New England Aqua ium

*Protecting the blue planet*

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Tara Trinko
Fisheries Biologist
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Dear Tara,

After thorough review of the thorny skate Status Review Report, it is my belief that the Extinction Risk Assessment (ERA) team performed an extensive, comprehensive, and accurate review of the thorny skate population in the North Atlantic Ocean. Although somewhat limited information exists on thorny skate biology, ecology, and physiology, the team compiled numerous documents that provide insights into the species' life history, population structure, and environmental preferences over the entirety of their North Atlantic range. Areas of data deficiency are also adequately acknowledged and supplemented with information from sympatric species. The available information has also been synthesized appropriately for each component of the review and the team's assessment of the overall extinction risk, including the Distinct Population Segment (DPS) analysis, is strongly rooted in the best available science. The draft's overall writing quality is also strong, however, there are numerous technical and/or grammatical errors that should be easily addressed by a thorough read through. Please find a detailed review of the evaluation topics below.

**1. The accuracy, quality, and completeness of the data considered, particularly if any additional data exist that were not considered.**

Having preformed numerous research projects on thorny skates over the past 15 years, I am very familiar with the biological, ecological, physiological, and fisheries data that are available for this species, particularly in the Northwest Atlantic. Within each section of this status review it was clear that the ERA team compiled information from a suite of different sources (e.g., peer-reviewed literature, catch/survey records, final project reports), and I am confident that this information is of high quality and represents the best available science for thorny skates in the North Atlantic. Consequently, this collective information provided a strong platform on which accurate and complete assessments of each topic and ESA Section 4 factors were based. I could only find a few discrepancies and/or omissions, which I have highlighted below.

Scott (1982) reported that catch rates of thorny skate were highest on coarser-grained sediments and diminished as grain size decreased on the Scotian Shelf. This corroborates the findings of Sosebee et al. (in prep), and should be cited in the review since it represents a peer-reviewed document that describes habitat preferences within an important region of the species' range. Reference:

Scott, J.S., 1982. Selection of bottom type by groundfishes of the Scotian Shelf. *Canadian Journal of Fisheries and Aquatic Sciences*, *39*(7), pp.943-947.

There is a potential discrepancy with the reported age at 50% maturity (A50) of 14.7±1.4 years for male thorny skate on page 10. Reviewing Sulikowski et al. (2006), which to my knowledge is the only study to directly assess age at maturity, male A50 is estimated at 10.9 years in the Gulf of Maine. Accordingly, the range and error reported on page 10 do not corroborate the only direct information on male A50. The source of the 14.7±1.4 estimates should be identified/cited, or if an error, this information should be corrected.

During the composition of this review document, additional information on the movements and temperature preferences of thorny skate in the Gulf of Maine became available as part of an ongoing research project that I'm conducting through the New England Aquarium (along with co-PI John Mandelman). To date, we have received conventional fisheries-dependent recapture information from five skates and fisheries-independent location and daily (min/max) temperature records from 23 thorny skate that were tagged with pop-up satellite archival transmitting (PSAT) tags. Preliminary conventional tag-recapture information indicates that thorny skates remained relatively sedentary, moving 5-32 km away from release/tagging sites near northern Stellwagen Bank in the western Gulf of Maine over periods of 74-210 days at liberty. Data recovered from five thorny skate tagged with PSATs in the vicinity of Cashes Ledge indicated horizontal displacements of 3-26 km at 100 days post-tagging. Three thorny skate tagged offshore in the Gulf of Maine near the Hague line exhibited horizontal displacements of 3.5-6.5 km over 100 days post-tagging. In the western Gulf of Maine (Massachusetts Bay), data from 13 PSAT-tagged skates revealed horizontal displacements of 2-30 km over 100 day (n=12) and 200 day (n=1) tag deployment periods. Daily temperature records from all PSAT-tagged skates indicated that thorny skate occurred in temperatures of 4.5-10.5˚C from November to August. Collectively, these preliminary data corroborate the information presented in the review and provide some confirmation that thorny skate exhibit limited movements in the Gulf of Maine and have a broad temperature tolerance.

**2. Whether uncertainties in the data are reasonably identified and characterized.**

Despite the vast distribution of thorny skates throughout the North Atlantic and their present and historical interactions with commercial fisheries there is surprisingly limited information available for certain aspects of the species' biology and ecology. While general information on their abundance trends, distribution, depth/substrate preferences, size, and size at maturity is well documented, information on historical catch (in some areas), population structure/genetics, small- and large-scale movements (particularly offshore), and the factors that contribute to the drastic differences in size/size at maturity throughout their range is lacking. All of these areas of data deficiency are clearly acknowledged within this status review. Although additional detailed information on any of these topics would undoubtedly bolster our understanding of the species, the ERA team clearly utilized the best available science on each of these data poor topics to formulate their conclusions. In addition, when no information was available to address a specific question/topic (e.g., the impacts of ocean acidification), data from sympatric species were utilized to draw reasonable inferences. Consequently, it is my belief that data uncertainties are both reasonably identified and characterized.

**3. If you believe that information is missing, justification for a statement is lacking, or specific information was applied incorrectly in reaching conclusions, please be specific in your comments.**

While I firmly believe that additional data are direly needed to improve our understanding of and ability to manage/conserve thorny skate populations throughout their range, the ERA team did a thorough job of compiling the presently available information on this species. As previously stated, I feel as though the best available scientific information on thorny skate is presented in this review and is utilized appropriately to provide support and justification for the ERA teams' conclusions. That said it is entirely possible that future research will provide novel data that may alter some of the conclusions drawn in this review. For example, our preliminary tagging data suggest that thorny skate in the Gulf of Maine exhibit very limited movements (<35 km) in the short term (100-200 days), thereby suggesting that the connectivity between this and adjacent areas (e.g., Scotian shelf) may be limited. If this trend of limited movement persists throughout our study it will provide critical information on stock/population structure (i.e., DPS) and hold important implications for the overall resilience of the population(s) in this area. Similarly, if additional sampling reveals that the apparent differences in thorny skate size and size at maturity are genetically driven then some of the conclusions presented in this review may require revision. Regardless of this speculation, it is clear that the ERA utilized the best available existing data to generate a complete, thorough, and accurate assessment of the current level of extinction risk for thorny skate in the North Atlantic and/or U.S. population.

Thank you for the opportunity to review this document. I hope you found my review to be objective, fair, constructive, and complete. Please don't hesitate to contact me if you require and additional information or clarification.

Sincerely,

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