Status Determination Process for New Jersey's Marine Fishes

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Objectives

The objectives of this project were to 1) determine the status of selected marine fish species based on the consensus of experts 2) provide recommendations to the New Jersey Department of Environmental Protection's (NJDEP) Commissioner regarding which species should be listed as Endangered or Threatened pursuant to the Endangered and Nongame Species Conservation Act 3) make recommendations to the National Marine Fisheries Service (NMFS) regarding New Jersey species that may warrant a Species of Concern (SOC) status designation.

Summary

We used the Delphi Technique to determine the status of 59 marine fish species. Consensus by expert panelists was achieved on 39 out of 59 species in four rounds. Although no species was found through consensus to warrant an Endangered or Threatened status, panelists discussed evidence of significant declines in Atlantic sturgeon and the need for additional protection. Results of the status review will be presented to the Endangered and Nongame Species Advisory Committee to determine further actions.

Background

The state Endangered and Threatened species lists (N.J.A.C. 7:25-4.13 and N.J.A.C. 4.17) are used by regulatory programs and the Division of Fish and Wildlife to enforce the state Endangered and Nongame Species Conservation Act (N.J.S.A. 23:2a-7e) and

enforce other regulatory restrictions on modifying habitats for listed species. Therefore, species status must be determined through an objective, defensible approach that provides a listing that is complete and, insofar as possible, accurately reflect species' biological status. We use the Delphi Technique to reach consensus among experts and review species status by taxonomic group. This methodology has been successfully used in New Jersey to determine official status for species groups such as birds, reptiles and amphibians, freshwater mussels, butterflies, and most recently dragonflies and damselflies. In addition, a status review of mammals using the Delphi Technique is now underway and should be completed by late 2007.

The Delphi Technique is a systematic method for reaching consensus among experts when absolute, quantitative answers are either unknown or unknowable (Linstone and Turoff 1975). It is an interative process characterized by anonymity among participating experts, controlled feedback via the principal investigator, and a statistical estimator of group opinion (Dalkey 1969). The technique consists of a series of anonymous reviews that allow participants to comment and read the comments of others. Through this process, expert opinions and data can be shared to reach consensus on a species status.

Methods

We used methods following Clark et al. (2006). ENSP staff, along with biologists from the Division's Bureau of Marine Fisheries (BMF), selected 14 recognized experts to participate in the Delphi process. Experts initially selected included NJ Division of Fish and Wildlife staff, Rutgers University Marine Field Station researchers, DE Division of Fish and Wildlife personnel, private consultants, commercial fishing industry representatives, and other individuals knowledgeable in marine and/or estuarine fish ecology. These individuals were than contacted to determine if they were willing to participate in the Delphi Technique and if they could recommend qualified experts to serve on the panel.

Bureau of Marine Fisheries staff then selected 58 marine fish species out of 336 species in 116 families reported by Able (1992) to be reviewed by the panel of experts during the

Delphi Technique (Table 1). The list included New Jersey species that were thought to be declining, of conservation concern, or were already considered to be Federal Species of Concern.

The first-round species status review form was then sent to each panelist via electronic mail. Included in the package were detailed instructions on how to complete the form, available information on the species (e.g. NMFS stock assessments) and the list of species to be reviewed. The instructions outlined definitions for the status choices of Endangered, Threatened, Special Concern, Secure/Stable, Unknown, No Opinion or Not Applicable (Table 2) and confidence levels (1-8, with one being unreliable and 8 being certain) (Table 3). Each reviewer was then asked to 1) choose a status for each species 2) choose a confidence level associated with their status selection and 3) provide comments aimed at supporting their status recommendation. An example of a first-round species evaluation form is reflected in Figure 1. Each reviewer was also asked to provide the names of additional species, if any, that they felt should be included in the Delphi Technique.

Results and comments from the first-round were compiled by the facilitator. Consensus on a species status was achieved when 85% of the participants agreed on a particular status (Clark et al. 2006). No Opinion votes were not considered when calculating the overall number of votes for a status. The second-round evaluation form was then sent to reviewers (Figure 2). This was comprised of status results and comments from the first-round, and only included those species for which consensus was not achieved. Subsequent rounds were performed in the same fashion.

Findings

We completed the Delphi Technique for marine fishes in four rounds. An additional species, Striped bass (*Morone saxatilis*) was added by one reviewer during the first round, bringing the total number of species reviewed to 59. Out of 14 individuals asked to participate, eleven contributed to all four rounds, with three dropping out at various times throughout the project period.

Results for each round are presented in Table 4. Thirty out of 39 species with consensus reached were voted Secure/Stable, with two species voted Special Concern, four species voted Not Applicable and three species voted Undetermined.

During Round 1, reviewers reached consensus on the following seven species: Secure/Stable - Atlantic croaker, Black drum, Mummichog, Northern Kingfish, Oyster toadfish, Spot, White Perch.

During Round 2, reviewers reached consensus on the following 26 species: Secure/Stable – Atlantic herring, Atlantic menhaden, Atlantic silverside, Banded killifish, Bay anchovy, Blueback herring, Bluefish, Gizzard shad, Goosefish, Hickory shad, Northern searobin, Scup, Silver hake, Smooth dogfish, Spiny dogfish, Striped searobin, Summer flounder, Tautog, White mullet, Striped bass; Special Concern – Dusky shark; Undetermined – American sand lance, Gulf stream flounder, Striped mullet; Not applicable – Atlantic salmon, Barndoor skate.

During Round 3, reviewers reached consensus on the following four species: Secure/Stable – Inland silverside, Threespine stickleback; Special Concern – Atlantic cod; Not applicable – Swordfish.

During Round 4, reviewers reached consensus on the following three species: Secure/Stable – Lined seahorse, Northern puffer; Not Applicable – White marlin.

Discussion

Consensus (defined as 85% or greater) was reached for 39 out of 59 species during the Delphi Technique for marine fishes. Despite having not achieved consensus, there was one species, Atlantic sturgeon, that appeared to warrant discussion and possible action by the Endangered and Nongame Species Advisory Committee (ENSAC). The Atlantic sturgeon, formerly a Federal Species of Concern, was upgraded to Candidate status in October 2006. During the final round, four reviewers voted Endangered for the species

(confidence level 6.8) and seven reviewers voted Threatened (confidence level 5.7). In addition, panelists generated several pages of comments which expressed evidence of significant decline and need for additional protection. Also, the Sand tiger generated five votes for Special Concern (confidence level 4.6), one vote Unknown and five votes No Opinion. Again, this species may warrant discussion by the ENSAC to determine if further action is required.

Of the remaining Federal Species of Concern, consensus was achieved as follows: Dusky shark – Special Concern, Barndoor skate – Not Applicable, Blueback herring – Stable, Alewife – No consensus, Rainbow smelt – No consensus, White marlin – Not Applicable.

Some species that elicited votes for Not Applicable, such as Barndoor Skate and Swordfish, were not typically found within the state's three mile limit. In addition, there were other species that lacked sufficient information to confirm a New Jersey distribution. Rainbow smelt for example, occur from Labrador to New Jersey, with NJ being the on the edge of its habitat range. In this case, the species received one vote Not Applicable, one vote Special Concern, and nine votes No Opinion. It was unclear to two panelists whether or not fish coming out of the Hudson River should be considered residents, whereas the remaining reviewers had no personal knowledge of distribution. Panelists also expressed that there was not enough available information on American sand lance, Gulf stream flounder and Striped mullet, each achieving a consensus of Unknown.

<u>Recommendations</u>

We recommend the following actions be taken now that the Delphi Technique for marine fishes is completed:

1. Present results of the Delphi Technique to ENSAC during Spring 2007 meeting and seek approval to finalize consensus results. Also, seek guidance from ENSAC regarding the status of Atlantic sturgeon and Sand tiger and solicit input to determine which species, if any, should be recommended to NMFS for the Federal Species of

Concern program. Invite Bureau of Marine Fisheries staff to participate in the meeting.

2. Once approval from ENSAC is obtained, begin state rule-making process to amend N.J.A.C. 7:25-4.13 and N.J.A.C. 7:25-4.17 to add appropriate species and solicit public comments.
3. Repeat Delphi Technique for marine fishes (and for all major species groups) every three to four years to update species status based on most current information.

Literature Cited

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Table 1. Species reviewed during the marine fish delphi technique.

Alewife (*Alosa pseudoharengus*)
American Eel (*Anguilla rostrata*)
American Sand Lance (*Ammodytes americanus*)
American Shad (*Alosa sapidissima*)
Atlantic Cod (*Gadus morhua)*
Atlantic Croaker (*Micropogonias undulatus*)
Atlantic Herring (*Clupea harengus*)
Atlantic Mackerel (*Scomber scombrus*)
Atlantic Menhaden (*Brevoortia tyrranus*)
Atlantic Salmon (*Salmo salar*)
Atlantic Silverside (*Menidia menidia*)
Atlantic Sturgeon (*Acipenser oxyrhynchus*)
Atlantic Tomcod (*Microgadus tomcod*)
Banded Killifish (*Fundulus diaphanus*)
Barndoor skate (*Raja laevis*)
Bay Anchovy (*Anchoa mitchilli*)
Black Drum (*Pogonias cromis*)
Blue Marlin (*Makaira nigricans*)
Blueback Herring (*Alosa aestivalis*)
Bluefin Tuna (*Thunnus thynnus*)
Bluefish (*Pomatomus saltatrix*)
Butterfish (*Peprilus triacanthus*)
Cunner (*Tautogolabrus adspersus*)
Dusky Shark (*Carcharinus obscurus*)
Gizzard Shad (*Dorosoma cepedianum*)
Goosefish (*Lophius americanus*)
Gulf Stream Flounder (*Citharichthys arctifrons*)
Hickory Shad (*Alosa mediocris*
Inland Silverside (*Menidia beryllina*)
Lined Seahorse (*Hippocampus erectus*)
Mummichog (*Fundulus heteroclitus*)
Northern Kingfish (*Menticirrhus saxatilis*)
Northern Puffer (*Sphoeroides maculatus*)
Northern Searobin (*Prionotus carolinus*)
Oyster Toadfish (*Opsanus tau*)
Rainbow Smelt (*Osmerus mordax*)
Rough Silverside (*Membras martinica*)
Sand Tiger (*Odontaspis taurus*)
Scup (*Stenotomus chrysops*)
Sheepshead (*Archosargus probatocephalus*)
Shortnose Sturgeon (*Acipenser brevirostrum*)
Silver Hake (*Merluccius bilinearis*)
Smallmouth Flounder (*Etropus microstomus*)
Smooth Dogfish (*Mustelus canis*)
Spiny Dogfish (*Squalus acanthias*)
Spot (*Leiostomus xanthurus*)
Striped Bass (*Morone saxatilis*)*
Striped Mullet (*Mugil cephalus*)
Striped Searobin (*Prionotus evolans*)
Summer Flounder (*Paralichthys dentatus*)
Swordfish (*Xiphias gladius*)
Tautog (*Tautoga onitis*)
Threespine Stickleback (*Gasterosteus aculeatus*)
Tilefish (*Lopholatilus chamaeleontiseps*)
Weakfish (*Cynoscion regalis*)
White Marlin (*Tetrapturus albidus*)
White Mullet (*Mugil curema*)
White Perch (*Morone americana*)
Winter Flounder (*Pleuronectes americanus*)
*added by reviewers

Table 2. Status definitions used during the delphi technique for marine fishes.

Status	Definition
Endangered	Applies to species whose prospects for survival within the state are in immediate danger due to one or several factors, such as loss or degradation of habitat, overexploitation, predation, competition, disease or environmental pollution, etc. An Endangered species likely requires immediate action to avoid extinction within New Jersey.
Threatened	Applies to species that may become Endangered if conditions surrounding it begin to or continue to deteriorate. Thus, a Threatened species is one that is already vulnerable as a result of small population size, restricted range, narrow habitat affinities, significant population decline, etc.
Special Concern	Applies to species that warrant special attention because of inherent vulnerability to environmental deterioration or habitat modification that would result in their becoming Threatened. This category would also be applied to species that meet the forgoing criteria and for which there is little understanding of their current population status in the state.
Secure/Stable	Applies to species that appear to be secure in New Jersey and not in danger of falling into any of the preceding three categories in the near future.
Unknown	Applies to species for which it is impossible to assign any of the preceding categories because enough information on which to base a judgment simply does not exist.
No Opinion	Applies to any species for which the panelist does not possess sufficient information or experience on which to base a judgment.
Not Applicable	Applies to species that do not occur in New Jersey, including occasional non-breeding strays and transient breeders that fail to persist.

Table 3. Confidence levels and definitions used during the delphi technique for marine fishes.

Confidence level	Definition
Unreliable (1-2)	Great risk of being wrong; of no use as basis for a decision.
Risky (3-4)	Substantial risk of being wrong; unwilling to use as basis for decision without other information.
Reliable (5-6)	Some risk of being wrong; willing to make a decision based on this but recognizing some chance of error.
Certain (7-8)	Low risk of being wrong; decision based on this will not be totally wrong because of at least some supporting fact(s).

Table 4. Species status and confidence levels achieved during the delphi technique for marine fishes.

Round	Status	Species	Average Confidence level
1	Secure/Stable	Atlantic croaker	7.3
1	Secure/Stable	Black drum	5.0
1	Secure/Stable	Mummichog	6.0
1	Secure/Stable	Northern kingfish	4.3
1	Secure/Stable	Oyster toadfish	5.8
1	Secure/Stable	Spot	5.3
1	Secure/Stable	White perch	6.3
2	Secure/Stable	Atlantic herring	5.8
2	Secure/Stable	Atlantic menhaden	6.3
2	Secure/Stable	Atlantic silverside	5.9
2	Secure/Stable	Banded killifish	5.8
2	Secure/Stable	Bay anchovy	5.9
2	Secure/Stable	Blueback herring	5.3
2	Secure/Stable	Bluefish	6.0
2	Secure/Stable	Gizzard shad	5.7
2	Secure/Stable	Goosefish	5.0
2	Secure/Stable	Hickory shad	5.2
2	Secure/Stable	Northern searobin	5.9
2	Secure/Stable	Scup	5.1
2	Secure/Stable	Silver hake	5.0
2	Secure/Stable	Smooth dogfish	5.6
2	Secure/Stable	Spiny dogfish	5.3
2	Secure/Stable	Striped bass	7.0
2	Secure/Stable	Striped searobin	5.4
2	Secure/Stable	Summer flounder	6.3
2	Secure/Stable	Tautog	5.9
2	Secure/Stable	White mullet	4.0
2	Special concern	Dusky shark	4.6
2	Unknown	American sand lance	2.7
2	Unknown	Gulf stream flounder	3.3
2	Unknown	Striped mullet	3.0
2	Not applicable	Atlantic salmon	--
2	Not applicable	Barndoor skate	6.0
3	Secure/Stable	Inland Silverside	5.2
3	Special Concern	Atlantic cod	4.5
3	Not Applicable	Swordfish	8.0
4	Secure/Stable	Lined seahorse	5.0
4	Secure/Stable	Northern puffer	4.3
4	Not Applicable	White marlin	8.0

Figure 1. Example of the "first-round" species status evaluation form.

Species Status Assessments: Marine Fishes
Round One

1. **Alewife** (*Alosa pseudoharengus*)

Status: E T SC S U NO NA (please bold face selection)

Confidence Level: Unreliable Risky Reliable Certain

1 2 3 4 5 6 7 8 (please bold face number)

Explanation:

2. **American Eel** (*Anguilla rostrata*)

Status: E T SC S U NO NA (please bold face selection)

Confidence Level: Unreliable Risky Reliable Certain

1 2 3 4 5 6 7 8 (please bold face number)

Explanation:

3. **American Sand Lance** (*Ammodytes americanus*)

Status: E T SC S U NO NA (please bold face selection)

Confidence Level: Unreliable Risky Reliable Certain

1 2 3 4 5 6 7 8 (please bold face number)

Explanation:

Figure 2. Example of the "second-round" species status evaluation form, with first-round status assessments and comments by panelists.

SPECIES STATUS ASSESSMENTS: Marine Fishes, Round 2

Alewife (*Alosa pseudoharengus*)

Status	# of People	Confidence Level
E		
T	1	6
SC	2	6.5
S	6	5.3
U		
NO	3	
NA		

Your New Status	Your New Confidence Level

Explanation: Reported to be "scarce in Round Valley Reservoir. Ranked 10th in 2005 Delaware River Striped Bass survey.-----Status probably heavily influenced by habitat quality of freshwater spawning site.----- Abundance may be on the decline but limited information may delay important management decisions-----Some trawl survey data available for DE Estuary-----Existing spring spawning runs remain strong, with recent construction of fish passage facilities on several waterways providing potential for an increase in population size; young and juveniles are commonly abundant in cold season trawl samples of coastal waters.-----Too many contradictions in data; OK in Delaware Basin, but NE states have been adopting fishing moratoriums due to predation, fishing pressure (for bait) and habitat degradation-----Problems with the inlets along the coast.-----Too many dams preventing full use of breeding habitat.

American Eel (*Anguilla rostrata*)

Status	# of People	Confidence Level
E		
T	1	8
SC	4	5.0
S	4	5.5
U		
NO	3	
NA		

Your New Status	Your New Confidence Level

Explanation: Data from Canada shows that stocks are at record lows.-----Analysis of 18-year data set on glass eels at Little Egg Inlet does not indicate an obvious decline during the study period (Sullivan et al. in press).-----Elver production within the Delaware Estuary remains good and yellow and silver eel phases appear stable. Commercial landings remain robust within the mid-Atlantic.-----Trawl survey data available for DE Estuary.-----Reports of low population levels along the E Coast have not been confirmed for NJ; elvers remain abundant in winter/spring upstream migration.-----Status unknown throughout state but some areas doing well. -----ASMFC Stock Assessment says there are problems.

American Sand Lance (*Ammodytes americanus*)

Status	# of People	Confidence Level
E		
T	1	7
SC		
S	1	6
U	2	1.5
NO	8	
NA		

Your New Status	Your New Confidence Level

Explanation: Information from NY, abundance down from 1980's.-----Difficult to determine because not easily differentiated from *Ammodytes dubius*.-----No experience or knowledge of species abundance.----- Occasionally abundant in trawl samples; relative scarcity may be misperception from low accessibility to capture by sampling gear because they burrow into the bottom.-----No information.-----The extreme decline since the early 1980's.