JKAU: Mar. Sci., Vol. 26. 2, pp: 1-9 (2017 A.D. / 1438 A.H.)
DOI :10.4197/Mar. 26-2.1

Biometry of Arabian carpetshark, *Chiloscyllium arabicum*Gubanov, 1980 (Elasmobranchii: Hemiscyllidae) from Iraqi marine water

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Abstract. A total of 35 specimens (22 male and 13 female) of Arabian carpetshark *Chiloscyllium arabicum* Gubanov, 1980, ranging in total length from 262-731 mm were collected from Iraqi marine water (N: 29º46', E: 48º48') during December 2012 - April 2013 and April 2014.80 morphometrics and meristics were measured.The head length (HDL) was 17.0-19.2 mm and 16.9-19.7 mm, and the interdorsal space (IDS) was12.3-19.9 mm and 11.7-22.1mm for males and females respectively. Significant differences in some characters were found between males and females, the pelvic-anal space (PAS), the pelvic-caudal space (PCA) and the anterior vent-caudal tip length (VCL) in males were significantly larger than those in females, while the pre-pelvic fin length (PP2), the anal fin anterior margin length (ANA) and the pelvic base length (P2B) in females were significantly larger than those in males. The total count of vertebrae ranged between 162 and 175.

Introduction

Family Hemiscyllidae (Orectolobiformes) comprises small sharks, generally known as bamboo sharks, occurring in the tropical western Pacific and Indian Oceans (Cornish, 2005). There are two genera; *Chiloscyllium* with seven species and *Hemiscyllium* with five species. The maximum total length varies from 43 to 107 cm depending on species (Compagno, 2001).

Members of the Hemiscyllidae family are small, slender sharks with nasoral grooves, perinasal grooves, short barbels, small transverse mouths in front of eyes, dorsolateral eyes, large spiracles below eyes, no lateral skin flaps on head, two spineless dorsal fins, the second dorsal-fin origin well ahead of the anal-fin origin, a long low keel-like rounded anal fin separated from the lower caudal origin by a narrow notch, and a long precaudal tail much greater than the head and body length (Compagno, 2001).

However, the Arabian carpetshark *Chiloscyllium arabicum* is believed to occur in the western Indian Ocean (Compagno, 1984a), from the Arabian Gulf between Iraq and the Arabian Peninsula to the west coast of

India (Weigmann, 2012; Froese & Pauly, 2014).

Day (1878) recorded the genus *Chiloscyllium* from Indian waters under the family Scyllidae. Jordan (1923) assigned *Chiloscyllium* under the family Hemiscyllidae. But Fowler (1941) and Berg (1947) classified this genus under the family Orectolobidae. Compagno (1984a) dealt *Chiloscyllium* with the family Hemiscyllidae.

The Arabian carpetshark inhabits coral reefs, rocky shores, and mangrove estuaries. It is free-living at 10.1 cm TL, and feeds on squid, shelled molluscs, crustaceans, and snake eels (Compagno, 2001).

Presentstudy aims to enhance information on the taxonomy of the Arabian carpetsahrk through the morphometric and meristic features.

Materials and Methods

A total of 35 specimens (22 male and 13 female) of Arabian carpetshark *Chiloscyllium arabicum* Gubanov, 1980, 262-731 mm total length were collected from Iraqi marine water (N: 29º46', E: 48º48') during December 2012 - April 2013 and April 2014 . Fish specimens were caught by seine net.Head length and measurements of body parts are given as proportions of total length (TL).Morphometric and meristic dimensions were measured following (Compagno, 1984b) (fig.1). The common and scientific name followed Froese & Pauly (2014). All specimens were deposited in the Department of Fisheries and marine resources, College of Agriculture, Basrah University. In the laboratory, different morphometric and meristic features were measured. The total and precaudal lengths of the specimens were determined to the nearest mm by a measuring board, and the lengths of the different dimensions were measured using electronic caliper and dissecting microscope. Ten specimens were used to calculate the total vertebrae after boiling in water and removing the skin and muscles.

Results

The distribution of the Arabian carpetshark, *C. arabicum* spreads in the Iraqi marine waters northwest of the Arabian Gulf and enters the Iraqi inland water in the Shatt Al-Arab River, (fig.1and 2) shows the different morphometric measurements.

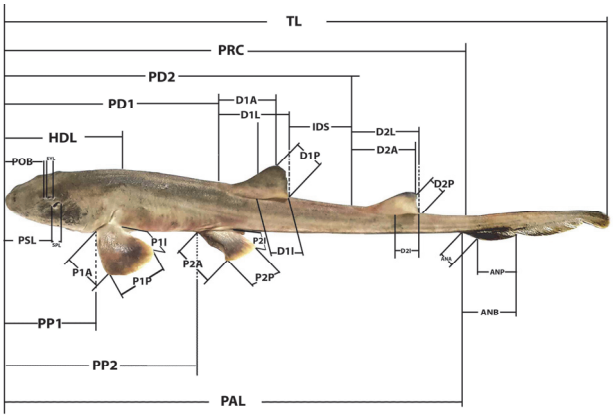

Figure (1). Arabian carpetshark, *Chiloscyllium arabicum*, 535 mm TL

The nostrils are subterminal on snout (Fig.2). Snout is rounded with small mouth with

barbles well in front of eyes. The preoral snout is long, and the mouth is closer to eyes than snout tip. There is no black hood on head or large dark spot or spots on the sides of the body above the pectoral fins.

Table 1 shows the different measurements taken on males ranging from304 to 731mm TL and females ranging from 262 to 712 mm TL of *C. arabicum*. The head [i]length (HDL) was17.0-19.2 mm and 16.9-19.7 mm, the interdorsal space (IDS) was12.3-19.9 mm and 11.7-22.1,the pectoral base length (P1B) was 4.5-6.6 mm and 5.1-5.9 mm, the dorsal fin 1 base length (D1B) was7.1-8.8mm, and 7.5-11.1mm, the dorsal fin 2 base length (D2B) was7.2-9.4 mm and7.3-12 mm, The anal fin base length (ANB) was 8.1-12.1 mm and 8.6-12.2 mm, the eye-spiracle length (ESL) was 0.7-1.6 mm and 0.56-1.5 mm, the barble length (BL) was 1.0-2.6 mm and 1.7-2.5 mm, for males and females respectively. The SPSS analysis illustrated significant differences between males and females in some characters at $P<0.01$ and F calculated were PAS (7.732), PCA (13.325) and VCL (8.555) for males, PP2 (6.378), ANA (6.305) and P2B (10.171) for females, total vertebrae were 162-175.

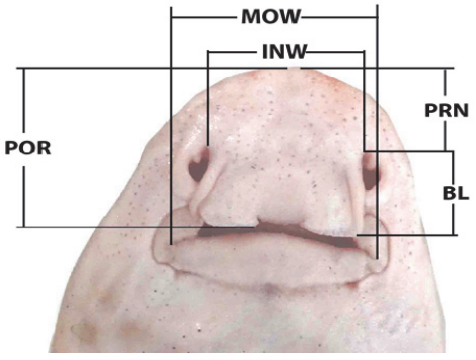

Figure (2).Underside of head of *Chiloscyllium arabicum*

Discussion

The body and tail were moderately cylindrical in shape, the snout fairly thick and rounded anteriorly and lateral ridges were absent from trunk. The dorsal fins were large and angular, somewhat larger than pelvic fins with projecting free rear tips, inter-dorsal space was very long, 12.3-19.9 and 11.7-22.1 mm., over twice as first dorsal base, 7.2-9.4 and 7.3-12 mm. for male and female, respectively.

The first dorsal origin is located over or behind pelvic fin bases (fig.1), origin of anal fin somewhat lay behind the free rear tip of the first dorsal fin, anal fin length from origin to free rear tip is nearly less than hypural caudal lobe from the lower caudal origin to the free rear tip. This coincides well with the description of Compagno (2001).

In comparison with the results of Compagno (2001) and Dash et al.(2013), there was an acceptable consensus in the results of (pre pectoral fin length) PP1,(snout-anterior vent length) SVL, VCL, (eye length) EYL, D1B, (dorsal fin one vertical height) D1H,D2B and (dorsal fin two vertical height) D2H, (tab.2), while other measurements such as HDL, (pre Orbital length) POB, IDS, and (internarial width) INW were higher in the current study than those described previously by Dash et al. (2013).

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Table(1) Different measurements of *Chiloscyllium arabicum* as proportions of total length

Measurement	male		female	
	Range	Mean ± Sd	Range	Mean ± Sd
T.L. total length	304-731	456.48±131.89	262-712	394.23±117.1
PRC pre caudal length	73.2-82.8	78.06± 3.35	57.4-82.7	76.86±6.66
PD1 preDorsal fin 1 length	30.1-57.3	41.09±10.64	32.5-56.7	42.36±11.14
PD2 pre Dorsal fin 2 length	32.7-63.2	49.19±10.94	34.0-58.6	47.89±10.92
HDL head length	17.0-19.2	17.98±0.59	16.9-19.7	18.18±0.86
PSL pre spiracle length	7.4-9.1	8.15±0.46	7.5-9.1	8.25±0.47
POB pre Orbital length	6.1-7.6	6.88±0.43	6.3-9.6	7.12±0.83
PPl, pre pectoral fin length	12.2-23.5	14.96±2.31	12.7-19.7	15.48±1.68
PP2, pre pelvic fin length	29.1-34.1	31.4±1.24	30.0-35.1	32.55±1.39
SVL, snout-anterior vent length	31.5-35.2	33.63±0.85	29.4-35.8	33.54±2.05
PAL, pre anal fin Length	69.1-75.6	71.6±1.65	52.2-73.5	69.73±5.42
IDS, interdorsalspace	12.3-19.9	14.13±1.8	11.7-22.1	13.90±2.66
DCS, dorsal (D2)-caudal space	18.0-27.3	20.0±1.99	18.0-20.5	19.33±0.67
PPS, pectoral-pelvic space	11.5-19.9	16.93±1.67	15.7-19.2	17.64±1.02
PAS, pelvic-anal space	38.1-44.8	40.55±1.75	37.0-41.2	38.83±1.33
ACS, anal-caudal space	2.3-11.8	9.57±2.89	3.1-13.3	8.89±3.86
PCA, pelvic-caudal space	49.1-57.7	51.14±1.98	37.8-52.2	46.55±5.17
VCL, anterior vent-caudal tip length	57.7-68.4	66.63±2.22	46.3-66.9	61.62±7.4
PRN, prenarial length	2.4-3.5	2.88±0.27	2.5-3.3	2.86±0.22
POR, preoral length	3.4-4.8	4.34±0.31	3.4-5.0	4.38±0.42
EYL, eye length	1.6-2.4	2.05±0.21	1.8-2.4	2.13±0.19
EYH, eye height	0.6-1.3	0.96±0.17	0.7-1.8	1.00±0.28
ING, intrgill length 1st to last slit	4.61-5.84	5.32±0,41	4.44-543	4.9±0.32
GS1, 1st gill slit height	1.4-2.0	1.72±0.15	1.0-1.9	1.66±0.29
GS2, 2nd gill slit height	1.5-2.3	1.97±0.19	1.7-2.2	1.99±0.17
GS3, 3rd gill slit height	1.7-2.8	2.29±0.27	1.9-2.5	2.22±0.21
GS4, 4th gill slit height	1.8-2.6	2.33±0.21	1.9-2.4	2.16±0.15

GS5, 5th gill slit height	2.1-3.2	2.75±0.33	2.2-2.8	2.48±0.22
P1A, pectoral anterior margin l.	9.9-14.1	12.73±1.16	2.4-12.9	10.50±3.72
P1B, pectoral base length	4.5-6.6	5.68±0.64	5.1-5.9	5.42±0.36
P1I, pectoral inner margin length	4.7-6.8	5.55±0.54	4.6-6.3	5.45±0.55
P1P, pectoral posterior margin l.	6.3-9.9	7.92±0.81	5.3-9.7	7.75±1.29
P1H, pectoral height (base end to tip)	9.0-11.8	10.7±0.84	6.9-11.8	10.30±1.41
P1L, pectoralleng. (ant.base to post tip)	10.7-13.5	12.04±0.98	9.4-12.2	11.23±0.99
D1L, D1 total length	10.1-13.0	11.8±0.69	10.8-12.4	11.73±0.49
D1A, D1 anterior margin length	8.2-12.6	11.15±1.0	10.1-12.1	11.26±0.68
D1B, D1 base length	7.1-8.8	8.01±0.46	7.5-11.1	8.63±1.14
D1H, D1 vertical height	6.3-8.5	7.54±0.57	6.6-8.9	7.87±0.7
D1l, D1 inner margin length	2.7-3.4	3.07±0.21	2.8-3.5	3.15±0.25
D1P, D1 posterior margin length	5.1-7.9	6.75±0.79	5.0-7.9	6.24±0.83
D2L, D2 total length	9.9-11.3	10.93±0.39	9.8-11.2	10.36±0.57
D2A, D2 anterior margin length	8.4-11.3	9.76±2.13	9.4-11.5	10.50±0.72
D2B, D2 base length	7.2-9.4	8.48±0.62	7.3-12	8.94±1.4
D2H, D2 vertical height	4.3-7.3	5.95±0.74	5.0-8.1	6.17±0.87
D2I, D2 inner margin length	1.94-2.95	2.43±0.30	2.25- 2.83	2.50±0.18
D2P, D2 posterior margin length	4.1-6.5	5.49±0.56	2.7-6.2	4.97±1.09
P2L, Pelvic total length	9.0- 11.3	10.42±0.62	4.4-11.4	9.24±2.09
P2A, pelvic anterior margin length	7.8-10.2	9.25±0.63	7.8-10.5	9.38±0.78
P2B, pelvic base length	5.3-6.9	6.02±0.51	5.5-7.2	6.43±0.59
P2H, pelvic height (max. width)	5.2-7.9	6.93±0.67	6.5-7.9	7.2±0.59
P2I, pelvic inner margin length	2.9-5.9	4.72±0.79	3.5-7.0	4.75±1.06
P2P, pelvic posterior margin length	5.0-7.3	6.36±0.66	4.0-7.3	6.05±1.08
ANL, anal fin total length	8.8-13.3	11.69±1.15	6.1-13.5	11.07±2.46
ANA, anal fin anterior margin l.	4.2-7.3	5.66±1.05	4.4-13.3	7.00±2.32
ANB, anal fin base length	8.1-12.1	10.38±0.98	8.6-12.2	10.52±1.01
ANH, anal fin vertical height	1.9-2.9	2.50±0.30	2.3-3.0	2.65±0.23
ANI, anal fin inner margin length	1.0-2.2	1.30±0.31	0.9-3.2	1.53±0.74

ANP, anal fin posterior margin l.	5.3-8.0	6.20±0.67	5.8-7.5	6.8±0.57
HDH, head height at P origin	6.7-9.0	7.81±0.63	7.2-9.3	8.08±0.76
ABH, abdomen height at D1B end	4.5-6.6	5.81±0.66	5.2-7.5	6.09±0.7
TAH, tail height at pelvic base end	4.9-7.3	6.16±0.62	4.7-7.2	6.24±0.73
CPH, caudal peduncal height	2.8-3.4	3.16±0.19	2.9-3.5	3.23±0.17
CPW, caud. p. width at caud. orign	1.0-1.7	1.30±0.20	1.2-1.5	1.38±0.11
MOL, mouth length (arc radius)	2.7-3.7	3.44±0.27	1.9-3.6	3.13±0.39
MOW, mouth width	3.9-5.8	4.52±0.46	3.4-5.1	4.19±0.854
SPL, spiracle length	1.1-1.6	1.32±0.14	1.2-1.6	1.35±0.18
INW, internarial width	3.1-4.0	3.57±0.23	3.2-4.2	3.63±0.28
ESL, eye-spiracle length	0.7-1.6	1.11±0.23	0.56-1.5	1.11±0.22
HDW, head width at middl gill slits	9.4-11.5	10.45±0.67	10.7-11.5	11.01±0.42
TRW, trunk width at P base ends	9.3-13.5	11.08±0.99	9.9-13.7	11.35±1.17
ABW, abdomen width at D1B end	4.0-6.2	5.54±0.63	5.2-6.2	5.59±0.39
TAW, tail width at pelvic base end	4.8-6.9	6.09±0.51	5.0-8.9	6.23±0.99
CLI, clasper inner margin length	0.95-12.5	4.61±2.850	-	-
CLO, clasper outer margin length	0.64-6.3	1.94±1.88	-	-
CLB, clasper base width	0.5-2.6	1.16±0.59	-	-
BL. barble length	1.0-2.6	2.07±0.4	1.7-2.5	2.15±0.25
INO, interorbital space	4.1-5.0	4.94±0.34	4.3-4.9	4.56±0.23
PD1R, pre dorsal 1ridge length	2.11-2.34	2.19±1.01	2.07-2.22	2.14±0.66
IDR, iner dorsal ridge space	10.9-12.0	11.60±0.43	9.9-14.4	11.98±1.84
Total vertebrae	162-175 (169.1±4.14)			

From the data of the current study, this species could be differentiated from *C. griseum* by inter-dorsal space which was about twice as long as 1st dorsal fin base, while in *C. griseum* it do not exceed 1.5 times as long as 1st dorsal fin base. Dorsal fins are also larger than pelvic fins in *C. griseum*, although they were smaller than those mentioned previously by Carpenter *et al.* (1997). In addition, the dorsal ridges of *C. griseum*are are not prominent or even absent as shown by Compagno (2001). Moreover, all of the examined specimens have distinct pre- and inter-dorsal ridges.

The collected specimens in the present study do not have faded stripes on their caudal fin and the base of the second dorsal fin is longer than that of the first dorsal fin. The rudimentary alternate dark and light bands which showed in *C. griseum* do not appear in *C. arabicum*. Additionally, *C. griseum* distribution area ranges from Pakistan and India over most parts of Southeast Asia to Papua New Guinea in the south and East China and South Japan in the north as demonstrated by Compagno (2001).

Mahdi (1971) and Al-Daham (1977) mentioned the presence of *C. griseum* in the Iraqi marine waters. Hussain *et al.* (1988) also recorded the two species from Khor Al-Zubair, North West of the Arabian Gulf. However, the previous studies that indicated the presence of *C. griseum* in the Iraqi marine waters did not supported with thorough taxonomic information, although Carpenter *et al*. (1997) pointed to the presence of the *C. arabicum* in the Arabian Gulf. More recently, Jabado and Ebert (2015) mentioned the occurrence of *C. arabicum* in the Arabian Gulf and the Gulf of Oman in contrast to *C. griseum* which occur only in the southern part of the Arabian Gulf and Gulf of Oman.

The current study is consistent with the above researchers about the presence and the spread of Arabian carpetshark *Chiloscyllium arabicum* in the Iraqi marine waters North West Arabian Gulf.

Table (2) Comparison for some measurement with previous studies

Measurement	Compagno, 2001	Dash *et al*., 2013	Present study
HDL	-	8.57	16.9-19.7
POB	-	3.62	6.1-9.6
PP1	16.1-19.6	-	12.2-23.5
SVL	33.1-36.3	28.57	29.4-35.8
IDS	8.7-14.5	10.48	11.2-22.1
VCL	61.0-67.6	60.0	46.4-68.3
EYL	1.4-1.8	1.14	1.6-2.4
D1B	-	5.7	7.1-11.1
D1H	4.5-8.4	7.62	7.3-8.9
D2B	-	6.29	7.2-12.0
D2H	4.2-7.1	6.86	4.3-8.1
MOL	-	4.76	1.9-3.7
INW	-	2.86	3.1-4.2
TL mm	-_	525	262 - 712

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الصفات المظهرية والعددية لقرش السجاد العربي *Chiloscyllium arabicum* Gubanov, 1980 (صفائحية الخياشيم: عائلة قرش السجاد) في المياه البحرية العراقية

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قسم الاسماك والثروة البحرية ، كلية الزراعة ، جامعة البصرة ،البصرة، العراق

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المستخلص. جمع ٣٥ فرد (٢٢ ذكر و١٣ أنثى) من قرش السجاد العربي *Chiloscyllium arabicum* Gubanov, 1980 ، باطوال كلية تراوحت بين ٢٦٢–٧٣١ ملم من المياه البحرية العراقية من المنطقة ذات الاحداثيات N: 29°46' , E: 48°48' خلال الفترة من كانون الثاني ٢٠١٢ ـ نيسان ٢٠١٣ ونيسان ٢٠١٤. تم قياس ٨٠ صفة مظهرية وعددية، شكل طول الرأس ١٧,. – ١٩,٢ ملم و ١٦،٩ –١٩،٧ ملم والمسافة بين الزعنفتين الظهريتين ١٢،٣—١٩,٩ ملم و١١،٧– ٢٢،١ ملم كنسبة مئوية الى الطول الكلي للذكور والاناث على التوالي. بين التحليل الاحصائي فروقات معنوية بين الذكور والاناث في بعض الصفات مثل المسافة بين الزعنفة الحوضية – الزعنفة المخرجية والمسافة بين الزعنفة الحوضية – الزعنفة الذنبية والطول من مقدمة المخرج – قمة الزعنفة الذنبية لصالح الذكور، بينما المسافة قبل الزعنفة الحوضية وطول الحافة الأمامية للزعنفة المخرجية وطول قاعدة الزعنفة الحوضية لصالح الاناث، تراوح العدد الكلي للفقرات ١٦٢–١٧٥ فقرة.