



Report of the butterfly kingfish, *Gasterochisma melampus* (Scombridae: Gasterochismatinae) in southeastern Brazil

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Abstract. The present study reports the occurrence of the butterfly kingfish, *Gasterochisma melampus*, off the southeastern Brazilian coast, based on a female measuring 141.3 cm total length, and 27.0 kg. The unusual occurrence of this fish in Brazilian waters may be explained by the intrusion of cold southern Atlantic waters during the winter.

Keywords: Oceanic fish, tuna-like species, gill net, southwestern Atlantic

Resumo. Registro do atum-borboleta, *Gasterochisma melampus* (Scombridae: Gasterochismatinae) no sudeste do Brasil: O presente estudo relata a ocorrência do atum-borboleta, *Gasterochisma melampus*, na costa sudeste do Brasil, baseado em uma fêmea com 141,3 centímetros de comprimento total e 27,0 kg. A ocorrência incomum da espécie em águas brasileiras pode ser explicada pela intrusão de águas frias do Atlântico sul durante o inverno.

Palavras chave: Peixe oceânico, Atuns e afins, Rede de emalhe, Atlântico sudoeste

Introduction

One of the two subfamilies of Scombridae is Gasterochismatinae, which contains the only one species the Southern Ocean butterfly kingfish, *Gasterochisma melampus* Richardson, 1845. The species occurs primarily between 35° and 50°S degrees circumglobally. In Brazilian waters, it was previously cited exclusively in the southernmost region (Figueiredo & Menezes 2000, Menezes *et al.* 2003) although no individual has been formally documented. Within the reported range, the species is occasionally taken as by-catch in longline fisheries from the surface to below 200 m (Collette & Nauen 1983, Collette 2003). In general, biological data are scarce, and there are reports as follows: osteology (Kohno 1984), nutritional studies in New Zealand (Vlieg *et al.* 1993), cytochrome b (Finnerty & Block 1995), stomach contents of the specimen in the Eastern Pacific Ocean (Tsuchiya & Sawadaishi 1997) and Hawaiian Archipelago, which included

onychoteuthids, ommastrephid squid, vertebrae and fin rays from an unidentified fish, bird feathers and parasitic nematodes (Ito *et al.* 1994). Jaureguizar & Milessi (2008) characterized the butterfly kingfish as a high-level carnivore and top predator (C3 Trophic Level 4.35). Its status is listed as Least Concern (LC) by the International Union for Conservation of Nature (Collette *et al.* 2011).

The butterfly kingfish is considered more primitive in the evolutionary lineage and quite different from the rest of the scombrids (Kohno 1984). The morphology of this species is different from other scombrids, leading some authors to suggest that it might belong to a different family (Collette 1978). However, Santini *et al.* (2013) provided molecular evidence placing *G. melampus* as a basal scombrid, with its subfamily Gasterochismatinae represented by a single species.

The occurrence of the butterfly kingfish is expected to decrease sharply to the north because

they are characterized as most abundant in waters from 8° to 10°C along the north of the southern polar front or Antarctic divergence (50°S). According Collette & Nauen (1983) surface temperatures range from about 11.5°C in the southern winter to 14.5°C in the southern summer, as observed in the present report in July (during the winter). Occasionally, Japanese fishermen targeting southern Bluefin tuna, *Thunnus maccoyii*, reported *Gasterochisma melampus*, but captures are rare even along the southern Argentine coast, with only three specimens found at 39°S by tuna longliners in 1970 (Cousseau 1970). However, due to a record fork length of 195 cm (Kohno 1984, Juan-Jordá *et al.* 2013), much smaller average size, combined with its relative rarity, the species is not considered of great commercial importance. According to Collette & Nauen (1983), large-sized fish over 110 cm dominate fishing grounds in the western parts of the Atlantic, Pacific and Indian Oceans, while smaller fish are more abundant in eastern fishing grounds.

Considered rather primitive among the Scombridae, this species has traditionally been allocated to the monotypic subfamily Gasterochismatinae. Its distinctive morphology (Kohno 1983) has led some authorities to suggest the possibility of moving it to a different family altogether (Collette 1978). In contrast with other scombrids, its large cycloid scales and the lack of a lateral keel on the caudal peduncle are noteworthy. Also, juveniles of the butterfly kingfish possess uniquely enormous pelvic fins that tuck into a deep ventral groove. Santini *et al.* (2013), however, provided molecular evidence supporting the phylogenetic placement of *G. melampus* as a basal scombrid, but within its own subfamily.

Materials and methods

One female individual was captured in a gill net on July 29th 2012 in the locality in São Sebastião Island, near the small rocky Buzios Island, off the northern coast of São Paulo State (Fig. 1). The gill net measured 200 meters in length, with an 11 cm mesh, and was positioned at 23°49'10"S, 45°8'49"W. The fish (Fig. 2) was stored in ice on board by the fishermen and then forwarded to the authors for analysis in the laboratory. In order to compare our findings with descriptive and analytical data of other studies, 27 measurements of the body were obtained as well as the respective proportions in relation to the total length.

Results

We report here for the first time, a detailed description of one *Gasterochisma melampus* individual taken off in the southeastern Brazilian coast, 1036 km north of the nearest known record at 32°S. Table I summarizes the measurements taken from the exemplar. The fish, measuring 141.3 cm total length and 27.0 kg total weight, was in very good condition and presented the following meristic data: first dorsal fin with 17 spines, second dorsal fin 11 rays, caudal fin with 32 rays, anal fin with 11 rays, pelvic fin with 5 rays, pectoral fin with 19 rays, 6 dorsal finlets, and 6 anal finlets. Gill rakers were composed of a bunch of spinal tubercles, with 9 in the upper raker and 17 in the lower raker. Ovaries were in the maturation stage and measured approximately 20 cm in total length and were 3 cm wide. The specimen was deposited in the Zoological Collection of the Santa Cecilia University as Voucher Number AZUSC4135.

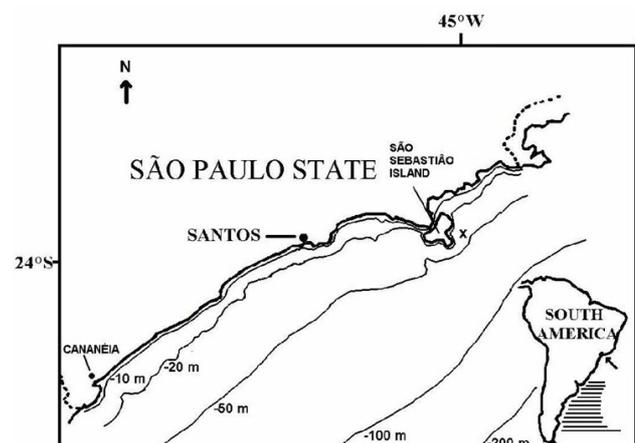


Figure 1 – São Sebastião Island off the São Paulo coast with isobaths. X is the site where the butterfly kingfish was captured. The dashed area show the distribution of *Gasterochisma melampus* in South America.

Discussion

A single butterfly kingfish was captured outside its typical range which comprises circumglobal waters of the Southern Ocean mostly between 35° and 50°S. The unusual occurrence of this species in Brazilian waters during the winter may be explained by the intrusion of cold waters influenced by the branches of the Falklands current in southern Brazil. Butterfly kingfish have also been reported in similar latitudes around 30°S in the Pacific off the coast of Chile (Tsuchiya & Sawadaishi 1997). Our capture site, off the São Paulo State coast, is characterized by a broad continental shelf with marked seasonal variation of water masses during the winter, where the South Atlantic Central Water (SACW) penetrates



Figure 2 – Butterfly kingfish, *Gasterochisma melampus*, from southeastern Brazil. Color scale: 20.0 cm.

extensively producing a remarkable thermocline at 10 to 15 m in a total depth of 50 m (Pires-Vanin *et al.* 1993). This individual probably came to the region following cold currents and for some reason, moved to shallow waters where it was captured.

Table I – Proportional measurements of a 141.3 cm total length *Gasterochisma melampus* (AZUSC4135) expressed as percentages of total length (% TL).

Body Measurements	cm	% TL
Total length	141.3	100
Standard length	115.2	81.53
Fork length	126.7	89.67
Head	32.8	23.21
Greater height	34.7	24.56
Snout	14.1	9.98
Eye diameter	3.3	2.34
Interorbital	11.8	8.35
Nasal diameter	0.4	0.28
Internasal	8.4	5.94
Pre-nasal	7.1	5.02
Pre-maxilar	15.9	11.25
Pre-first dorsal	33.9	23.99
Pre-second dorsal	75.9	53.72
Pre-pectoral	30.6	21.66
Pre-pelvic	30.5	21.59
Pre-anal	81.3	57.54
Greater width oral cavity	10.6	7.50
Epibranchial length	5.1	3.61
Ceratobranchial length	17.3	12.24
Greater width	14.9	10.54
First dorsal length	6.5	4.60
Pectoral length	26.3	18.61
Pelvic length	13.1	9.27
Anal length	9	6.37

While many fishes exhibit seasonal shifts in their geographical distribution, some do not. Examples may be observed in some tropical fish species with large body size, strong swimming ability, and pelagic spawning behavior that are more likely to show successful settlement into temperate habitats (Feary *et al.* 2013). Goatley & Bellwood (2014) periodically found species in the northern Great Barrier Reef that are classically restricted to the central and southern portions of this expansive feature. In the present report, the occurrence so far from its normal distribution is probably primarily due to the cold water mass from the southern ocean that reached the Brazilian coast during the winter (Odebrecht & Castello 2001, Burrage *et al.*, 2008), and does not imply some new adaptation to another habitat or a permanent range extension.

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