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  Simone Vincenzi, Alain J Crivelli, Dusan Jesensek and Giulio A De Leo, Italy, France, Slovenia

Defining fish communities for restoration in waterways supporting society and nature

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Clear and measurable environmental standards have resulted in greatly improved water quality in many highly developed countries. In contrast, today's restoration efforts are often shaped around historic conditions and natural reference sites. Consequently, restoration goals and needs have varied by case and are often impractical in human dominated settings. A philosophy and set of specific methods for setting clear and measurable fish community targets have been developed for restoration in contemporary waterways. Fish community targets can be used to diagnose impediments to fish populations, define needed restoration activities, and identify precisely what will be achieved. My approach will be justified and then demonstrated using a river restoration effort on a small dammed and industrialized river in the Northeast United States. A target fish community was defined by ten species at specified levels of relative abundance. The initial fish community had underrepresented species that were mostly fluvial fishes and overly abundant species that were habitat generalists. Results indicated flowing water habitat improvement was the highest priority. A second target fish community was defined for shorelines of New York City. While this estuarine ecosystem has a high diversity of fishes and no or few missing species, the shoreline community was determined to be highly biased toward fishes using open pelagic waters. Departures from target conditions were used to define clear and practical restoration needs in this most intensely urbanized waterway. The target fish community approach relies on agency and waterway user representatives to shape broad restoration goals but fish biologists set the specific needs and endpoints. Integrating restoration policy, objective zoogeography analyses, and theory-based parameters of community structure yields restoration specifications that are future oriented, meaningful to the public, and scientifically justified. Fundamentally I want to make the case for charting a renaissance of our waterways that can improve a fish community and attract public support.

Cultivation of endangered species to achieve "FITTNES FOR SURVIVAL" at release into natural habitats

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Aquaculture for production and aquaculture for restocking (or simply stocking) in natural waters are two VERY DIFFERENT objectives requiring TOTALLY different culture methodologies to meet their specific goals. Unfortunately, most of the presently employed criteria and technical culture approaches in production of juveniles for aquaculture purposes and for stocking purposes are essentially the same. This is a serious mistake. While the aquaculture production system thrives and selects for (a) best survival, (b) high food conversion via feeds designed for best biomass gain, (c) fast growth rates to shorten grow-out time, (d) disease resistance for target diseases, (e) cost-effective production and finally (f) for high quality of the end product (e.g. fillet), the culturing for restocking needs to serve different objectives by providing progeny with the ability to (a) rapid response to changing environmental cues (light, currents), (b) adjust behavioural traits to diurnal and nocturnal rhythms, (c) recognize predators (to distinguish friend from fo) by training avoidance responses, (d) display robustness to abruptly changes in water quality parameters (e.g. temperature = expeirencing a thermocline; oxygen depletion; rapid changes in turbidity; highly variable micro-light climate due to cloude cover changes and wind- and wave action changing light reflection in parts of seconds in the upper few meters), (e) resist a variety of challenges by pathogens and parasites, and (f) finally to effectively interact with appropriate behavioural traits with con-specifics in natural cohort (perfect intermingling). In short, culture for release must be designed to allow progeny at the time of release to matche the "FITNESS" required for survival in the receiving habitat while also "MATCHING" the characteristics in all traits of the con-specifics of the remaining natural population.

Although this is logical, 99% of the practical stocking and rehabilitation programmes lack a cohesive concept and systematic approach to meet these requirements. We would like to present a framework based on the recently developed strategies for sturgeon species (a species group that exhibits a high longivity, low residual population size (facing severe allee-effects in dwindling recruitment) and specific habitat-depending traits. The conventional hatchery systems offer largely monotonous life conditions of little use to prepare the progeny for the harsh and challenging environmental conditions which they are facing in nature after release. Step by step adaptation to these highly variable conditions and gradual transfer to natural challenges are issues for which technologies are not sufficently advanced to provide these challenges in a standardized format with largely automated logistics can help improving performance, and this includes the transition from prepared diets to natural food; exposure to predators and training of avoidance responses, as well as acclimation to diurnal rhythmic cues (lunar cylces - tides, currents, wind and wave action in the littoral zone etc).

Overview of the IUCN Guidelines for Re-introductions with emphasis on developing taxon specific guidelines for fish restoration projects

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An overview of the IUCN/SSC Guidelines for Re-introductions will be presented with examples from fish re-introductions to explain the various aspects of the guidelines. The guidelines are divided into a Feasibility Stage, Planning Stage, Implementation Stage and Post-release Monitoring Stage. To develop fish re-introduction guidelines an overview will be given of how various taxon or species-specific re-introduction guidelines have been developed in the past. Lessons learned from these initiatives will be used to develop guidelines for fish re-introductions based on the existing IUCN/SSC Guidelines for Re-introductions.

Restoration and Management of Atlantic Sturgeon and American Shad on the U. S. Atlantic Coast

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Atlantic sturgeon (*Acipenser oxyrhinchus oxyrhinchus*) and American shad (*Alosa sapidissima*) once supported valuable commercial fisheries in many rivers of the Atlantic seaboard of the United States. Sturgeon and shad fisheries peaked in the late 1800s and declined precipitously through the twentieth century. Populations of these anadromous species are currently under intense management by individual states under auspices of the Atlantic States Marine Fisheries Commission (ASMFC). Compliance with approved ASMFC fishery management plans is mandatory and failure to meet critical plan measures can result in federal closure of any state fishery. Commercial landings of shad are currently at an all time low. All ocean fisheries were terminated in 2005 and several states have also closed their inland fisheries. Restoration of depleted or lost shad populations is underway in numerous rivers in ten states. These programs typically include providing fish passages at dams, and restocking of waters above dams with prespawned adults and/or hatchery-reared larvae. ASMFC enacted their most severe fishery management action for Atlantic sturgeon in 1998. Commercial and sport fisheries in all waters throughout the species range (ocean and inland) are closed until two generations have an opportunity to spawn at least once. Since females mature in 15-20 years this amounts to a 30-40 year moratorium. Some states are now examining the possibility of using hatchery culture and stocking of sturgeon to restore or enhance depleted populations. Although breeding and stocking protocols have been developed, there remains considerable controversy regarding use of cultured sturgeon. In response to a petition to list this species under the Endangered Species Act, the National Marine Fisheries Service (NMFS) completed a formal status review in 2006-2007. That review suggests there may be five distinct population segments and that at least three are likely candidates for listing. A final decision by NMFS is expected in 2009.

The Marble Trout (*Salmo marmoratus*) Conservation Program: main insights from a 15 years' reintroduction experience.

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Trout species or genetically distinct populations at risk of extinction are generally restricted to headwaters preventing hybridization with other introduced salmonids. The Marble Trout (*Salmo marmoratus*) Conservation Program started in 1993 in the upper basin of the Soca river (Slovenia) with two main goals: finding genetically pure population of marble trout and duplicating the existing populations through translocation of marble trout in fishless streams to enhance the long-term viability of the species. New populations have been created by introducing from 200 to 600 marble trout aged 1 in six pristine streams between 1996 and 2004; five of them were previously fishless (Gatsnik, Gorska, Mirna, Zakojska and Zventarska) while in one stream (Martinkov) hybrid trout were previously removed. In order to acquire useful information on the translocation experiment and to study the population dynamics, life-histories and demographic traits of marble trout, the new populations have been systematically monitored since their creation by individually tagging and sampling marble trout. Gorska, Zakojska and Zventarska were wiped away by severe floods in 2004 and 2007 (recurrence interval 50-100 years) while the other populations are still viable. Empirical observations coupled with a population viability analysis (PVA) performed by using a data-driven model of population dynamics suggested that only extreme floods, landslides and severe droughts, are able to trigger local extinction of marble trout populations in these pristine environments. As the absence of fish in the streams was probably a consequence of severe exogenous events, new translocations must be undertaken in streams where fish have been removed in order to avoid the rapid loss of populations. Moreover, the PVA results indicated that less individuals might be necessary to establish a new population, as in a few years density-dependent body growth and first-year survival will regulate population size around stream carrying capacity.