1050-AMIWR2019

Food ingredients of *Himantura walga* (Müller and Henle, 1841) in Iraqi marine waters

Jinan Hassan AL- Lami, Faleh Musa Jafar Al-Zaidy, Audai M. Hasn Qasim
E-mail: **adaimsc@yahoo.com**
Marine Science Center, Marine Vertebrate Department, University of Basrah-Iraq

Abstract

The nature of food for Himantura wage in the Iraqi marine waters in the Northwest of the Persian Gulf for the period from January to December 201۷has been studied. At about 321 individuals were collected (176 for females and 145 for males). Samples were obtained by fishing boats that were caught in Iraqi marine waters using by trawl net. The composition of the food was identified using the numerical and volumetric methods for each food ingredient. The percentage of Vacuity Stomach Index (VI) for studying individuals were ranged (VI = 33%), and the values for females and males were closer. The highest value was recorded in mature females (VI = 35%) and in mature males (VI = 32.2%). The remains of food in the stomachs were classified into three main groups: crustaceans, molluscs and fish. Crustaceans ranked first in terms of nutritional importance and the relative mass index of prey was (C. P=35.5) the numerical percentage was calculated and the location of crustaceans was ranked first (C.N = 31.2).

Keywords: Food ingredients, *Himantura walga*, Iraqi marine waters.

Introduction

The cartilaginous fish, play an important role as top predators in marine ecosystems (Heithaus *et al*., 2008), and occupy the top of the series of predators in the Iraqi marine waters (Ali *et al*., 2011). Cartilaginous fish are characterized by a cartilage-free structure of real bone, but varying degrees of calcification, and emerged in the middle Devonian eras. It's implanted in the gums and not in the jaws, and its jaw was developed and teeth were sharp and renewed with them. It does not contain the air bladder (Aldaham, 1977). This species *Himantura walga* exists in the central and the Western Pacific (in the Sea of Java, Sumatra and Borneo), Singapore and Malaysia (Last and Compagno, 1999; White *et al*., 2006). It's present in Thailand and it has been registered in Cambodia, Vietnam and the Philippines (Compagno *et al*., 2005). H. walga has two acute prickles that cause a painful wound when prickled and through which the toxin was injected as a defensive method. There is a similarity between H. walga and H. imbricata but they differ from each other in the number of tubers in the dorsal region (Manjaji, 2004; White *et al*., 2006). The biological information about H. walga is somewhat few at the present time. The maximum width of the disc is about 24 cm and the display of the disc at birth 8 - 10 cm (Manjaji, 2004; White *et al*., 2006; White and Dharmadi, 2007) .Feeding of the genus Himantura is generally benthic and feeds on marine invertebrates and other animals buried in the sand, while this species H. walga feeds on crustaceans, molluscs and small fish (White *et al*., 2006). There are no previous local studies on nutrition of this species, except one study for H. randalli on breeding strategy in Iraqi marine waters, northwest of the (Persian, Arabian) Gulf (AL-Lami *et al*., 2016). Feeding habit studies are necessary for conservation strategies, and ecosystem-based management through the estimation of trophic levels (Pauly and Christensen, 2000). The current study aimed to

identify the food and feeding habits of the Dwarf Whip ray H. walga and compare the results with the results of the global studies.

Materials and methods

About 321 individuals of H. walga (176 females and 145 male) was collected for the period from January to December 2017 in Iraqi marine waters. Samples were obtained by fishing boats in Iraqi marine waters using trawl nets. The captured fish were placed in containers containing ice and transported to the laboratory. The width of the disc was measured to the nearest mm using a tape measuring the total body weight to the nearest gram using the Sartorius weight scale (German origin). The abdominal cavity was opened and gastrointestinal tract was extracted by weighing the empty and filled stomach to the nearest 0.1 g and then isolating the contents of the filled stomach. The stomach Vacuity Index (VI) (hunger factor) was calculated using the following equation as (Euzen, 1987):

VI = Es × 100 / Ts. Where,

Es =Number of empty stomach samples

Ts = Total number of stomach samples.

VI is interpreted as: Edacious species $0 \leq VI < 20$

Relatively edacious species $20 \leq VI < 40$

Moderate feeder $40 \leq VI < 60$

Relatively abstemious $60 \leq VI < 80$

Abstemious $80 \leq VI < 100$

The contents of the gastrointestinal tract were examined immediately after the dissection of the sample and a portion of the contents of the container was kept in the freezer. The excess fluid was discarded using the filter paper, the shellfish shell and fish otoliths were collected to determine the number of preys (Smale and Goosen 1999).

Methods of studying the dietary content

Numerical Percentage of prey index: (CN)

By calculating the number of each type of prey to the total number of total prey in the stomach using the following equation:

C.N= NI×100/NP

C.N= the numerical percentage of prey members of the prey

NP = Total number of prey

NI= Number of individuals prey

The weighting method (the mass index of the prey) Gravimetric percentage of prey index :(G.P) By calculating the percentage of the wet mass (weight) of a particular type of prey for the total weight of the stomach contents (Hyslop, 1980) using the following equation:

G.P = M × 100/ MP

G.P =Relative mass index of prey

M= Mass of prey of a specific type

MP= Mass number of prey.

Results

H. walga individual's weights ranged between 38 to 999.07 g and its disks width ranged from 11 to 24 cm. The results of the food study showed that the number of feeding individuals was 195 from the total of 321. Their food components included crustaceans, molluscs and fish, but the number of empty stomach individuals was 126. The results of the present study showed that the total of stomach Vacuity Index (VI) for immature males and females was

greater than the value of mature males and females. The VI % for immature females was 43.75 % and 35% for mature females. For immature males, the VI% was 43.1% and 32.3% for mature males (Table1). The gastrointestinal tract of the samples was dissected, it was found that the stomach was short and had a solid wall. It consisted of a number of jagged layers, while her intestines were spiral-shaped and internal wall had mucous lobby's (Fig. 1). An analysis of the monthly results of the female VI % for H. *walga* showed that there were two peaks in April, 60 %, and the second in October, 57.1 %. For males, it was higher in May, 58.33%. (59.09%), but declined significantly in August, reaching 16.66% as shown in Table (2)

Fig (1) the digestive system of *H. walga*.

Table (1) Vacuum Index for females and males (mature and immature) of H. *walga* from Iraqi marine waters.

Individuals	Filled stomachs	Empty stomachs	Total stomachs	VI (%)
Immature females	54	42	96	43.75
Mature females	52	28	80	35.0
Immature males	49	37	86	43.1
Mature male	40	19	59	32.023
Total summation	195	126	321	39.25

Table (2) Vacuum Index Values (VI %) For females and males H.*walga*

Year 2016	Male			Females			Male & Females	
	Empty stomachs	Total number For males	VI%	Empty stomachs	Total number For females	VI%	Empty stomachs For males and females	VI% In males and females
January	3	6	50	5	12	50	9	50
February	3	10	30	4	11	36.3	8	38.1
March	2	7	28.6	4	8	50	7	46.6
April	3	6	5 0	9	15	60	13	62
May	7	12	58.3	6	19	31.5	11	35.4
June	5	14	35.7	8	23	34.7	13	35.13
July	6	22	27.2	5	16	31.25	11	29
August	3	15	20	6	15	40	9	30
September	12	22	54.5	5	15	33.3	15	40.5
October	4	11	36.3	8	14	57.1	12	48
November	2	8	25	6	16	37.5	7	29.1
December	6	12	50	4	12	33.3	11	45.8
Total	56	145	39.3 *	70	176	40.5 *	126	40.8*

*refer to the average of VI %

The remains of preys in H. walga stomach were classified into three groups which are Crustacea, Mollusca and Fishes.

1- Group of Crustacea

Preys belonging to the crustacean occupied first ranked as shown in the fig (2) the percentage of the numerical (CN = 65.4%), In terms of relative mass, the crustaceans were CP =59.3 (fig 3), and found that crustaceans are preferred in the first place.

2 - Group of Mollusca

This group of prey was occupied second ranked of the H. walga food

The numerical percentage for molluscs was CN = 22.1% (fig 2), While the relative mass was CP = 29.2 (As shown in Fig. 3).

3. Fish Group

The numerical percentage of fish in H. walga stomach was very little, it was CN =12.5% (fig2), While the mass percentage reached CP = 11.5)As shown in Fig. 3).

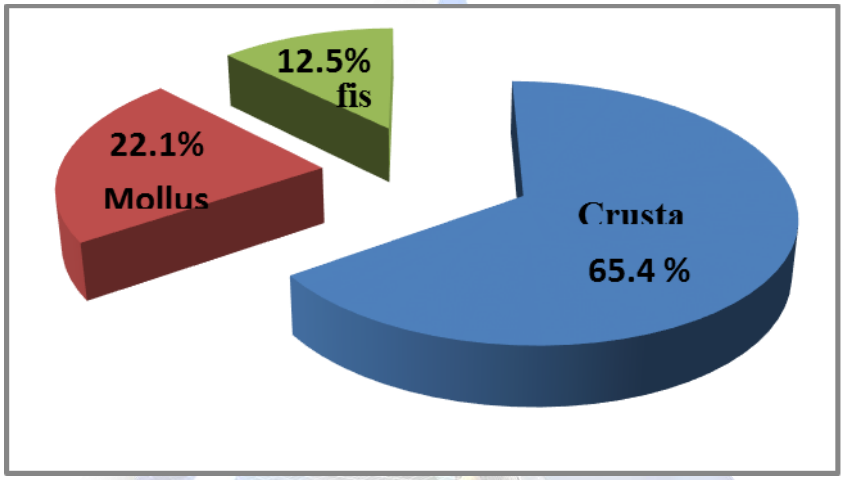

Figure (2) shows the numerical value of V.I for prey in the foot of H. walga

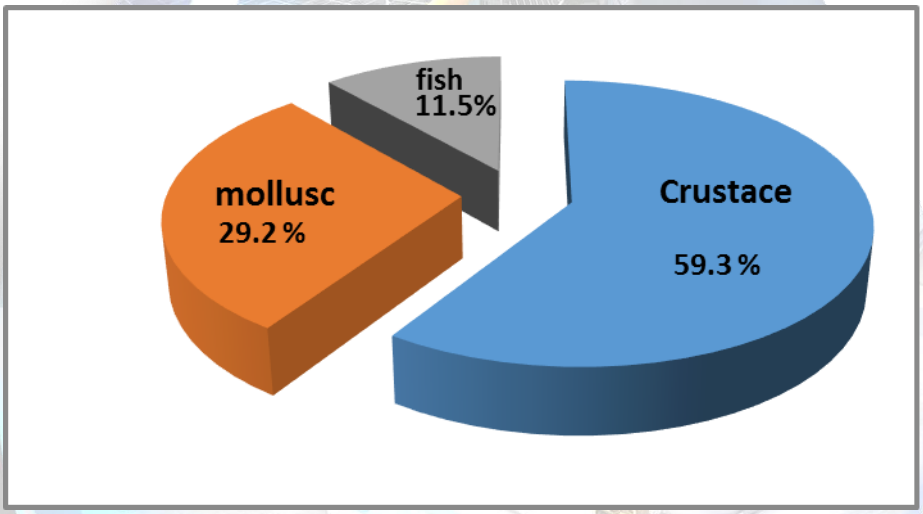

Figure (3) shows the numerical ratio of c.p for prey in the H. walga food

Discussion

The study of feeding habits of marine predators inside the food web is critical to explain their ecological role in the ecosystem (Navarro *et al*., 2013. Also, the feeding habits of marine predators provide an inclusive understanding of their ecological interactions such as feeding competition predator-prey size relationships and habitat selection (Scharf *et al*., 2000; Koen Alonso *et a*l., 2001; Heupel *et al*., 2007; O'Shea *et al*., 2013). The measured weights for H. walga ranged from 38 - 999.07 g and the width of the disc between 11- 24 cm. The members of this type reach the maximum width of the disk to about 24 cm, as for the maturity of individuals, we note according to the obtained results that the width of the disk reaches to 16-17 cm in mature males and females, and the width of the disc at birth is 8-10 cm (Manjaji, 2004; White *et al*., 2006; White and Dharmadi, 2007). The results of the present study show that H. *walga* is a predator which

feeds on benthic fauna in general, and it's especially fed on crustaceans, followed by molluscs and small fish, this is consistent with White *et al.* (2006) When studying the feeding of this species in the Gulf of Thailand, he stressed that H. *walga* feeds on marine invertebrates and other animals that are buried in the sand, especially crustaceans and molluscs. Although the feeding habits of *H. walga* has not been described in Iraqi marine water, the preferential consumption of crustacean by this species has been reported by Rastgoo *et al* (2018) when studied Feeding habits and trophic level of *Himantura gerrardi* in northern of Oman Sea. When the digestive system of the samples was dissected, it's shown that the stomach of H. walga is short and has a solid wall and consists of a number of layers and be condensed, the intestines have a spiral shape and inside the wall has mucous membranes, and this corresponds to the study of tissue in the digestive system of this type which done by Twohig *et al.* (2002) in the Malaysian Borneo seacoast. It was found by analyzing the results of the stomach vacuum index (VI) in the two categories of females (mature and immature) that (VI) in the immature females is higher than in mature females and this is due to the reproductive biology, this period coincides with the period of sexual maturity and with the development of embryos during pregnancy, which is also accompanied by the growth and development of eggs to be ready for ovulation, This is in line with the study of AL-lami *et al*., (2016) on the strategy of breeding for H. *randalli* in the Iraqi marine waters as the period of growth of embryos affect the nutrition of the species.

References

Al-Daham, N.K. (1977). Fishes of Iraq and the (Persian, Arabian) Gulf. Studies Center of Arab Gulf. Basra University, Al-Rashad Press, Baghdad, Part I, 546 p. (In Arabic)

Al- Lami, J. H.; Resen, A.KH and Hassan, S. S. (2016). Reproduction strategy of (Persian, Arabian) Whipray *Himalura randalli* (Randall, 1995) in Iraqi marine waters. University, Iraqi Journal of Aquaculture. (Accepted for publication). (In Arabic)

Ali, M. F.; Saad, A. And Haitham, K. (2011). Feeding habits of shark *Mustelus mustelus* (Triakidae) (Linnaeus, 1758) in Syrian marine waters .Iraqi Journal of Aquaculture, Volume (8), Issue (2): 109-124. (In Arabic)

Compagno, L. J. V.; Last, P. R.; Stevens, J. D. And Alava, M. N. R. (2005). Checklist of Philippine Chondrichthyes. Marine Laboratories Report, 243. CSIRO.

Euzen, O., 1987. Food habits and diet composition of some fishes of Kuwait. Kuwait Bulletin Science, 9, 65-86.

Heithaus, M.R., Frid, A., Wirsing, A.J., and Worm, B. (2008). Predicting ecological consequences of marine top predator declines. Tr. *Ecol. Evol.* 23:202–210.

Heupel, M.R., Carlson, J.K. and Simpfendorfer, C.A., 2007. Shark nursery areas: concepts, definition, characterization and assumptions. Marine Ecology Progress Series, 337, 287–297.

Hyslop, E. J. (1980). Stomach content analysis, a review of methods and their application. J. Fish Biol.17:411-429.

Koen Alonso, M., Crespo, E.A., Garcia, N.A., Pedraza, S.N., Mariotti, P.A., Beron Vera, B. and Mora, N.J., 2001. Food habits of Dipturus chilensis (Pisces: Rajidae) off Patagonia, Argentina. ICES Journal of Marine Science, 58, 288– 297

Last, P.R. and Compagno, L.J.V. (1999). Dasyatidae, pp.1479- 1505. in: Carpenter, K.E.; Niem, V.H. (eds). FAO species identification guide for fishery purposes. The living

marine resources of theWestern Central Pacific. Volume 3. Batoid fishes, chimaeras and bony fishes part 1 (Elopidae to Linophrynidae). Food and Agriculture Organization of the United Nations, Rome.

Manjaji, B. M. and White, W. T. (2004). *Himantura uarnak* in IUCN. IUCN Red list of Threatened Species. Retrieved April 8. 2010.

Navarro, J., Coll, M., Preminger, M. and Palomera, I., 2013. Feeding ecology and trophic position of a Mediterranean endemic ray: consistency between sexes, maturity stages and seasons. Environmental Biology of Fishes, 96, 1315-1328.

O'shea, O.R., Thums, M., Van Keulen, M., Kempster, R. M. andMeekan, M.G., 2013. Dietary partitioning by five sympatric species of stingray (Dasyatidae) on coral reefs. Journal of Fish Biology, 82, 1805–1820.

Pauly, D. and Christensen, V., 2000. Trophic levels of fishes. in FishBase 2000: Concepts, Design and Data Sources, R. Froese and R.D. Pauly, Eds., ICLARM, Manila, Pa, USA

Pillay, T. V. R. (1952). A critique of the methods of study of food of fishes. J. Zool. Soc. India, 4: 185-200.

Rastgoo A.R; Fatemi S.M.R; Valinassab T; Mortazavi, M.S. (2018). Feeding habits and trophic level of Himantura gerrardi (Elasmobranchii; Dasyatidae) in northern Oman Sea: effects of sex and size class. Iranian Journal of Fisheries Sciences 17(1) 137-150.

Smale, J. M.; Goosen, J. J. A. (1999). Reproduction and feeding of spotted gully shark, *Triakis megalopterus*, of the Eastern Cape, South Africa. Fishery Bull., 97 (4): 987-998.

Scharf, F.S., Juanes, F. and Rountree, R.A., 2000. Predator size: prey size relationships of marine fish predators: interspecific variation and effects of ontogeny and body size on trophic-niche breadth. Marine Ecology Progress Series, 208, 229–248.

Twohig, M. E.; Caira, J. N. And Fyler, C. A. (2002). Two new crested species from the dwarf whipray, *Himantura wage* (Batoidea: Dasyatidae), from Borneo, with comments on the site and mode of attachment. Department of Ecology and Evolutionary Biology, University of Connecticut, Storrs, Connecticut 06269-3043. janine.caira@uconn.edu

White, W. T.; Last, P. R.; Stevens, J. D.; Yearsley, G. K.; Fahmi and Dharmadi (2006) Economically important sharks and rays of Indonesia. ACIAR Publishing, Canberra, 329 pp.

White, W.T. and Dharmadi, (2007). Species and size composition and reproductive biology of rays (Chondrichthyes, Batoidea) caught in target and no target fisheries in eastern Indonesia. J. Fish Biol., 70: