

Food of narrow barred Spanish mackerel in north Queensland waters, and their relevance to the commercial troll fishery

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Abstract

The stomach contents of adult and juvenile narrow barred Spanish mackerel (*Scomberomorus* (Lacepède)) from north Queensland waters were examined. Food items identified from commercially caught adult *S. commerson* showed that open water pelagic fish formed 66% of the diet with squid and penaeid prawns contributing 18%.

The major food groups are rarely utilised as bait in the north Queensland troll fishery. They are now seen as appropriate additional, or alternative baits to the hemiramphids (garfishes) traditionally used.

INTRODUCTION

The narrow barred Spanish mackerel (*Scomberomorus commerson* (Lacepède)) is Queensland's major offshore fin fishery. A total of 800 tonnes were landed in 1980-81 (Anon. 1982) with a major proportion produced by the north Queensland commercial fishery. No estimates are available for the landings of amateur fishermen. It is considered that the amateur contribution to the fishery is substantial and would significantly increase the overall landing figures, particularly from southern Queensland where amateur fishing predominates (McPherson 1985).

The north Queensland fishery is based almost entirely on catches made by trolling using mainly garfish (Hemiramphidae) as bait. Commercial fishermen have traditionally used heavy multistrand bowden cable (1.14 mm diameter) or monofilament hand lines while amateur fishermen have tended to use light sportfishing tackle (McPherson 1985). In recent years commercial fishermen have been using rod and reel equipment as an integral part of their fishing operations. The information carried in popular angling magazines over recent years has led to a vast improvement in the trolling techniques of commercial and amateur fishermen, including bait and lure preparation. In addition, drift fishing with live or dead bait during the day or night has become a more widespread practice.

The objective of this study was to identify the prey species eaten by *S. commerson*, to assess the importance of pelagic fish species to the diet of *S. commerson*, and to compare these prey species with traditionally used baits.

MATERIALS AND METHODS

McPherson (1981) indicated that *S. commerson* less than 40 cm LCF (length from snout to caudal fork) are more commonly encountered from shallow inshore north Queensland waters with larger fish being more commonly encountered in Great Barrier Reef waters.

In this study juvenile fish less than 50 cm LCF were collected from inshore commercial trawls and amateur and commercial bait net catches in the Cairns area. Stomachs were preserved in 10% formalin.

Stomach contents of *S. commerson* greater than 50 cm LCF were examined on commercial troll fishing vessels operating in northern Great Barrier Reef waters. Stomachs with readily identifiable contents were examined at sea while those stomachs with uncertain contents were preserved in 10% formalin for later study. Whenever bait fragments or remnants of recently processed fish were present, they were excluded from analysis.

Examination of juvenile and adult *S. commerson* stomach contents from commercial fishing vessels was complicated by the problem of partial digestion of prey items prior to processing which often made prey identification either difficult or impossible. The removal of skin and outer muscle layers within a short period of time by digestive enzymes made identification more reliant on hard structures such as gill rakers, tail scutes, scales, caudal vertebrae and chitinous exoskeletons.

Samples from inshore and reef locations were taken from June to December in 1977 and 1978 and observations of stomach contents from *S. commerson* greater than 50 cm LCF continued until 1980. The restricted time span precluded any study of seasonal abundance or availability of prey items.

RESULTS

Stomach contents of juvenile *S. commerson* (<50 cm LCF)

Most juveniles examined for stomach contents were captured by amateur bait net or inshore otter trawls in depths from 1 to 10 m. Two fish of 42 and 45 cm LCF were captured by commercial handline in reef waters. Of 59 stomachs examined 31 contained prey fish items (Table 1).

Table 1. Food items of juvenile *S. commerson* (LCF < 50 cm)

Size LCF (cm)	No. of stomachs examined	No. of stomachs with food items	Items	No. of individual items	No. of items/family group
0-9.9	12	8	Fish-unidentified	8	8
100-49.9	47	31	Fish-unidentified	14	14
			Clupeidae		
			unidentified	1	11
			<i>Sardinella</i> sp.	10	
			Carangidae		
			unidentified	2	5
			<i>Decapterus</i> sp.	1	
			<i>Megalaspis cordyla</i>	1	
			<i>Selar</i> sp.	1	
			Leiognathidae		
			unidentified	2	3
			<i>Equulities bindus</i>	1	
			Hemiramphidae		
			<i>Hyporhamphus</i> sp.	2	2
			Theraponidae		
			<i>Therapon theraps</i>	1	1
			Pomacentridae		
			unidentified *	1	1
	59	39	Total prey items		45

* From a reef captured fish.

The food items of juveniles in the 0 to 9.9 cm LCF size range were difficult to identify due to problems of partial digestion. The food items of juveniles in the 10 to 49.9 cm LCF size range were pelagic fish families such as Carangidae, Clupeidae, Hemiramphidae and the semi-pelagic Leiognathidae. Most of the identifiable fish were generally present as fragments only, making estimation of prey size difficult.

Juvenile *S. commerson* individuals have been observed by the author feeding on schools of clupeids in very shallow (less than 5 m) inshore waters off Cairns.

Stomach contents of large *S. commerson* (>50 cm LCF)

Regurgitation of stomach contents during fishing operations was commonly observed. This possibly explains why a major proportion (63.9%) of the 1051 stomachs examined of fish from this size range were empty (Table 2). Fish remains were recorded in 32.9% of stomachs with mollusc (cephalopod) and crustacean remains in 3.1% (Table 2).

Table 2. Stomach content groups for *S. commerson* (LCF>50 cm)

Stomach contents	No. of stomachs sampled	Percentage of occurrence
Fish-identified -unidentified	346	32.9
Molluscs	20	1.9
Crustaceans	13	1.2
Empty	672	63.9
Total examined	1051	100

Of the 379 stomachs that contained food items (Table 3) unidentified fish remains were present in 51.5%. Clupeid fish of the genus *Amblygaster* (sardinellas, pilchards) were the most common prey items being found in 20.5% of the stomachs containing food. As the second major prey group, 8.4% of stomachs contained carangids, mainly *Decapterus*, *Selar* and *Megalaspis* spp. Caesionids (*Caesio* spp., i.e. bananafish, fusiliers) formed the third most important prey group occurring in 6.9% of stomachs that contained food.

Squid was the most abundant invertebrate (in 5.3% of stomachs) while penaeid prawns were found in 1.9% of stomachs.

Other prey items of *S. commerson* commonly reported by commercial fishermen or observed by me since sampling ceased in 1980 have included fish such as hairtails (*Trichiuridae*), juvenile Spanish mackerel (*Scombridae*), toadfish (*Tetraodontidae*), and flying fish (*Exocoetidae*). In addition, the species readily feeds on discarded trash fish from prawn trawling activities or the fish remnants discarded by troll fishing vessels during processing of the catch.

DISCUSSION

The northern Great Barrier Reef commercial troll fishery relies extensively on a number of garfish species (*Hemiramphidae*) for bait. Yet this family was represented in less than 1% of the adult stomach samples from this survey. Subsequent involvement by the author with the fishery (1976-1983) has not demonstrated any regular occurrence of this family in *S. commerson* stomach contents other than as bait. It is uncertain whether their low occurrence is due to hemiramphids successfully evading predation by *S. commerson* or if *S. commerson* chooses not to prey on these species.

Table 3. Contents from 379 *S. commerson* (LCF) > 500 mm stomachs that contained food items

Stomach contents	No. of prey items		Occurrence %
	Individual items	Items/family	
Fish			
Unidentified	195	195	51.5
Clupeidae			
unidentified	5	78	20.5
<i>Sardinella</i> sp.	68		
<i>Sardinella sirm</i>	3		
<i>Sprattelloides</i> sp.	2		
Carangidae			
<i>Decapterus</i> sp.	10	32	8.4
<i>Decapterus maraudsi</i>	3		
<i>Decapterus russelli</i>	1		
<i>Selar</i> sp.	10		
<i>Alectis</i> sp.	2		
<i>Megalaspis cordyla</i>	6		
Caesionidae			
<i>Caesio chrysozonus</i>	18	25	6.6
<i>Caesio zanthurus</i>	1		
<i>Caesio cuning</i>	4		
<i>Caesio pisang</i>	2		
Scombridae			
<i>Scomberomorus queenslandicus</i>	1	6	1.6
<i>Grammatocynus bicarinatus</i>	3		
<i>Rastrelliger</i> sp.	2		
Scaridae	2	2	<1.0
Nemipteridae			
<i>Pentapodus setosus</i>	1	2	<1.0
<i>Nemipterus</i> sp.	1		
Exocoetidae	1	1	<1.0
Hemiramphidae	1	1	<1.0
Balistidae	1	1	<1.0
Platacidae			
<i>Platax tiera</i>	1	1	<1.0
Sphyraenidae	1	1	<1.0
Lutjanidae			
<i>Lutjanus</i> sp.	1	1	<1.0
Molluscs (Cephalopod)			
Squid (all families)	20	20	5.3
Crustaceans			
Penaeidae			
<i>Penaeus</i> sp.	6	7	1.9
<i>Penaeus longistylus</i>	1		
Metapenaeidae	3	3	<1.0
Trachypenaeidae	3	3	<1.0
Total food items		379	100.0

Other studies of *Scomberomorus* species that examined the bait fish used in relation to stomach contents showed that at least one of the dominant prey items was used as a major bait item (Prado 1970, Tongyai 1970, for *S. commerson*; Menezes 1969 for *S. cavalla*; and Klima 1959 for *S. maculatus*). The importance of clupeids, carangids, caesionids and squid in the diet of *S. commerson* in northern Queensland waters suggests

that utilising these groups as additional or alternative baits in the commercial fishery may be possible.

In the present study where food items were present, estimation of prey size was not possible as most prey items were identified from fragments. The species appears to feed primarily by biting larger fish (or baits) in half (or pieces) on the first attack, then perhaps snapping up the remains on the second pass. Tongyai (1970) found that 76% of identifiable food items of *S. commerson* in the Gulf of Thailand were present as the posterior half only.

Stomach contents of *S. commerson* adults taken from the commercial northern Great Barrier Reef troll fishery show that the species has a marked preference for open water pelagic fish (Clupeidae, Carangidae and Scombridae) and squid. MacInnes (1950) described the diet of *S. commerson* in Australian east coast waters as small fish, especially flying fish (Exocoetidae), prawns and squid. Other studies of the diet of *S. commerson* in Indo-Pacific waters have confirmed a preference toward pelagic fish and invertebrates. In the northern Gulf of Thailand the pelagic groups of Scombridae, Carangidae, Clupeidae, Lactariidae and squid comprised 76% of food items (Tongyai 1970) while beloniform fish (Hemiramphidae and Exocoetidae) and squid were the dominants in Papua New Guinea (Lewis *et al.* 1974). Clupeidae, Engraulidae, Carangidae, Caesionidae and squid were major prey items in Madagascar reef waters (Prado 1970).

Regurgitation and digestion of prey items contributed to a relatively low occurrence of food items (36.1%) from *S. commerson* stomachs in this study. Only 5% of 5 118 *S. commerson* stomachs examined by Tongyai (1970) in the Gulf of Thailand contained food items.

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