

## Three Angelshark Status Peer Review Report

### Peer Review Comments

We solicited review of the document “Draft Status Review Report of 3 Species of Angelsharks: *Squatina aculeata*, *S. oculata*, and *S. squatina*” from seven potential reviewers. Five people agreed to be reviewers and four provided reviews. Reviewer comments are compiled below from comments on drafts of the manuscript and are not in the order of the reviewer identification list below.

#### Reviewers (listed alphabetically):

Dr. Murat Bilecenoglu  
Professor at Adnan Menderes Üniversitesi  
Aydin, Turkey

Dr. Christian Capapé  
Professor at Université Montpellier 2  
Montpellier, France

Ms. Eva Meyers  
Shark Biologist and Principal Investigator of Angel Shark Project  
Zoological Research Museum Alexander König (ZFMK)  
Bonn, Germany

Dr. Declan Quigley  
Fisheries Biologist  
Sea Fisheries Protection Authority  
County Wicklow, Ireland

#### **Reviewer Responses to Terms of Reference Questions (in random order)**

Evaluate the adequacy, appropriateness and application of data used in the Status Review document.

- 1. In general, does the Status Review include and cite the best scientific and commercial information available on the species, its biology, stock structure, habitats, threats, and risks of extinction?**

*Yes*

*The document under review presents information on the biology, population status and future outlook for the three angel shark species (*Squatina aculeata*, *Squatina oculata*, and *Squatina squatina*), which were all severely declined in their global range, primarily as a result of human impact. These species are currently so rarely reported that there is very limited knowledge available on their biology, current distribution or size of stocks. Despite of the*

*scarcity of published data, I think the existing literature has been quite well reviewed in the status report, adequate enough to reflect the major components of life history traits of angel sharks.*

*In general, the report includes wide material on all commercial and scientific information currently available for 3 species of Angel Shark: *Squatina oculata*, *Squatina aculeata* and *Squatina squatina*. The literature used in this report covers the best available information on this shark biology, including stock structure, habitats and threats. For *S. squatina* in particular, there is more detailed information on the biology and reproduction that can be referred to in the doctoral thesis of Dr. Krupskaya Narvaez and Dr. Filip Osaer ([www.elasmocan.org](http://www.elasmocan.org)). A detailed overview of the historic and current distribution of the three species is given, which shows temporal changes in their abundance and distribution and the possible causes for these changes. The report identifies the main threats for the three angel shark species, such as the continued fishing pressure by trawlers and artisanal fishermen, continued landings despite prohibitions, questionable survival of discarded individuals, potential hindering of re-establishment in certain areas, lack of protection and lack of data.*

## **2. Are the scientific conclusions factually supported, sound, and logical?**

*Yes*

*I found the overall scientific conclusions robust, sound and rational. An exception is for the conclusive remark on the distribution of *S. aculeata* (page 16 - historical vs. current range). "A relatively recent range expansion into the eastern Mediterranean" was claimed, probably based on the recent occurrence records of the species, but this suggestion is quite unlikely, since the available literature is not sufficient enough to prove such an approach. The species is presumably always naturally rare in the region (as indicated several times through the text), and can well be confused with other squatinids due to its morphological similarity (so it is possible that the species maybe overlooked in previous research and/or misidentified).*

*In my opinion, there is not enough evidence that supports a recent range expansion of *Squatina aculeata* into the eastern Mediterranean. It appears to me that this might be due to past misidentifications. It is still rather doubtful whether different populations of the species are connected, since there is no evidence for this. However, this possibility may not be entirely excluded. The scientific conclusions are all factually supported by the best available information and are coherent with the background information.*

## **3. Where available, are opposing scientific studies or theories acknowledged and discussed?**

*Yes*

*As far as I see, this term of reference is not applicable for the present status report.*

**4. Are the results and conclusions of the Extinction Risk Analysis supported by the information presented?**

*Yes*

*Whether a species is threatened or not was assessed by the examination of any (or a combination) of the following threat factors: (A) destruction or modification of habitat, (B) overutilization, (C) disease or predation, (D) inadequacy of existing regulatory mechanisms, or (E) other natural or man-made factors. Any of the present threats likely to have negative influence on biological traits of any of the three angelshark species was evaluated, together with forecasts on possible future threats. A demographic risk analyses for the three species was also carried out, evaluating population viability characteristics and their trends (such as abundance, growth rate/productivity, spatial structure and connectivity, and diversity), to determine the potential risks they pose to the species. All these analyses were used to evaluate overall extinction risk of relevant angel shark species'. The results obtained (based on the methodology defined above) were supported by the information presented, clearly increasing the confidence level of conclusions reached. Analyses were conducted in accordance with widely accepted biological norms and I believe no revisions are necessary.*

**5. Are uncertainties assessed and clearly stated?**

*Yes*

*The most significant uncertainty in the status report is that if *S. oculata* and *S. aculeata* were ever truly common throughout the Mediterranean, or even their entire range. This information gap was also the main reason of difficulties in assessing their extinction risks, which are all clearly stated and discussed. Rest of the uncertainties regarding the biology of species' were also referred accordingly.*

*Uncertainties are all clearly assessed and stated. They suggest a strong lack of data for all three species which might be necessary to draw concrete conclusions. However, based on all available current information, the three angel shark species seem to be at high risk of extinction throughout their entire range.*

**General Comments Regarding the Report**

*Overall, your report is an excellent and erudite synopsis of the current and historical status of the three *Squatina* species*

*It is perfectly written and well documented.*

**Editorial Comments**

**Throughout document, reviewers made minor editorial changes (to sentence structure, word choice, etc.) and also included additional citations for some of the information presented in the document.**

**The substantial reviewer edits/comments are shown in italics below.**

### **Taxonomy and Distinctive Characteristics (page 6)**

*Unlike the title, this section does not include taxonomical information at all - which I believe is needed to be mentioned, even by a few lines. Species identification of angel sharks is mainly based on the examination of external characters (such as the dorsal denticles, shape of nasal barbels, various metric proportions of the body, color, etc.), but angel shark taxonomy is often considered to be complex since several species are morphologically similar with overlapping characters (Vaz and Carvalho, 2013). Only 12 *Squatina* species was known three decades ago (see Compagno, 1984), which have currently raised to 23 (Froese and Pauly, 2014). Recent research have shown that there are currently undescribed species (see Stelbrink et al., 2010; Vaz and Carvalho, 2013), indicating that taxonomy of the angel sharks is still poorly known. Such data is vital in underlining the urgent need of further research.*

### **Historical Range and Habitat Use (page 8)**

*See Pethon (1979) – *S. squatina* rarely found in southern Scandinavia*

### **Feeding and Diet (page 10)**

*Apart from the literature review of food items found in the stomachs of three angel shark species, information on trophic levels (TL) should also be given. Stergiou and Karpouzi (2002) explains in detail the importance of TL values, while Cortes (1999) has presented discrete TL estimates (together with standardized diet compositions) for *S. aculeata* (=4.2), *S. oculata* and *S. squatina* (=4.0 for each). It is worth to mention that Squatinids have one of the highest trophic levels among sharks, suggesting that overall yield from fisheries should be low and not sustainable at high exploitation levels, as seen for other high trophic level fishes (see Cortes, 1999).*

*Krupskaya Narvaez did her PhD on the Angel Shark *S. squatina*. She made an analysis of stomach content.*

### **Reproduction and Growth (page 11)**

*Filip Osaer did his PhD on this [gestation period]. He suggests a gestation period of 5-6 months.*

*Asociacion Tonina is working on a project with angel sharks in the nursery area (<http://asociaciontonina.com/portfolio/estudio-poblacional-del-angelote/>) and we have also identified a nursery ground with the Angel Shark Project: in Lanzarote, Puerto del Carmen.*

### **Distribution and Historical and Current Abundance (page 12)**

*Relevant data was reviewed separately for species' across their global distribution range (Mediterranean vs Atlantic Ocean), which I found to be scientifically robust and appropriate. Regarding the eastern Mediterranean occurrences of angel sharks, I advise mentioning of six more important research (Tortonese, 1956 - Italy; Hureau and Monod, 1973 - north eastern Atlantic and the Mediterranean; Papaconstantinou, 1988 - Greek seas; Golani, 2005 - Israel; Moftah, 2011 - Egypt; Giusto and Ragonese, 2014 - Italy). The recent report of UNEP-MAP (2014) gives information on the biomass of *Squatina* spp. in the Adriatic (by a comparison with Hvar surveys), and Ragonese et al. (2013) underlines the status of angel shark species' occurring*

at the central Mediterranean (from 1994 to 2009 and between a depth of 10 and 800 m), both of which should be cited in the status review report.

S. squatina (Northeastern Atlantic – page 19)

Heike Zidowitz even suggests that they might have never been there [North Sea and Baltic Sea]. She looks at museum specimens of all elasmobranchs that occur in Germany.

S. squatina Mediterranean Sea (page 22)

Also evidence of presence in Antalya Bay (Turkey), specimens caught in commercial trawl vessels in April and July 2013 Bulguroglu et al. 2014

S. squatina Eastern Atlantic (page 23)

Information presented on sightings of *S. squatina* in Canary Islands is not up to date anymore. Instead, mention data presented at EEA 2014 (suggested text: Since the launch of the Poseidon portal in April 2014, there have been more than 200 validated records, covering areas with no previous records such as El Hierro and La Palma (Meyers et al. 2014)).

**Present or Threatened Destruction, Modification, or Curtailment of Habitat or Range (page 25)**

There has been a recent report of *S. oculata* in Turkey. This info comes from Sophie Benbow (Fauna and Flora International).

**Overutilization for Commercial, Recreational, Scientific, or Educational Purposes (page 27)**

[*S. oculata* & *S. aculeata*] Very rare, but still present in Turkey

I think that recreational angling, in addition to commercial trammel net fishing for Crawfish and Spider Crab, had a lot to do with the demise of *Squatina* (and other elasmobranchs e.g. undulate ray in Tralee Bay and elsewhere in Ireland. You can view dozens to similar disturbing photos taken during angling competitions in the mid-1960s on [www.kennellyarchives.com/](http://www.kennellyarchives.com/). Although the recapture rate of Irish rod-caught tagged specimens has been relatively high (18%), there is no definitive data on the impact of recreational angling on the overall survival rate of rod-caught catch & release specimens. However, in general, research has shown that the survival rate of discarded commercially caught elasmobranchs can be relatively high provided the specimens are handled with care (Enever et al. 2009, 2010; Mandelman et al. 2013). It is thought that the introduction of trammel nets for the commercial exploitation of Crawfish (*Palinurus elephas*) [Quigley & MacGabhann 2014] and Spider Crab (*Maja brachydactyla*) [Fahy & Carroll 2009] in Tralee Bay may also have had a significant negative impact on the local population of *S. squatina*.

**Disease or Predation (page 42)**

A recent paper of Bulguroglu et al. 2014 on the finding of a marine leech on *S. squatina* should be referred.

**Inadequacy of Existing Regulatory Mechanisms (page 42)**

*S. squatina* is not included in the list of endangered species in the Canaries. Therefore there is no protection for it or reinforcement of any kind.

*Asociacion Tonina has received funding to investigate Las Teresitas nursery habitat in order to implement proper management measures. Las Teresitas is the most popular beach right next to the capital in Tenerife.*

**Other Natural or Manmade Factors (page 48)**

*There is strong concern that diver disturbance might negatively affect *S. squatina* population in the Canary Islands. Divers in Lanzarote note that the female angel sharks are not going to their usual areas to give birth or reproduce. Instead, they are moving to more remote coastal areas, where no divers go. A collaborator from a diving center just reported that he went to a remote beach and suddenly found 4 females, 2 of them giving birth this week. Unfortunately divers disturb sharks a lot while they are buried. They lift their tail and follow them to get good pictures or film the sharks.*

**Extinction Risk Analysis – *S. squatina* Threats Assessment (page 55)**

*[Include as threats] And also artisanal fisherman that fish angelsharks illegally for personal consumption. Angelsharks do not profit from any protection in the Canary Islands.*

**Extinction Risk Analysis – *S. squatina* Risk of Extinction (page 55)**

*There is not 100% evidence that the Canary Island population is confined to its geographic area.*

**Conservation Efforts (page 56)**

*Are there no conservation efforts for the other two angel shark species? In the Canary Islands, there are two more initiatives that are worth to mention: (1) Asociación Tonina (<http://asociaciontonina.com/portfolio/estudio-poblacional-del-angelote/>). They are investigating the habitat use and population structure of juvenile angel sharks at Las Teresitas beach, a city beach off Santa Cruz de Tenerife. They will also be involved in the tagging study of the Angel Shark Project. In addition, (2) Alianza Tiburones Canarias is another NGO with a strong educational and awareness raising campaign in the Archipelago.*