



CHAPTER 2.1.8.4: ROUNDSCALE SPEARFISH	AUTHORS: J. HOOLIHAN	LAST UPDATE: Jan. 14, 2013
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2.1.8.4 Description of Roundscale Spearfish (RSP)

1. Names

1.a Classification and taxonomy

Species name: *Tetrapturus georgii* (Lowe, 1841)

Synonyms in use: none

ICCAT species code: RSP

ICCAT names: Roundscale spearfish (English), Makaire épée (French), Marlin peto (Spanish)

Nakamura (1985b) classified roundscale spearfish as follows:

- Phylum: Chordata
- Subphylum: Vertebrata
- Superclass: Gnathostomata
- Class: Osteichthyes
- Subclass: Actinopterygii
- Order: Perciformes
- Suborder: Xiphoidei
- Family: Istiophoridae

1.b Common names

List of vernacular names in use according to ICCAT and Fishbase (www.fishbase.org). List is not exhaustive and may exclude some variants of local names.

China: 园鳞四鳍旗鱼 (Yuán Lín sì chì chí-yu)

Denmark: Rundskællet spydfisk

France: Makaire épée

Greece: Ξιφομαρλίνος, Xiformarlinos

Italy: Marlin atlantico

Portugal: Espadim-peto

Spain: Marlin peto

Sweden: Rundfjällig Spjutfisk

United Kingdom: Roundscale spearfish

United States of America: Roundscale spearfish

2. Identification

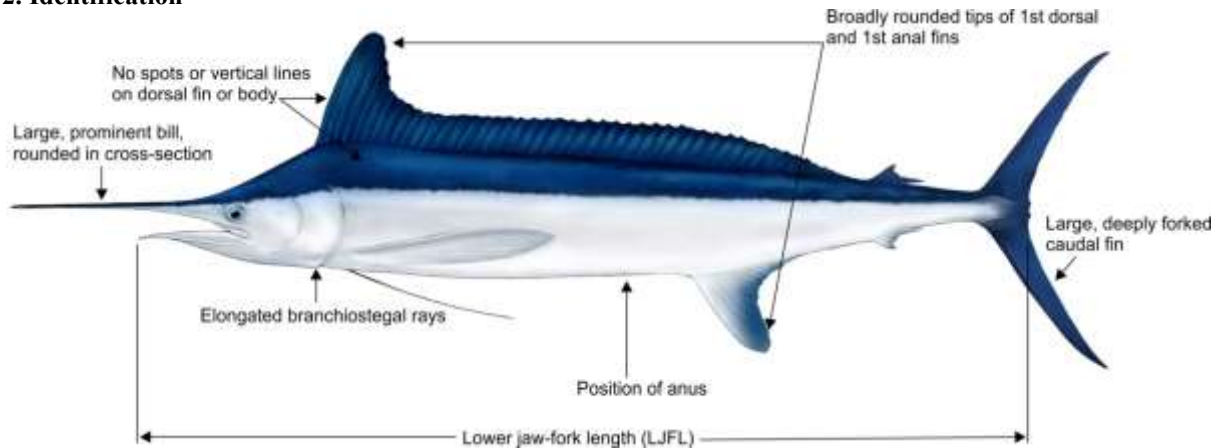


Figure 1. Drawing of adult roundscale spearfish by Les Gallagher (Les Gallagher: fishpics), with annotated prominent features.

Characteristics of Tetrapturus georgii (see Figure 1)

The roundscale spearfish is a small sized istiophorid. Maximum size reported by Nakamura (1985a) was 160 cm LJFL for males and 157 cm LJFL for females, while maximum body weight was 21.5 kg and 23.5 kg for males and females, respectively. Historically, little was known of the roundscale spearfish, other than a few specimens reported from the eastern North Atlantic and Mediterranean (Robins, 1972). In recent years, validation of this species using genetic analyses (Shivji *et al.*, 2006), along with more astute observation of morphological characteristics (Shivji *et al.*, 2006) has revealed that the distribution of roundscale spearfish is widespread, often mixing with the morphologically similar white marlin.

No information on age and growth, or tagging is available for roundscale spearfish.

External

- First dorsal fin rays, 43-48; second dorsal fin rays, 6-7; first anal fin rays, 14-16; ; second anal fin rays, 5-7; pectoral fin rays, 19-20; pelvic fin rays, 2; branchiostegals, 7; vertebrae, 12 precaudal, 12 caudal: gill rakers, 0; adult jaws and palatine exhibit small, file-shaped teeth.
- Body elongated and compressed.
- Head profile (nape) between preorbital region and origin of first dorsal fin moderately humped.
- Upper jaw prolonged into long stout spear (bill), rounded in cross-section.
- Branchiostegal rays extended, almost reaching posterior edge of operculum.
- Long first dorsal fin, with height of anterior lobe slightly greater than body depth, then decreasing moderately posteriorly.
- Tips of first dorsal and first anal fins broadly rounded.
- Pelvic fins nearly equal in length to pectoral fins.
- Caudal fin large and deeply forked.
- Caudal peduncle with double keels on each side, with a caudal notch on the dorsal and ventral surface.
- Single lateral line visible.
- Anal opening situated moderately anterior from origin of first anal fin, generally a distance of about 50-70% of height of longest anal fin ray.
- Mid-lateral scales rounded anteriorly with usually 2-3 posterior points (**Figure 2**).
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Figure 2. Examples of roundscale spearfish mid-lateral scales.

Colour:

- Dark blue dorsally, brownish-silvery-white laterally, and silvery-white ventrally. No vertical barring.
- First dorsal fin membrane bluish-black, with no spots. Remaining fins are brown to bluish-black.

Internal

- Asymmetrical gonads.
- Swimming bladder present, consisting of many small bubble-shaped chambers.

External characteristics of roundscale spearfish larvae

- There is no available information on roundscale spearfish larvae.

Misidentification

Gross morphology of roundscale is very similar to the white marlin, often resulting in mis-identification (Arocha and Beerkircher, 2012; Shivji *et al.*, 2006). Definitive identification is available using genetic tools (Shivji *et al.*, 2006). However, close observation helps to distinguish between subtle morphological differences, which include:

- Position of roundscale spearfish anus is further anterior from origin of first anal fin, compared to white marlin.
- Compared to white marlin, roundscale spearfish mid-lateral scales are rounder on the anterior edge, generally softer, and have more posterior points (2-3 vs.1-2).
- Roundscale spearfish branchiostegal rays (**Figure 3**) extend further posterior, compared to white marlin (Beerkircher and Serafy, 2011).



Figure 3. Comparative lengths of branchiostegal rays (black arrows) in white marlin (upper) and roundscale spearfish (lower) relative to posterior edge of operculum (red arrows, *photo courtesy of Meredith Jones*).

3. Biology and population studies

3.a Habitat preferences

Robins (1972) reported landings of roundscale spearfish from Portugal, Spain, and Sicily. More recently, catch records verified by genetic analyses show the geographical range for roundscale spearfish extends from at least 37°24'N in the western North Atlantic to 28°52'S in the western South Atlantic (Bernard *et al.*, 2013). Like its counterparts (*Tetrapturus* spp), roundscale spearfish are probably an epipelagic and oceanic species, found in offshore water over 100 m deep, usually above the thermocline.

Temperature preferences for roundscale spearfish have been derived from sea surface temperatures recorded by scientific observers on board longline vessels. This species seem to associate with the epipelagic zone in water temperatures ranging from 24-29°C. In general, the thermal preference for this species appears to be the warmest waters available in the open ocean, similar to other istiophorids.

Depth distribution seems to be similar to that of white marlin, a similar species, found within the first 25 m. However, information derived from scientific observers at sea seem to indicate that catches of roundscale spearfish overlaps with longbill spearfish, and are common when the target is yellow fin tuna when sets are between 40-60 m in the Caribbean Basin and the Atlantic area between 12°N and 18°N.

Dissolved oxygen requirements for billfishes are poorly understood, partly due to the difficulty in maintaining these animals in a laboratory environment. However, habitat utilization, based on electronic tagging data (Prince and Goodyear, 2006; Prince *et al.*, 2010), suggests that billfishes are limited by a minimal dissolved oxygen concentration requirement of around 3.5 mL L⁻¹, similar to the high demand oxygen requirements and associated metabolic rates exhibited by tropical tunas (Brill, 1996). Studies indicate that billfishes located in the eastern tropical Atlantic oxygen minimum zone (Prince *et al.*, 2010) are restricted to a narrow surface layer of adequate oxygen. This, in turn, increases their susceptibility to capture in surface fishing gears.

3.b Growth

Roundscale spearfish age determination and growth studies have not been undertaken. No growth model is available for the species. However, the largest size recorded from the Venezuelan longline tuna fishery was 200 cm LJFL.

3.c Length-Weight relationship

There are no available length-weight relationships for roundscale spearfish.

3.d Maturity

There is no information regarding the size or weight at which sexual maturity is reached. However, in an ongoing research study that examined around 50 females roundscale spearfish from the western central Atlantic, indicated that females of 155 cm LJFL and beyond displayed high gonad index values and ripe gonads with hydrated oocytes (Arocha *unpublished data*).

3.e Sex ratio

In an ongoing research study conducted on western central Atlantic spearfishes (5°N - 25°N), sex ratio at size of roundscale spearfish (n=263) seem to indicate a seasonal pattern between trimesters, but due to low sample size, patterns were not clearly differentiated (Arocha *unpublished data*). However, preliminary results indicated that the proportion of females was around 35-80% for sizes between 165 and 185 cm LJFL in the second and fourth trimesters. During the third trimester, the proportion of females drops monotonically from 50% to near 0%, for sizes 160 cm to >190 cm LJFL. Indicating that in the aforementioned trimester, sex ratio favours males for size classes >170 cm LJFL. However, the sex ratio issue has not been formally addressed in ICCAT's Billfish Workshops.

3.f Reproduction and first life stages

Similar to other istiophorids, roundscale spearfish do not show apparent sexual dimorphism in color pattern or external morphological characters.

Spawning

Roundscale spearfish are batch spawners, shedding batches of hydrated oocytes, in separate spawning events (de Sylva and Breder 1997), most likely directly into the sea where fertilization occurs.

Based on the microscopic assessment of gonads, concentrations of spawning females have been recorded within the Venezuelan Basin, Caribbean Sea (Arocha *unpublished data*).

In the western central Atlantic, spawning occurs from June to November; with peak spawning events occurring from August to September (Arocha *unpublished data*).

Eggs and larvae

Estimated batch fecundity for female fish between 161 and 180 cm LJFL was estimated in 135,000-500,000 of fully hydrated oocytes per female (Arocha *unpublished data*). Eggs are pelagic, spherical and transparent; whole hydrated oocytes are on average 1.684 mm (1.370-1.978 mm, $n=60$) in diameter and contain an oil globule measuring on average 0.340 mm (0.268-0.417 mm, $n=15$) in diameter (Arocha *unpublished data*).

Recruitment

Knowledge of the early life stages in billfishes is very scarce. It is assumed that larval period is short due to fast growth during this period (Prince *et al.* 1991; Luthy 2004).

Young (immature) roundscale spearfish first appears in the catches when they are around 120 cm LJFL. From this time on, it is easier to track their migratory movements both by observing the fisheries and by tagging experiments.

3.g Migrations

Roundscale spearfish may display extensive movements in the Atlantic because is found in the eastern Atlantic, Mediterranean Sea and the western central Atlantic, but no tagging experiments have been recorded. Therefore, little is known about this species movement patterns.

3.h Diet

Feeding habits of roundscale spearfish have not been reported in the scientific literature. However, like all apex predators, they most likely feed opportunistically on schooling fish and squids.

3.i Physiology

Billfishes, like tunas, have anatomical and physiological adaptations for continuous swimming, and cranial endothermy (brain and eyes) which facilitate foraging at different depths. roundscale spearfish, like the other billfishes, feature a thermogenic organ situated beneath the brain and close to the eyes that generates and maintains elevated temperatures in the cranial region (Block 1986). This thermogenic organ or 'brain heater' facilitates the deep diving behaviour in marlins by permitting ocular and physical functions at low temperatures.

3.j Behaviour

Roundscale spearfish, like all marlins, are not schooling fish. They are considered rare and solitary species.

3.k Natural mortality

No reliable estimates of natural mortality rates are available. Tagging data are insufficient for that effort. Estimating M from growth parameters is limited because they have not been estimated. Natural mortality based on the estimated longevity would range from 0.15 to 0.30. However, based upon body size, behaviour, and physiology, estimates of adult fish would likely be fairly low (ANON. 1994, 1998).

3.l Conversion factors

There are no conversion factors available for roundscale spearfish.

4. Distribution and exploitation

4.a Geographical distribution

Roundscale spearfish was originally known from Sicily, the Strait of Gibraltar and the waters around the Madeira Islands (Nakamura 1985). However, scientific observers on board pelagic longline vessels fishing in the western central Atlantic have identified roundscale spearfish in the Caribbean Sea and waters of the northwestern Atlantic (Arocha and Silva, 2011; L. Beerkircher, personal communication). Also, genetic analyses have verified roundscale spearfish catches in the southwestern Atlantic (Bernard *et al.*, 2013). The known range, based on the aforementioned observations is shown in **Figure 4**. This species is likely more widely distributed in the Atlantic, but due to the similarities with white marlin it could have been misidentified in commercial catches since most field guides do not include a description of the roundscale spearfish (Shivji *et al.* 2005).

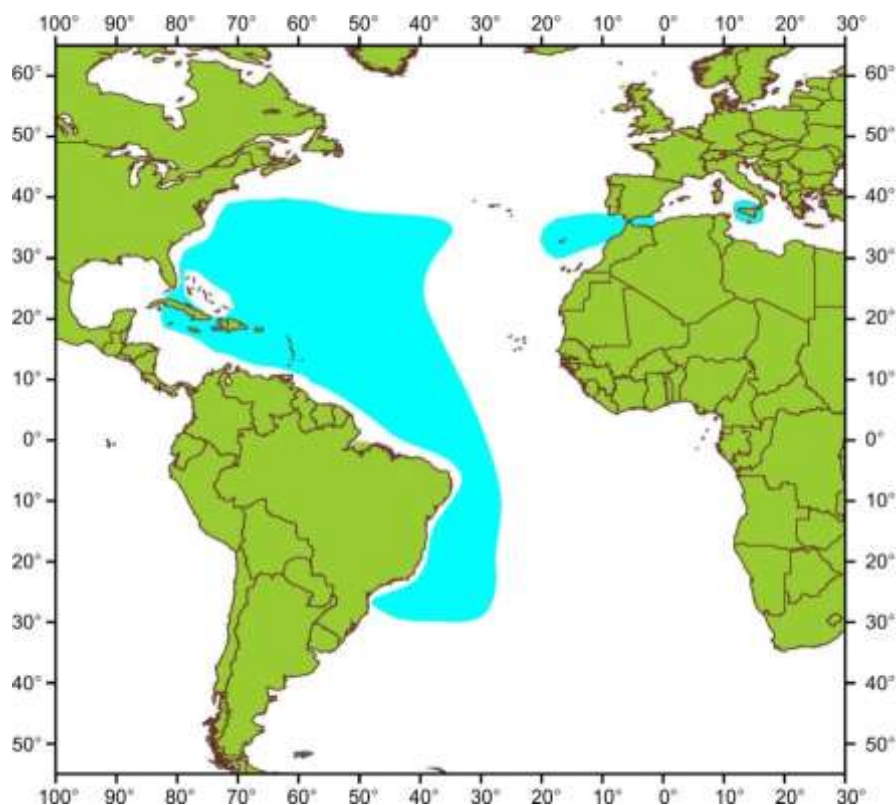


Figure 4. Presently known geographical distribution of roundscale spearfish based on verified observations.

4.b Populations/Stock structure

Landings of roundscale spearfish have been traditionally combined by ICCAT with those of Atlantic sailfish, Mediterranean spearfish, and the longbill spearfish. Therefore, the species group sailfish+spearfish have been considered by ICCAT as a separate east and west stock for management purposes. However, in the sailfish assessment of 2001 (Anon. 2002) a procedure was developed to separate sailfish catch from that of spearfish, but without differentiating between the spearfish species caught by the fleets.

4.c Description of fisheries: Catches and effort

In recent years scientific observers in the western central Atlantic longline fisheries began to disaggregate roundscale spearfish from other spearfish catches by. However, due to the difficulties in separating roundscale spearfish from white marlin or longbill spearfish without detailed identification, no quantitative catch data is available.

4.d Catch-at-size There are no estimates of catch-at-age nor catch-at-size for roundscale spearfish.

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