

**FOOD AND FEEDING HABITS OF *POMADASYS KAAKAN*  
(CUVIER, 1830) (FAMILY: HAEMULIDAE) FROM KARACHI  
COAST, PAKISTAN-NORTHERN ARABIAN SEA**

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**ABSTRACT:** This study focused on the feeding habits of *P. kaakan*, collected from Karachi fish harbor during January to December 2022. A total of (N=119) specimens were analyzed for gut content to understand their diet composition and monthly variations. The primary diet components identified were crustaceans, molluscs, fish, and miscellaneous items. The fullness index (FI) and coefficient of variance (CV%) also varied monthly, with the highest (FI) in July (50.0%) and the lowest in April (25.0%), while the (CV%) peaked in April (75.0%) and lowest in July (50.0%). Frequency of occurrence (FO%) of food items were highest in February, August, and September and lowest in March, April, and May. This research is pioneering in its comprehensive analysis of the *P. kaakan* diet composition from the Pakistani coastal waters those providing crucial insights into their feeding ecology. These findings offer valuable data for the effective management and conservation of this commercially important species, highlighting the importance of understanding their dietary habits for fisheries development and ecological sustainability.

**KEYWORDS:** Haemulidae, *P. kaakan*, feeding habits, diet composition, Karachi coast

### **INTRODUCTION**

Haemulidae is a family of fishes in the order Perciformes known commonly as grunts. It is composed of the two subfamilies Haemulinae (grunters) and Plectorhynchinae (sweetlips), which contain approximately 133 species in 19 genera (Froese and Pauly, 2006). These fish can be found all over the world in tropical fresh, brackish, and salt water. They are bottom-feeding predators and named for the ability of Haemulinae to produce sound by grinding their teeth (Johnson and Gill, 1998).

Fish are a key top predator in the aquatic ecosystem and have a deterministic status in the aquatic ecosystem's trophic cascade. Examining the feeding biology of a species proves valuable as it yields insights into the ecological characteristics, resource utilization, and trophic interactions of the organism (Braga *et al.*, 2012). Insights into their dietary preferences also offer valuable support for the development of effective aquatic management strategies, encompassing areas such as agriculture, aquaculture, and conservation. Several fish species contribute significantly to the economics of various countries across the world. However, the food that fish receives for growth and nutrition is what decides its marketing success it is critical to understand the feeding habits and food items of each fish species in order to understand the relationship between all species

living in the same fishing habitat. Food items and feeding patterns influenced fish migration, growth, reproduction, and all other biological features (Sabtan and Shehata, 1994; Mohanraj and Prabhu, 2012). Diet breadth, among other biological features, has a considerable impact on non-indigenous fish establishment success (García-Berthou, 2007). Fishes are at the top of the predator-prey pyramid in both fresh and salt water, and as a result, they are susceptible to a wide variety of parasites. By interfering with the natural physiology of fish, parasites and disease diminish fish productivity (Kabata, 1985). Understanding the nutritional needs of various fish species allows us to create more effective breeding programmes and optimise feeding regimens to boost growth rates and general health.

Studies on feeding habits on *Pomadasys* species was reported by Van Der Westhuizen, (1977), Fehri-Bedoui and Gharbi, (2008), Valinassab and Jalali, (2009), Annisa *et al.*, (2018), Karimi *et al.*, (2019), Valinassab *et al.*, (2011), Tuzun and Gucu, (2023). From Pakistan scarce data is available on feeding habits of *Pomadasys* sp. including that of Safi and Khan, (2005); Akhtar and Bilqees, (2011) for feeding content in *P. maculatum* and Safi *et al.*, (2013) for *P. stridens* from Karachi coast. Thus, the present research aims to investigate the feeding habits of *P. kaakan* from Karachi fish harbor.

## MATERIALS AND MATHODS

A total of 119 specimens of *P kaakan* were collected during January to December 2022 from Karachi Fish Harbour (24.84°N 66.98°E), west wharf (Fig. 1&2). Fish species was evaluated for one year, in monthly collections (January to December 2022). The samples were collected for stomach/feeding contents of fish. The samples were shifted to the laboratory for measuring the length (cm) and weight (gm) of fish. Detailed morphometric measurements and meristic counts were carried out to verify the taxonomical status of each fish species (FAO, 2017). Fish guts were removed from their bodies and kept in sterile vials with 5% formalin for study of the contents. The component food items were identified using identification guide and cited literature. The counts of component elements in the gut contents are the focal point of the numerical approaches. The frequency of occurrence, number, and dominance were all measured using numerical methods. The foods that were encountered were examined based on how frequently they occurred method by Hynes, (1950).

1. The dominance were calculated by method (Zacharia and Abdurahiman, 2004).

**Dominance of food,  $D_i$**  =  $N_{di} / N \times 100$

2. Fullness index (FI) was calculated through the following equation (Dadzie *et al.*, 2000)

**Fullness index (FI%)**: No. of stomach with the same degree of fullness/Total no. of stomach Examined x100

3. Coefficient of variance (CV %) was calculated through the following equation (Euzen, 1987)

**Coefficient of variance (CV% )** =  $(ES/TS) \times 100$

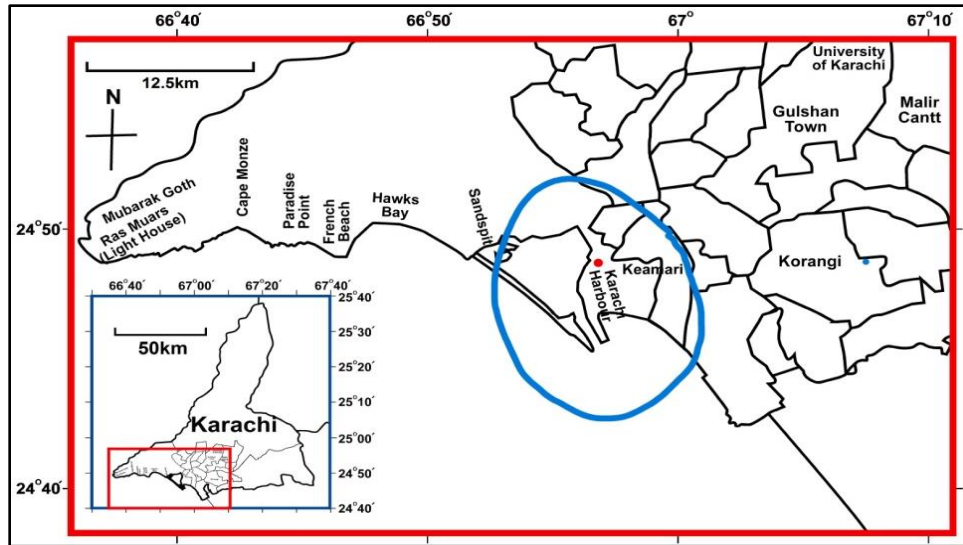


Fig. 1. Map of Karachi Fish Harbour (KFH).



Fig. 2. Sample collection of *P. kaakan* from Karachi Fish Harbor.

## RESULTS AND DISCUSSION

**Results:** Fish samples of *P. kaakan* were collected from Karachi fish harbor for estimation of feeding content analysis. The samples were collected on monthly basis during January to December 2022. Total (N=119) specimens of *P. kaakan* were collected. The length range (23 - 66 cm) and weight range (530 – 3230 gm) were recorded throughout the study period during January to December 2022.

**Feeding habits and diet composition of *P. kaakan*:** Monthly variations in diet composition and feeding habits of *P. kaakan*, showed that crustaceans, molluscs and miscellaneous were the most dominant part of the diet composition of *P. kaakan*.

Monthly variations in diet composition and dominance of food (Di) of *P. kaakan* shown in (Table 1). In *P. kaakan* gut highest dominance (Di) (15.3%) of crustaceans was measured in March whereas lowest (3.4) in August. Highest dominance (Di) (7.8%) of molluscs was found in September and lowest (1.6) was recorded in June. Highest dominance (Di) (4.3%) of fish was measured in February and May however, lowest (2.5%) was found in July. Highest dominance (Di) (94.7%) of miscellaneous was observed in April and lowest (82.5%) in July (Table 1).

Monthly variations in fullness of index (FI %) and coefficient of variance (CV %) of *P. kaakan* were presented in (Table 2). In *P. kaakan* the highest fullness of index (FI) (50.0%) was calculated in July and lowest (25.0%) in April whereas highest coefficient of variance (CV %) (75.0%) was measured in April and lowest (50.0%) in July (Fig. 3). Table (3) shows monthly variations in frequency of occurrence (FO %) of *P. kaakan*. In *Pomadasys kaakan* the highest frequency of occurrence (FO) (11.36%) was recorded in February, August and September whereas lowest (4.54%) was measured in March, April and May (Fig. 4). Gut content of *P. kaakan* were presented in (Fig. 5).

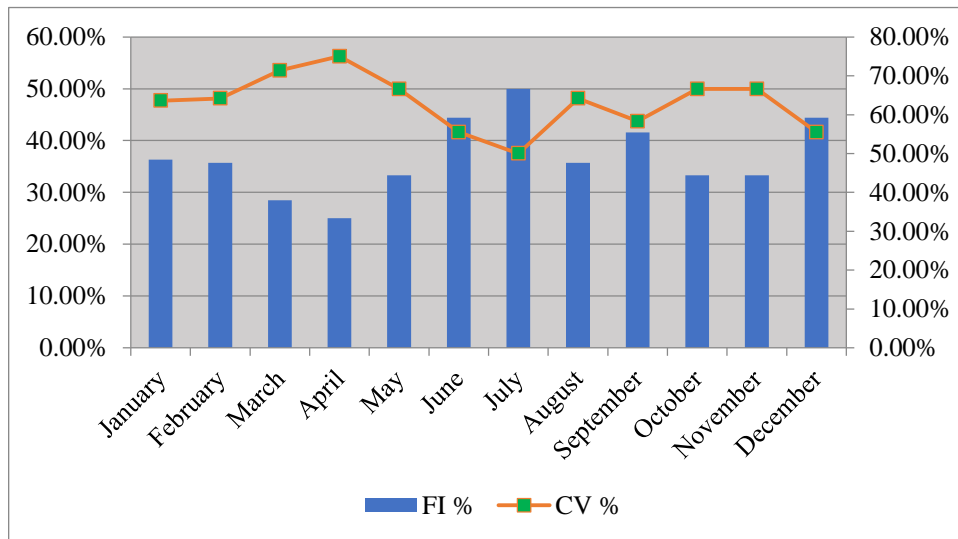


Fig. 3. Monthly variations in Fullness of index (FI %) and coefficient of variance (CV %) of *P. kaakan*.

**Table 1. Monthly variations in diet composition and dominance of food ( $D_i$ ) in *P. kaakan***

Months	Diet Composition	No. of individual	$D_i$
January	Crustaceans	4	11.1%
	Molluscs	2	5.5%
	Fish	0	0%
	Miscellaneous	30	83.3%
	<b>Total</b>	<b>36</b>	
February	Crustaceans	4	8.6%
	Molluscs	1	2.1%
	Fish	2	4.3%
	Miscellaneous	39	84.7%
	<b>Total</b>	<b>46</b>	
March	Crustaceans	2	15.3 %
	Molluscs	0	0%
	Fish	0	0%
	Miscellaneous	11	84.6%
	<b>Total</b>	<b>13</b>	
April	Crustaceans	1	5.2%
	Molluscs	0	0%
	Fish	0	0%
	Miscellaneous	18	94.7%
	<b>Total</b>	<b>19</b>	
May	Crustaceans	1	4.3%
	Molluscs	0	0%
	Fish	1	4.3%
	Miscellaneous	21	91.3%
	<b>Total</b>	<b>23</b>	
June	Crustaceans	3	4.9%
	Molluscs	1	1.6%
	Fish	0	0%
	Miscellaneous	57	93.4%
	<b>Total</b>	<b>61</b>	
July	Crustaceans	3	7.5%
	Molluscs	3	7.5%
	Fish	1	2.5%
	Miscellaneous	33	82.5%
	<b>Total</b>	<b>40</b>	

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August	Crustaceans	3	3.4%
	Molluscs	2	2.2%
	Fish	3	3.4%
	Miscellaneous	79	90.8%
	<b>Total</b>	<b>87</b>	
September	Crustaceans	2	5.2%
	Molluscs	3	7.8%
	Fish	0	0%
	Miscellaneous	33	86.8%
	<b>Total</b>	<b>38</b>	
October	Crustaceans	4	11.7%
	Molluscs	1	2.9%
	Fish	0	0%
	Miscellaneous	29	85.2%
	<b>TOTAL</b>	<b>34</b>	
November	Crustaceans	5	8.4%
	Molluscs	0	0%
	Fish	2	3.3%
	Miscellaneous	52	88.1%
	<b>TOTAL</b>	<b>59</b>	
December	Crustaceans	5	10.4%
	Molluscs	1	2.0%
	Fish	2	4.1%
	Miscellaneous	40	83.3%
	<b>TOTAL</b>	<b>48</b>	

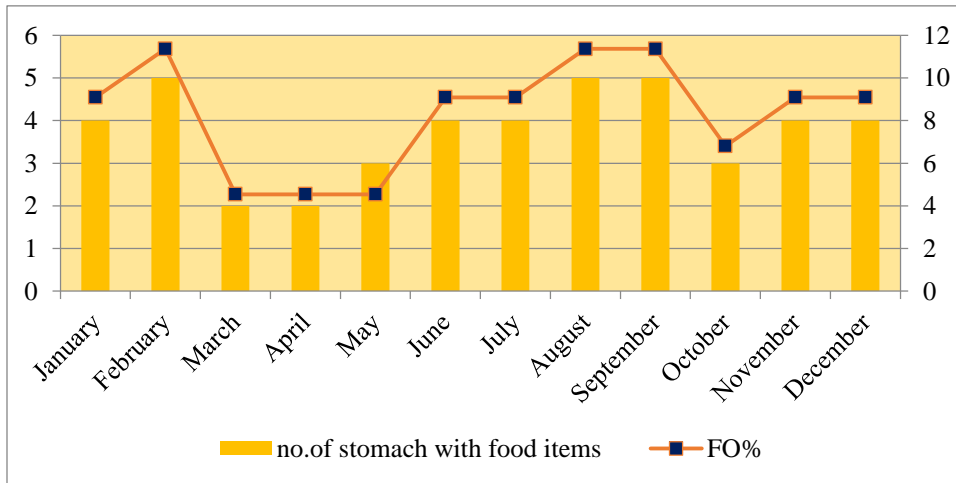


Fig. 4. Monthly variations in frequency of occurrence (FO %) of *P. kaakan*.

**Table 2. Monthly variations in Fullness of index (FI %) and coefficient of variance (CV %) of *P. kaakan***

Months	Total no. of Stomach examined	Full stomach	Empty Stomach	FI %	CV %
January	11	4	7	36.3%	63.6%
February	14	5	9	35.7%	64.2%
March	7	2	5	28.5%	71.4%
April	8	2	6	25.0%	75.0%
May	6	2	4	33.3%	66.6%
June	9	4	5	44.4%	55.5%
July	8	4	4	50.0%	50.0%
August	14	5	9	35.7%	64.2%
September	12	5	7	41.6%	58.3%
October	9	3	6	33.3%	66.6%
November	12	4	8	33.3%	66.6%
December	9	4	5	44.4%	55.5%

**Table 3. Monthly variations in frequency of occurrence (FO %) of *P. kaakan***

Months	Total no of stomach with food items	Frequency of occurrence FO %
January	4	9.09%
February	5	11.36%
March	2	4.54%
April	2	4.54%
May	3	4.54%
June	4	9.09%
July	4	9.09%
August	5	11.36%
September	5	11.36%
October	3	6.81%
November	4	9.09%
December	4	9.09%
<b>Total Annual</b>	<b>44</b>	



Fig. 5. A, Gut content of *P. kaakan*; B, Stomatopod; C, Shrimp head; D, Fragment of crab carapace; E, *Octopus* sp.; F-G, Complete fish; H, Fish fragment; I, Fish vertebrae; J-K, Fish scale.

**Discussion:** The present research study provides the first inclusive knowledge on gut content analysis of *P. kaakan* collected from Karachi coast. From Pakistani coastal waters there is no gut content analysis of *P. kaakan* from family- Haemulidae from the past, thus the present research study is a pioneer effort towards the research topic from Pakistani coastal waters.

The present study shows monthly variations in diet composition of *P. kaakan*. Crustaceans, molluscs and miscellaneous were the most dominant part of the diet composition of *P. kaakan*. In *P. kaakan* highest dominance (Di) of crustaceans (15.3%), molluscs (7.8%), fish (4.3%), miscellaneous (94.7%) was observed. Safi and Khan,



(2005) studied of feeding habits of *P. maculatum* from the Karachi coast, Pakistan. The result indicated that fish showed carnivorous habits, which constituted the main food items are crustaceans (17%), small teleosts (10%), molluscs (6.20%) and polychaetes (1%) etc. The present study did not found polychaete worms in *P. kaakan* diet. Safi *et al.*, (2013) investigated the food and eating habits of *P. stridens* and discovered that the fish was carnivorous, dining primarily on crustaceans (14.53), molluscs (11.57) small teleosts (11.1), and polychaetes (1.99) among other things. Similarly, the current study reveals the same pattern of diet composition, with the exception of the polychaetes group in their diet. Food that has been partially digested. When individuals reached sexual maturity, their diet shifted from copepods to higher trophic level prey (decapods, peracarid crustaceans, and teleosts). *P. stridens* feeds on crustaceans, molluscs, tiny fishes, and polychaetes, according to the data. Because these organisms are active swimmers, they are classified as predators, and their feeding patterns are determined by the availability of food in the environment. Overall, *P. stridens* appears to be a macrophagus fish that feeds on crustaceans, molluscs, and small juvenile fishes, which is comparable to the feeding habits of other *Pomadasys* sp. as observed by (Deshmukh, 1973; Van Der Westhuizen and Marais, 1977). Akhtar and Bilqees, (2011) reported the food and feeding habits of the marine edible fish *P. maculatum* from the Karachi coast. During the analysis of food items, nematodes were also observed from the stomach, indicating the presence of a new nematode species that causes infection in the intestine when compared to literature. The nematodes corresponded to a new species of *Dujardinascaris*. Food and feeding behaviors of *P. maculatum* specimens were analyzed, and there was no significant seasonal fluctuation in food contents. *P. kaakan* nutrition and feeding patterns were researched by Annisa *et al.*, (2018) in Pabean Bay, West Java. The result showed that the javelin grunt was crustacivore. Generally, the diet of javelin grunt consists of *Acetes* sp., *Penaeus* sp., *Portunus* sp., Clupeid, Ambassid, Sciaenid, Gobiid, Sillaginid, and unidentified organisms. In monthly observations, *Penaeus* sp. was the principal food and could be detected on each size of group. Similarly, the food composition of *P. kaakan* collected from the Karachi coast is shown in this study with diet including *Acetes* sp., *Penaeus* sp., *Portunus* sp., *Charybdis* sp., Clupeid were observed. Valinassab and Jalali, (2009) reported feeding regime of *P. kaakan* in the Persian Gulf (Hormuzgan province waters) with gut content with swimmer crab, scorpion crab, bony fishes, asteroids, bivalves, gastropods, cephalopods, shrimps and sea weeds. The result showed crustacean (77.7), fishes (32.1), Molluscs (28.6) and Echinoderms (18.8). The present result showed crustaceans (15.3%), molluscs (7.8%), fish (4.3%), however no echinoderms observed. Valinassab *et al.*, (2011), reported feeding indices of *P. kaakan* in the Northern Persian Gulf. The main stomach contents were crustaceans (esp. crab & shrimp), fish, molluscs (bivalves, gastropods and cuttlefish), stomatopoda, brittle stars, *Lingula* sp. and sea weeds. Similar results were observed in the present study crustaceans along with stomatopods and *Octopus* sp, were seen except brittle stars, *Lingula* sp.

In conclusion, this research represents an innovative study on the gut content analysis of *P. kaakan* from the Karachi coast, marking the first such comprehensive investigation of this species within Pakistani waters. The data collected provides crucial insights into the diet and feeding behaviors of this commercially significant fish species. This information is invaluable for future scientific planning, aiding in the development

and implementation of effective fishery management and conservation strategies in Pakistan.

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