conservation organizations

and fishermen themselves. Hinman asserted that fishermen can supply a positive form of peer pressure to encourage others to practice effective catch and release.

Pete Barrett, of *The Fisherman*, sounded a warning call for the recreational fisheries industry, saying that "as we see more and more regulations imposed on recreational fisheries, we need to expand catch and release or we may be out of business or at least in trouble." He said successful catch and release keeps tackle shops and charter boats in business, even in the 'thin' times of stricter regulation.

Barrett said the ethic of sport fishing should be to release fish--"to enjoy the catch and put something back into the system." But he said first the public has to overcome the idea that releasing fish just benefits the commercial fishery by providing them with more fish to harvest. Specifically, Barrett suggested that the media has to promote catch and release repeatedly--not just with one feature article, but with more and shorter articles addressing the release of specific species, accompanying longer articles on those species. This more frequent message would have a greater impact, he said.

Albia Dugger, of *Sport Fishing and Marlin*, emphasized the need for communication between scientists and fishermen. "Basically, fishermen want to do what's right; if they have a choice, they're going to do what will not hurt the fish," she said. Fishermen need to know what the scientific research means to them, and scientists have to make specific, practical, and not necessarily complicated recommendations to the fishing community, Dugger said.

Al Anderson, a charter captain in Narragansett, Rhode Island, pointed out one way fishermen and researchers *are* interacting--through data gathering for scientific studies. He said the charter industry can assist scientists in their catch and release sampling efforts by providing information quickly, easily and at low cost.

Captain Anderson agreed with fellow fishing guide Brady Bounds that using catch and release is a good way to distinguish their charter services from others.

Bounds said, "catch and release is not just a practice that occurs on a boat, but a marketing strategy to control clientele." His clients consist of groups of anglers, as well as family fishing trips interested in conservation. He said the conservation ethic appeals to the public and helps his business.

Brady Bounds also works as a volunteer with the Careful Catch Program of the Chesapeake Bay Foundation. Through this program, Bounds has handed out almost 2,000 brochures on catch and release as well as barbless hooks to users of Chesapeake Bay. Barbless hooks are recommended for catch and release because they are easier to remove. Bounds uses barbless hooks on his boat, as good catch and release technique and for personal safety. He explained that if one of the anglers on board accidentally gets hooked by a barbed hook, that would end the trip with a hasty return to shore and to the hospital. He pointed out that barbless hooks are also easier to remove from anglers!

Bounds also sees the wisdom in teaching children about catch and release. He said they "like the idea of letting the fish go to live again." This ethic, he said, is the key to the future of catch and release.

Discussion: Current and Future Management/Regulatory Needs and Adjustments

The Release Mortality Conference concluded with a roundtable discussion among scientists, educators and staff of fishery agencies to assess current and future management needs and adjustments in response to the growing research data base on susceptibility or resistance of estuarine and marine fish species to release mortality.

The participants in this discussion addressed the need for more, better and longer-term research, more definite conclusions and a more effective means to transfer these conclusions from researchers to fisheries managers.

Dick Stone of the National Marine Fisheries Service began the session by

pointing out that catch and release mortality is both a national and international problem because of the lack of definable fisheries boundaries. Therefore, more definitive information is needed, including assessments of the impacts of regulations.

John Mark Dean, Director of the Center for Environmental Policy at the University of South Carolina, brought up a problem faced by many agencies--that their research is perceived as biased, or the data from research is used by special interest groups to further their goals. Misinterpretations of the motivations for research has caused scepticism. He suggested a rigorous sampling design is needed to make better determinations on catch and release issues such as wound healing, and possible longer term pathology problems associated with hooking, handling, and releasing fish.

Bruce Halgren of the New Jersey Marine Fisheries Association said fisheries managers must be careful when it comes to catch and release mortality estimates. He said that if hooking mortality is ignored or underestimated, objectives such as spawning and recruitment are not met; if it is overestimated, it negatively impacts recreational fishermen by requiring stricter bag limits.

During the question and answer period several attendees expressed confusion or frustration about survival rates and trying to arrive at an appropriate number upon which to base regulations. Dick Stone suggested an integrated approach to estimating release mortality, because "no one group has the resources to do it all."

The participants agreed that current studies on release mortality have provided valuable data, but that more definitive and practical research is needed to assist the angling community and fishery managers with sound information for future recreational fisheries management decisions.

Reducing Mortality in Tag and Release Fishing: Advice from Experienced Captains

At the Release Mortality Conference, Captains Bob Eakes, owner of the Red Drum Tackle Company in Buxton, North Carolina, and Al Anderson of Narragansett, Rhode Island, spoke about their practical experience successfully catching, tagging and releasing large gamefish.

Capt. Eakes tagged an unprecedented number of giant bluefin tuna off Hatteras this winter (approximately 350 fish tagged). According to Capt. Eakes, fishermen should choose fishing gear appropriate to the targeted species and specifically suited to reducing a major cause of hooking mortality--gut hooking.

In spite of the usual high incidence of gut hooking associated with chunking² for bluefin, Capt. Eakes has practically eliminated this problem on his boat. Through systematic experimentation with different tackle, Capt. Eakes was able to achieve a 99% rate of lip-hooking in 450 catches and releases of bluefin. This feat was accomplished using appropriately heavy gear, and, more importantly, large full circle hooks.

Capt. Anderson's long term experience tagging fish aboard the Prowler has given him practical insight into the causes of mortality in the tag and release event. He has found that methods of handling and the length of handling time contribute to mortality of pelagic and coastal gamefish in the catch, tag, and release event.

Last season, 1,076 fish of a variety of species were tagged and released from the Prowler. Capt. Anderson suggested several methods to limit handling time and expedite the tagging process, thereby reducing the risk of mortality following release. He has tested the methods he suggests and considers them to be effective in reducing mortality. Aboard the Prowler, anglers minimize fight time by using heavy tackle to land fish quickly. He also uses an in-the-water Gamefish Measuring Cord (GFMC) for pelagics to record relatively accurate lengths. The GFMC is simply

²Chunking is a method of fishing in which the hooks are imbedded in large chunks of natural bait.

a length of nylon cord with alternating bands of color at measured distances. The angler estimates the length of the fish by the alternating bands of color. Once length is determined, the weight can be estimated from length-to-weight tables compiled by Capt. Anderson. Thus, anglers can make relatively accurate estimates of the weight without removing the fish from the water.

Capt. Anderson has published length-to-weight charts as well as other instructions on how to tag and release gamefish of many sizes and species in his new book *Gamefish Tag and Release: A Complete Guide to Tag and Release Techniques and Programs*, published by The Fisherman Library, Point Pleasant, New Jersey.

Capt. Anderson stressed the importance of releasing fish, saying, "We have to look towards the future and do what we can to ensure good resources for the next generation."

Ultrasonic Tracking in Release Mortality Research

Traditionally, ultrasonic tracking has been used to observe the behavior patterns of a variety of animals. Now ultrasonic transmitters are being used to study release mortality for various species of fish. Randy Edwards of the Mote Marine Laboratory in Sarasota, Florida and Phillip Bettoli of the Tennessee Cooperative Fisheries Research Unit at Tennessee Technological University have both conducted release mortality studies using ultrasonic transmitters. In both studies fish were caught, tagged with small ultrasonic transmitters, and tracked for varying amounts of time to determine release mortality. These researchers presented the results of their studies at the recent Release Mortality Conference.

Randy Edwards shared his results on "Assessing Release Mortality by Ultrasonic Tracking: Blue Marlin, Tarpon, King Mackerel, Spanish Mackerel, Red Drum, Snook and Sharks." He says ultrasonic tracking has advantages and disadvantages over traditional methods of release mortality research.

For example, ultrasonic tagging is immediate, direct, and more closely approximates natural conditions. It eliminates what Edwards calls "problems with artifacts," such as holding tanks and pens, and transportation to holding facilities. The fish are not subjected to the additional stress of captivity. In addition, for Edwards' study, captivity was impractical. Ultrasonic tagging allows him to study large free-swimming fish in their natural environment.

However, ultrasonic tagging does have some disadvantages. Each tag can cost as much as \$150-\$200 or more. And, although some studies recover the tags, some loss is inevitable. In addition, tracking fish ultrasonically requires a high level of skill and experience. Some ultrasonic transmitters have a typical range of more than 1.5 miles; other, smaller transmitters have a range of approximately .75 mile under the best conditions. Strong currents and shallow water interferes with tracking.

Edwards tracked a variety of species in environments from the deep open ocean to shallow sea grass beds. Survival rates for blue marlin, tarpon, red drum and snook were between 96% and 100%. Mackerel, which are normally thought to be relatively fragile recorded high survival rates. Spanish mackerel's survival rate was 88%, and 83% of the king mackerel survived. Edwards says these results, "reaffirm the appropriateness of catch and release as part of management strategies for the fisheries studied."

Phillip Bettoli and Randall Osborne also used ultrasonic transmitters in their study on the "Use of Ultrasonic Tagging to Determine the Survival of Free-Ranging Striped Bass Following Catch-and-Release in a Tennessee Reservoir." They tracked striped bass for a minimum of three days and found a correlation between air temperature at capture and survival rate. Mortality rates differed significantly by the month the fish were caught. In November and December, mortality rates were approximately 15%, but went as high as 67% in August of 1993 and July of 1994. Statistical analyses identified air temperature as the most important main effect. Landing time and total length of fish caught in the summer months were found to

have no statistical relationship with survival rate for this species. The researchers were somewhat surprised to find that the observed “good” or “poor” condition of a fish when initially released was not an accurate indication of whether the fish lived or died.

This study also allowed for the recovery of the ultrasonic transmitters by fitting them with a float and attaching them with decomposable suture material. When the gut suture material decomposed, the tag floated to the surface where it was retrieved.

Edwards' study on large free-ranging fish and Bettoli's study on striped bass incorporated the advanced technology of ultrasonic tracking to research catch and release mortality of a variety of species. This technology has made possible research on fish in their natural surroundings and provided important information to anglers and fishery managers about the effects of catch and release on mortality rates of these species.

Summary of Conference Recommendations

1. Focused on educational efforts. The basic message to get out to anglers is to release fish, tagging them when possible—but the most important lesson to teach is the correct way to tag and release. The targets for this lesson include experienced fishermen, novice anglers, fisheries managers and the public. The public is an important final link in the support of fisheries. Their enthusiasm for the outdoors includes support for the release ethic. More education about fishermen's catch and release efforts could increase public support.
2. Fisheries managers should include accurate assessments of fish mortalities due to catch and release in their regulations. They also need to be informed of ways to improve survival rates of fish involved in catch and release fisheries.

3. A variety of vehicles to deliver the catch and release message should include magazines and newsletters, fisheries services and councils, fishing clubs and tournament organizers, boat captains, tackle shops, conservation organizations and fishermen themselves. Fishermen can supply a positive form of peer pressure to encourage others to practice effective catch and release.
4. The recreational fisheries industry needs to encourage catch and release or it may be out of business or at least in trouble. Successful catch and release keeps tackle shops and charter boats in business, even in the 'thin' times of stricter regulation.
5. The media has to promote catch and release repeatedly--not just with one feature article, but with more and shorter articles addressing the release of specific species, accompanying longer articles on those species. This more frequent message would have a greater impact.
6. Need for communication between scientists and fishermen. "Basically, fishermen want to do what's right; if they have a choice, they're going to do what will not hurt the fish." Fishermen need to know what the scientific research means to them, and scientists have to make specific, practical, and not necessarily complicated recommendations to the fishing community.
7. The charter industry can assist scientists in their catch and release sampling efforts by providing information quickly, easily and at low cost.
8. Using catch and release is a good way to distinguish charter services from others. Captain Bounds* said, "catch and release is not just a practice that occurs on a boat, but a marketing strategy to control clientele." His clients consist of groups of anglers, as well as family fishing trips interested in conservation. He said the conservation ethic appeals to the public and helps his business.

9. A rigorous sampling design is needed to make better determinations on catch and release issues such as wound healing, and possible longer term pathology problems associated with hooking, handling, and releasing fish.
10. Fisheries managers must be careful when it comes to catch and release mortality estimates. If hooking mortality is ignored or underestimated, objectives such as spawning and recruitment are not met; if it is overestimated, it negatively impacts recreational fishermen by requiring stricter bag limits.