



## Threatened brill species in marine waters of Turkey: *Scophthalmus rhombus* (Linnaeus, 1758) (Scophthalmidae)

Cemal Turan<sup>1\*</sup>, Deniz Yağlıoğlu<sup>2</sup>, Deniz Ergüden<sup>1</sup>, Mevlüt Gürlek<sup>1</sup>,  
Ali Uyan<sup>1</sup>, Serpil Karan<sup>1</sup>, Servet Dođdu<sup>1</sup>

<sup>1</sup>Molecular Ecology and Fisheries Genetics Laboratory, Marine Science Department, Faculty of Marine Science and Technology, Iskenderun Technical University, 31220 Iskenderun, Hatay, Turkey

<sup>2</sup>Department of Biology, Faculty of Arts and Science, Duzce University, Duzce, Turkey

### Abstract

*Scophthalmus rhombus* is rarely occurred and restricted to marine and estuarine sites in the eastern Marmara Sea and western Black Sea coast of Turkey. *S. rhombus* is occasionally caught in low numbers and continuously decreased in abundance due to overfishing and habitat degradations. This species should be considered to be threatened for Turkish marine waters. This species might also be recorded in the IUCN Red List of Threatened Species as Near Threatened (NT).

### Keywords:

*Scophthalmus rhombus*, Threatened species, Marmara Sea, Western Black Sea, Turkey.

### Article history:

Received 19 January 2016, Accepted 01 February 2016, Available online 02 February 2016

### Introduction

Brill *Scophthalmus rhombus* (Linnaeus, 1758) is a flatfish species belong to the family of Scophthalmidae. There are two more species of the genus *Scophthalmus* as *Scophthalmus maximus* and *Scophthalmus maeticus* for European fisheries and aquaculture. These three species are closely related congeneric species (Pardo *et al.*, 2005; Azevedo *et al.*, 2008; Turan, 2007) which show a similar distributional range (Blanquer *et al.*, 1992; Pardo *et al.*, 2001). *S. rhombus* is a commercial species and distributed on the parts of the Mediterranean Sea and Black Sea to the northeast Atlantic. To date, little is known about the biology of *S. rhombus* and there have been scarce published literature such as length-weight (Dulcic and Glamuzina, 2006), age (Robert and Vianet, 1988; Arneri *et al.*, 2001) and reproductive biology (Caputo *et al.*, 2001) data conducted from the Atlantic and to Adriatic.

\* Corresponding Author: Cemal Turan, e-mail: turancemal@yahoo.com

In the past literatures, *S. rhombus* was occurred mainly in marine and estuarine sites in the Turkish part of Black Sea, Marmara Sea and Aegean Sea (Erazi, 1942; Nielsen, 1986; Akşiray, 1987; Fischer *et al.*, 1987; Torcu and Aka, 2000; Fricke *et al.*, 2007). Up to date, little is known about the biology of *S. rhombus* in the Sea of Marmara and Black Sea coast of Turkey (Samsun *et al.*, 2001). According to the field studies (TÜBİTAK 112O920) and personal communications with fishermen and scientists, *S. rhombus* populations were severely declined and rarely found in the Black Sea and Marmara Sea. The primary threats are overfishing, habitat degradation and pollution. The species is now occasionally caught in low numbers and continuously decreasing in abundance. This species should be considered to be threatened in the Black Sea and Marmara Sea in Turkey. Moreover, this species might be recorded in the IUCN Red List of Threatened Species as Near Threatened (NT).

### ***Common names***

Brill (English), Çivisiz Kalkan (Turkish)

### ***Conservation status***

Least concern (Golani *et al.*, 2011), *S. rhombus* should be considered to be threatened for the Turkish Black Sea Coast and Marmara Sea.

### ***Identification***

*Scophthalmus rhombus* have slender bodies, skin with small, smooth scales, without bony tubercle, brown covered with lighter and darker coloured flecks, excluding the tailfin; the underside of the fish is usually cream coloured or pinkish white (Figure 1). Like other flatfish the brill has the ability to match its colour to the surroundings (Muus and Nielsen, 1999). Part of the dorsal fin of the fish is not connected to the fin membrane, which gives the fish a frilly appearance. Dorsal fin is 72-85, Pectoral fin is 11-12, Anal fin is 53-65, Pelvic fin is 6 (Slastenenko, 1956; Nielsen, 1986). *S. rhombus* is on average between 30 cm and maximum 75 cm in length and up to 8 kg in weight (Muus and Nielsen, 1999).



Figure 1. *Scophthalmus rhombus* collected from the Marmara Sea (photo by Cemal Turan).

### **Distribution**

*S. rhombus* occurs in the east and central Atlantic, Adriatic Sea, Mediterranean and Black Sea (Bauchot, 1987). It is also known from Iceland (Jonsson, 1992). In the Mediterranean Sea, it is reported in the Gulf of Lion (Arneri *et al.*, 2001; Pranovi *et al.*, 2001; Dulcic and Glamuzina 2006; Letourneur *et al.*, 2001; Dumay *et al.*, 2004). In the Turkish coast, *S. rhombus* is occasionally found in the west Black Sea and Marmara Sea. *S. rhombus* were reported from the east Levant basin (Egypt, Israel, Lebanon, Syria and Mediterranean Sea coast of Turkey) by Golani (1996) that are possibly erroneous.

### **Abundance**

Although no precise data on population trends are available in literatures, with the field studies for turbot species (TÜBİTAK 112O920) based on about three years observation and personal communications with fishermen and scientists this species is locally rare occurred mainly in marine and estuarine sites in the Turkish western part of Black Sea and Marmara Sea. The species is occasionally caught in low numbers on Gölcük coast in the Marmara Sea and Akçakoca in the west part of the Black Sea.

### **Habitat and ecology**

*S. rhombus* has a demersal lifestyle living on sandy and muddy bottoms, ranging in depth from 5 to 50 m in shallow water (Muus and Dahlstrøm, 1989; Riede, 2004; Franco *et al.*, 2006). It is also found in lagoons. It is carnivorous with a rather narrow prey-spectrum; juveniles feed on molluscs and crustaceans, and adults mainly on other bottom-living fish (such as sandeels and gobies) and cephalopods, and to a lesser extent on crustaceans and bivalves (Holmes and Gibson, 1983; Besyst *et al.*, 1999; Froese and Pauly, 2015).

### **Reproduction**

Movement on the nursery grounds seems to be associated with tidal cycles and foraging activity. An increase in the offshore migration distance is observed in adults of *S. rhombus*, likely associated with spawning behaviour. Spawning is sequential, every 2 to 4 days, and the spawning season occurs between April and June in the Mediterranean region and between May and August in the Atlantic region. Females reach maturity at 3 years of age and males at 2 years (at a length of about 46 cm and 30 cm, respectively). Maximum reported age is 6 years (Robert and Vianet, 1988). Each spawning season more than 5 million eggs are produced. The eggs are pelagic and demersal in the Atlantic, Mediterranean and Black Sea (Muus and Nielsen, 1999).

### **Threats**

*S. rhombus* is a commercial species and caught with beach seines, trammel nets, longlines and trawls in Turkish coasts. Serious shifts have occurred in the Black Sea ecosystem in the last 25 years (Turan *et al.*, 2010). The ecosystem was also affected by bottom trawling, which destroys the seabed communities and affects the links between the benthic and pelagic components of the system. Therefore, over-fishing pressure, pollution and excessive harvesting of brill populations in these regions result in further declines in the occurrence of brill. Thus, monitoring studies and conservation policies must be developed and restorations of the habitats of this species must be achieved immediately.

### **Conservation action**

No current conservation action has been implemented (IUCN, 2015).

### **Conservation recommendations**

More information on biology and ecology of *S. rhombus* is required. Moreover, a detailed knowledge on current population status is needed, and conservation measures for the protection of the local population are strongly suggested. Genetic analysis should also be conducted to determine its genetic structure as defined for other marine species (Turan, 2006; Turan, 2008). This species should be protected along the Turkish Black Sea and Marmara Sea. In addition, this species might be recorded in the IUCN Red List of Threatened Species as Near Threatened (NT).

### **Acknowledgments**

Thanks to the Scientific & Technological Research Council of Turkey (TUBITAK-112O920) for financial support.

### **References**

- Akşıray, F. 1987. Türkiye Deniz Balıkları ve Tayin Anahtarı. II. Baskı, İ.Ü. Rektörlüğü Yayınları, İstanbul, 811 p. [in Turkish].
- Arneri, E., Colella S., Giannetti, G. 2001. Age determination and growth of turbot and brill in the Adriatic Sea: reversal of the seasonal pattern of otolith zone formation. *Journal of Applied Ichthyology* 17 (6): 256-261.
- Azevedo, M.F.C., Oliveira, C., Pardo, B.G., Martinez, P., Foresti, F. 2008. Phylogenetic analysis of the order Pleuronectiformes (Teleostei) based on sequences of 12S and 16S mitochondrial genes. *Genetics and Molecular Biology* 31: 284-292.
- Bauchot, M.L. 1987. Poissonsosseux. 891-1421. In: W. Fischer, M.L. Bauchot and M. Schneider (Eds.). Fiches FAO d'identification pour les besoins de la pêche. (rev. 1). Méditerranéetmer Noire. Zone de pêche 37. Vol. II. Commission des Communautés Européennes and FAO, Rome.
- Besyst, B., Cattrijsse A., Mees, J. 1999. Feeding ecology of juvenile flatfishes of the surf zone of a sandy beach. *Journal of Fish Biology* 55: 1171-1186.
- Blanquer A., Alayse, J.P., Berrada-Rkhami, O., Berrebi, R. 1992. Allozyme variation in turbot (*Psetta maxima*) and brill (*Scophthalmus rhombus*) (Osteichthyes, Pleuronectiformes, Scophthalmidae) throughout their range in Europe. *Journal of Fish Biology* 41: 725-736.
- Caputo, V., Candi G., Colella, S., Arneri, E. 2001. Reproductive biology of turbot (*Psetta maxima*) and brill (*Scophthalmus rhombus*) (Teleostei, Pleuronectiformes) in the Adriatic Sea. *Italian Journal of Zoology* 68: 107-113.
- Dulčić, J., Glamuzina, B. 2006. Length–weight relationships for selected fish species from three eastern Adriatic estuarine systems (Croatia). *Journal of Applied Ichthyology* 22(4): 254-256.
- Dumay, O, Tari, P.S., Tomasini, J.A., Mouillot, D. 2004. Functional groups of lagoon fish species in Languedoc Roussillon, southern France. *Journal of Fish Biology* 64: 970-983.
- Erazi, R.A.R. 1942. Marine fishes found in the Sea of Marmara and in the Bosphorus. *Revue de la Faculte des Sciences de L'universite D'Istanbul* 7(1/2): 103-114.

- Fischer, W., Bauchot, M.L., Schneider, M. 1987. Fiches FAO d'identification des espèces pour les besoins de la pêche. Méditerranée et mer Noire. FAO and EEC, Rome. *Zone de pêche* 37: 761-153.
- Franco, A., Franzoi, P., Malavasi, S., Riccato, F., Torricelli, P., Mainardi, D. 2006. Use of shallow water habitats by fish assemblages in a Mediterranean coastal lagoon. *Estuarine Coastal and Shelf Science* 66: 67-83.
- Froese, R., Pauly, D. (Eds) 2015. Fishbase, World Wide Web Electronic Publication, Available at: <http://www.fishbase.org>, version (01/2015).
- Fricke, R., Bilecenoglu, M., Sari, H.M. 2007. Annotated checklist of fish and lamprey species (Gnathostomata and Petromyzontomorpha) of Turkey, including a Red List of threatened and declining species. *Stuttgarter Beiträge zur Naturkunde Serie A (Biologie)* 706: 1-169.
- Golani, D. 1996. The marine ichthyofauna of the eastern Levant-history, inventory and characterization. *Israel Journal of Zoology* 42: 15-55.
- Golani, D., Kada, O., Nouar, A., Quignard, J.P., Cuttelod, A. 2011. *Scophthalmus rhombus*. The IUCN Red List of Threatened Species. [cited 2015 June 22]. Available at: <http://www.iucnredlist.org>, version (01/2015).
- Holmes, R.A., Gibson, R.N. 1983. A comparison of predatory behaviour in flatfishes. *Animal Behavior* 31: 1244-1255.
- IUCN, 2015. IUCN Red List of Threatened Species. Available at: <http://www.iucn.org>, version (4/2015).
- Jonsson, G. 1992. *Islenskirkfiskar. Fiolvi*, Reykjavik, 568 p.
- Letourneur, Y., Darnaude, A., Salen-Picard, C., Harmelin-Vivien, M. 2001. Spatial and temporal variations of fish assemblages in a shallow Mediterranean soft bottom area (Gulf of Fos, France). *Oceanologica Acta* 24: 273-285.
- Muus, B.J., Dahlstrøm, P. 1989. *Havfiskog Fiskerii Nordvest Europa*. GEC Gads Forlag, København, 244 p. [in Danish].
- Muus, B.J., Nielsen, J.G. 1999. *Sea Fish. Scandinavian Fishing Year Book*, Hedehusene, Denmark. 340 p.
- Nielsen, J.G. 1986. *Scophthalmidae*. 1287-1293. In: P.J.P. Whitehead, M.L. Bauchot, J.C. Hureau, J. Nielsen and E. Tortonese (Eds.). *Fishes of the North-eastern Atlantic and Mediterranean*, Vol. III, UNESCO, Paris.
- Pardo, B.G., Bouza, C., Castro J., Martínez P., Sánchez, L. 2001. Localization of ribosomal genes in Pleuronectiformes using Ag and CMA3 banding and in situ hybridization. *Heredity* 86: 531-536.
- Pardo, G.B., Casas, L., Fortes, G.G., Bouza, C., Martínez, P., Clark, M.S., Sánchez, L. 2005. New microsatellite markers in turbot (*Scophthalmus maximus*) derived from an enriched genomic library and sequence databases. *Molecular Ecology Notes* 5: 62-64.
- Pranovi, F., Raicevich, S., Franceschini, G., Torricelli, P., Giovanardi, O. 2001. Discard analysis and damage to non-target species in the "rapido" trawl fishery. *Marine Biology* 139 (5): 863-875.
- Riede, K. 2004. *Global Register of Migratory Species - from Global to Regional Scales*. Final Report of the R&D-Projekt 808 05 081. Federal Agency for Nature Conservation, Bonn, Germany. 329 p.
- Robert, F., Vianet, R. 1988. Age and growth of *Psetta maxima* (Linné, 1758) and *Scophthalmus rhombus* (Linné, 1758) in the Gulf of Lion (Mediterranean). *Journal of Applied Ichthyology* 4(3): 111-120.
- Samsun, N., Kalaycı, F., Samsun, S. 2001. The determination of biologic and morphologic characteristics of turbot (*Scophthalmus maeoticus* Palas, 1811) caught in the Sinop Region. *National Water Days* 2005(1): 58-64.

- Slastenenko, E., 1956. Karadeniz Havzası Balıkları. E.B.K. İstanbul, 711 p. [in Turkish].
- Torcu, H., Aka, Z. 2000. A study on the fishes of Edremit Bay (Aegean Sea). *Turkish Journal of Zoology* 24: 45-61.
- Turan, C. 2006. Phylogenetic relationships of Mediterranean Mullidae species (Perciformes) inferred from genetic and morphologic data. *Scientia Marina* 70 (2): 311-318.
- Turan, C. 2007. Atlas and Systematic of Marine Bony Fishes of Turkey. Nobel Publishing House, Adana, 549 p.
- Turan, C. 2008. Molecular Systematic Analyses of Mediterranean Skates (Rajiformes). *Turkish Journal of Zoology* 32: 437-442.
- Turan, C., Boero, F., Boltachev, A., Duzgunes, E., Ilyin, Y.P., Kideys, A., Micu, D., Milliman, C.D., Minciheva, G., Moschella, P., Oguz, T., Ozturk, B., Pörtner, H.O., Shiganova, T., Shivarov, A., Yakushev, E., Briand, F. 2010. Executive Summary of Climate Forcing and its Impacts on the Black Sea Marine Biota. No: 39. CIESM Workshop Monographs, Monaco.