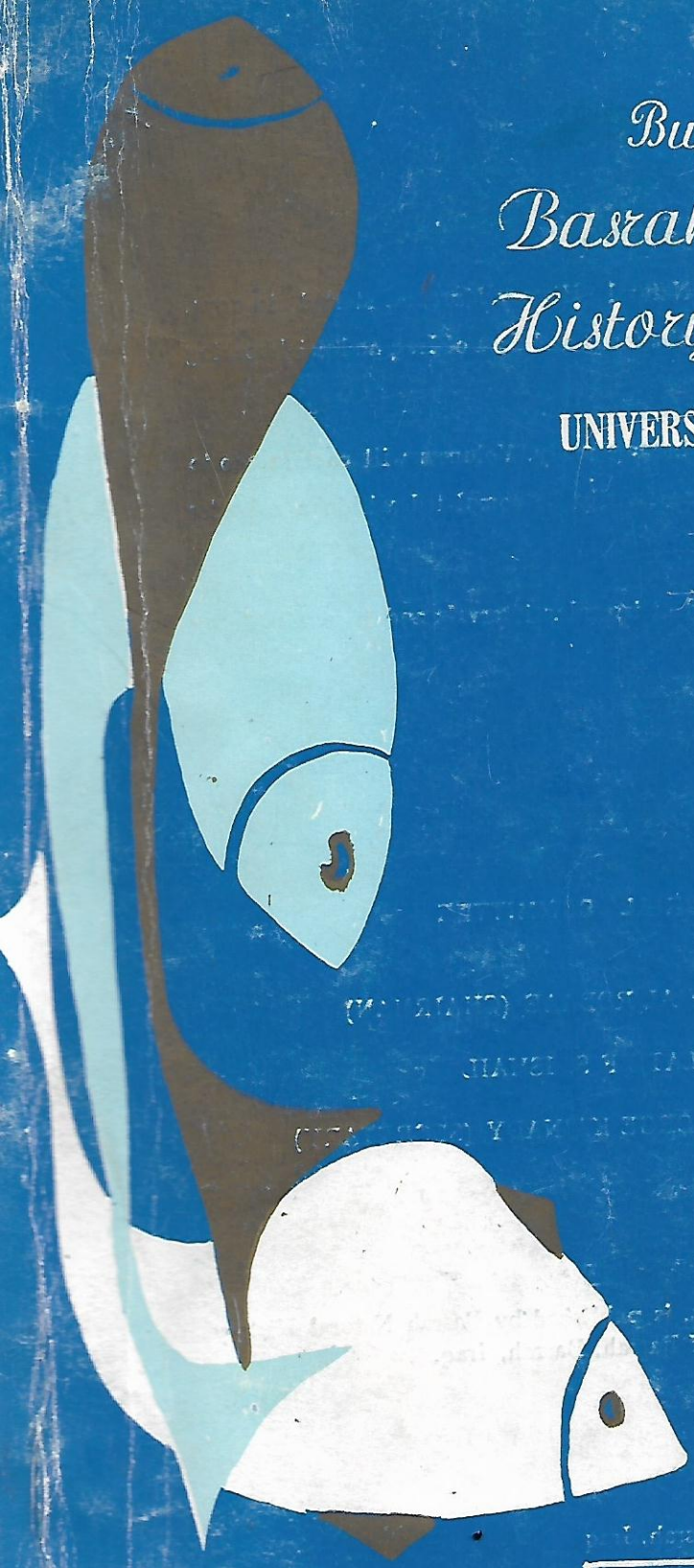

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BULLETIN OF

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FISHES OF IRAQ AND THE ARAB GULF :

ORDERS SQUALIFORMES AND RAJIFORMES

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INTRODUCTION

The considerable expansion of fisheries industry in Iraq and other countries surrounding the Arab Gulf has made the study of the systematics of fishes in this region a pressing need. Such kind of study forms the first step towards exploiting the fishery resources and formulating a common policy for development and management of these resources.

This paper deals with the first group of fishes which includes the sharks (order Squaliformes) , and the rays and skates (Order Rajiformes) from fresh waters of Iraq and the Arab Gulf. All these fishes are marine. however, few of them ascend the rivers Shatt-al-Arab, Tigris and Euphrates to the border of tide or beyond.

The cartilaginous fishes of Iraq and the Arab Gulf are poorly known. Day (1878) reported the Ganges shark, **Carcharhinus gangeticus,** from the Tigris river at Baghdad. Lane (1916) described two species of sharks and Kennedy (1937) reported one species of shark from the Tigris river. Graman (1913) indicated the occurrance of **Torpedo sinus-persici** in the Arab Gulf. The study of Blegvad (1944) was more significant. He described seven species of sharks and 13 species of rays and skates from the Arab Gulf. Notable works on cartilaginous fishes of the region were also done subsquently by Menon (1960) , Khalaf (1961), Mahdi (1962), Mazhar (1966), Mahdi and George (1969), Bibik (1970), White and Barwani (1971), Mahdi (1971), Volvic and Al-Kholy (1972), Kuronma and Abe (1972) and Al-Daham (1974).

The present study is based on previous literature and on the collection of fishes by the Basrah Natural History Museum and the Department of Biology, University of Basrah. Classification used here follows those of Bigelow and Schroeder (1948,1953), Romer (1966) and Norman (1966). Families and genera are systematically arranged but the species under their respective genera are arranged alphabetically. The original reference for each species is always cited. This is followed by synonyms used in regional faunas, Arabic local names and distributions.

As regards illustrations those taken from other works are duly acknowledged in the legends of the figures.

SYSTEMATIC ACCOUNT

ORDER SQUALIFORMES

SHARKS

Body torpedo shaped, possessing five to seven pairs of lateral gill openings. Anterior edge of pectoral fin not attached to side of head anterior to gill openings. Teeth arranged in one to four series of functfonal type and one to several of reserve type. One or two dorsal fins. Anal fin either present or absent. Caudal fin heterocercal, with well developed upper lobe. Male with a pair of myxopterygia formed at the edges of pelvic fins. Fertilization internal. Food composed of fishes and crustaceans. Only one suborder in the Arab Gulf and nearby inland waters of Iraq.

SUBORDER LAMNOIDEI

MODERN SHARKS

Head either normal or laterally extended. Snout neither swordlike nor bearing lateral teeth. Five pairs of gill arches and five pairs of gill openings. Nictiating membrane either present or absent. Spiracles present in some. Rostral cartilages, if present, not more than three. Two spineless dorsal fins. Five families in the Arab Gulf.

Key to families of suborder **Lamnoidei**

1 a. Nouth terminal, gill arches connected with each other by spongy masses.
RHINCODONTIDAE

1 b. Mouth inferior, gill arches not connected with each other by spongy masses.

2 a. Anterior margin of nostril with a barbel
ORECTOLEBIDAE

2 b. Anterior margin of nostril without abarbel
3 a. Head expanded laterally
SPHYRNIDAE

3 b. Head of normal shape, not expanded. laterally,

4 a. Teeth low, rounded and pavment-like, with several series functional
TRIAKIDAE

4 b. Teeth blade-like, with one series functional
CARCHARHINDAE

FAMILY ORECTOLOBIDAE

CAT SHARKS & CARPET SHARKS

Head of normal shape. Eyes small, lower lid without nictitating membrane. Anterior margin of nostril with well developed fleshy barbel. Spiracles present. Mouth inferior, transverse, lips with fleshy folds at corners of mouth. Oro-nasal groove deep; connecting between mouth and nostril. Teeth small, with several cusps. Gill arches without spongy masses connecting them togeher. Origin of first dorsal opposite or behind origin of ventral fins Caudal fin not lunate, its length. less than half body length, narrow and not lobed. Longitudinal dermal ridges present or absent. Precaudal pits. Development either oviparous or ovoiviparous. They live on bottom in shallow water . feeding on invertebrates and fishes. Of the 12 genera belonging to this family , only one genus present in the Arab Gulf.

GENUS HEMISCYLLIUM SMITH

Hemiscyllium Smith, Proce. Zool. Soc. London. 1838 : 86 (type: **Squalus ocellatus** Bonnaterre).

Head short and depressed. Snout brounded. Mouth closer to the line between the anterior edge of eyes than tip of snout. The lower labial furrow not crossing mentum. Body length from tip of snout to center of cloaca shorter than tail. Back with one or three longitudinal ridges. First dorsal fin posterior to ventral fins. Only one species present in the Arab Gulf.

HEMISCYLLIUM GRISEUM (MULLER AND HENLE)

RIDGE-BACK CAT SHARK
Fig. 1

Chiloscyllium griseum Muller & Henle, Syst. Beschr. Plagiost ., 1841 : 19 (type locality : India; Japan). - Blegavad Danish Sci. Invest. Iran, pt. 3, 1944 : 35, pl. 1, fig, 1. — Mazhar, Bull. Biol. Res. Centre, Baghdad, 2, 1966 : 44, figs. 1 and 2. — Mahdi, Iraq Nat. Mus. Pub. 28, 1971 : 4, 1, fig. 1. — Kuronuma and Abe , Fish. Kuwait, 1972 : 43, fig. 1.

Local Names. Hayassah; Kossetch Al-Qitt; Lehi.

Head moderately flattened above. Snout short and broadly rounded, its length in front of mouth nearly one-fourth the length to fifth gill opening. Eye narrow, oval, about twice as broad as high, its horizontal diameter about half as long as snout in front of mouth. Spiracle oval, its long axis oblique, about as long as diameter of eye in large specimen (667 mm), but a little shorter than eye in small (270 mm), situated close behind the posterior margin of the eye. Nostril nearly longitudinal, its posterior end connected with the mouth by a deep open groove, its anterior edge connected with a tapering fleshy barbel (cirrus) reaching backward to the mouth. Gill openings low on sides of neck, oblique, the first to fourth widely spaced, but fourth and fifth gill slits close together, the third over margin of pectoral fin, the fifth slightly longer. Mouth transverse, with well developed labial

folds on lower jaw, its breadth nearly equal to length of snout in front of mouth, its corners with deep furrows, the upper extending inward to edge of the groove and the lower a little farther, but far from being continuous across chin. Teeth minute, alike in both jaws with three cusps, the median much the longest, slender, narrow, and sharp-pointed; nearly seven series fcnctional in the upper jaw and nine in the lower; those toward corners of month with relatively less functional rows and shorter cusps.

Trunk subcylinderical and tapering rearwards, its breadth opposite origin of pectorals about one-ninth to one-tenth of total length. Midline of back with one dermal ridge running rearward from about opposite first gill opening nearly to a short distance before the origin of second dorsal. Caudal peduncle compressed laterally without precaudal pits either above or below. Body sector from snout to cloaca much shorter than tail sector. Dermal denticles very small, loosely spaced or overlapping; the blades varying in size, usually with three ridges, the axial much the strongest; the margin with one tooth; pedicle slender and relatively short.

First and second dorsal fins similar in shape with nearly straight anterior margins, rounded apices, slightly concave rear margins and subacute rear corners. Origin of first dorsal fin nearly over midpoint of base of ventral fins, its vertical height about as long as base. Second dorsal fin nearly or quite as long as first dorsal at base. its origin about midway between origins of first dorsal and upper caudal. Caudal about one-fourth of total length, its axis very slightly raised, its upper margin nearly straight, its terminal sector transversely truncate with rounded corners, occupying about one-third total length of the fin, its lower anterior and posterior margins nearly straight, with strongly deve loped subterminal notch. Anal fin separated from caudal by a definite notch, but continuous with later at its base, its vertical height about one-fourth to one-fifth the length of its base. Ventral fins about as long as base of pectoral fin, with slightly convex anterior margin, very weakly convex posterior margin. Clasders compressed dorso-ventrally, reaching two-third of the length of the ventral fins in immature males and extending beyond ventral tips in adults. Pectoral fin about one and half times as large in area as first dorsal, nearly two third as broad as long, its outer margin very

weakly convex, its distal margin nearly straight, its corners broadly rounded. Upper surface greyish yellow, lower lighter, none of them showing the cross bars seen in specimens from Arabian Sea and Red Sea.

Description prepared from four males ranging from 270 mm. to 667 mm., and three females ranging from 260 mm. to 520 mm. length. from northern sector of the Arab Gulf near the mouth of Shat-al-Arab River.

Distribution :- Abundant in Arab Gulf, also in the Arabian sea, Red Sea, Malay Archipelago, China and Japan.

FAMILY RHINCODONTIDAE

WHALE SHARKS

Head large, mouth wide and terminal, eyes and spiracles small. Gill arches connected with each other by spongy masses of tissue forming a sieve with small openings. Anterior margin of nostril without a barbel. Lower eyelid without nictitating membrane. Corner of mouth with fleshy folds. Teeth small, numerous and in many series. Two dorsal fins, the first much larger than the second. Caudal fin lunate, its axis sharply raised. Precaudal pit on upper surface only. Sides of trunk with longitudinal dermal ridges anterior to anal fin. One genus.

GENUS RHINCODON SMITH

Rhincodon Smith, Zool. Journ. London. 4, 1829 : 443 (type : **Rhincodon typus** Smith) .

Body spindle shaped, snout broad and flat, eyes lateral and without nictitating membrane. Mouth terminal, its corners with fleshy folds.

Teeth very small, Lower lobe of caudal well developed. One species distributed in all tropical seas and oceans.

RHINCODON TYPUS SMITH

WHALE SHARK

Fig. 2

Rhincodon typus Smith, Zool. Journ. London. 4,1829 : 443 (type : locality : Table Bay, South Africa). — Blegvad, Danish Sci. Invest. Iran, pt. 3, 1944 : 34, fig. 6. — Mahdi, Iraq Nat. Hist, Mus, Pub, 28, 1971 : 5, pl. 1. fig. 2. — White and Barwani, Comm. Sea Fish , Arab Gulf and Gulf of Oman, 1, 1971 : 11.

Local Names :- Channaz ; Kossetch Al-Hoot.

Body robust. Sides of trunk with a pair of longitudinal dermal ridges anterior to anal fin. Upper precaudal pit present. First dorsal fin closer to precaudal pit than to tip of snout, its origin anterior to ventral fin origin. Second dorsal larger than anal fin, its origin anterior to anal origin. Caudal lunate, very large. Skin with small placoid scales. Colour dark brown with irregular pale spots. Harmless. Food composed of plankton, small animals, and fishes.

Distribution :- All temperate and tropical seas, occasionally seen in the Araba Gulf.

FAMILY TRIAKIDAE

SMOOTH DOGFISHES

Head of normal shape, short and pointed. Lower eyelid without nictitating membrane but with external longitudinal fold. Oro-nasal groove present or absent. Barbels absent. Spiracles present or absent. Teeth low, rhomboidal, or if sharp with three to five cusps, usualy in mosaic arrangement, several series functional together. Two dorsal fins, the first much shorter than the caudal, its base terminating anterior to origin of ventral fins. Caudal not lunate, its length much lses than half total length. Size small. Harmless. Development either viviparous or ovovivparous. One genus in the Arab Gulf.

GENUS MUSTELUS LINK

Mustelus Link, Mag. Physik. Naturgesch. Gotha, 6, 2, 1790 : 31 (type : **Squalus mustelus** Linnaeus) .

Head short, flattened, snout pointed. Spiracles present. Corners of mouth with well developed labial furrows on upper and lower jaws. Oronasal groove absent. Teeth small, numerous, low, in mosaic arrangement, Posterior margins of dorsal, anal, and ventrals moderately

concave, their posterior ends produced. Origin of anal below base of second dorsal. Caudal with well marked subterminal notch. Precaudal pit lacking. One species in the Arab Gulf.

MUSTELUS MANAZO BLEEKER

GUMMY SHARK

Fig. 3

Mustelus manazo Bleeker, Verh. Batav. Genootsch, Japan, 26, 1857 : 126 (type locality : Nagasaki) . — Blegvad, Danish Sci. Invest Iran pt. 3, 1944 : 42, figs. 13, 14 — White and Barwani, Comm. Sea Fish. Arab. Gulf and Gulf of Oman, 1, 1971 : 13

Local Names :- Kossetch ; Yuryur ; Jar jur.

Snout pointed, mouth crescentic, with long labial folds. Spiracles present, though small . Last gill opening small , above pectoral fin. Nasal closer to mouth than to tip of snout. Lower eyelid with longitudinal dermal fold externally, Teeth small, in mosaic arrangement. Origin of first dorsal above inner angle of pectoral fins. Origin of second dorsal a little anterior to origin of anal fin. Precaudal pit absent. Grey brown above, whitish below. Length up to 1.5 meters. There is one specimen in our collection with the following measurements :-

Total length	=	620	mm.
Height of trunk at origin of pectoral	=	70	mm.
Snout length in front of mouth	=	46	mm.
Snout length in front of eye	=	55	mm.
Breadth of mouth	=	34	mm.

Distribution :- The Arab Gulf. Arabian Sea and Indian Ocean.

FAMILY CARCHARHINIDAE

REQUIEM SHARKS

Body subcylindrical, elongated. Head of normal shape, depressed, not extended laterally. Lower eyelid fith nictitating membrane. without folds. Mouth crescent-shaped. Oronasal groove absent. Barbels absent. Labial furrows confined to corners of mouth. Gill arches without gill rakers. Spiracles present in some genera. First dorsal fin much shorter than caudal, its base completely anterior to ventral origin. Second dorsal small, opposite anal fin. Caudal not lunate, its length

much less than half total length, with well developed subterminal notch and a distinct lower lobe. Precaudal pits more or less distinct. Teeth triangular, blade-like, with one conspicuous cusp, arranged in longitudinal rows of which only one functional along sides of jaws. Development ovoviviparous or viviparous. The majority of sharks in the Arab Gulf belong to this family and some of its members are very dangerous to bathers. Some species enter Shatt-al-Arab, Tigris and Euphrates.

Key to genera of family **Carcharhinidae**

1 a. Spiracle present.

2 a. Caudal peduncle with lateral dermal ridge
Galeocerdo

2 b. Caudal peduncle without lateral dermal ridge
Hemigaleus

1 b. Spiracles absent.

3 a. Margins of cusps of teeth smooth in both upper and lower jaws.

4 a. Bases of upper teeth as well as lowers smooth
Scoliodon

4 b. Bases of upper teeth serrated
Hypoprion

3 b. Margins of cusps of teeth serrated in upper jaw, those of lowers either serrated or smooth.
Carcharhinus

GENUS HEMIGALEUS BLEEKER

Hemigaleus Bleeker, Verh. Batav. Genootsch., 24, 1852 : 45

(type : **Hemigaleus microstoma** Bleeker).

Head flat and depressed at lower surface. Snout longitudinally produced. Eyes of medium size, lower lid with nictitating membrane. Spiracles present though size small. Lips with distinct folds. First dorsal opposite space between pectoral and ventral fins. Caudal with well developed subcaudal lobe, and distinct subcaudal notch. Precaudal pits well developed above and below. Caudal peduncle without

longitudinal dermal ridges. Teeth dimorphous, the upper teeth serrated but lowers smooth. Size small. One species in the Arab Gulf.

HEMIGALEUS BALFOURI DAY

BALFOUR'S SHARK

Fig. 4

Hemigaleus balfouri Day, Fish. India, 1878 : 717, pl. 135, fig 4 (type locality : Waltair, Cormandel Coast, India). - Blegvad, Danish Soi. Invest. Iran, pt. 3, 1944 : 40, fig. 11. Al-Daham, Bull. Basrah Nat. Rist. Mus., 1, 1, 1974 : 101 , figs. 1 and 2.

Local Names : Kossetch; Jar jur; Krabi

Head flattened from above. Snout thin-tipped, narrow-ovoid, its length in front of mouth about one-third the length of head to origin of pectoral fin. Spiracle a minute slit behind eye. Nostril closer to mouth than to tip of snout. Corners of mouth with labial folds on both jaws. Upper teeth triangular, with inner margins nearly straight, the outer margins oblique, deeply notched toward corners of mouth with three to four denticles on outer side of base; lower teeth with slender unserrated cusps, broad, and without denticles. First dorsal larger than second, its origin a little posterior to axil of pectoral. Second dorsal about as large as anal, its origin a little anterior to the origin of anal. Caudal nearly 22% of total length. Dark brown, second dorsal with black summit. Total length of specimen studied 805 mm (female). Distribution :- Known from different parts of the Arab Gulf, Arabian Sea, and Indian Ocean.

GENUS GALEOCEROD MULLER AND HENLE

Galeocerdo Muller and Henle, Sits. Ber. Preuss. Akad. Wiss. Berlin . 1837 : 115 (type : **Squalus arcticus** Faber) .

Head depressed, mouth crescent-shaped. Spiracles present, small behind eye. Teeth alike on both jaws, triangular, with serrated margins. Lower eyelid with nictitating membrane. Labial folds on both jaws. First dorsal opposite space between pectoral and ventral fins. Origin of second dorsal above or slightly before origin of anal. Base of anal a little longer than base of second dorsal. Caudal peduncle with longitudinal dermal ridge on each side. Midback with longitudinal

low dermal ridge. Precaudal pits above and below. Development ovoviviparous. The genus includes only one species in the Arab Gulf.

GALEOCERDO CUVIERI (LESUEUR)

TIGER SHARK

Fig. 5

Squalus cuvier LeSueir, Journ. Akad. Nat. Sci, Phila.. 2, 1822 : 351 (type locality : North west coast of New Holland).

Galeocerdo cuvier, White and Barwani, Comm. Sea. Fish. Arab. Gulf and Gulf of Oman, 1, 1971 : 15.

Laocal Names :- Kessetch; Jar jur; Sawaar.

Snout blunt. Eyes closer to tip of snout than to first gill opening. Labial folds on upper jaw longer than those on lower. Teeth compressed serrated, with notched external margin. Origin of first dorsal opposite axil of pectoral. Origin of second dorsal slightly anterior to origin of anal. Ventral fins small, closer to second dorsal than to first dorsal. Caudal long, pointed, its length ranging between one-third of total length before maturity to one-fourth of total length after maturity. The colour of immature sharks light grey with many, irregular darker spots on different parts of body. Very dangerous, attacks bathers.

Distribution :- Very rare in the Arab Gulf. Present in Arabian Sea, Indian Ocean.

GENUS SCOLIODON MULLER AND HENLE

Scoliodon Muller and Henle, Sitzungsber. Akad. Wiss. Berlin, 1837:117 (type : **Carcharias (Scoliodon) laticaudus** Muller and Henle). Bigelow and Schroeder, Fish W. N. Atl., 1948 : 292.

Body length from tip of snout to cloaca nearly as long as tail. Lower eyelid with nictitating membrane. Spiracles absent. Mouth curved, labial furrows either limited to corners of mouth, or extending on one jaw or both. Teeth alike on both jaws, blade-like, smooth, with inner margins deeply notched, bases of teeth not enlarged. Base of first dorsal more than twice as long as base of second dorsal, but base of anal not more than twice as long as base of second dorsal. Midpoint of base of first dorsal about equidistant from origin of ventrals and axil of pectoral. Precaudal pits above and below. Peduncle without

longitudinal dermal ridges. Anterior lobe of subcaudal prominant. Members of this genus are small sharks, the length reaches upto 100 cm. One species in the Arab Gulf.

SCOLIODON WALBEEHMI (BLEEKER)

WALBEEHM'S SHARP-NOSED SHARK.

Fig. 6

Carcharias (Scoliodon) walbeehmi Bleeker, Nat. Tijds. Neederland , Indie, 10, 1856 : 348 (type locality : Rio, Bintang Island).

Local Names :- Keossetch; Jar jur.

Body length from tip of snout to cloaca slightly longer than tail. Corners of mouth with long-labial furrows on upper jaw, equal in length to diameter of eye, while the lower one is much shorter. Nasal opening closer to mouth than to tip of snout. Snout length equidistant from eye to second gill opening. Teeth with serrated margins. Posterior margin of pectoral slightly concave. Second dorsal smaller than anal, its origin above posterior part of base of the latter. Dorsal surface brownish grey, ventral surface whitish. Size small.

Distribution :- Rare in the Arab Gulf. Spreading in the Arabian Sea. Indian ocean, China and Japan.

GENUS HYPOPRION MULLER AND HENLE

Hypoprion Muller and Henle, Syst. Beschr. Plagiost. 1841 : 34 type: **Carcharia (Hypoprion) macloti** Muller and Henle). - Bigelow and Schroeder, Fish, W. N. Atl., 1948 : 315.

Body length from tip of snout to cloaca a little longer than tail . Lower eyelid with nictitating membrane. Spiracles absent. Labial furrows short on upper jaw, absent on lower. Teeth on upper jaw very oblique, notched on outer margins or erect with smooth cusps, but teeth bases either serrated or with low denticles on outer side, but indistinctly serrated on inner. Midpoint of base of first dorsal closer to axil of pectoral than to origin of ventrals. Base of first dorsal twice as long as base of second dorsal. Precaudal pits present above and below. Peduncle without longitudinal dermal ridges. Anterior lobe of subcaudal prominent. One species in the Arab Gulf.

HYPOPRION PALASORRAH (CUVIER)

GREY SHARK

Fig. 7

Carcharias palasorrah Cuvier, Regne Anim., 2, 1829 : 388 (on Palasorrah Russel, Fishes of Coromandel, 1, 1803 : 9, pl. 14 (type locality : Vizagapatam; Madras) .

Scoliodon palasorrah, Mazhar; Bull. Biol. Res. Centre: Baghdad Univ., 2, 1966 : 46.

Carcharias palasorrah, Mahdi, Iraq. Nat. Hist. Mus. Pub. 28, 1971 : 3.

Local Names :- Kossetch; Jar jur.

Snout before mouth as long as or less than distance between eye and first gill opening. Mouth arched, its length less than its breadth. Corners of mouth with labial folds. Nasal opening a little closer to mouth than to tip of snout. Upper teeth with fine serration on the inner sides of their bases and coarse serration on outer sides. Bases of teeth on lower jaw without serration. Base of first dorsal closer to base of ventral fin than to base of pectoral. Origin of second dorsal opposite end of base of anal. Upper surface grey. lower whitish. Margins of pectoral, ventral and anal fins whitish. Length reaches to 120 cm.

Distribution :- The Arab Gulf, Arabian Sea, Indian Ocean, China and Japan.

GENUS CARCHARHINUS BLAINVILLE

Carcharhinus Blainville, Bull. Soc. Philom, Paris, 8, 1816 : 121 (type **C. commersonii** Blainville).- Bigelow and Schroeder, Fish W. N. Atl., 1948 : 320.

Body elongated, spindle-shaped. Body sector from tip of snout to cloaca either less or more than tail sector. Snouth produced longitudinally. Lower eyelid with well developed nictitating membrane. Upper labial furrow very short, lower labial furrow lacking. Spiracles absent. Teeth subtriangular, cusps of uppers regularly serrated, of lowers either serrated or smooth. First dorsal subtriangular with concave posterior margin. Second dorsal either same size, smaller, or larger than anal. Caudal peduncle without dermal ridges. Upper precaudal

pit well developed to hardly distinguished. Development viviparus. Six species in the Arab Gulf, of these some enter Shatt-al-Arab, Tigris and Euphrates.

Key to species of genus **Carcharhinus**

1 a. Second dorsal and anal equal in size.
  2 a. Teeth of lower jaw unserrated
    menisorrah
  2 b. Teeth of lower jaw serrated
    spallanzani
1 b. Second dorsal smaller or larger than anal.
  3 a. Second dorsal smaller than anal.
    4 a. Origin of second dorsal opposite origin of anal
      limbatus
    4 b. Origin of second dorsal behind origin of anal
      soorrah
  3 b. Second dorsal larger than anal.
    5 a. Snout very short, its length before mouth about 1/3 length of head before first gill opening.
      gangeticus
    5 b. Snout long, its length before mouth equal to 1/2 length of head before first gill opening.
      lamia

CARCHARHINUS GANGETICUS (MULER AND HENLE)

GANGES SHARK

Fig. 8

Carcharias (Prionodon) gangeticus Muller and Henle, Syst. Beschr. Plagiost., 1841 : 39, pl. 13 (type locality : Ganges River).
Carcharhinus gangeticus. Khalaf, Mar. F. W. Fish. Iraq, 1961 : 9.
Local Names:- Kossetch, Jar jur.

Snout blunt, very short, its length in front of mouth about 1/3 length of head in front of first gill opening. Mouth large, its length about half its width. Corners of mouth with very short labial folds. Teeth subtriangular, all serrated, uppers broad with very distinct notch in outer margin in immature sharks, disappearing with maturity, lower teeth erect, narrower in the cusps, broad based. Origin of first

dorsal above end of pectoral base. Second dorsal larger than anal, its origin slightly before origin of the latter. Anal closer to caudal than to ventral fin. Pectoral subfalciform, angles pointed. Subcaudal lobe prominent. Greyish above, lighter beneath. Length up to 8 meters.

Distribution :- The Arab Gulf, Arabian Sea, Indian Ocean. Ascending Shatt-al-Arab, Tigris and Euphrates to above tidal influence.

CARCHARHINUS LAMIA (BLAINVILLE)

LAMIA SHARK

Squalus lamia Blainville, Faune Francaise, Poiss., 1820 : 88, pl. 22, fig. C (On Duhamel, Traite gen. Peches, 4, 1782-92 : 297, pl. 19 (type locality : Our seas).

Carcharhinus lamia, Khalaf, Mar. F. W. Fish. Iraq, 1961 : 11.
Carcharias lamia, Mahdi. Fish, Iraq., 1962 : 9
Local Names :- Kossetch ; Jar jur.

Snout blunt, very broad, its length in front of mouth about half the length of head in front of first gill opening. Corners of mouth with short labial folds. Nasal opening midway between mouth and tip of snout. Teeth subtriangular, all serrated. Origin of first dorsal opposite inner angle of the pectoral, its size large, its depth nearly as long as body depth. Second dorsal larger than anal, its origin before origin of anal. Precaudal pits present. Subcaudal lobe produced sharp. Greyish above, whitish below. Length reaches up to 150 cm.
Distribution :- Present in Shatt-al-Arab, Tigris and Euphrates, but due to constraction of irrigation dams on the last two rivers, the sharks rarely seen above the dams. Also present in the Arab Gulf, Arabian Sea, Indian Ocean, Pacific and Atlantic Oceans.

CARCHARHINUS LIMBATUS (MULLER AND HENLE)

BROWN SHARK

Fig. 9

Carcharias (priondon) limbatus Muller and Henle, Syst. Beschr. Plagiost,. 1841 : 49, pl. 19, fig. 9 (type locality : Martinique).
Local Names :- Kossetch; Jar jur; Krabi.

Snout elongated, pointed. Mouth large, strongly curved. Labial furrow at corner of mouth scarcely extending on to upper jaw. Nasal openings closer to mouth than to tip of snout. Teeth ereet, with narrow cusps and broad bases. Uppers with serrated bases and slightly serrated cusps, lowers with smooth cusps and serated bases. Origin of first dorsal above inner angle of pectoral. Second dorsal somewhat smaller than anal, its origin above origin of anal. Origin of ventral closer to origin of subcaudal than to origin of pectoral. Greenish grey above, paler below, first dorsal, pectoral and subcaudal with black tips. One specimen from the Arab Gulf, total length 46 cm.

Distribution :- The Arab Gulf where where a male of 81 cm. was captured by a fishing trawler in 1973 in Ras-al-Motaf. Also reported from the Arabian Sea, Red Sea, Indian Ocean and Atlantic Ocean.

CARCHARHINUS MENISORRAH (MULLER AND HENLE)

GREY - FINNED SHARK

Fig. 10

Carcharias (Prionodon) menisorrah Muller and Henle, Syst. Beschr. Plagiost., 1841 : 46, pls. 17, 19, fig. 7 type locality : Java ; Australia; Red Sea). - Blegvad, Danish Sci. Invest. Iran, pl. 3 , 1944 : 37, fig. 8, 10.- Mahdi, Fish. Iraq, 1962 : 9.

Carcharhinus menisorrah, Khalaf, Mar. F. W. Fish. Iraq, 1961 : 9. - Mazhar, Bull. Biol. Res. Centre, Baghdad Univ., 1966 : 46. - Kuronuma and Abe, Fish. Kuwait, 1972 : 43, Fig. 2.

Local Names :- Kossetch; Jar jur; Krabi.

Head in front of first gill opening about one-fourth body length to origin of subcaudal. Snout in front of mouth equal to width of mouth. Nostril a little closer to mouth than to tip of snout. Labial folds at angles of mouth short but with relatively longer extension on the upper jaw than lower. Teeth with broad bases, uppers triangular, outer edge notched and serrated basally; lower cusps narrow erect and smooth with broad bases. Width of pectoral about two thirds its length. First dorsal large, its origin above inner angle of pectoral, its upper angle sharp. Second dorsal and anal equal in size, their origin on one plane.

Precuadal pits present. Back grey, lower surface whitish, upper half of second dorsal deep black. Five specimens studied ranging in total length from 65 - 98 cm.

Distribution :- The most abundant shark in the Arab Gulf, ascends rivers, known from Shatt-al-Arab and Tigris. Spreading in the Arabian Sea, Red Sea and the Indian Ocean.

CARCHARHINUS SORRAH (MULLER AND HENLE)

SORRAH SHARK

Fig. 11

Carcharias (Prionodon) sorrah Muller and Henle, Syst. Bescher. Plagiost., 1841 : 45, pl. 16 (type locality :- India; Java; Madagascar).

Head length in front of first gill opening about one - fourth body length to origin of subcaudal. Snout length in front of mouth equal to distance between eye and first gill opening. Mouth strongly arched. Nostrils about midway from mouth to tip of snout. Corners of mouth without labial furrows. Teeth serrated, uppers triangular, with straight inner edges and notched outer edges, lowers narrow and more erect with broad bases. Pectoral falciform, its width more than half the length, outer angle sharp. Origin of first dorsal behind base of pectoral. Second dorsal very small about half the size of anal. Caudal pointed , its lower anterior lobe produced and pointed. Caudal peduncle with precaudal pits. Back grey, lower surface pale. Size small, not more than 80 cm. One specimen, B.N.H.M. No. 425, total lenpth 48.5 cm.

Distribution :- Rare in the Arab Gulf. Spreading in the Arabian Sea, Red Sea, Indian and Pacific Oceans.

CARCHARHINUS SPALLANZANI (LESUEUR)

BLACK - TIP SHARK

Squalus spallanzani LeSueur, Journ. Acad. Nat. Sci. Phila., 2 (2), 1822 : 351 (type locality : Terre de Witt, New Holland).

Carcharia melanopterus, Lane, Journ. Bombay Nat. Hist. Soc., 24, 1916 : 746.

Carcharhinus melanopterus, Tortonese, Bull. Mus. Zool. Anat. Comp. Univ. Torino, 3, 44, 1934 : 4 (Persia) .
Local Names :- Kossetch; Jar jur.

Snout short, very obtuse, its length in front of mouth equals to width of mouth. Nasal opening closer to tip of snout than to mouth . Labial folds restricted to corners of mouth, very short, with labial furrows above and below. Teeth erect, narrow, finely serrated. Pectorals falciform, outer angle sharp, inner rounded, its width less than half its length. Origin of first dorsal above inner angle of pectoral. Second dorsal opposite and similar to anal in size. Caudal less than 1/3 of the total length. Anterior lobe of subcaudal produced and pointed. Caudal peduncle with precaudal pits. Back brownish or grey, lower surface light, fins black edged. Length up to three meters.
Distribution :- Common in southern part of the Arab Gulf. Also in the Arabian Sea, Red Sea and Indian Ocean.

FAMILY SPHYRNIDAE

HAMMERHEAD SHARKS

Head produced laterally into a shape of hammer, with eyes at its outer margins. Mouth crescent-shaped. Labial folds rudimentary. Spiracles absent. Nictitating membrane well developed. Last gill opening above base of pectoral. Barbels absent. Oronasal lacking. Teeth alike on both jaws, compressed and oblique, with outer margins notched near bases. First dorsal above interspace between pectoral and ventral though nearer to pectoral. Second dorsal opposite anal. Development viviparous. One genus represented in the Arab Gulf.

GENUS SPHYRNA RAFINESQUE

Sphyrna Rafinesque, Indice Ittiol. Sicil., 1810 : 46, 60 (type **Squalus zygaena** Linnaeus). - Bigelow and Schroeder, Fish. W. N. Atl., 1948 : 408.

Head with moderate extension from each side. Eyes and nostrils closer to each other than midline of snout. Labial furrows either absent or present. First dorsal closer to pectoral than to ventral. Second dorsal much smaller than first. Anterior subcaudal lobe well produced. Subcaudal notch near the end of the caudal well developed. Other characteristics of the genus as for the family.

Key to species of genus **Sphyrna**

1 a. Anterior margin of head with concavities restricted to the area of nares **zygaena**

1 b. Anterior margin of head with five concavities **mokarran**

SPHYRNA MOKARRAN (RUPPELL)

SQUAT-HEADED HAMMERHEAD SHARK.

Zygaena mokarran Ruppell, Neue Wirbelth. Fische, 1835 : 66, pl. 17, fig. 3 (type locality : Massawa) .

Sphyrna tudes, Al-Daham, Bull. Basrah Nat. Hist. Mus., 1,1, 1974 : 105, fig. 3, 4.

Local Names :- Kossetch Abul-garn; Jar jur Abul-karn.

Head hammer-shaped, its anterior margin thin, tipped, with five concavities (one in the centre, one opposite each nostril and a large one between the central concavity and each nostril concavity). Width of lateral expansion near eye equal to length of its hind edge, about one-third of the total length of the lateral expansion. Front margin of the hammer with a weakly marked groove extending from edge of nostril half way to the midline. Snout length in front of mouth nearly equal to breadth of mouth. Teeth almost alike in both jaws except that the lowers are a little smaller than the uppers, their edges coarsely serrate. First dorsal origin over inner corner of pectoral. Second dorsal about half as long at base as first dorsal and nearly one-third as high. Caudal about one-third of total length, with well marked subterminal notch, anterior lobe of subcaudal well developed. Pectorals with weakly concave anterior and posterior margins. Caudal peduncle laterally compressed, upper precaudal pit yell marked, the lower hardly

defined. Grey brown above, whitish below; second dorsal with black summit. Description prepared from a male specimen obtained by trawling in 1971, with total length of 85 cm, from northern sector of the Arab Gulf.

Distribution :- Rare in the Arab Gulf; nearly of world-wide distribution.

SPHYRNA ZYGAENA (LINNAEUS)

ROUND-HEADED HAMMERHEAD SHARK

Fig. 12

Squalus zygaena Linnaeus, Syst. Nat.. ed. 10, 1, 1758 : 234 (type locality : Europe; America).

Sphyrna zygaena White and Barwani, Comn. Sea Fish. Arab Gulf and Gulf of Oman, 1971 : 14.

Local Names :- Kossetch Abul-Garn; Jar jur Abul-Karn.

Head hammer-shaped. Hind margin of lateral expansion almost equal to its width but with concavities near nares only, anterior margin of lateral expansion with a furrow. Nares very close to eyes. Teeth alike in both jaws. inner margin of tooth nearly straight, outer margin notched and finely serrated. Origin of first dorsal posterior to end of base of pectoral, its height longer than its base. Base of second dorsal about half as long as base of anal fin, its origin opposite midpoint of anal fin. Length up to 3.8 meters. One specimen from the Arab Gulf of a total length of 47 cm.

Distribution :- The Arab Gulf, Arabian Sea, Indian Ocean and Atlantic Ocean.

ORDER RAJIFORMES

SKATES AND RAYS

Body typically disc-like in form, tail usually slender and thin. Pectoral fins extended anteriorly to combine with sides of head anterior to gill openings and posteriorly to meet with ventral fins. Anterior vertebrae united with each other to from a tube which support pectoral fins.

Five pairs of gill openings located entirely on the lower surface of the body. Spiracles large located on the upper surface near the eyes. Mouth transverse on the lowerssurface of the head. Nictitating membranes and upper eyelids are absent. Nostrils inferior. Teeth wide and flat, not blade-like. One or two dorsal fins, sometimes both absent. Anal fin absent. Caudal fin, if present, small. Precaudal pits absent. Skin either naked or armed with thorns, tubercles or prickles. Some with pair of electric organs located between each pectoral fin and the head. Fertilization internal. Development oviparous or ovoviviparous.

Key to suborders of order **Rajiformes**

1 a. With a caudal fin and two dorsal fins

2.a. Snout saw-shaped with toothlike structures from both sides
PRISTOIDEI

2 b. Snout not saw-shaped and not bearing toothlike structures on sides.

3 a. With two electric organs; skin naked
TORPEDINOIDEI

3 b. Without electric organs, skin not naked
RHINOBATOIDEI

1 b. Caudal fin absent; with one dorsal fin or without
MYLIOBATOIDEI

SUBORDER PRISTOIDEI

SAWFISHES

Head sharklike, with head and trunk ventrally flattened. Snout produced anteriorly forming a saw with toothlike structures on both sides. Mouth transverse. Spiracles large, behind eyes. Upper eyelid absent. Two large dorsal fins. Caudal fin well developed. Tail sector stout, precaudal pits absent. Oral teeth numerous. One family. They live near the bottom.

FAMILY PRISTIDAE

SAWFISHES

Characteristics of family as those of suborder. One genus.

GENUS PRISTIS LINK

Pristis Link, Mag. Physik. Naturgesch., Gotha, ser. 3, vol. 6, 1790 : 31 (type **Squalus pristis** Linnaeus) .- Bigelow and Schroeder, Fish. W. N. Atl., 1953 : 18.

Characteristics of genus as those of family. Represented by three species in the Arab Gulf.

Key to species of genus Pristis

1 a. Caudal fin with a distinct lower lobe.

2 a. Origin of first dorsal posterior to origin of ventral, rostral teeth ranging from 23 to 35 pairs

cuspidatus

2 b. Origin of first dorsal anterior to origin of ventrals, rostral teeth ranging fom 17 to 21 pairs.

microdon

1 b. Caudal fin without lower lobe

zijsron

PRISTIS CUSPIDATUS LATHAM

POINTED SAWFISH

Fig. 13

Pristis cuspidatus Latham, Trans. Linn. Soc. London, 2, 1794 : 279, pl. 26, fig. 3 (type locality : not known). - Blegvad, Danish Sci. Invest. Iran, pt. 3, 1944 : 45. - White and Barwani, Fish. Arab. Gulf and Gulf of Oman, 1, 1971 : 18

Local Names :- Kossetch Abu-Minshar; Abusef; Sayyafa.

Rostrum narrow and thin, tapering at end, its length about one - third of body length to origin of subcaudal fin. Rostral teeth 23 - 35 on either side. Oral teeth small, in many rows, in pavement.

Origin of first dorsal posterior to base of ventrals. Second dorsal a little

smaller than first. Caudal fin with well developed subcaudal lobe. Upper surface yellowish grey, lower surface whitish. Length up to six meters.

Distributions :- Common in the Arab Gulf near mouth of Shatt-al-Arab. Spreading in the Arabian Sea, Red Sea, Indian Ocean, Japan, and China.

PRISTIS MICRODON LATHAM

SMALL - TOOTHED SAWFISH

Fig. 14

Pristis microdon Latham, Trans. Linn. Soc. London, 2, 1794 : 280, pl. 26, fig. 4 (type locality : not known).

Local Names :- Kossetch Abu-Minshar; Abusef, Sayyafah.

Rostrum relatively wide, its length about one-third of body length to origin of subcaudal fin. Rostral teeth 17 - 22 on either side, short and widely spaced, present even near base of rostrum. Oral teeth in many rows, in pavement. Origin of first dorsal considerably anterior to origin of ventrals. Second dorsal almost equal to first, its origin in midpoint between posterior end of first dorsal and origin of subcaudal fin. Caudal fin with slightly produced lower lobe. Upper surface grey, lower dusky white. Length up to five feters.

Distribution :- Rare in the Arab Gulf. Spreading in the Arabian Sea , Indian Ocean and Tropical Atlantic.

PRISTIS ZIJSRON BLEEKER

GREEN SAWFISH

Fig. 15

Pristis zijsron Bleeker, Nat. Tijdschr.. Nederland, Indie, 2, 1851 : 417, 442 (type locality : Band jermassing, Boroneo in rivers) .

Pristis zysron, Blegvad, Danish Sci. Invest. Iran, pt. 3, 1944 : 45.- White and Barwani, Fish Arab. Gulf and Gulf of Oman, 1, 1971:18.

Local Names :- Kossetch Abu-minshar; Abusef; Sayyafah.

Rostrum not tapering at end, its length about one-third of body length to origin of subcaudal fin. Rostral teeth 25-32 on either side, present even near base of rostrum. Oral teeth in several rows in pavment. Origin of first dorsal posterior to mid - point of bases of ventrals . Dorsal fins almost equal in size. Subcaudal fin not forming a lobe. Upper surface greenish grey, lower whitish. Length up to six meters. Distribution :- Rare in the Arab Gulf. Spreading in the Arabian Sea, Indian Ocean and Australia.

SUBORDER RHINOBATOIDEI

GUITAR FISHES

Body anterior to cloaca ranging from sharklike to raylike in form. Disc triangular, passing gradually into stout tail. Snout either pointed or broadly rouded, its edges without teeth. Spiracles very large, behind eyes. Two dorsal fins. Caudal fin well developed. Tail sector not marked off from trunk sector. Electric organs absent. No anal fin. Body and fins covered with small placoid scales of different shapes. Thorns often present on midline of back, on shoulders, around eyes and spiracles. Tail without serrated spines. Teeth small, numerous, in pavement . Development ovoviviparous. Two families. They live either close to the bottom or lie half buried in it.

Key to families of suborder **Rhinobatoidei**

1 a. Origin of first dorsal above or a little anterior to base of ventrals
RHYNCHOBATIDAE

1 b. Origin of first dorsal considerably posterior to base of ventrals
RHINOBATIDAE

FAMILY RHYNCHOBATIDAE

Snout either long and pointed or short and broadly rounded. Origin of first dorsal either above or a little anterior to ventral bases. Posterior margin of pectoral fin anterior to origin of ventrals. Caudal fin bilobed, its posterior margin deeply concave. Food composed mainly of crustaceans and molluscs. Two genera, both present in the Arab Gulf.

Key to genera of family **Rhynchobatidae**

1 a. Snout pointed ..... **Rhynchobatus**

1 a. Snout broadly rounded ..... **Rhina**

GENUS RHINA SCHNEIDER

Rhina Schneider in Bloch and Schneider, Syst. Ichth., 1801 : 352 (type : **Rhina ancylostomus** Bloch and Schneider).

Body depressed. Snout broadly rounded. Body anterior to cloaca almost as long as tail. Mouth anteriorly arched and strongly undulate. Nostrils either transverse or slightly oblique. Posterior margin of spiracle without ridges. Length of disc about one-third of total length. First dorsal fin opposite ventral fins. Lower lobe of caudal well developed.

One species.

RHINA ANCYLOSTOMA SCHNEIDER

BOW - MOUTHED GUITARFISH

Fig. 16

Rhina ancylostoma Schneider in Bloch and Schneider , Syst. Ichth. 1801 : 352, pl. 72)type locality : Indian Seas ; Coromandel).

Rhynchobatus ancylostomus, Blegvad, Danish Sci. Invest. Iran, pt. 3, 1944 : 47.

Local Names :- Kossetch mdawar al-fam; Nawwam.

Snout short and broadly rounded. Mouth strongly undulate and slightly arched anteriorly. Spiracle as large as eye, its posterior margin without ridges. Teeth obtusely rounded, with many ridges. Origin of first dorsal nearly opposite origin of ventrals. Second dorsal a little smaller than first, its origin midway between origin of first dorsal and origin of subcaudal. Caudal well developed, anterior lobe of subcaudal very distinct. Tail with longitudinal dermal ridge on each side. Head with a longitudinal row of tubercles above the eye and extending to

shoulder on each side. Another row of tubercles on anterior part of midback, and two more short rows between each pectoral fin and the midback row. Upper surface redish brown, with several spots. Lower surface whitish. Length up to two meters.

Distribution :- Abundant in the Arab Gulf. Spreading in the Arabian Sea and Indian Ocean.

GENUS RHYNCHOBATUS MULLER AND HENLE

Rhynchobatus Muller and Henle, Sitzungsber. Akad. Wiss Berlin, 1837 : 116 (type : **Rhincobatus laevis** Schneider).

Disc subtriangular, its length more than its width. Mouth slightly undulate, with labial folds. Posterior margin of spiracle with two small ridges. Teeth obtusely rounded and not similar. First dorsal opposite ventrals. Second dorsal far away from first. Anterior lobe of subcaudal well developed. Origin of ventral far from base of pectoral. A single row of tubercles on middle of back between the dorsals and in front of the first. One species present in the Arab Gulf.

RHYNOCHOBATUS DJIDDENSIS (FORSSKAL)

WHITE - SPOTTED GUITARFISH

Fig. 17

Raja djiddensis Forsskal, Descript. Animal., 1775 : 18 (type locality : Djedda and Lohaja, Red Sea).

Rhynchobatus djiddensis, Blegvad, Danish Sci. Invest. Iran, pt. 3, 1944 : 47, Fig. 17. Mahdi, Iraq, Nat. Hist. Mus. Pub. 28, 1971 : 7, pl. 2, fig. 7. - Kuronuma and Abe, Fish Kuwait, 1972 : 44, fig.3.

Local Names :- Kossetch Abu-Misha ; Balando ; Nawwam.

Snout long, pointed. Disc subtriangular, its length more than its width. Labial folds prominant. Spiracle as large as eye, its posterior margin with two low ridges. Teeth blunt. First dorsal larger than second, its origin a little posterior to origin of ventrals. A single row

or tubercles on midback, another short row on each shoulder, and a row extending between each spiracle and the orbit of eye. Tail with a lateral dermal ridge. Upper surface grey with several scattered white spots and round black spots on scapular region. Lower surface whitish. Length up to three meters. There are two specimens in our collection from the Arab Gulf, a male with the following description :- Total length = 1230 mm, disc width = 470 mm, snout length in front of eye = 190 mm, breadth of mouth = 82 mm, breadth of nostril = 57 mm, and a female with a total length of 450 mm, tail length = 235 mm, breadth of mouth = 31 mm, breadth of nostril = 25 mm.

Distribution :- Abundant in the Arab Gulf, inflecting heavy damage to crustaceans in coastal area of the Gulf. Spreading in the Arabian Sea, Red Sea, Malay Archipelago and Indo-China.

FAMILY RHINOBATIDAE

Shape of body intermediate between spindlelike and disclike. Body moderately or strongly depressed. Snout ranging from produced and pointed to short and rounded. Spiracle directly behind eye, its posterior margin sometimes with transverse ridges. Nostrils oblique. Anterior margin of pectoral fin either a little beyond nostril or to tip of snout, but its posterior margin extended at least to origin of ventrals. Origin of first dorsal considerably posterior to rear ends of ventrals. Subcaudal fin without defiite lobe. One genus in the Arab Gulf.

GENUS RHINOBATOS LINK

Rhinobatos Link, Mag. Phys. Naturg. Gotha, ser. 3, vol. 6, 1790 : 32 (type : **Raja rhinobatos** Linnaeus).

Snout produced, pointed. Trunk strongly depressed anteriorly. Spiracles large, its posterior margin with one or two dermal ridges. Nostril more or less oblique, its anterior margin with narrow lobe in the middle. Mouth transverse. Teeth numerous, rounded. Width of disc less than distance between tip of snout and cloaca. First dorsal fin considerably posterior to ventrals, similar to second dorsal in shape and equal to it in size. Caudal small, without distinct lower lobe. Tail

flattened ventrally with lateral dermal ridge. Two species in the Arab Gulf.

Key to species of genus **Rhinobatos**

1 a. Internarial space almost equal to width of nostril **annulatos**

1 b. Internarial space about twice width of nostril **granulatus**

RHINOBATOS ANNULATOS MULLER AND HENLE

GREYISH SPOTTED GUITARFISH

Fig. 18

Rhinobatus (Syrrhina) annulatus Muller and Henle, syst. Beschr. Plagiost., 1841 : 116 (type locality : Cape of Good Hope).

Rhinobatus annulatus Mahdi, Iraq, Nat. Hist. Mus. Pub. 28, 1971 : 6, pl. 2, fig. 5.

Local Names :- Korsetch Abu-Misha ; Suss ; Nawwam.

Snout produced, pointed. Longitudinal rostral ridges converging from each other. Width of nostril equal to internarial space. Nostril with anterior large lobe extending beyond its posterior margin. Spiracle small, almost as large as eye, with two well developed folds. Small tubercles on middorsal, on orbital ridges, above spiracles, and on shoulder. The tubercles become less distinct with advancement in age. Upper surface yellowish grey with some rings of greyish colour, the largest smaller than eye. Lower surface whitish. One specimen in our collection with total length = 1327 mm, length of snout before eye = 295 mm, width of disc = 440 mm, width of mouth = 95 mm, width of nostril = 47 mm, internarial space = 42 mm.

Distribution :- Rare in the Arab Gulf. Spreading in eastern coast of South Africa.

RHINOBATOS GRANULATUS CUVIER

GRANULATED GUITARFISH
Fig. 19

Rhinobatus granulatus Cuvier ; Regne Animal, ed. 2, Vol. 2, 1829: 396 (No. locality). - Blegvad, Danish Sci. Invest. Iran, pt. 3, 1944 : 46, fig. 16 - Mahdi, Iraq Nat. Hist. Mus. Pub. 28, 1971 : 6, pl. 2, fig. 4.

Local Names :- Kossetch Abu-Misha ; Balando ; Nawwam.

Snout produced, pointed. Longitudinal rostral ridges approaching each other at their posterior half. Nostril large, wide, oblique at posterior end, its width about twice internarial space. Spiracle small immediately behind eye, its posterior margin with two small dermal ridges. A row of large tubercles (19-30) on middorsal before first dorsal fin, another row of small tubercles between first and second dorsal. Large tubercles on shoulders. Upper surface yellowish grey. Lower surface whitish up to two meters. Feeding on crustaceans molluscs, and small fishes where a heavy damage inflected because of such feeding.

Distribution :- Abundant in the Arab Gulf. Spreading in the Arabian Sea. Indian Ocean and Pacific Ocean.

SUBORDER TORPEDINOIDEI

ELECTRIC RAYS

Head, trunk and pectoral fins forming a depressed circular or subcircular disc. Edges of disc thicker than other suborders. Snout short and obtuse. Mouth either small or medium. Nostrils very close to mouth. Eyes small in the majority, sometimes rudimentary or absent. Spiracles large near eyes. Gill opening small. Two electric organs between pectoral fins. Anterior edge of pecoral attached to head before eyes. One or two dorsal fins, sometimes none. Caudal well developed. Tail sector of body short and relatively stout, sometimes with lateral folds. Teeth small, smooth, or with sharp ridges. Skin naked. Their food composed of crustaceans, molluscs and other bottom organisms.

Development ovoviviparous. They live in tropical, subtropical and temperate seas and oceans. Three families, one of them in the Arab Gulf.

FAMILY TORPEDINIDAE

ELECTRIC RAYS

Disc ranging from elongate to circular. Skin naked, soft, without scales, tubercles or thorns. Nostrils separated from mouth. Eyes either absent or well developed. Two dosal fins. Two large electric organs. Ventral fins large, close to pectoral. Caudal of medium size. Two genera in the Arab Gulf.

Key to genera of family **Torpedinidae**

1 a. Tail only slightly shorter than disc, origin of first dorsal posterior to bases of ventrals

Narcine

1 b. Tail much shorter than disc, origin of first dorsal above bases of ventrals.

Torpedo

GENUS TORPEDO HOUTTUYN

Torpedo Houttuyn, Nat. Hist. Linn., 1764 : 453 (type : **Raja torpedo** Linnaeus). - Bigelow and Schroeder, Fish. W. N. Atl., 1953 : 90.

Snout short, as long as interorbital space. Eyes well developed. Spiracles of medium size, their posterior edges sometimes with papillae. Nostril either transverse or slightly oblique, closer to mouth than to tip of snout. Nasal curtain a little broader than long. Teeth in rows not extending to corners of mouth. Disc boader than long. Base of first dorsal either entirely or party above bases of ventrals. Second dorsal a little smaller than first. Tail very short, with a low lateral fold. Skin soft. Two species in the Arab Gulf.

Key to species of genus **Torpedo**

1 a. End of base of first dorsal either exactly above end of bases of ventrals or anterior to them.

marmorata

1 b. End of base of first dorsal posterior to ends of bases of ventrals. **sinus-persici**

TORPEDO MARMORATA OLFERS

VERMICULATE TORPEDO RAY

Torpedo mararata var. **panthera** Olfers, Torpedo, 1831 : 16 (type locality : Red Sea).

Torpedo panthera, Blegvad, Danish Sci. Invest. Iran, pt. 3, 1944 : 44, pl. 3.

Local Names :- Lokma ; Fitra ; Awala.

Disc subcircular, broader than long. Snout short, its anterior margin nearly straight. Eyes well developed, though small. Spircles as large as eyes, their posterior margins with papillae, ranging from seven to nine. First dorsal slightly larger than second, the end of its base either above or anterior to end of bases of ventrals. Distance between first dorsal and second equal to distance between second dorsal and caudal. Length of tail sector about one-third of total length. Each side of tail with a longitudinal dermal fold. Teeth small with wide bases. They live on bottom. The voltage of electric organ in large animals exceeds 100. Upper surface light brown with numerous irregular deep brown spots or stripes, lower surface whitish.

There are several specimens in our collection from the Arab Gulf. One of them has the following measurments : Total length = 350 mm; tail length = 135 mm ; disc length = 200 mm ; disc width = 240 mm.

Distribution :- Relatively abundant in the Arab Gulf, spreading also in the Arabian Sea and Red Sea.

TORPEDO SINUS - PERSICI OLFERS

Fig. 20

Torpedo sinus persici Olfers, Torpedo, 1831 : 15, 17 (on Kampfer).

Narcacion sinus persici, Garman, Mem. Harv. Comp. Zool. 36, 1913: 309 (Persian Gulf).

Local Names :- Lokma ; Fitra ; Awala.

Snout short, obtuse. Eyes smaller than spiracles ; Posterior margin of spiracle with seven to nine papillae. Teeth small. First dorsal slightly larger than second, end of its base noticeably, posterior to ends of bases of ventrals. Length of tail sector about 3/7 total length. Skin soft. Upper surface pale brown with large black spots, lower surface whitish.

One specimen (total length = 135 mm) obtained in 1972 from southern section of the Arab Gulf.
Distribution :- Not common in the Arab Gulf. Spreading in the Arabian Sea and Red Sea.

GENUS NARCINE HENLE

Narcine Henle, Uber Narcine, Berlin, 1834 : 31 (type : **Torpedo brasilinensis** Olfers). - Fowler, Bull, U. S. Nat. Mus., 100, vol. 13, 1941 : 332.

Snout twice as long as interorbital space, with broad anterior margin. Spiracles large, their posterior margins sometimes with papillae. Mouth narrow, transverse and almost straight, Nasal curtain much broader than long. Teeth not extending to corners of mouth. Origin of first dorsal posterior to ventral fins. Tail slightly shorter than disc, with longitudinal lateral fold. Caudal well developed. Skin smooth. One species is encountered in the Arab Gulf.

NARCINE TIMLEI (SCHNEIDER)

SPOTTED ELECTRIC RAY

Raja timlei Schneider in Bloch and Schneider, Syst. Ichth, 1801:359 (type locality : Tranquebar ; Madras).

Local Names :- Lokma ; Fitra ; Awala.

Snout short, blunt. Disc subcircular, its width slightly more than its length. Mouth small and straight. Eyes small. Spiracles larger than eyes, located directly behind them and without papillae. Origin of first dorsal posterior to ends of bases of ventrals in a short distance.

Origin of second dorsal closer to origin of first dorsal than to origin of caudal. Tail only slightly shorter than disc. Skin soft. Upper surface brown with scattered darker spots, lower surface whitish. Two specimens obtained in 1972 by trawling near Ras Al-Motaf.
Distribution :- Very rare in the Arab Gulf, spreading in the Arabian Sea and Indian Ocean.

SUBORDER MYLIOBATOIDEI

Cranium without rostral projection. Head and anterior part of trunk strongly depressed. Eyes and spiracles either lateral or dorsal. Disc ranging from oval to very wide. Teeth ranging from numerous and small to few and large. Pectoral fins either united anterior to head, or with parts completely separated from the main body of the fin, forming one or two cephalic fins. Tail sector well destinguished from trunk, either shorter than disc or much longer. Upper surface with tubercles or thorns, lower surface almost naked. Development ovoviviparous . They live in tropical and subtropical seas and oceans (Bigelow and Schroeder, 1953 : 331-333). Five families can be encountered in the Arab Gulf.

Key to families of suborder **Myliobatoidei**

1 a. Without any cephalic fin, eyes on dorsal surface of head.
  2 a. Disc not more than 1.3 times as broad as long, tail not shorter than rest of body.
    DASYATIDAE
  2 b. Disc more than 1.5 times as broad as long, tail shorter than rest of body.
    GYMNURIDAE
1 b. With one or two cephalic fins, eyes lateral.
  3 a. With one cephalic fin
    MYLIOBATIDAE
  3 b. With two cephalic fins.
    4 a. Cephalic fins united at their bases
      RHINOPTERIDAE
    4 b. Cephalic fins well separated from each other
      MOBULIDAE

FAMILY DASYATIDAE

STING RAYS

Pectoral fins united anterior to head. No cephalic fin or fins. No rostral projection. Disc not more than 1.3 times as broad as long. Mouth either straight or slightly arched. Floor of mouth with a row of fleshy papillae. Eyes and spiracles on dorsal surface of head. Nostril separated from mouth, its anterior edge with more or less fringed curtain. No dorsal fins or caudal. Tail narrow and well marked off from trunk, much longer than disc and tapering at end. Upper surface of tail with one serrated spine or more. Upper surface of disc either smooth or with tubercles and thorns (Bigelow and Schroeder, 1953 : 331-335). Very dangerous to bathers because of their spines. They feed on crustaceans and other invertebrates. Two genera in the Arab Gulf.

Key to genera of family **Dasyatidae**

1 a. Lower surface of tail posterior to spine with a longitudinal dermal fold.

Dasyatis

1 b. Lower surface of tail posterior to spine without a longitudinal dermal fold.

Himantura

GENUS DASYATIS RAFINESQUE

Dasyatis Rafinesque, Carratt. Nuov. Gen. Spec. Sicilia, 1810 : 48 (type : **Dasyatis ujo** Rafinesque), - Bigelow and Schroeder, Fish. W.N. Atl., 1953 : 340.

Disc oval or rhomboidal, either soft or with thorns and tubercles. Tail whiplike, much longer than disc, with one long pointed and serrated spine or more on upper surface, and well developed longitudinal dermal fold on lower surface, starting just posterior to the spine ; upper surface posterior to spine either with a longitudinal low fold or ridge or without. Spiracles large, behind eyes. Nostril slightly oblique. Teeth either flat or with median ridges. Alltogether about thirty species are known, three in the Arab Gulf.

FAMILY DASYATIDAE

STING RAYS

Pectoral fins united anterior to head. No cephalic fin or fins. No rostral projection. Disc not more than 1.3 times as broad as long. Mouth either straight or slightly arched. Floor of mouth with a row of fleshy papillae. Eyes and spiracles on dorsal surface of head. Nostril separated from mouth, its anterior edge with more or less fringed curtain. No dorsal fins or caudal. Tail narrow and well marked off from trunk, much longer than disc and tapering at end. Upper surface of tail with one serrated spine or more. Upper surface of disc either smooth or with tubercles and thorns (Bigelow and Schroeder, 1953 : 331-335). Very dangerous to bathers because of their spines. They feed on crustaceans and other invertebrates. Two genera in the Arab Gulf.

Key to genera of family **Dasyatidae**

1 a. Lower surface of tail posterior to spine with a longitudinal dermal fold.

Dasyatis

1 b. Lower surface of tail posterior to spine without a longitudinal dermal fold.

Himantura

GENUS DASYATIS RAFINESQUE

Dasyatis Rafinesque, Carratt. Nuov. Gen. Spec. Sicilia, 1810 : 48 (type : **Dasyatis ujo** Rafinesque), - Bigelow and Schroeder, Fish. W.N. Atl., 1953 : 340.

Disc oval or rhomboidal, either soft or with thorns and tubercles. Tail whiplike, much longer than disc, with one long pointed and serrated spine or more on upper surface, and well developed longitudinal dermal fold on lower surface, starting just posterior to the spine ; upper surface posterior to spine either with a longitudinal low fold or ridge or without. Spiracles large, behind eyes. Nostril slightly oblique. Teeth either flat or with median ridges. Alltogether about thirty species are known, three in the Arab Gulf.

Key to species of genus **Dasyatis**

1 a. Dermal fold both above and below.

2 a. Tail almost as long as disc, floor of mouth with two papillae.

imbricatus

2 b. Tail about twice length of disc, no buccal papillae.

zugei

1 b. Dermal fold on tail below, not above.

sephen

DASYATIS IMBRICATUS (SCHNEIDER)

SCALY STING RAY

Raja imbricata Schneider in Bloch and Schneider, Syst. Ichth., 1801 : 366 (type locality : Coromandel).

Local Names :- Lokma ; Shurus.

Snout produced, pointed. Mouth slightly undulate, its floor with two fleshy papillae. Spiracles as large as eye and posterior to it. Teeth in several rows. Disc as broad as long. Tail almost as long as rest of the body, with one pointed and serrated spine, followed by a longitudinal dermal fold both above and below. Body covered with small tubercles on back and top of head. Tail with large and small tubercles before the spine. A row of thorns on back and shoulder.

Body colour above reddish brown, below whitish.

Distribution :- Very rare in the Arab Gulf, spreading in Arabian Sea, Red Sea and Indian Ocean.

DASYATIS SEPHEN (FORSSKAL)

COW - TAIL RAY

Fig. 22

Raja sephen Forsskal, Descript. Animal., 1775 : 17 (type locality : Djedda, Lohaja, Red Sea).

Hypolophus sephen, Blegvad, Danish Sci. Invest. Iran, pt. 3, 1944 : 51.

Dasybatus sephen, White and Barwani, Fish. Arab Gulf, and Gulf of Oman, 1, 1971 : 21.

Local Names :- Lokma; Shurus.

Snout obtuse. Disc rhomboidal, broader than long. Mouth undulate, its floor with five papillae, the median three closer to each other and longer. Spiracles about twice as large as eyes. Tail about three times as long as disc or more; its upper surface with one serrated spine or two but without longitudinal dermal fold or ridge, its lower surface with a longitudinal dermal fold. Skin smooth when young, as they advance in age, tubercles start to cover top of head, midback and anterior part of tail. Two or three large oval tubercles always present on middorsal. Upper surface brown, lower white.

Distribution :- Abundant in entrance of Shatt-al-Arab and different parts of the Arab Gulf. Spreading in the Arabian Sea, Red Sea, South Africa and Malay Archipelago.

DASYATIS ZUGEI (MULLER AND HENLE)

STELLATE STING RAY

Fig. 23

Trygon zugei Muller and Henle, Syst. Beschr. Plagiost., 1841 : 165, pl. 54 (type locality : Japan : China; India).

Local Names :- Lokma; Shurus.

Snout well produced, narrow and pointed, sharper than any species of this genus. Disc rhomboidal, as broad as long or slightly more. Mouth undulate, its floor without papillae, its width as long as distance between nostrils. Spiracles little larger than eyes. Tail twice as long as disc. Dermal folds both above and below, upper fold very low and much shorter than lower. Well developed serrated spine on tail, proceeded by two rows of small thorns. Skin smooth when young, as they advance in age tubercles start to appear on back. Large tubercles sometimes forming a row on midback. Upper surface either brown or yellowish brown, lower whitish.

Disribution :- Rare in the Arab Gulf. Spreading in the Arabian Sea, Malay Archipelago, China and Japan.

GENUS HIMANTURA (MULLER AND HENLE)

Himantura Muller and Henle, Arch. Naturg. 1, 1837 : 400 (type : **Raja uarnak** Forsskal). - Bigelow and Schroeder, Fish. N. W. Atl., 1953 : 389.

Disc oval or rhomboidal, either soft or with tubercles and thorns. Tail much longer than disc, with one serrated spine or more on upper surface and without any dermal fold or ridge on upper or lower surface of tail.

Characters otherwise as of **Dasyatis** Rafinesque. Four species encountered in the Arab Gulf.

Key to species of genus **Himantura**

1 a. Floor of mouth with two papillae.
2 a. Tail only slightly longer than disc
walga
2 b. Tail about 3 times as long as disc
bleekeri
1 b. Floor of mouth with four papillae or more.
3 a. Tail about 2.5 times as long as disc
uarnak
3 b. Tail about 3.5 times as long as disc
gerrardi

HIMANTURA BLEEKERI (BLYTH)

BLEEKER'S STING RAY
Fig. 24

Trigon bleekeri Blyth, Journ. Asiat. Soc. Bengal, 29, 1860 : 41 (type locality : Bengal).

Local Names :- Lokma ; Shurus.

Snout produced narrow and pointed. Disc subrhomboidal, nearly as long as broad. Tail about three times as long as disc or more, with one serrated spine. Mouth strongly undulate, with two fleshy papillae, each of them closer to the other than to corner of mouth. A large tubercle on middorsal with three smaller tubercles anterior and three

posterior to it. Tail in front of the serrated spine, sometimes with tubercles. Uuuer surface dark brown without spots, lower whiitsh. Tail without rings.

One specimen (male) in the collection of Basrah Natural History Museum from the Arab Gulf of the following measurements : Disc length = 185 mm, Disc width = 200 mm, Tail length = 595 mm.
Distribution :- Rare in the Arab Gulf, spreading between Arabian Sea and China.

HIMANTURA GERRARDI (GRAY)

GERRARD'S STING RAY

Fig. 25

Trygon gerrardi Gray, List Fish. Brit. Mus., 1851: 116 (type locality: India). - Blegvad, Danish Sci. Invest. Iran, pt. 3, 1944 : 50, fig. 19, pl. 2, figs. 2, 2a.

Dasyatis gerrardi, Mazhar. Bull. Biol. Res. Centre, Baghdad, 2, 1966: 49, 56, fig. 6.

Local Names :- Lokma ; Shurus.

Snout obtuse, not produced. Disc subtriangular, broader than long, its anterior margin undulate. Tail long, about three times as long as disc or more, with one serrated spine. Mouth undulate with four fleshy papillae on its floor. Spiracle about as large as eye and directly posterior to it. Youngs with soft skin, as they advance in age, a large tubercle appears on middorsal and several irregular rows of tubercles appear anterior and posterior to it. Upper surface brown when young, as they advance in age, spots of yellow colour appear on posterior part of body and black and white narrow rings on tail. Lower surface white.

Distribution :- Very abundant in the Arab Gulf. Spreading in Arabian Sea, Red Sea and Indian Ocean.

HIMANTURA UARNAK (FORSSKAL)

BANDED WHIPTAIL STING RAY.

Fig. 26

Raja uarnak Forsskal, Descript. Animal., 1775 : 18 (type locality : Arabia).

Trygon uarnak, Blegvad, Danish Sci. Invest. Iran, pt. 3, 1944 : 48. pl. 2, fig. 1.

Dasyatis uarnak, Mazhar, Bull. Biol. Res. Centre, Baghdad, 2, 1966: 49. - White and Barwani, Fish. Arab. Gulf and Gulf of Oman, 1, 1971 : 20.

Himantura uarnak, Mahdi, Iraq Nat. Hist. Mus. Pub. 28, 1971 : 7.

Local Names :- Lokma ; Shurus ; Abu-Sarreiha ; Marna.

Snout slightly produced and pointed. Disc rhomboidal almost as broad as long. Tail about three times as long as disc, with one serrated spine. Mouth undulate, with four to seven papillae in its floor. Spiracle slightly larger than eye, its margin not fringed. Youngs with smooth skin, as they advance in age, tubercles appear on head, trunk and tail. Mid-dorsal of disc with large white tubercle, surrounded by small tubercles, forming rhomboidal shape. They change their colour as they advasce in age. Upper surface brown with small darker spots, lower white. Tail with brown spots anteriorly and cross bands posteriorly. Spots on disc and bands on tail disappear with advancement in age. There is one male specimen in our collection from the Arab Gulf with the following measurements: Total length = 87 cm, tail length=66 cm, Disc length = 22.5 cm, Disc width = 23.5 cm.

Disribution :- Abundant in different parts of the Arab Gulf.

Spreading in Arabian Sea, Red Sea and Malay Archipelago,

HIMANTURA WALGA (MULLER AND HENLE)

WALGA STING RAY

Fig. 27

Trygon walga Muller and Henle, Syst. Beschr. Plagiost., 1841 : 159, pl. 51, fig. 1 (type locality : India ; Red Sea) .

Dasyatis walga, Mazhar, Bull. Biol. Res. Centre, Baghdad, 2, 1966: 47, 54.

Local Names :- Lokma ; Shurus.

Snout produced, pointed. Disc rhomboidal, as long as broad or slightly more. Tail a little longer than disc, with one or two serrated spines but without any longitudinal fold. Mouth small, undulate, with two fleshy papillae on its floor. Spiracle as large as eye, directly posterior to it. Disc free from tubercles except one row extending from an area close to eyes until origin of the serrated spine, and several other tubercles behind the latter. Upper surface brown, lower white. Length up to 52 cm. One specimen in the collection of Basrah Natural History Museum (No. 407) of the following measurements : Total length = 46.5 cm. Tail length = 21.5 cm. Disc length = 22 cm. Disc width = 21 cm.

Distribution :- The Arab Gulf, Arabian Sea, and Red Sea.

FAMILY GYMNURIDAE

BUTTERFLY RAYS

Disc very wide, more than 1.5 times as broad as long. Tail shorter than rest of body, with one or two serrated spines or none. A small dorsal fin sometimes present on midlength of tail. Floor of mouth without papillae. Characters otherwise as in Dasyatidae.

One genus in the Arabian Gulf.

GENUS GYMNURA VAN HASSELT

Gymnura van Hasselt, Alg. Konst. en Letterbode Haarlem, 1823 : 316 (cited from : Bigelow and Schroeder, 1953 : 396).

Disc much broader than long, with rounded angles. Dorsal fin absent. Tail as long as disc or much shorter. Serrated spine either

present or absent. Mouth large, either transverse or a little arched. Spiracle large, directly behind eye, with or without tenticles. Eyes small, prominent. One species in the Arab Gulf.

GYMNURA POECILURA (SHAW)

SPOTTED BUTTERFLY RAY
Fig. 28

Raja poecilura Shaw, General Zoology, 5, 1804 : 281 (on Tenkee Kunsal Russell, Fish. Coromandel, 1, 1803 : 4, pl. 6 (type locality : Vizagapatam).

Pteroplatea poecilura, Blegvad, Danish Sci. Inves. Iran, pt. 3, 1944 : 52, fig. 21. - White and Barwani, Comm. Sea Fish. Arab. Gulf and Gulf of Oman, 1, 1971 : 22.

Local Names :- Lokma.

Disc subrhomboidal, about twice as broad as long. Snout obtuse, with small produced process. No dorsal fin. Tail about as long as disc, without a serrated spine and without a longitudinal dermal fold. Tubercles absent. Upper surface brown, lower white. Tail annulated with white and brown, ranging from nine to eleven. Several specimens in the collection of Basrah Natural History Museum from the Arab Gulf, of these two males of the following measurements :- Total length = 18.5, 44.5 cm, tail length = 7.0, 20.0 cm, disc length = 12.3, 27.0 cm, disc width = 24.3, 51.2 cm.

Distribution :- Abundant in the Arab Gulf. Spreading in Arabian Sea, Red Sea, Indo-China and China.

FAMILY MYLIOBATIDAE

EAGLE RAYS

Pectorals either narrow, opposite eyes or entirely disappear there then reappear at the tip of snout and unite to form a cephalic fin. Eyes and spiracles lateral. Mouth with transverse curtain on its roof and several papillae on its floor. Teeth large, flat and pavement-like, in one to seven series on each jaw. Tail narrow, whip-like, much longer than disc, sometimes with one serrated spine or more. One dorsal fin on

anterior part of tail but no caudal fin, or any dermal fold. Skin naked except a serrated spine or spines, some tubercles around orbit on mid-dorsal are seen on males (Bigelow and Schroeder, 1953 : 433). Two genera in the Arab Gulf.

Key to genera of family **Myliobatidae**

1 a. Teeth in one series on each jaw, tail with a serrated spine
Aetobatus

1 b. Teeth normally in seven series, no serrated cacdal spine
Aetomyleus

GENUS AETOMYLEUS GARMAN

Aetomylaeus Garman, Bull. Mus. Comp. Zool. Harvard, 51, 1908 : 252 (type **Myliobatis maculatus** Gray).

Disc about twice as broad as long or less, rhomboidal. Tail narrow, whip-like, much longer than disc, and without any serrated spine. Dorsal fin opposite end of bases of ventrals or posterior to them. Teeth in seven series, one central series of large teeth, and three other series of narrow teeth on each side. Skin either smooth or with small thorns and tubercles on middorsal. Two species in the Arab Gulf.

Key to species of genus **Aetomyleus**

1 a. Origin or dorsal posterior to end of bases of ventrals, disc less than twice as broad as long
maculatus

1 b. Origin of dorsal opposite end of bases of ventrals, disc twice as broad as long
nichofii

AETOMYLEUS MACULATUS (GRAY)
MOTTLED EAGLE RAY

Myliobatis maculatus Gray, Illustr. Indian Zool., Hardwicke, 2, 1834: 101. - Blegvad, Danish Sci. Invest. Iran, pt. 3, 1944 : 55.

Local Names :- Lokma ; Gharabi.

Disc less than twice as broad as long. Pectoral fin as long as wide, anterior margin convex, posterior concave. Origin of dorsal behind ends of bases of ventrals. Tail more than four times as long as the

body, without a serrated spine. Skin rough with small tubercles or thorns (Garman, 1913 : 435). Upper surface brown with light round spots, margin of disc dark posteriorly, lower surface white. Tail of uniform colour. Length up to 72 cm.

Distribution :- Arab Gulf, Arabian Sea, Indian and Pacific Oceans.

AETOMYLEUS NICHOFII (SCHNEIDER)

NIEUHOF'S EAGLE RAY

Fig. 29

Raja nichofii Schneider in Bloch and Schneider, Syst. Ichth., 1801 : 364 (On Zeevleermuis Nieuhof, Gedenk. Reize. 1, 1682 : 278).

Myliobatus nichofii, Blegvad, Danish Sci. Invest. Iran, pt. 3, 1944 : 54. - White and Barwani, Comm. Sea Fish. Arab Gulf and Gulf of Oman, 1, 1971 : 24.

Aetomyleus nichofii, Kuronuma and Abe, Fish, Kuwait, 1972 : 46, pl.1.

Local Names :- Lokma ; Gharabi.

Disc about twice as broad as long. Pectoral width a little more than its length, its anterior margin almost straight, its posterior margin concave. Tail about three times as long as disc, without serrated spine. Skin smooth when young, as they advance in age, it becomes rough. Upper surface dark brown, sometimes with irregular dark and light spots, lower white.

Distribution :- The Arab Gulf, Arabian Sea, Red Sea, Malay Archi - pelago, Australia, China and Japan.

GENUS AETOBATUS BLAINVILLE

Aetobatus Blainville, Bull. Soc. Philom. 8, 1816 : 122 (type : **Raja Narinari** Euphrasen). - Bigelow and Schroeder, Fish. W. N. Atl., 1953 : 451.

Disc rhomboidal, about twice as broad as long. Floor of mouth with a row of papillae from two to four. Teeth formed of a single series of broad plates on each jaw. Tail much longer than disc, with or without a serrated spine. A small dorsal fin on base of tail. One species enters the Arab Gulf.

AETOBATUS FLAGELLUM (SCHNEIDER)
GREY EAGLE RAY

Raja flagellum Schneider in Bloch and Schneider, Syst. Ichth., 1801: 361, pl. 73 (type locality : Coromandel).
Aetobatus narinari, Blegvad, Danish Sci. Invest. Iran, pt. 3, 1944 : 55.
Stoasodon narinari, White and Barwani, Comm. Sea Fish. Arab Gulf and Gulf of Oman, 1, 1971 : 23.
Local Names :- Lokma ; Gharabi ; Tess.

Disc rhomboidal; its width less than twice its length. Cephalic fin straight and pointed. Mouth a little arched. Teeth in a single series, flat and broad. Dorsal fin arises at base of ventral fins. Tail very long ranging from three to four times as long as disc, with one serrated spine or two, posterior to dorsal fin. Upper surface grey, lower whitish. In **A. narinari** (Euphrasen) of tropical Atlantic and eastern Pacific, the upper surface of disc and ventrals is spotted. Fowler (1941) regards **A. flagellum** as a synonym of **A. narinari.**
Distribution :- The Arab Gulf, Arabian Sea, Red Sea and Indian Ocean.

FAMILY RHINOPTERIDAE
COW - NOSED RAYS

Two cephalic fins united at their bases only, separated completely from the main body of pectoral fins, and located at the same level of lower surface of head. Upper surface of head with a longitudinal notch. Floor and roof of mouth without papillae. Eyes prominent and lateral. Spiracles large, lateral, behind eyes. Teeth in several series, broad flat and pavement-like. Disc rhomboidal. Tail long and narrow, carrying a dorsal fin and a serrated spine. One genus of worldwide distribution.

GENUS RHINOPTERA CUVIER
Rhinoptera Cuvier, Regne Animal, 2, ed. 2. 1829 : 401 (Type : **Myliobatis marginata** Geoffroy Saint-Hilaire).

Disc rhomboidal, about twice as broad as long or less. Tail long, narrow, its base with a dorsal fin followed by a serrated spine. Teeth

GENUS MOBULA RAFINESQUE

Mobula Rafinesque, Indice d'Ittiol. Siciliana, 1810 : 48, 61 (type : **Mobula auriculata** Rafinesque). - Bigelow and Schroeder, Fish. W.N.Atl., 1953 : 486.

Disc rhomboidal, about twice as broad as long. Mouth on lower surface. Teeth on both jaws. Cephalic fins thin and leaflike. One dorsal fin. No caudal fin. Tail short and whiplike. One species in the Arab Gulf.

MOBULA DIABOLUS (SHAW)

LESSER DEVIL RAY

Fig. 31

Raja diabolus Shaw, General Zoology, 5, 1804 : 291 (on Eregoodoo-tenkee Russel, Fish. Coromandel, 1, 1803 : 5, pl. 9 (type locality : Vizagapatam).

Local Names :- Firs ; Lokma.

Disc rhomboidal, about twice as broad as long. Two undulate cephalic fins used to draw food into mouth. One dorsal fin. No serrated spine. Teeth small, in several series. Skin soft. Upper surface dark grey, lower white.

Distribution :- The Arab Gulf, Arabian Sea, Red Sea and Malay Archipelago.

GENUS MANTA BANCROFT

Manta Bancroft, Zool. Journ., 4, 1829 : 144 (type: **Cephalopterus manta** Bancroft).

Disc rhomboidal, about twice as broad as long. Mouth terminal. Tail whiplike, about as long as disc, with or without a serrated spine. Teeth only on lower jaw. One dorsal fin. One species in the Arab Gulf.

MANTA EHRENBERGII (MULLER AND HENLE)

Manta

Fig. 32

Ceratoptera ehrenbergii Muller and Henle, Syst. Sechr. Plagiost., 1841 : 187 (type locality : Red Sea).

Local Names :- Firs.

Disc about twice as broad as long. Cephalic fins produced anteriorly. Tail as long as bdoy including cephalic fins. Mouth broad, ter-

minal. Teeth small, in several series extending over whole width of lower jaw. Spiracle smaller than eye. Skin rough. Upper surface purple, lower white. Width of disc upto five meters. One specimen obtained in 1972 by trawling near Ras-al-Motaf.

Distribution :- The Arab Gulf ; Arabian Sea, Red Sea and South Africa.

SUMMARY

The present paper is an abbreviated descriptive account of the cartilaginous fishes of Iraq and the Arab Gulf.

A total of 15 species of sharks (Order squaliformes) comprising five families and nine genera ; and 24 species of rays and skates (Order Rajiformes) comprising nine families and 14 genera are presented.

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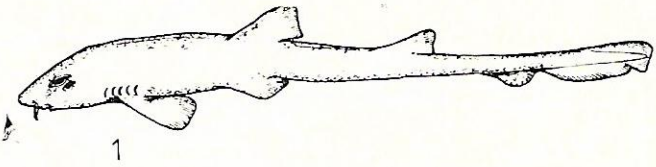
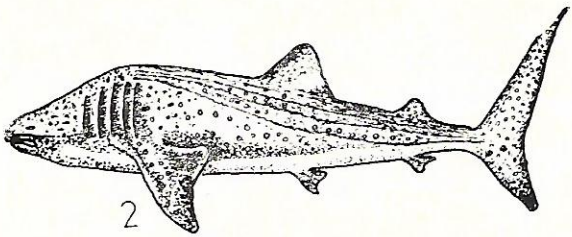
الخلاصة

يحتوى البحث على وصف موجز للاسماك الغضروفية فى العراق والخليج العربى ويشتمل على ١٥ نوعا من رتبة القرشيات موزعة بين خمس عوائل وتسعة اجناس وعلى ٢٤ نوعا من رتبة القوبعيات موزعة بين تسع عوائل و١٤ جنسا .





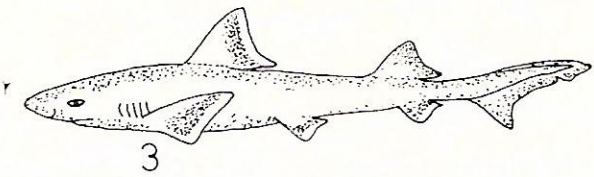


Fig. 1. **Hemiscyllium griseum** (Muller & Henle).

Fig. 2. **Rhincodon typus** Smith (After Bigelow & Schroeder).

Fig. 3. **Mustelus manazo** Bleeker (After Fowler).

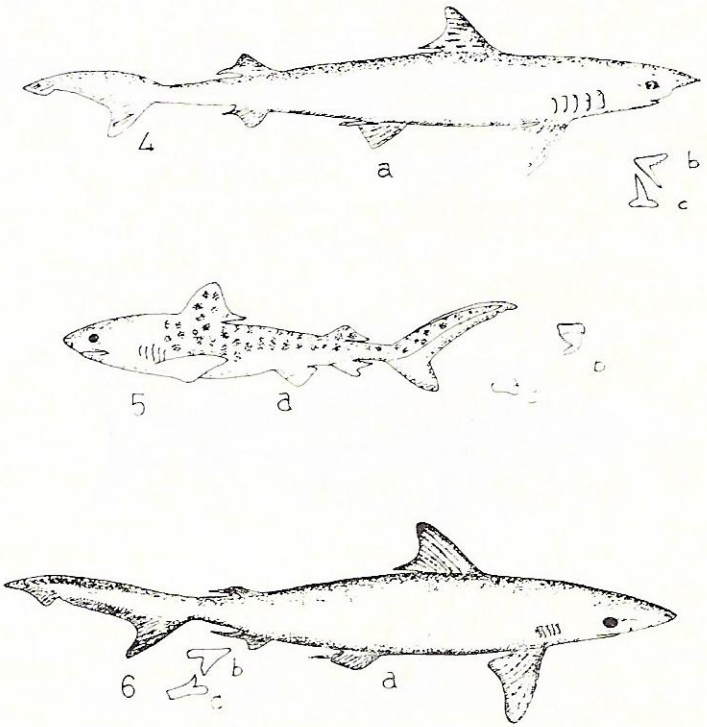


Fig. 4. (a) **Hemigaleus balfouri** Day (After Day), lateral tooth of (b) upper and (c) lower jaws.

Fig. 5. (a) **Galeocerdo cuvieri** (Le Sueur) (After Fowler) , lateral tooth of (b) upper jaw and (c) lower jaws.

Fig. 6. (a) **Scoliodon walbeehmi** Bleeker (After Day), lateral tooth of (b) upper and (c) lower jaws.

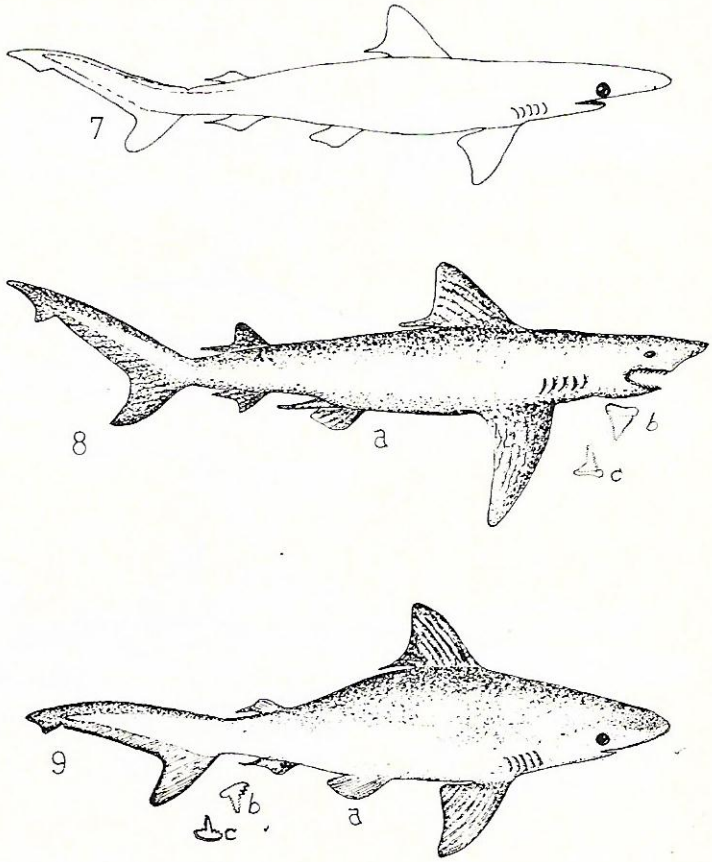
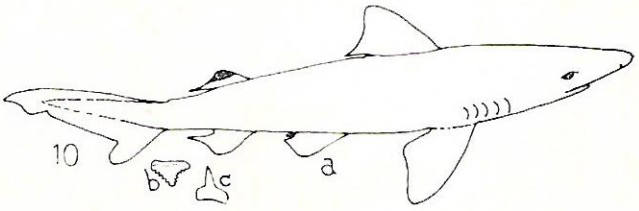
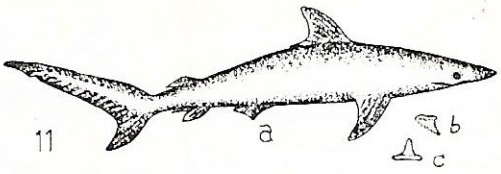


Fig. 7. **Hypoprion palasorrah** (Cuvier) (After Day).

Fig. 8. (a) **Carcharhinus gangeticus** (Muller & Henle) (After Muller & Henle), lateral tooth of (b) upper and (c) lower jaws.

Fig. 9 (a) **Carcharhinus limbatus** (Muller & Henle) (After Day), lateral tooth of (b) upper and (c) lower jaws.





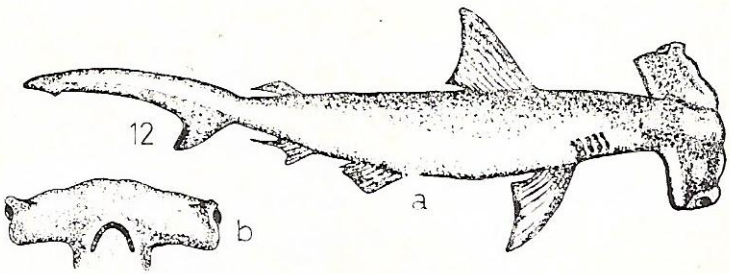


Fig. 10. (a) **Carcharhinus menisorrah** (Muller & Henle) (After Day), lateral tooth of (b) upper and (c) lower jaws.

Fig. 11 (a) **Carcharhinus sorrah** (Muller & Henle) (After Muller & Henle), lateral tooth of (b) upper and (c) lower jaws.

Fig. 12. **Sphyrna zygaena** (Linnaeus) (After Day), a) dorso-lateral view, b) ventral view.

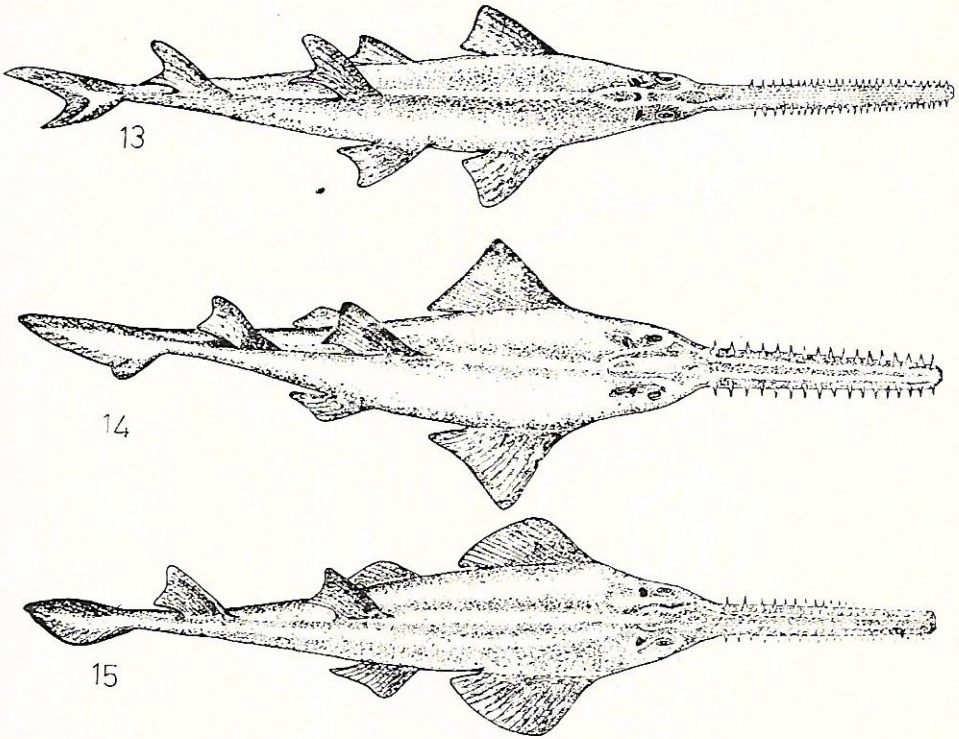
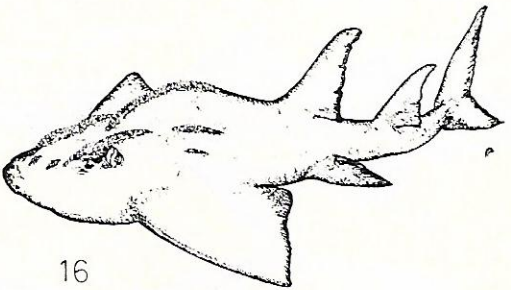


Fig. 13. **Pristis cuspidatus** Latham (After Day).

Fig. 14. **Pristis microdon** Latham (After Day).

Fig. 15. **Pristis zijsron** Bleeker (After Day).



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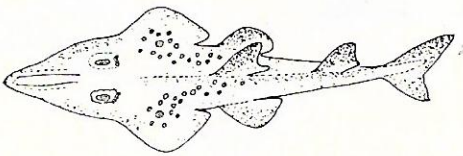

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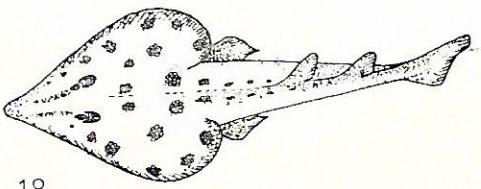

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Fig. 16. **Rhina ancylostoma** Schneider.

Fig. 17. **Rhynchobatus djiddensis** (Forsskal) (After Day).

Fig. 18. **Rhinobatos annulatus** Muller & Henle (After Barnard).

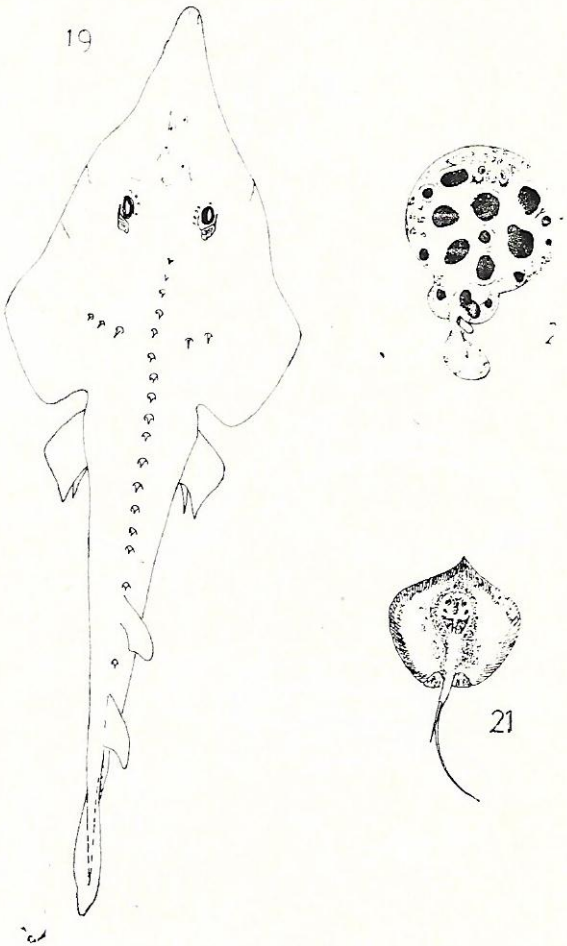

Fig. 19. **Rhinobatos granulatus** (Cuvier) (After Day).

Fig. 20. **Torpedo sinuspersici** Olfers (After Fowler).

Fig. 21. **Dasyatis imbricatus** (Schneider) (After Munro).

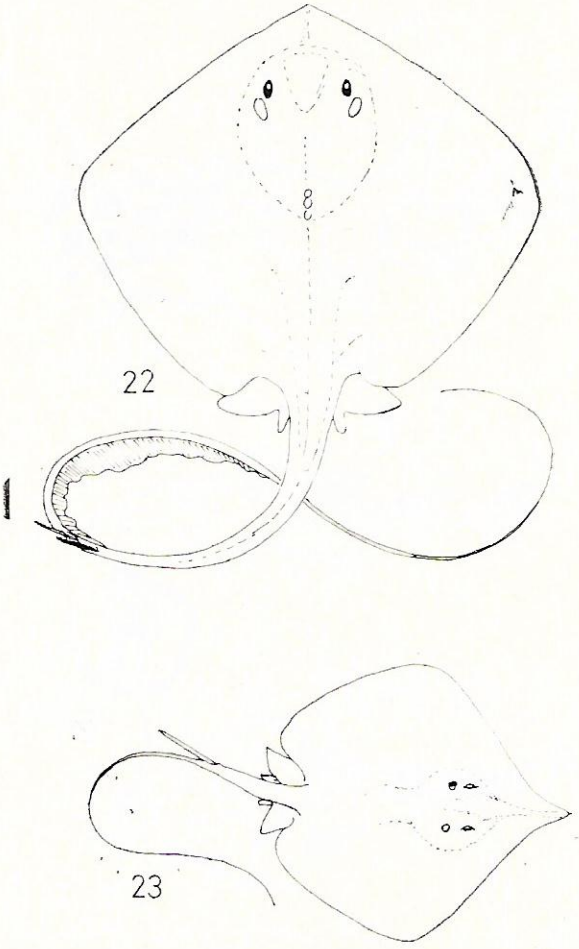

Fig. 22. **Dasyatis sephen** (Forsskal) (After Day).

Fig. 23. **Dasyatis zugei** (Muller & Henle) (After Day).

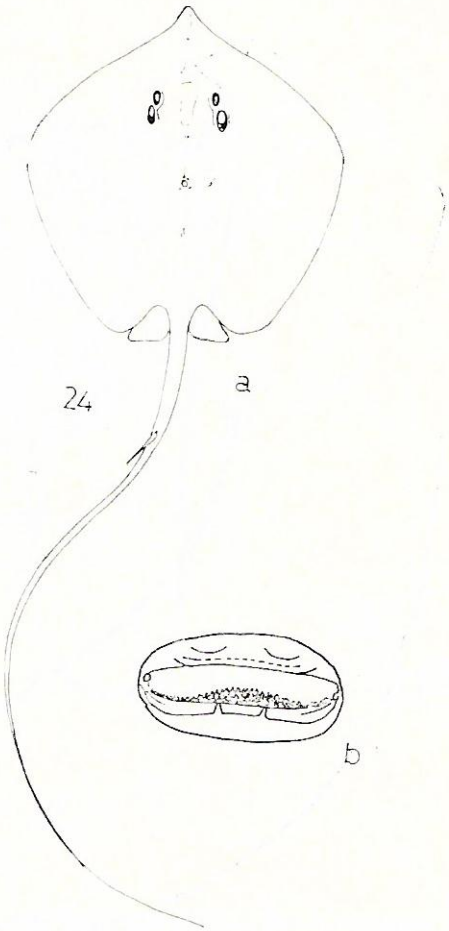

Fig. 24. (a) **Himantura bleekeri** (Blyth) (After Day), (b) mouth showing oral papillae (After Misra).

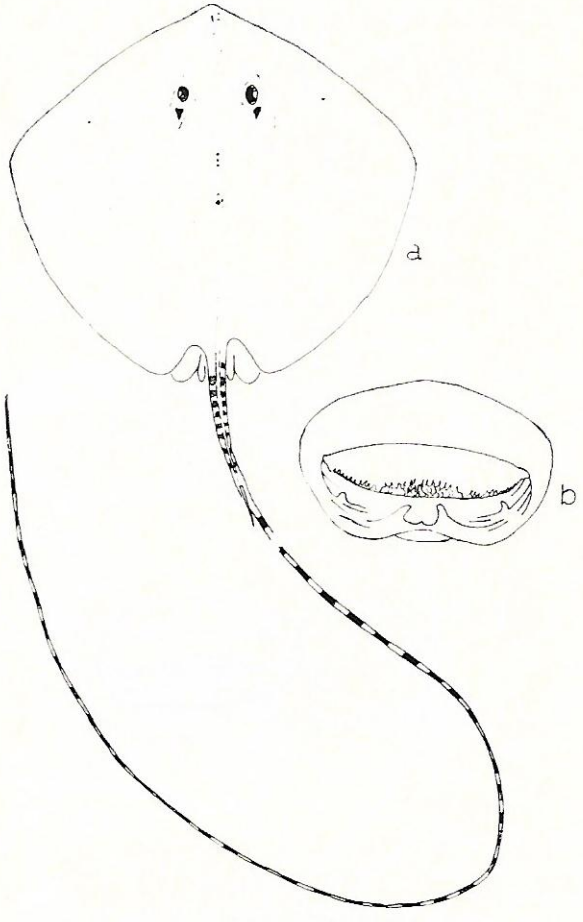

Fig. 25. (a) **Himantura gerrardi** (Gray) (After Day), (b) mouth showing oral papillae (After Misra).

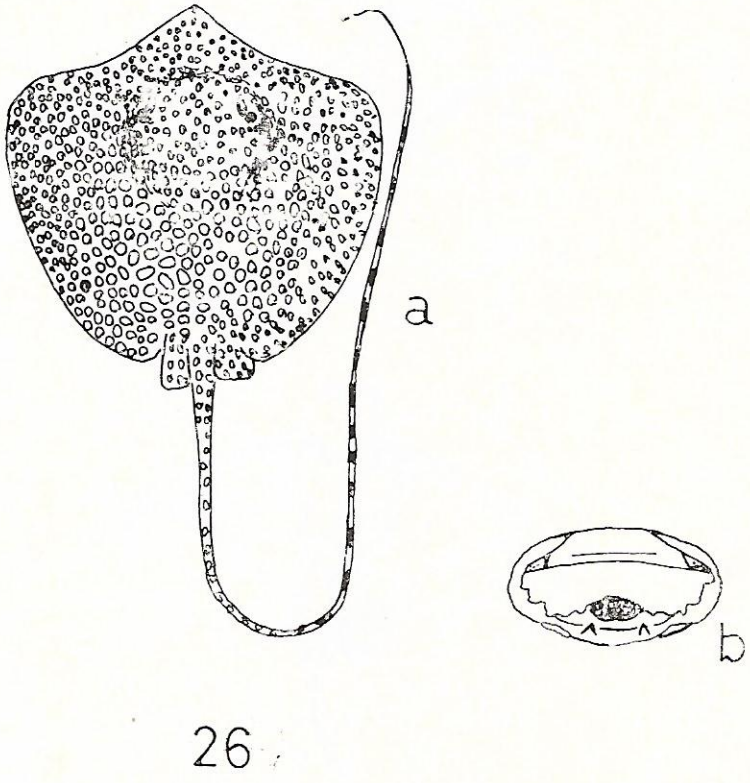

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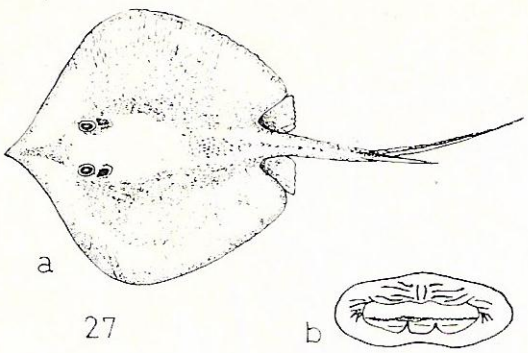
Fig. 26. (a) **Himantura uarnak** (Forsskal) (After Kuronuma & Abe), (b) mouth showing oral papillae (After Misra).



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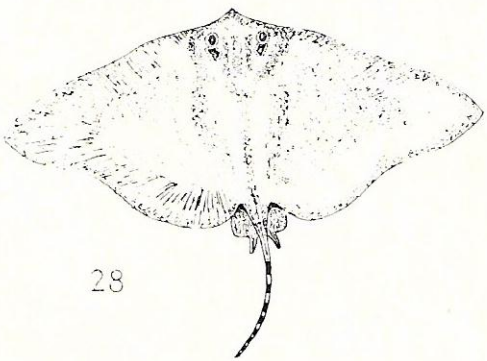

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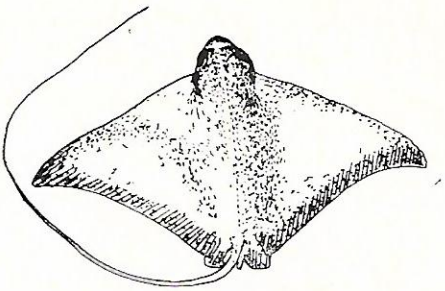
Fig. 27. (a) **Himantura walga** (Muller & Henle) (After Day
mouth showing oral papillae (After Misra).

Fig. 28. **Gymnura poecilura** (Show).



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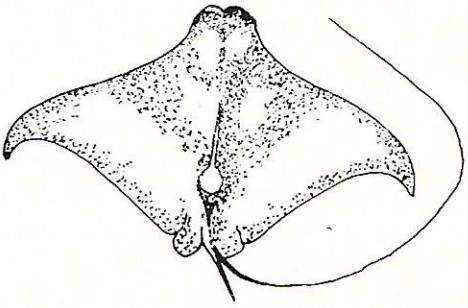

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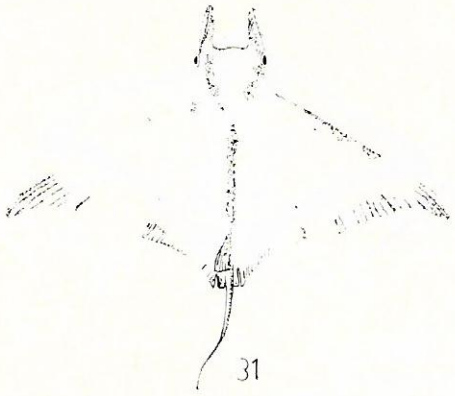
Fig. 29. **Aetomyleus nichoffi** (Schneider) (After Kuronuma & Abe).

Fig. 30. **Rhinoptera javanica** Muller & Henle (After Smith).



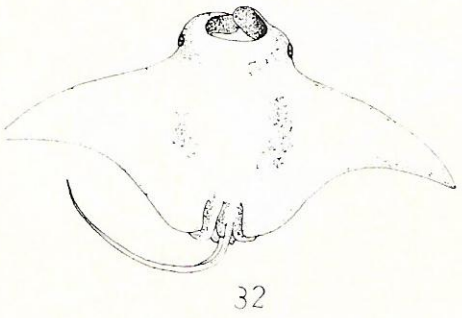


Fig. 31. **Mobula diabolus** (Shaw) (After Day).

Fig. 32. **Manta ehrenbergii** (Muller & Henle) (After Fowler)

Bull. Basrah nat. Hist. Mus.
Vol. 3, October 1976

ON A COLLECTION OF MAMMALS FROM MOSUL, NORTH IRAQ

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Natural History Museum, University of Basrah, Basrah, Iraq

The present paper is based on a collection of Mammals exhibited in the regional Natural History Museum of the University of Mosul. This museum was originally started for the purpose of exhibiting local fauna as mounted specimen for the public. Majority of the specimens were collected by the founder of the museum Mr. Ibrahim Rassam.

Most of the mounted specimens are displayed in glass cases. Removal of the specimen from the cabinet was difficult, and hence I had to relay solely on external characters for identification. Therefore, some of the identifications will not be very exact. Books by Harrison (1968, 1970, 1972), Hatt (1959), Van Den Brink (1973), and Walker and associates (1964) helped me in the identification of the collection.

At present the Mosul Natural History Museum has no scientific collection. Recently a start has been made by the University of Mosul to put the museum on a scientific basis.

Mosul region is an important one because it lies between three different geographical areas - in the northeast the mountains, in the west the western desert and the Tigris river.

Practically there is no separate study on the Mammalian fauna of north Iraq. Time is appropriate to make a comprehensive study on the Mammalian fauna of this region. A good collection of Mammalian skins with skulls is highly desirable.

ORDER INSECTIVORA : INSECT-EATING MAMMALS

FAMILY ERINACEIDAE : HEDGEHOGS

Erinaceus europaeus Linnaeus European Hedgehog

Material : 1 unsexed specimen

From Mosul - al - Muhalabia (40 km. W of Mosul) on 7 Feb. 1955.

Hemiechinus auritus (Gmelin) Longeared Hedgehog

Material : 3 unsexed specimens

All from Mosul on 12 Feb. 1955.

ORDER CHIROPTERA : BATS

FAMILY RHINOLOPHIDAE : HORSESHOE BATS

Rhinolophus ferrum - equinum (Schreber) Greater Horseshoe Bat

Material : 1 unsexed specimen

From Mosul on 7 May 1965. This looks very similar to this species. There are two specimens collected from Mosul on 2 Apr. 1976, resembling Myotis sp. More specimens are to be collected with skulls for a proper detailed study of bats of Mosul region.

ORDER CARNIVORA : CARNIVORES

FAMILY CANIDAE : DOGS, JACKALS, WOLVES, & FOXES

Canis lupus Linnaeus Wolf

Material : 6 specimens; 1 young & 1 adult males, and 4 young & 2 adult females.

Two young, male and female, from Spindar village (110 km. NE of Mosul) on 5 May 1957. In 1968 from Al-Jazira one adult male on 9 Feb., two females on 15 Feb. & 28 Mar., and three young females on 22 May.

Canis aureus Linnaeus Asiatic Jackal

Material : 4 specimens; 1 unsexed head, 1 male, and 2 females.

In 1955, a head from Amadia (120 km. NE of Mosul) on 10 Aug. and a male from Mosul farm on 28 Aug. In 1968 two females from Al-Hawi (10 km. NW of Mosul) on 1 and 25 Jan.

The asiatic Jackal is common in and around Mosul.

Vulpes vulpes (Linnaeus) Common Red Fox

Material : 4 specimens; 1 male and 3 females

In 1955, one female from Mosul farms on 25 Aug. and one male from Mosul on 15 Sept. From Al-Jazira two females on 20 June 1956 and 29 Feb. 1968.

The Common Red Fox is common in the Mosul area.

FAMILY URSIDAE : BEARS

Ursus arctos Linnnaeus Brown Bear

Material : 2 specimens; 1 young male and 1 female

The young male from Spindar village on 30 Nov. 1956, and one male from Bamerni village (110 km. NE of Mosul) on 25 May 1969.

FAMILY MUSTELIDAE : MARTENS, WEASELES, & POLECATS

Martes foina (Erxleben) Beech, or Stone Marten

Material : 2 specimens; 1 unsexed and 1 male

One male from Aqra (95 km. E of Mosul) on 19 Sept. 1961 and the unsexed specimen from the same area on 15 Aug. -975. This unsexed specimen looks more yellowish.

I have seen many skins said to have collected around Mosul, in the Mosul market.

Vormela peregusna (Guldenstaedt) Marbled Polecat

Material : 6 specimens ; 4 males and 2 females

In 1956, one male from Mosul area on 20 Apr., another male from Nainawa farms (10 km. N of Mosul) on 15 June, and a female from left side of Tigris at Mosul on 25 June. Two males from Mosul on 8 & 9 Dec. 1975, and another male from Sinjar (120 km. W of Mosul) on 18 Apr. 1976.

Mellivora capensis (Schreber) Ratel

Material : 2 specimens; 1 female and 1 unsexed

There are two mounted specimens; one female from Mosul farms on 20 Oct. 1975, the other unsexed specimen is without date and locality. Ratel has not been previously reported from Mosul area, however, it has been reported from north Iraq from T1, ravines above Rawa in Al-Jazira, and Jabel Baradust (Hatt 1959). Harrison (1968) does not mention of the Baradust record.

Meles meles (Linnaeus) Badger

Material : 3 females (Fig. 1)

One female from Sharanish village (120 km. N of Mosul) on 2 July 1976, and another female from Mosul farms on 28 Oct. The Basrah Natural History Museum received a skin and skull of a female Badger as a gift from the Mosul Natural History Museum. This specimen was collected from Bnenan village (60 km. NE of Mosul) on 28 Mar. 1976.

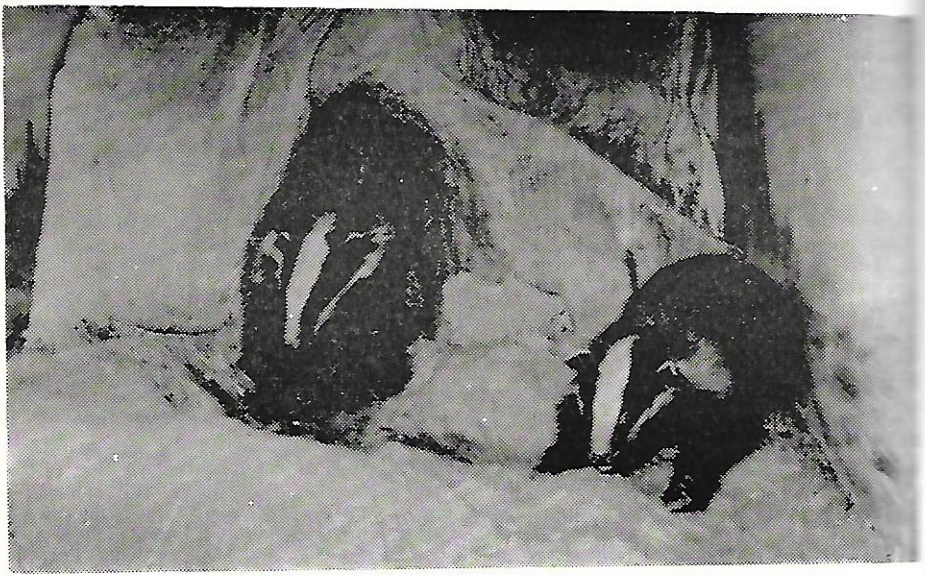

Fig. 1. **Meles meles** in Mosul Natural History Museum.

The specimen measures in cm : HB 76, T 13, HF 10, E2 ; and the skull : GTL 12.2, CBL 11.2, ZB 6.7, BB 4.9, IC 2.5, M8.1

Meles meles appears to be new record for Mosul area.

Lutra lutra (Linnaeus) Common Otter

Material : 2 specimens ; 1 male and 1 unsexed (Fig. 2)

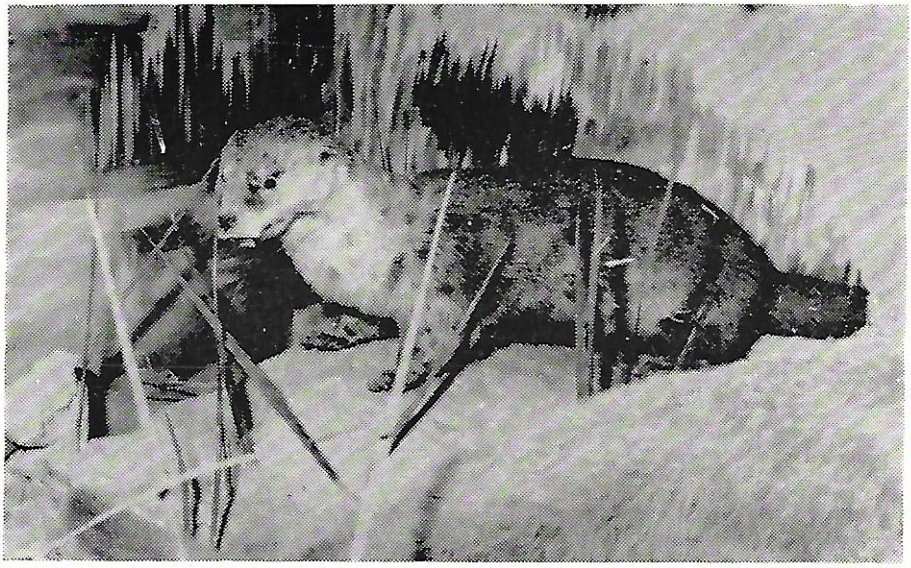

Fig. 2. **Lutra lutra** in Mosul Natural History Museum.

The male collected on 12 Oct. 1955 from Ain Kirbriet (2 km. N of Mosul), and the unsexed specimen from Badush (40 km. W of Mosul) on 10 Apr. 1968.

This forms the first definite record of the species for north Iraq, however, Hatt (1959) noted a trade skin at Mosul market.

FAMILY VIVERRIDAE : MONGOOSES

Herpestes auropunctatus (Hodgson) Small Indian Mongoose

Material : 1 female

This female was collected from around Mosul on 12 June 1965.

There is no report on this species subsequent to Hatt's (1959) recording of an unsexed native skin from Mosul market. The present finding forms the second recording of this species from north Iraq.

Herpestes ?ichneumon Linnaeus Egyptian Mongoose

Material : 1 female

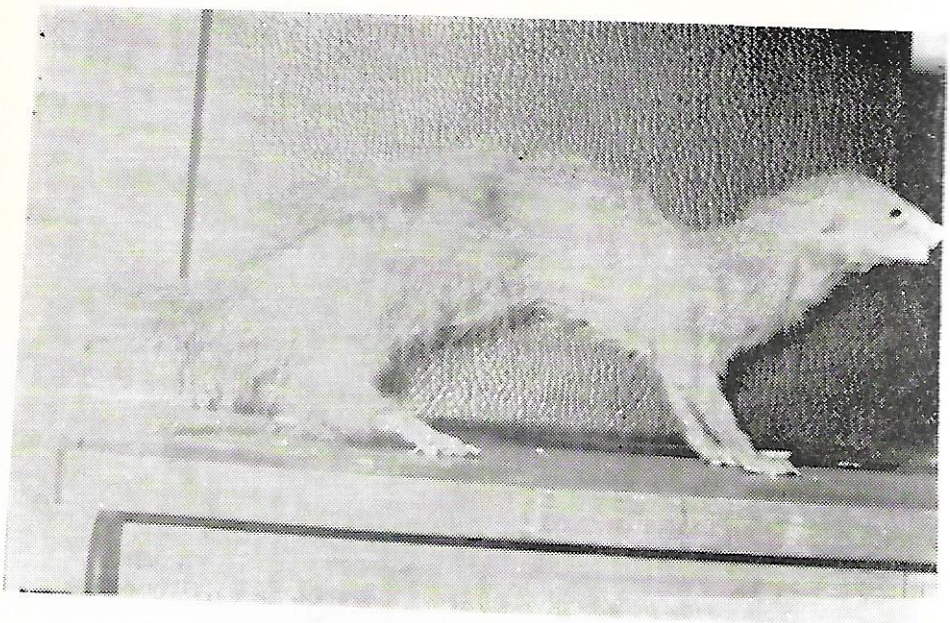

Fig. 3. **Herpestes ?ichneumon** in Mosul Natural History Museum.

Ibrahim Rassam collected this female specimen from Amadia on 14 July 1955, and it is kept as a mounted exhibit. It is without tail (Fig. 3). The specimen measures in cm. : HB 50, HF 10, E2. **H. ichneumon** is not previously recorded from Iraq but from the neighbourhood of the southwestern border. The specimen looks similar to Egyptian Mongoose. More materials are to be collected and studied before this species could be included in the Iraqi list.

FAMILY HYAENIDAE : HYAENAS

Hyaena hyaena (Linnaeus) Striped Hyaena

Material : 1 male

This male was collected from Muhalabia on 20 Nov. 1963.

FAMILY FELIDAE : CATS, LYNXES, CARACALS, & LEOPARDS

Felis chaus Guldenstaedt Jungle Cat

Material : 3 specimens ; 1 male and 2 females

The male from the road of Dohuk on 29 Nov. 1956. From Al-Hawi, two females dated 8 Mar. 1970 and 28 Mar. 1971.

Panthera pardus (Linnaeus) Leopard

Material : 1 female

This female was collected on 10 Dec. 1975 from Aqra.
The Leopard is very rare in the present time in north Iraq.

ORDER ARTIODACTYLA : EVEN-TOED UNGULATES

FAMILY SUIDAE : PIGS

Sus scrofa Linnaeus Wild Boar

Material : 3 unsexed young specimens

These were collected from Mosul farms on 20 Apr. 1956.
At present the Wild Boar is rather rare in the mountainous north Iraq.

FAMILY BOVIDAE : CATTLE, BUFFALO, GAZELLES, GOATS, &SHEEP

Gazella subgutturosa (Guldenstaedt) Persian Gazelle

Material : 1 female

Mohammed Saaid Al-Nohmawi captured one female of this species on 12 Nov. 1975. It is kept as mounted specimen in the exhibit. This Persian Gazelle might have been caught in the mountains.

Gazelle ?dorcas (Linnaeus) Dorca's Gazelle

Material : 3 unsexed specimens

These three mounted specimens in the Museum were collected from Mosul market on 20 Aug. 1955, 12 May 1956, and 30 Apr. 1966.
These specimens look similar to Dorca's Gazelle, which is at present only once recorded for Iraq (see Harrison 1968).

Capra aegagrus Erxleben Wild Goat
Material : 1 mounted head
This specimen is without daet and locality.

ORDER LAGOMORPHA : HARES

FAMILY LEPORIDAE : HARE

Lepus capensis Linnaeus Brown Hare
Material : 4 specimens ; 1 unsexed, 1 male, and 2 females
In 1955, from Al-Jazira one unsexed specimen on 6 Mar., and one male on 16 Mar. From Mosul area two females dated 3 Dec. 1971 and 16 May 1974.

ORDER RODENTIA : RODENTS

FAMILY SCIURIDAE : SQUIRRELS

Sciurus anomalus Guldenstaedt Persian Squirrel

Material : 5 specimens ; 3 unsexed, 1 male, and 1 female

From Aqra three unsexed specimens collected on 15 Mar., 20 Apr., and 15 May 1955; one male on 15 Mar. 1965; and one female on 15 Mar. 1969.

There are two specimens, which differs from the rest in colouration by being very dark to blackish. It needs more material with skulls for a proper study.

FAMILY HYSTRICIDAE : OLD WORLD PROCUPINES

Hystrix indica Kerr Indian Crested Procupine

Material : 2 females

Both females collected from Al-Fathelia (5 km. NE of Mosul) on 9& 25 Mar. 1965.

FAMILY DIPODIDAE : JERBOAS

Allactago euphratica Thomas Fivetoed, or Euphrates Jerboa

Material : 2 males

Both males were collected from Al-Muhalabia on 11 & 16 Nov. 1956.

FAMILY SPALACIDAE : MOLE RATS

Spalax leucodon Nordmann Lesser Mole Rat

Material : 2 specimens ; 1 unsexed and 1 male

From the Mosul area, the male collected on 17 Aug. 1956, and the unsexed specimen on 15 June 1962.

SUMMARY

Notes on twenty-six species of mammals collected from North Iraq and exhibited in the Mosul Natural History Museum of the University of Mosul are presented with locality and date of collection. This is the first study of this collection.

ACKNOWLEDGEMENTS

I am indebted to the Mosul Natural History Museum Director, and officers in charge of the museum Messrs Sabah I. Salih and Ahmad A. Al-Kathili for their help during the study of the collection.

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الخلاصـــــة

ملاحظات عن (٢٦) نـوع من اللبائـن الموجودة فى متحـف التاريخ الطبيعى لجامعه الموصل • تتضمن المكان والزمان الذى جمعت فيه وهذه أول دراسة حول مجموعة لبائن المتحف المذكور •

Bull. Basrah nat. Hist. Mus.
Vol. 3, October 1976

DEVELOPMENT OF TEMPERATURE REGULATION IN NESTLING COMMON SWALLOWS HIRUNDO RUSTICA

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and
P. V. GEORGE KAINADY
Basrah Natural History Museum, University of Basrah, Iraq

During the 1972 breeding season, from March to June, we studied the development of thermoregulation in nestlings of the Common Swallow **Hirundo rustica*** Linnaeus. The breeding colony was located at the College of Education, Baghdad, Iraq (Al-Rawy & George 1966). The nests were attached to walls near the ceiling and on flanges of iron girders in corridors of the ground and first floors. The birds found their way to the closed corridors through the windows at staircase and ventilations that were kept open.

The earlier work on the temperature of the Swallow nestlings (**H. r. erythrogaster**) is that of Stoner (1935), who gives the temperature of 1, 5, 10, and 15-day old nestlings. Our aim was to have a more detailed study on the development of temperature regulation by taking nestling temperatures daily from beginning to end of nestling period, making continuous temperature recording of some nestling of selected stages, and by conducting some cold chamber experiments. The results of these investigations are analysed in this paper.

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* The nominate subspecies **rustica** is recorded as the breeding population of Iraq (Vaurie 1959).

MATERIALS AND METHODS

A total of 38 **H. rustica** nestlings were used, of which 27 came from eight early brood nests and 11 from three late brood nests. The early nests constituted first broods while the late nests could have been second broods. From May 25 onwards the three late nests were the only active ones in the breeding colony.

Nest contents were under daily check towards the end of incubation period. The nestlings were individually marked by tying a colour thread around a leg at the time of hatching, and, later at about 14th day, by ringing them with numbered Iraq Natural History Museum rings.

The hatching spread (between the first and last hatching) was within 48 hours. Nestlings were aged from the day that hatching began irrespective of their exact hatching time.

Nestlings were taken from the nest, one at a time, in a cardboard box (slightly bigger than the nest) containing cotton in the bottom and carried immediately to a three-sided covered work-room with rather still air. The longest distance from the nest to the working area was about 30 m, but most of the nests were within 8 m. All possible precautions were taken to ensure that the nestlings were not disturbed. The first data taken were the temperature of the nestlings. Inserting the left hand into the box, the nestling was caught from the back, a slow turn of the hand placed the nestling in a slanting semi upside down position, the sensor was quickly introduced into the cloaca to a depth of 12 to 15 mm, and the temperature read. The sensitive part of the sensor has a length of 10 mm, a diameter of 2 mm, and a response time of about four seconds. Less than half a minute after removal of the nestling from the box was sufficient to complete the recording of the temperature. The measurements were taken daily between 16:00 and 18:00 except for two late brood nests, for which from the 10th day onwards they were made between 09:00 and 10:00.

The temperature measuring unit used was the Tastomed Script B manufactured by the Braun Electronic Company (now Deutsche Gulton). Their standard probe M and skin probe HZ were used for

taking the cloacal temperatures and recording of skin temperatures respectively. The accuracy of the temperature indicator was $\pm$ 0.15 °C and that of the temperature recorder, $\pm$ 0.25 °C. By fixing a maximum and minimum self-registering thermometer at the level of the nest and about 1.5 m away, the environmental temperature was measured.

RESULTS

ENVIRONMENTAL TEMPERATURE

The mean of the maximum and minimum temperatures recorded around the nest for the early brood was approximately 25 °C (range: maximum 24-31, minimum 20-25, mean 22-28) and for the late brood 33-34 °C (range: maximum 33-38, minimum 28-34, mean 31-36). The daily fluctuations was mostly 4-5 °C, with a maximum of 8° and minimum of 2 °C. The ambient temperature of the working area, where the temperature of the nestlings was taken, was generally higher by 1°-2°C.

NESTLING TEMPERATURES

The approximate mean body temperature of five nestlings in an early brood was continuously recorded for four days after the start of hatching by inserting the sensor (standard probe) through the nest from below so that it was in close contact with the birds. The nestlings maintained a body temperature varying between 35° and 39.5 °C, mostly around 38 °C. The cloacal temperature of both early and late brood nestlings was taken from the 4th day until they left the nest (Fig. 1).

Udvardy (1953) gives the mean minimum (standard) proventriculus temperature of adult **H. rustica** in the post absorptive resting state as 40.45 °C (range 40.72-40.06). Although some nestlings of the early brood attained a temperature of 40.0 °C by the 8th day, on the average this temperature was not reached until the 10th day. In late broods, some individual nestlings reached this temperature by the 5th day, and the mean for all nestlings on the next day was 40.4 °C. No bird had a temperature below 40.0 °C beginning with the 14th day in early broods and with the 7th day in late broods.

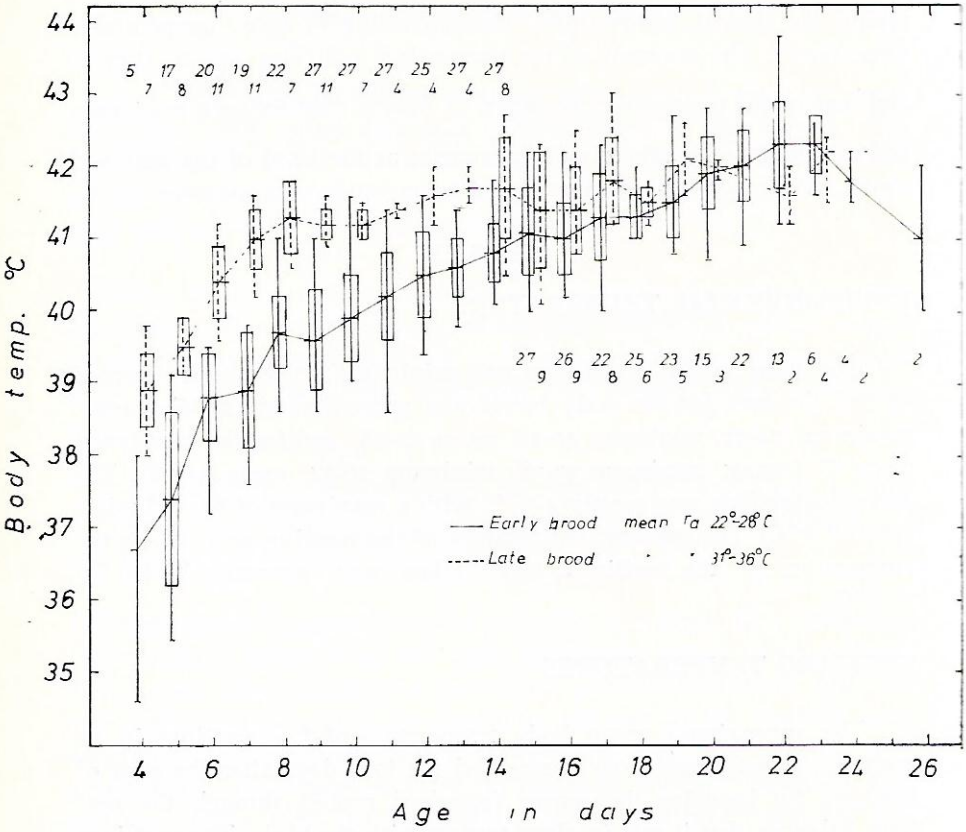

Fig. 1. The deep body (cloacal) temperature of nestlings. Ta = air temperature around the nests ; vertical lines = ranges ; rectangles = ± standard deviation ; horizontal lines = mean; upper and lower numbers denote the sample size of early and late broods respectively.

From the 4th to 14th day the temperature of the early and late brood nestlings of the same age were different. The latter, exposed to a higher ambient temperature, Ta, had an average body temperature 1.5°C higher (range 2.2-0.9) than the former. On the 15th day, the difference between the two broods decreased suddenly and for the period to the 19th day averaged 0.4°C (range 0.6-0.2).

The average temperature of nestlings (**H. r. erythrogaster**) given

by Stoner (1935) (1-day-old : 36.4°C, 5-day-old : 39.8°C, 10-day-old: 40.9°C, 17-day-old : 42.2°C) come within our range for the early brood but differ by being higher than the average obtained by us . He gives the average of 19 air temperatures close to the nest taken at the time of nest examination as 24.9°C (range 21.1-29.7), which is in the range of our early brood nest Ta. The difference in results may be attributable to the methods used ; Stoner obtained interthorasic temperature using a non-self-registering mercury thermometer.

COLD CHAMBER EXPERIMENTS

In order to get an insight into the development of temperature regulation some cold chamber experiments and continuous temperature recording of nestlings of selected ages were conducted. All nestlings utilized for the study came from the early brood nests.

A rectangular glass jar (20 × 15 × 10cm) , surrounded by ice and placed in a basin, formed the cold chamber which provided a temperature of 10.0°C. After noting the initial temperature of the nestling taken from the nest, it was placed on cotton in the bottom of the jar for a specified time and its temperature again measured (Table 1).

Nestlings, 2 to 4 days old, lost body temperature rapidly even at a moderate Ta and behaved like poikilothermic organisms. The 7-day old bird was better in resisting a loss of temperature and further improvement was shown by the 9 to 14-day old nestlings. Essentially full control of body temperature regulation was established in nestlings 15 to 18 days old.

CONTINUOUS RECORDING OF NESTLING TEMPERATURE

A circular skin probe, having a diameter of 7 mm, a thickness of 4 mm and weighing one gram, was used for continuous recording of two 8-day old and one 13-day old nestlings. The probe was fixed externally to the breast muscle with adhesive plaster. The nestlings were kept alone during recording in a small open cardboard box in a quiet room, where the change in outdoor light was discernible. Soon after the start and again towards the end of the recording, the cloacal temperature, taken with the standard probe, was found to be nearly identical with the skin temperature.

Table 1. Results of cold chamber experiments conducted on nestlings of various ages (temperature in °C).

Age (day)	Ta	Time (min.)	Temperature Initial	End	Loss
02	27.5	10	37.8	30.2	7.6
04	27.5	10	38.0	30.4	7.6
07	10.0	07	39.3	34.8	4.5
09	10.0	15	39.3	36.0	3.3
10	10.0	12	40.1	36.2	3.9
13	10.0	12	40.0	36.5	3.5
13	10.0	10	40.1	36.4	3.7
14	10.0	14	40.8	37.0	3.8
15	10.0	15	41.3	40.0	1.3
16	10.0	15	40.9	39.8	1.1
17	10.0	10	41.4	40.8	0.6
17	10.0	10	41.5	41.4	0.1
18	10.0	23	41.2	40.4	0.8
18	10.0	10	42.0	41.6	0.4

8-day old nestling

Nestling A, having a cloacal temperature of 39.7°C at 16:20, was collected from the nest at 20:00 and recording of its temperature was begun at 23:00. Nestling B, having a cloacal temperature of 39.8°C at 16:30, was collected at 17:00 and recording was commenced at 18:00. Both the 8-day old nestlings maintained a body temperature of 38-39°C until 05:00 in the morning. Thereafter the temperature dropped slowly and steadily by about 2°C to the close of the experiment at 07:00 (Fig. 2).

13-day old nestling

This nestling had a cloacal temperature of 39.8°C when collected from the nest at 17:00. Recording began at 19:00. Its temperature was maintained between 39.5° and 39.0°C until 01:00, then dropped to its lowest level of 38.8°C at 03:00, after which it rose to 39.8°C at 05:00, when the experiment was concluded (Fig. 2).

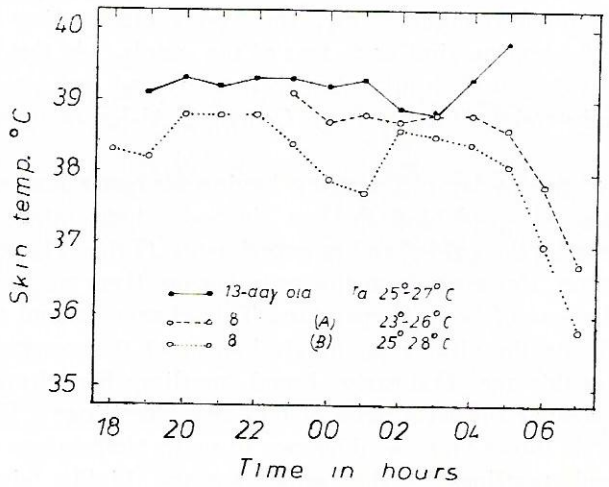

Fig. 2. Overnight skin temperature (average of maximum and minimum each hour) of nestlings, kept alone in an open box, as shown by continuous recording.

DISCUSSION

The feather covering of an 8-day old nestling, with the body contour feathers just beginning to come out of the follicles and the

wing and tail feathers still in their intact sheaths, does not provide good insulation for preventing heat loss from the body (Fig. 3). Maintenance of a high body temperature at this age depends primarily on muscular thermogenesis. This chemical heat production may be a great drain on the energy resources of the nestling. Perhaps the exhaustion of these energy resources accounts for the fall in body temperature in the experiments that is shown to occur towards morning. In nature, this fall does not occur as the nestlings are in close contact with each other, they are protected underneath and on the sides by the fine insulative lining of the nest, and they are provided with heat from the brooding adult.

When the adult swallow settles on the nest for the night, there is a lowering of its body temperature to a level between 40.0° and 39.5°C, which is maintained for some time, but it finally reaches 38.8°C at around 03:00. It then slowly rises to its daytime level 40-41°C by morning (unpublished observation). The 13-day old nestling exhibits a night time fluctuation similar to that of the adult. At this age the body is moderately well insulated with feathers and has attained its maximum body weight (Stoner 1935, George & Al-Rawy 1970).

Inspite of the 14-day old nestling having far better feather insulation than the 9-day old bird, the loss in body temperature at both ages, as shown by the cold chamber experiments (Table 1), was more or less the same. However, from the 15th day on, there was a marked decline in the loss of body temperature. This change around the 15th day may indicate the climax in the attainment of thermoregulation , as it is also at this age that early brood nestlings first have body temperature comparable with those of late brood nestlings (Fig. 1). A t-test analysis shows that the difference in mean temperature of early and late brood nestlings of the same age are highly significant ($P < 0.01$ to < 0.001) from the 4th through the 14th days but not at later ages. Night brooding by the adult is generally discontinued by the 14th day (Brown 1924).

There is no significant difference between the body temperature of nestlings 15 and 14 days old in the early broods, but there is a highly significant difference ($P < 0.001$) between the 15th day and ages 4 to 13 days. In late broods, there is no significant difference in nestling

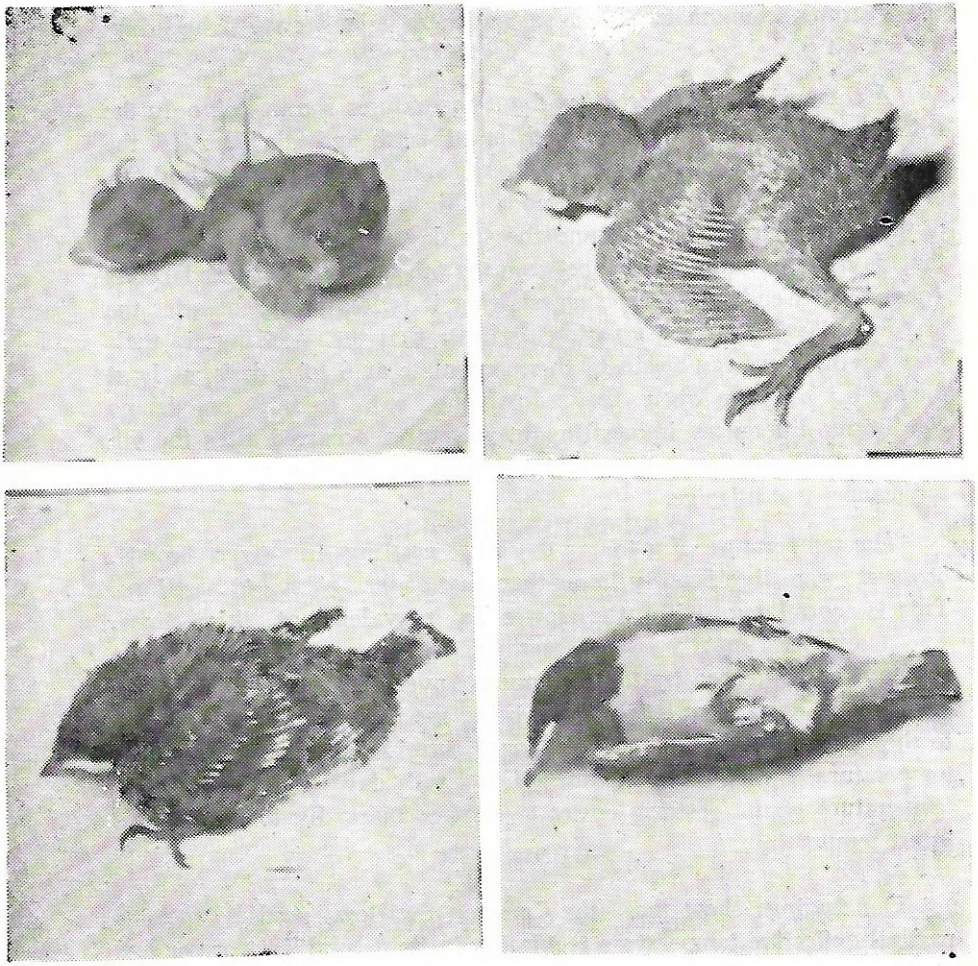

Fig. 3. Nestlings at different stages of development: (upper left) recently hatched; (upper right) 8-day-old; (lower left) 13-day-old ; (lower right) 18-day-old, ready to leave the nest in another two days.

temperatures from 7th to 14th days, but there is between 15th and days 4 through 6.

A comparison of consecutive day temperatures shows that only the differences between the 5th and 6th and the 7th and 8th days for the early broods are significant ($P < 0.001$) and between the 5th and 6th and the 6th and 7th for the late broods. This is suggestive that ontogeny of thermoregulation starts around the 5th day. Purchon (1948) records that daytime brooding ceases between the 6th and 9th days, and Davis (quoted by Kendeigh 1956) suggests that it is less prevalent after the first four days. These observations indicate that the nestlings in their nest environment can begin to thermoregulate at 6 to 9 days, at least during the daytime when they are being fed. In late broods, no significant differences in nestling temperatures occurred after the 7th day which shows that 7-day old birds have an effective thermoregulatory capacity at this age.

The temperature of 4 to 13-day old nestlings in early broods, however, were significantly lower than that of the 15-day old nestlings. This is correlated with the lower Ta prevalent at this time. The regulatory capacity was beginning to become effective by the 8th day, as evidenced by the continuous overnight recording of the nestlings, but was not sufficient to bring the nestling temperatures up to the level of the adults. Stoner (1935) surmised the establishment of temperature control at about the 9th to 10th day "when the body temperature of the nestling ceases to respond markedly to fluctuations in air temperature."

Our findings show that the Common Swallow nestling attains partially effective temperature regulation in its natural Ta more or less at the same age 7-8 days as is noted for the Field, Chipping, and Vesper Sparrows, **Spizella pusilla, S. passerina,** and **Pooecetes g. gramineus** (Dawson & Evans 1957, 1960) although the former has a nestling period twice that of the above sparrows.

SUMMARY

Hirundo rustica nestlings, 1 to 4 days old, are essentially poikilothermic. However, they are maintained in a virtually homoiothermic condition by parental brooding, a relatively stable microclimate surrounding the nest, and the insulative properties of the nest itself.

Isolated 8-day old nestlings are able to maintain their body temperature at 38°-39°C for overnight periods in a moderate Ta of 23°-28°C. Isolated 13-day old nestling has the same capacity as adults for maintaining overnight body temperature.

Early brood nestlings reared at a Ta of 22°-28°C attained the adult body temperature of 40.0°C on the 10th day. Late brood nestlings raised at a higher Ta of 31°-36°C reached the adult level on the 6th day.

The temperature of nestlings of the same age in early and late broods were significantly different from the 4th to 14th days but not from the 15th day on. The ontogeny of thermoregulation begins around the 5th day, becomes partially effective by the 7th day, and is fully attained around the 15th day.

ACKNOWLEDGEMENTS

We are thankful to Nuri Mahdi, former director of Iraq Natural History Museum (now Iraq Natural History Research Centre), for the facilities in conducting the study. We are particularly indebted to S. Charles Kendeigh, Professor Emeritus of Zoology, University of Illinois at Urbana-Champaign, for critically reading the manuscript and offering many important and constructive suggestions for its presentation.

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الخلاصة

مراحل التنظيم الحرارى فى صغار السنونو (سند وهند) **Hirundo rustica** وهو من ملازمات العش :ـ يوصف كالاتى :

التكيف او التحسن الحرارى يبدأ فى اليوم الخامس تقريبا ويصبح ذو تأثير جزئى فى اليوم السابع . ثم يصل فاعليته العظمى فى اليوم الخامس عشر تقريبا .

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PRELIMINARY STUDY ON THE AQUATIC BEETLES OF IRAQ (HALIPLIDAE, COLEOPTERA)

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An attempt toward the study of the aquatic beetles of Iraq has for the first time been made here. The present study deals with taxonomy of the family Haliplidae. An account of the history and phylogeny of Haljplids is also mentioned. The localities of the species according to their fixed labels are as well reported under each species recorded.

The Haliplid collection of the Department of Entomology of the British Museum (N.H.) was the main source of materials for this study. However, specimens from my own collection from the Natural History Museum of the University of Basrah was also used here. The latter collection is a small one made during the months of April, May and June from 1968-1972, by the author and his students in the Shatt Al-Arab and its adjacent canals as well as from the marshes of Southern Iraq. The localities in the Shatt-al-Arab river have fresh water which becomes braekish to the south near Al-Siba; south of this point the water tends to be more saline.

For the identification of the species and the formulation of the keys, only the external characters are utilized. Some specimens appeared to represent new species or subspecies. Because they were not enough in number and sex and due to their unsatisfactory condition none were erected in the present work.

NOTES ON THE FAUNA.

Although there is a relatively large amount of aquatic habitat in Iraq, very little is known about the country's water beetles. The three large rivers, Tigris, Euphrate and Shatt-Al Arab with their numerous branches and man made canals crossing the fields in the south provide much of the suitable habitat. There are as well extensive marshes in the south and some in the middle of the country such as Hor Alhammar. The mountainous parts of Iraq, in the north and north-east, also have many fast-flowing rivers which join to form the Tigris.

Zimmermann (1920) has recorded **Haliplus fulvicollis** and **H. fulvus** for Iraq.

THE SYSTEMATIC POSITION OF HALIPLIDAE

The morphological characters of Haliplids are regarded by Fowler (1887) as intermediate between the Carabidae and Dytiscidae. However in the insertion of the antennae beneath the eyes the Haliplids differ not only from the Dytiscidae but also from the Carabidae, Emden (1922). In this character they agree with the Cicindelids. In the elytral sculpture the differences between the Haliplids and Dytiscids are very clear and marked even in the primitive Hydroporini which have some resemblance in puncturation to the Carabidae. In this respect Balfour-Browne (1940) stated clearly that the Haliplids appear to have evolved on a parallel course.

Crowson (1960) placed the Haliplidae among the three lower families of the Hydradephaga (Amphizoidae, Hygrobiidae and Haliplidae). He presumed that these families arose from early adaptive form of Hydradephaga.

The future study of the life history, biology, and the internal anatomy may reveal more information to enrich the knowledge of the phylogeny of these beetles.

The Haliplidae were first separated by Thomson (1860) as a distinct family from the Dytiscidae. The most marked characters of the Haliplids are the posterior coxae which overlap and cover the trochanters and half of each femur. Movements of the hind legs are thus limited to one plane.

KEY TO THE GENERA.

This collection contains three genera of Haliplids which can be separated as follows :-

1— Pronotum quadrate. Elytral surface with longitudinal ridges and grooves ..... **Brychius Thoms.**

- - Pronotum trapezoid narrowing anteriorly. Elytral surface devoid of ridges and grooves ..... 2.

2— Terminal segment of maxillary palps long and conical. Body almost as long as broad and truncate posteriorly ..... **Peltodytes** Reg.

- - Terminal segment of maxillary palps short and subulate. Body longer than wide, produced behind ..... **Haliplus** Latr.

IRAQI SPECIES OF HALIPLIDAE.

Brychius elevatus Panzer (1794)

This is the only species of **Brychius** found in the collection studied here. It is easily distinguished from all other Haliplids by its rather long and narrow form, as well as by the raised third elytral interval. According to Balfour-Browne (1940) this species is an inhabitant of running water, from small streams to large rivers.

Locality :...Artificial canals of the eastern bank of river Shatt Al-Arab (Kebasi).

Peltodytes sp. This unidentified species is distinguished by its very broad and rather square shape and by the presence of very large punctures on the elytra. It is close to **P. caesus** Duft, but differs in the structure of the elytral surface and the shape of the maxillary segments.

Locality : Two specimens, neither in good condition from ponds of fresh water south end of Hore Alhammar.

KEY TO THE SPECIES OF HALIPLUS.

1— Upper and lower surface covered with fine punctures; Elytral striae weak 2

- - Upper and lower surface smooth; Elytral striae well developed and defined 3

2— Pronotal striae present ..... **H. confinis Steph.**
Locality : Canals in Abu-al-Khasseb.

- - Pronotal striae absent ..... **H. obliquus** F.
Locality : Ashar Canal, Tannoma, Hartha.

3— Pronotal striae absen; Setigerous striole present 4

- - Pronotal stria present; Setigerous striole absent 8

4— Anterior projection of metasternum without a pit or depression ..... **H. mucronatus** Steph .
Locality : Abu-al-Khasseb, Qurna.

- - Anterior projection of metasternum with a pit 5

5— Prosternal process with a definite ridge across the base and with side lines well marked to the base; Setigerous striole of metatibia short, not more than 1/3 length of tibia 6

- - Prosternal process with only a faint indication of a line across the base; Setigerous striole long, more than 3/4 length of tibia... 7

6— Setigerous striole of metatibia with 10 or more spines. Length 3.5 - 4 mm ..... **H. fulvus** F.
Locality : Marsh districts near Qurna.

- - Setigerous striole of metatibia provided with only a few spines much less than 10. Length 2.5 - 3.5 mm..... **H. variegatus** Sturm.
Locality : Very common , collected from many places in southern Iraq.

7— Angle between lateral margin of pronotum and elytra very obtuse approaching a straight line. Length 3.5 - 4 mm. **H. fulvicollis** Sturm.
Locality : Common in the canals passing throngh date palm gardens at Qurna.

- - Angle between pronotum and elytron less obtuse approaching a right angle. Length 2.5 - 3 mm. ..... **H. laminatus** Schall .
Locality : This species has been collected only from the canals connected to the eastern bank of river Shatt-Al-Arab.

8— Anterior tarsal claws almost equal. Basal segment of mesotarsus excised along its inner edge ..... **H. lineolatus** Mann.

- - Anterior tarsal claws unequal, the inner claw being shorter and strongly curved inwards. Basal segment of mesotarsus not excised. pronotal stria short and usually slightly curved... **H. ruficollis** Deg.

Locality : H. ruficollis has been taken in ponds where almost stagnant water is available in Qurna and Karmat Ali, probably it was mixed with other species which can not be identified at this stage of study.

The writer is not that much satisfied about the determination of **H. lineolatus** but such specimens have been found within the collection from Hore Alhammar.

SUMMARY

Two genera **Brychius** and **Peltodytes** , and seven species, namely **Haliplus confinis, H. laminatus, H. lineolatus, H. mucronatus, H. obliquus. H. ruficollis,** and **H. variegatus** of aquatic beetles are recorded for the first time from Iraq. Keys to identify the three genera and the ten species recorded for the area are supplied.

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خلاصة

اجريت هذه الدراسه في متحف التاريخ الطبيعى البريطانى عام ١٩٧٦ على عائلة الـ Haliplidae وهى من عوائل الحشرات المائية العراقية تعود الى رتبه غمدية الاجنحه Coleoptera تشمل هذه الدراسة تسجيل جنسين جديدين من العراق هما **Brychius, Peltodytes** مع سبعة انواع تسجل لاول مرة من العراق تعود للجنس **Haliplus** هذه الانواع هى :ـ

Haliplus confinis, H. laminatus, H. lineolatus, H. mucronatus H. obliquus, H. ruficollis, & H. variegatus

كما وضعت مفاتيح لتشخيص الاجناس وكذلك مفاتيح لتشخيص الانواع مع نظرة عامة لتطور هذه العائلة وعلاقتها بالعوائل القريبة .

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Vol. 3, October 1976

HIRUNDO RUSTICA MOULTING REMIGES WHILE REARING NESTLINGS IN IRAQ

P. V. GEORGE KAINADY

Natural History Museum, University of Basrah, Basrah, Iraq

The adult female (wing 123 mm) of a pair of Common Swallows **Hirundo rustica*** Linnaeus rearing a brood, collected on 9 June 1974 was moulting the first innermost primary on both wings. This pin feather on the right side measured 4.5 mm, and that of the left 4.0 mm. No tail or body feathers were in moult except the down feathers of the anterior half of the incubation patch (breast), which were all pin feathers, while the posterior half (belly) was naked (see Fig. 1). Tarsal scutelle were moulting on both legs. General condition of the plumage was rather good but for the slightly worn tips of two outermost primaries.

The male (wing 124 mm) of this pair collected on the next day had no wing or tail moult. Among the body feathers only the down feathers of the anterior breast were in moult; pin feathers were present interspersed among the old down feathers (see Fig. 1). The scales of tarsus were in moult on both legs.

The moult of body feathers seems to start with the down feathers of the anterior part of breast, and this happened in both sexes of this pair more or less at the same time. Renewal of the tarsal scales also occurred simultaneously ? at the start of general moult.

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* The nominate subspecies breed in Iraq.

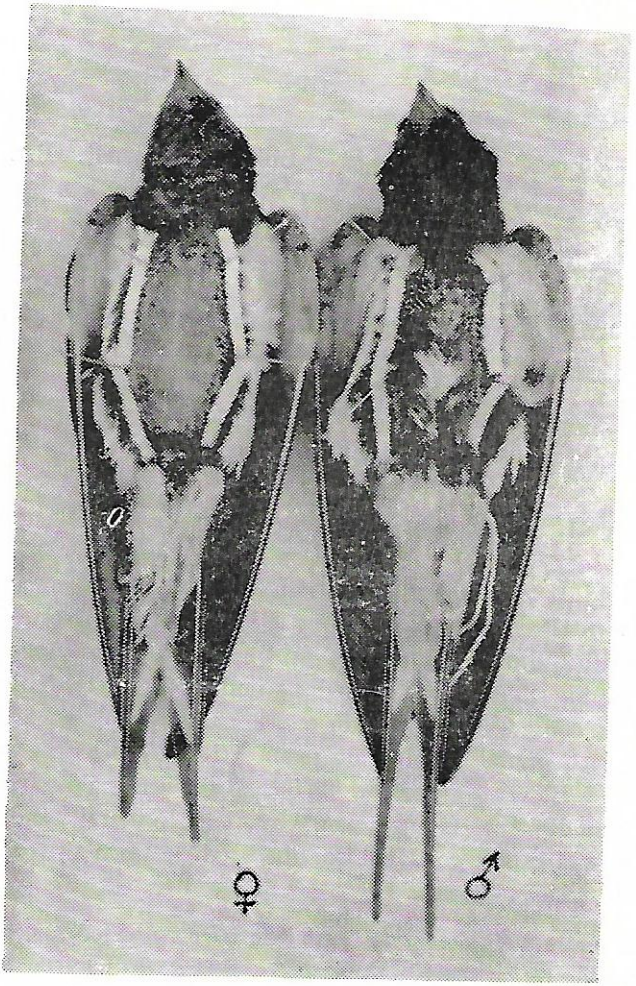

Fig. 1. A pair of **Hirundo rustica** rearing a brood of three nestlings about sixteen days old, collected on 9 & 10 June 1974, Basrah, Iraq. Pieces of plaster have been placed on contour feathers brushed to either sides to show the refeathering of the anterior part of the incubation patch in female and moult of the same area in male. (George Kainady)

The pair at the time of collection was rearing a brood of three nestlings about sixteen days old (wing 75, 74, & 63 mm). The daytime brooding by the female lasts for six to nine days (Purchon 1948), although one of the parents sleeps on nest for a fortnigt (Brown 1924). Refeathering of the incubation patch in female appears to have begun around the termination of daytime brooding.

The nest was located near the ceiling in a first floor room, kept unused for a couple of years, in the busy market of Ashar, Basrah, southern Iraq. Close to this nest one and half metre away there was another empty nest. On the floor below both nests excreta were present, more so under the active nest. This showed that both nests were in use this year and the nestlings could have been of the second rearing. Another pair visited the room occasionally while the nests were under observation (8-10 June). However, at no time the active nest was found attended by this pair. Soon after the collection of the parent male on 10 June, this pair came in, and the male was collected, the female escaped through a gap in the window. This male had no moult. The testes measurements in mm were L 3×2 & R 2.5×2 and L 7×4 & R 6×4.5 for the parent male and the other male respectively.

Since no Swallows taken in Europe examined by Witherby (1940) had any moult of remiges and rectrices, he held the view that the moult of these feathers of **H. rustica** takes place in its winter quarters in Africa. This was disproved when Richards and Goodwin (1950) recorded the innermost primary about threeparts grown in an adult Swallow collected on 19 September in southern England. As this was the only Swallow found in an after-dark search in the vicinity, they judged it to be the parent of three nestlings about twelve days old in a nest located about 90 m away. Excepting this, no **H. rustica** is so far recorded as moulting remiges while breeding.

Pimm (1970) has given further evidence of **rustica** moulting in southern Europe; out of 147 adult netted for ringing at Huelva, southern Spain in autumn (27 July to 13 Aug. 1967) 28 were in active primary moult (1 to 4 primaries), and most of the adults in heavy body moult, and also a similar situation noted next year.

In most populations of **H. rustica** the moult begins in September or October, after reaching the winter grounds. E. and V. Stresemann (1968) have shown that the subspecies breeding at the southernmost

borders of the Palearctic region, namely **savignii** of Egypt, **transitiva** of Lebanon and Palestine, and **rustica** of the southern Himalayas and southern Afganistan (which are either residents, or do not migrate farther than some hundred miles) start moulting their remiges "immediately after (or before ?) the last breeding cycle (at the end of June or in July) ". They suppose that this might be the case with the southernmost populations of the East Asiatic subspecies **gutturalis.**

Additional proof for the moult of the Himalayan populations of **rustica** is supplied by Pimm (1972) ; primaries 1-6 were in growth or completing moult in 15 adults caught in September at Wular Lake , Kashmir, by an Oxford University expedition. Medway's (1973) report of remiges moulting (1 to 4 primaries) noted in seven **gutturalis** (5 adults and 2 juveniles) among the first arriving birds collected on 26 July in Bentong, central Malaya, may lend support to Stresemanns ' forecast on **gutturalis.**

H. rustica, a common summer breeding visitor, is virtually absent in Iraq in winter; there are only two winter records of solos, both from southern Iraq in January (Chapman & McGeoch 1956, personal observation 1969). Iraqi Swallows are unlikely to be short-distance migrants in view of the two recoveries of Kenyan ringed birds from central Iraq, covering about 4,000 km (George 1971, Niazi 1975).

The present finding of the Swallow moulting while rearing nestlings fills the gap in the Middle East and we can say that most of the southernmost Palearctic populations of **H. rustica** start moulting of remiges in the breeding ground in summer.

One young Swallow ringed on 19 April 1976 at Shafi (60 km N of Basrah), having a wing of 118 mm, was moulting down feathers on the breast and abdominal regions, most of which were in pin stage . One adult collected on 21 October 1974 from the same locality (wing 120 mm), although had no visible moult of any feathers, had the innermost primaries one and two new, judging from the fresh appearance and colour of the web and shaft compared to the adjacent feathers, as well of the same primaries of other specimens collected during the same period. As most of the local breeding population leave the area by August, this bird could be from a breeding population north of Iraq, which may indicate the interruption of moult during migration.

ACKNOWLEDGEMENT

I am grateful to Mr. Ahmed Mustafa Al-Salman for kindly allowing me to use the upper room of his clinic for observation.

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الخلاصه

من المعروف سابقا عن طير سند وهند (Hirundo rustiea) تنسل ريش الطيران (القوادم والخوافى) ويحدث بعد موسم التكاثر الا اننا فى هذا البحث لاحظنا ان النسل يحدث خلال موسم التكاثر وهذه الملاحظة جديرة بالاهتمام لانها تسجل للمرة الاولى عن هذا الطير .

Bull. Basrah nat. Hist. Mus.
Vol. 3, October 1976

FIRST POSITIVE BREEDING RECORD OF ACROCEPHALUS ARUNDINACEUS EURASIAN GREAT REED WARBLER FOR IRAQ

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During a field trip on 17 June 1968 the calls of Great Reed Warblers attracted my attention. The calls were coming from a small reed-bed (20x6 m) growing in the borrow-pit of a canal, near Tharmiya about 60 km north of Baghdad in Baghdad - Mosul road. The reeds consisted predominantly of **Phragmites communis** with a few **Typha angustifolia** 3 to 3.5 m high were growing in 1 to 1.5 m deep water . Since it was a rather late date for the migrants, I decided to examine the area for possible breeding of the birds. A close search of the reed-bed by wading through unpleasant mud and water revealed three nests.

All the three nests were attached to **P. communis** stems. For support of nest three to five reeds were put into use. One nest was empty, the second contained three nestlings and one intact egg. The nestlings had just started unsheathing their wing feathers, and each had at the broader base of the tongue two black markings which were conspicuous in the orange-yellow mouth cavity. The third nest held four eggs. One of the parents of the latter nest was netted by fixing a mist-net 1.5 m close to the nest.

The bird weighed 22 g and measured: wing 91, tail 72, bill (from feathers) 15, (from skull) 23, tarsus 28; the third primary the longest, the second primary in between third and fourth primaries. It is identi-

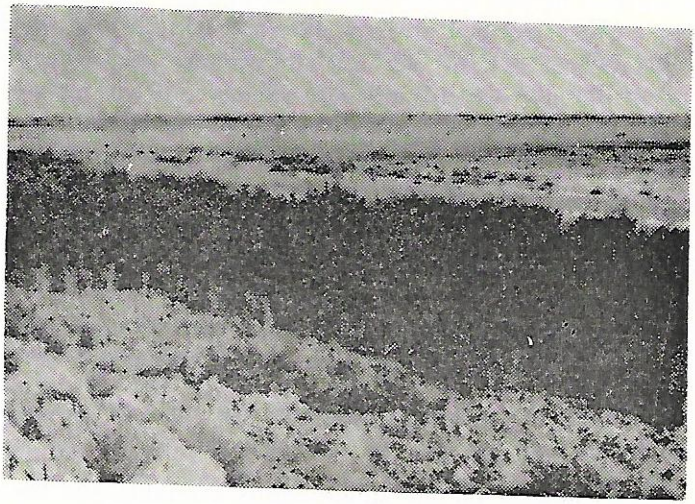
fied as **Acrocephalus arundinaceus** (Linnaeus) the Eurasian Great Reed Warbler. For lack of any comparative material no subspecific identification is attempted. However, it is not **A. arundinaceus griseldis** (Hartlaub) the Babylonian Great Reed Warbler, which is of a smaller size (wing 76-83, tail 59-68, tarsus 24-26 (Williamson 1963) , known to breed between Baghdad and Basrah. The specimen is deposited in the Bird Collection of the Iraq Natural History Museum.

In the first week of July 1972 I revisited the area and inspected the reed-bed. Three empty nests were found (Fig. 1). No birds were seen or heard. As was the case in 1968 all the three nests were looped round **P. communis** reed stems. The canal passes through a semidesert, where salt resistant thorny plants were growing. Although the reeds are usually cut in Oct./Nov. by farmers, by next Mar./Apr. the reeds are back again to their full height.

Basing on the sex organs 'enlarged to breeding size' of an **A. arundinaceus** collected by Cheesman on June 1, (which was singing there for a fortnight) from a fruit garden near Baghdad where 'there were no reeds or water in the vicinity' , Ticehurst **et al.** (1926) concluded that 'there can be little doubt' about its breeding in Iraq. They noted that the specimen was closer to **A. a. arundinaceus** than to **A. a. zarudnyi** Hartert. Allouse (1953) quoting the foregoing reference says that both the above subspecies as breeding in Iraq, and also states of Steward coming across 'one nest and eggs near Hindiya Barrage in May, 1949' .

On **A. arundinaceus** Chapman and McGeoeh (1956) records : 'At Habbaniya counted eight at a small reed-bed in the middle of May, and heard much song; birds were still present and in song in the middle of July, and may have bred there.' Moore and Boswell (1956) cites the PNC records of one singing on 13 May 1945 in Baghdad area as supporting the view of its breeding. Later Allouse (1962) reports that two subspecies namely **zarudnyi** and **griseldis** as breeding in Iraq, quoting the above references.

The only definite record of **A. arundinaceus (griseldis** excluded) breeding in Iraq rests on the report of Allouse (1953) of Steward's finding of nest and eggs near Hindiya Barrage.



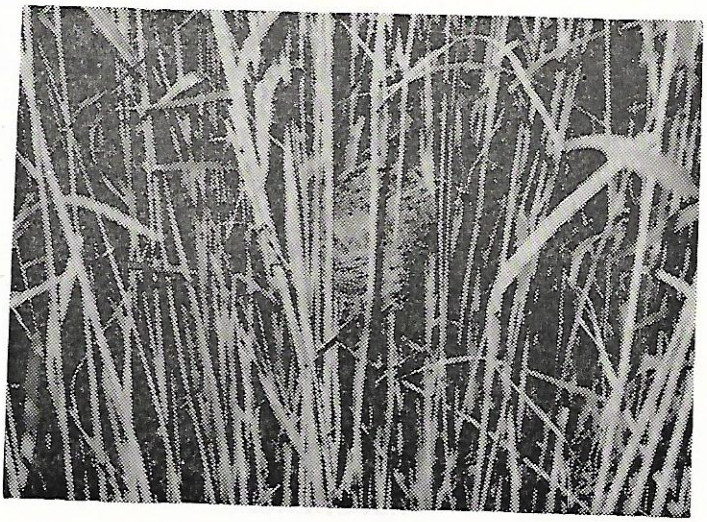


Fig. 1. (Upper) Breeding habitat of **Acrocephalus arundinaceus,** (lower) its nest slung on reed stems, July 1972, Baghdad, Iraq. (George Kainady)

Capt. Mc Neile (per. comm.) who found this Hindiya nest first, tells me that he was guided to the nest by the song of the Great Reed Warbler which sounded 'to be weaker and less harsh' than that of the European form. Steward and Mc Neile neither could collect nor see the owner of the nest, which was very secretive. The nest was found on 3 June 1949 (not in May as given by Allouse 1953 & 1962), and it contained only one egg, which looked 'like those of **A. a. arundinaceus'**, and the egg was collected by Steward. The nest was 'in a reed-bed along-side the road a short distance south-east of Hilla'. It was slung on tall reeds growing in deep water. It was 'a large nest with an outside depth of not less than 15 or 16 cm' , which makes it unlikely of **A. a. griseldis** for whose nest has an outside depth of only 7.6 to 8.8 cm (Ticehurst **et al.** 1922).

The dealer, who bought Steward's egg collection was contacted by Mc Neile, informs that he can find no trace or record of this single egg.

Since no data on the single egg is available and the egg is not traceable, the evidence rests only on the outside depth of the nest. Under the circumstances that **A. a. arundinaceus, A. a. zarudnyi,** and **A. a. griseldis** are the only three subspecies of Great Reed Warblers recorded for Iraq, it is very probable that the Hilla nest belonged either to **arundinaceus** or to **zarudnyi.** However, it may be noted that although **A. stentoreus** (Hemprich & Ehrenberg) the Indian Great Reed Warbler is not recorded for Iraq, close to Iraq in Iran it breeds, which has a nest more or less of the same outside depth.

Therefore, the present finding forms the first positive breeding record of **Acrocephalus arundinaceus** the Eurasian Great Reed Warbler for Iraq.

ACKNOWLEDGEMENT

I am indebted to Capt. J. H. Mc Neile for kindly providing me the details on **Acrocephalus** nest found on 3 June 1949 near Hilla.

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الخلاصة

Acrocephalus arundinaceus تم التسجيل الاول لهازجة القصب الكبيرة ووجدت آنها تتكاثر فى العراق .

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Vol. 3, October 1976

THE INDIAN PYGMY GOOSE, NETTAPUS COROMANDELIANUS, IN BASRAH, IRAQ

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On 19 November 1975 I saw two Indian Pygmy Geese **Nettapus coromandelianus** (Gmelin) kept for sale in the Ashar market, Basrah. Both were alive and in healthy state except for the removal of outer wing feathers (Fig. 1). I was told that both the birds were caught from the southern part of the Hor Hammar marshes (**c.** 30.30 N 47.35E) on the previous day. He could not give me the exact locality for the birds were sold to him by the hunter. The skins prepared from the specimens are kept in the Bird Collection of the Museum.

Measurements of the specimens are : Bs Nov 1/75, female, weight 175 g on 19 November 14:30 hrs., tarsus 24, bill (from feather) 23 ; Bs Nov 2/75, female, weight not taken, tarsus 25, bill (from feathers) 22. Tips of tail feathers are broken in both, hence not measured.

N. coromandelianus is an Asiatic-Malaysian species, which has a distribution as follows: **(N. c. coromandelianus)** China from northern Hopeh (Peking), south to Hainan, Indo Chinese countries, Pakistan , India, Sri Lanka, eastward through Bangladesh, Malay Peninsula and Greater Sundas (including Rhio Archipelago and Banka) to northern Celebes, also northern Luzon, and northern New Guinea; (**N. c. albipennis** Gould) northeastern Australia (Vaurie 1965, Ali & Ripley 1968).

During the breeding season (June to September, Ali & Ripley 1968), the Indian Pygmy Goose has been twice sight recorded in

Afghanistan from two localites close to Pakistan border; one bird, Kargah lake near Kabul (34.30N 69.11E) on 25 August 1964 and two birds, Kabul river near Jalalabad (34.26N 70.25E) on 19 August 1966 (Neithammer, G. & J. 1967). Scott (1975) records this species for Iran as accidental. Francis Argyle (per. comm.) of the Department of Environment, Tehran, informs me that a hunter shot this bird in Jan./ Feb. 1973, from Hamun-e Saberi (31.30N 61.20E) in Seistan

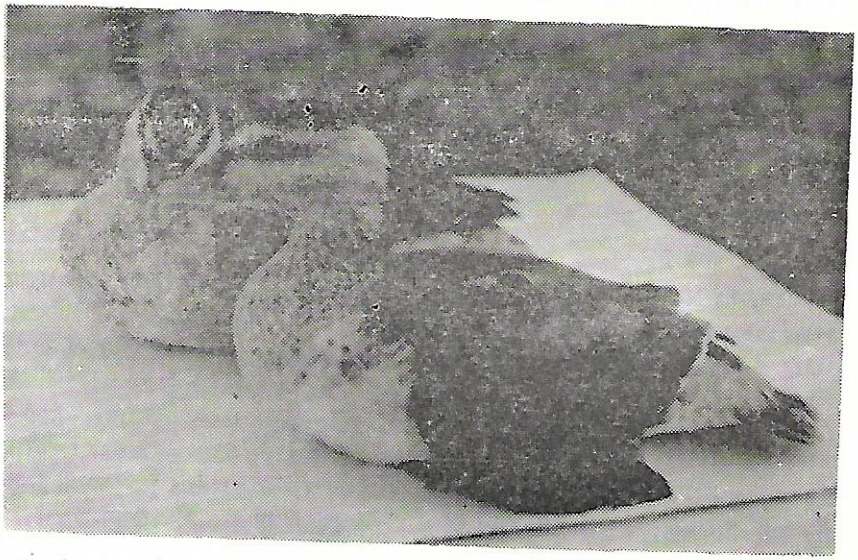

Fig. 1. Two female Indian Pygmy Geese **Nettapus coromandelianus** collected in November 1975 from Basrah, Iraq. (George Kainady)

Baluchistan close to Afghanistan border, and, ' not knowing what he had shot, took the head to Department personnel by whom it was reliably identified'. Sexes are not given in any of the above cases. The present finding and the above two recent westward recordings outside the bird's traditional distribution area may indicate a tendency for westward extension of its range.

The Indian Pygmy Goose, the smallest of all ducks, can be identified from the other twenty-seven species of anatids recorded for Iraq by its goose-like bill and small size. From these two salient features

the bird derives its vernacular name. In the Indian subregion the bird is known as Cotton Teal, and Quacky-duck.

The present collection of **Nettapus coromandelianus** from south Iraq makes the genus and species new additions to the avifaunal list of Iraq.

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الخلاصـــه

اصغر انواع البط هو البط الاقزم الهندى (Indian Pygmy Goose) والذى سجل فى العراق لاول مرة فى هذا البحث وبهذا سجلت جميع انواع البط فى العراق والتى عددها (٢٨) نوعـا ٠

Bull. Basrah nat. Hist. Mus.
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REPORT OF THE BIRD MIGRATION STUDY PROJECT OF BASRAH UNIVERSITY (1974-'75)

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The Natural History Museum of the University of Basrah started ringing of birds under the Bird Migration Study Project in autumn 1974. The aim of the Project is to study in general the movement of birds; the origin of the wintering birds, the wintering grounds of the summer breeding visitors, the wintering and summering areas of the passage migrants, and as well to collect the vital statistics.

Almost all ringing was conducted at Shafi (30.53N 47.31E) about 60 km north of Basrah. In 1974 and 1975 the netting was done at a mixed roost, predominantly of House Sparrows **Passer domesticus** , in the **Phragmites communis** reed-bed growing by the side of the Shatt-al-Arab river. During these two years about 20 days were spent for netting and ringing, and a total of 558 birds comprising 15 species were ringed (Table 1). Regular netting could not be established in the above period for lack of experienced hands and a suitable area for continuous netting.

The ringing consists of collecting live bird, fixing an aluminium ring round the leg, and its subsequent release. Details of species, race, age, sex (if ascertainable), date, locality and other data such as weight, measurement of wing, notes on moult etc., are entered on schedules at the time of ringing. Each ring carries a number and the

Table 1. Birds ringed in South Iraq.

	Species	1974	1975	Total
1.	**Hirundo rustica**	4	2	6
2.	**Riparia riparia**	9	1	10
3.	**Motacilla alba**	0	2	2
4.	,, **flava**	22	1	23
5.	**Pycnonotus leucotis***	3	14	17
6.	**Lanius collurio**	4	1	5
7.	**Luscinia svecica**	0	3	3
8.	**Erithacus rubecula**	2	1	3
9.	**Turdoides altirostris***	1	4	5
10.	**Acrocephalus arundinaceus**	3	7	10
11.	,, **scirpaceus**	33	5	38
12.	**Prinia gracilis***	0	1	1
13.	**Passer domesticus***	244	129	373
14.	,, **moabiticus***	0	3	3
15.	**Sturnus vulgaris**	18	41	59
				558

Those marked* are residents, the rest migrants.

address of the Museum 'BASRAH UNIV. N. H. MUS.-IRAQ'. The following are the affixes attached to numbers of different ring sizes in use by us.

Affix	Inside diameter	Affix	Inside diameter
A	2.5 mm	E	9.0
B	3.5	F	12.0
C	4.5	G	14.0
D	6.5	H	16.0

The Japanese made nylon mist-nets are used for collecting birds.

Recoveries of foreign ringed birds in Iraq and of our rings abroad will regularly be reported in this Bulletin. The annual report of the Bird Migration Study Project also will appear in the Bulletin. Persons interested in obtaining these reports may send their request to the Director.

Those who recover our bird rings, or foreign rings inside Iraq are requested to send the recovery details in the following address : The Director, Natural History Museum, University of Basrah, Basrah, Iraq.

الخـلاصـــــه

تصطاد الطيور وهى حية ـ تصنف ثم توضع حلقات معدنية فى ارجلها وهذه الحلقات مختوم عليها عنوان متحف التاريخ الطبيعى لجامعه البصرة · ومن ثم تطلق لدراسة هجرتها وانتشاها ·

وهذا هو التقرير الاول لمشروع دراسة هجرة الطيور لجامعة البصـرة التقرير القادم لنشاطات المشروع سوف ينظم فى العدد الجديد لهذه المجلة ·

RECOVERIES OF RINGED BIRDS

No.	Ring No. & Species	Ringing detail	Recovery detail	Remarks
1.	Moskwa A-091105 **Phalacrocorax carbo** Adult	14-22 Nov. 1973 Astrakhan State Nature Reserve, USSR 45.50N 47.50E	via Khalaf Al-Robaae ?- Oct. 1975 Basrah, Iraq 30.30N 47.47E	shot time elapsed **c.** 1 year 11 months distance covered **c.** 1800 km
2.	Moskwa A-111754 **Phalacrocorax carbo** Juvenile	22 May 1975 Astrakhan State Nature Reserve, USSR 46.00N 48.33E	M.K. Saud Jayid & A. S. Jabar 10 Mar. 1976 Nassiriah, Iraq 31.02N 46.16E	shot time elapsed 9months 20 days distance covered **c.** 1600 km
3.	Moskwa A-111770 **Phalacrocorax carbo** Juvenile	22 May 1975 Astrakhan State Nature Reserve, USSR 46.00N 48.33E	via Khalaf Al-Robaae ?- Nov. 1975 Shatt Al-Arab, Basrah, Iraq 30.30N 47.42E	shot time elapsed **c.** 6 months distance covered **c.** 1800 km
4.	Moskwa C-144506 **Ardea cinerea** Juvenile	29 May 1970 Astrakhan State Nature Reserve, USSR 46.00N 48.33E	S. H. Swaylim 22 Apr. 1974 Hor Hammar, Basrah, Iraq 30.37N 47.30E	shot time elapsed 3 years 11 months distance covered **c.** 1800 km
5.	Moskwa D-705129 **Egretta garzetta** Pullus	24 June 1973 Kizlijar (Dagestanskaja ASSR). USSR 43.52N 46.40E	M.K. Saud Jayid & A. S. Jabar 1 Sept. 1975 Nassiriah, Iraq 31.02N 46.16E	shot time elapsed 2 years 67days distance covered **c.** 1500 km

6.	Moskwa D-705858 **Egretta garzetta** Pullus	23 June 1974 Astrakhan State Nature Reserve, USSR 46.00N 48.33E	Fadhil Al-Joborae 9 Jan. 1975 Aluwey, Hor Hammar, Iraq 30.37N 47.15E	shot time elapsed 6 months 20 days distance covered **c.** 1900 km
7.	Moskwa D-705875 **Egretta garzetta** Pullus	23 June 1974 Astrakhan State Nature Reserve, USSR 46.00N 48.33E	via Khalaf Al-Robaae ?- Mar. 1976 Amara, Iraq 31.50N 47.09E	shot time elapsed **c.** 1 year 9 months distance covered **c.** 1400 km
8.	Moskwa D-837575 **Bubulcus ibis,** or **Egretta garzetta** Pullus	22 May 1975 Kyzyl-Agach State Nature Reserve, Azerbaijan, USSR 39.00N 48.50E	Beddoon Antoush Nov.-Dec. 1975 Seraifa, Basrah, Iraq 31.14N 47.24E	shot time elapsed **c.** 6 months distance covered **c.** 900 km
9.	Moskwa D-838749 **Bubulcus ibis,** or **Egretta garzetta** Pullus	22 May 1975 Kyzyl-Agach State Nature Reserve, Azerbaijan, USSR 39.00N 48. 50E	via Khalaf Al-Robaae ?- Dec. 1975 Amara, Iraq 31.50N 47.09E	shot time elapsed **c.** 7 months distance covered **c.** 800 km
10.	Tehran LL 6414 **Phoenicopterus ruber** Pullus	25 Aug. 197? Ashk Isl., Lake Rezaiyeh Azarbaijan, Iran 37.18N 45.35E	via Khalaf Al-Robaae 3 Oct. 1975 South Hor Hammar, Basrah, Iraq 30.20N 47.30E	shot distance covered **c.** 750 km

No.	Ring No. & Species	Ringing detail	Recovery detail	Remarks
11.	Moskwa D-747489 **Anas acuta** Adult male	14 July 1975 Astrakhan State Nature Reserve, USSR 46.14N 49.02E	via Khalaf Al-Robaae ?- Feb. 1976 Amara, Iraq 31.50N 47.09E	shot time elapsed **c.** 7 months distance covered **c.** 1500 km
12.	Moskwa E-993205 **Hydroprogne caspia** Juvenile	15 June 1975 Astrakhan State Nature Reserve, USSR 46.14N 49.00E	Abdul Radha ?- Oct. 1975 Garma, Basrah, Iraq 30.33N 47.45E	shot time elapsed **c.** 4 months distance covered **c.** 1800 km
13.	Moskwa E-993396 **Hydroprogne caspia** Juvenile	16 June 1975 Astrakhan State Nature Reserve, USSR 46.14N 49.00E	Jasim Jeber ?- Nov. 1975 Shafi, Basrah, Iraq 30.53N 47.31E	shot time elapsed **c.** 5 months distance covered **c.** 1800 km
14.	Basrah B-334 **Sturnus vulgaris** Adult	7 Jan, 1975 Shafi, Basrah, Iraq 30.53N 47.31E	Tayeb Salami, via F. B. Argyle Dept. of Environment, Tehran 25 Aug. 1975 Marivan, Kurdistan, Iran 35.51N 46.10E	caught alive and released time elapsed **c.** 7 months 20 days distance covered **c.** 600 km

Considering the paucity of **B. ibis** records (none in winter) and the abundance of **E. garzetta** wintering in Iraq, it is very likely that Nos. 8 and 9 constitute **E. garzetta**. Nos. 12 and 13 form the first reporting of **H. caspia** recovery from Iraq.

P. V. GEORGE KAINADY

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THE STINGRAY TAENIURA MELANOSPILOS, A NEW RECORD FROM THE ARAB GULF

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One male stingray, **Taeniura melanospilos** Bleeker, was captured by hook and line on 23 October, 1975 in the northern sector of the Arab Gulf, within the territorial waters of Iraq (29°38'N. 48°50' 10''E.) at a depth of 80 feet. The ray was preserved in the Natural History Museum, University of Basrah.

Distinctive characters

Taeniura meyeni Muller and Henle **T. lymma** (Forsskal) are the only rays of the Arabian Sea which is likely to enter the Arab Gulf and with which **T. melanospilos** might be confused. **T. melanospilos** can be distinguished from **T. meyeni** by the curved mouth and the presence of two to three oral papillae, while T. lymma has a rather straight mouth and five oral papillae. In the case of **T. lymma,** the length of the disc is greater than the breadth and has dark edged bluish spots on the dorsal side, while in **T. melanospilos** the disc breadth is greater than the disc length and has black spots.

Description

Total length, 1270 mm; disc length, 620 mm; disc breadth, 745 mm; tail length, 700 mm; body length before the anus, 570 mm; eye diameter, 20 mm; spiracle diameter, 25 mm; distance between orbits, 135 mm; preorbital distance, 110 mm; preoral length, 120 mm; breadth of mouth 65 mm; length of gill openings : Ist, 23 mm; 2nd, 28 mm; 3rd, 26 mm; 4th, 25 mm; 5th, 15 mm; length of tail spines:upper, 150 mm; lower, 80 mm. Disc broader than long; mouth curved, with three

papillae, its roof with finely undulated curtain. Teeth tessellate, groved transversely, 10 rows on upper jaw and 13 rows on lower. The subcaudal fin extending from just below the tail spines upto the end of the tail. The tail with two spines, the upper one is laterally serrated and about twice as long as the unserrated lower spine.

Disc is covered with fine aspertities and with a dorsal vertebral row of 69 small tubercles. Colour of disc is grey with black spots dorsally and a paler margin in the live specimen. Pelvic fins and anterior part of tail are also spotted. The body on the ventral side is whitish.

T. melanospilos has been reported from Indonesia, India, Ceylon, East Africa, Gulf of Oman and Red Sea (Bleeker 1853; Misra 1969) . No species of the genus **Taeniura** was reported from the Arab Gulf. Therefore, the present finding forms the first record for the species as well as the genus for the Arab Gulf.

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الخلاصة

جنس **Taeniura** لم يسجل فى الخليج العربى • لذلك التحصيل الجديد لـ **Taeniura melanospilos** يمثل التسجيل الجديد لهذا النوع والجنس فى الخليج العربى •

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A NEW NAME FOR PERILEPTUS JEANNELI JEDLICKA (COLEOPTERA : CARABIDAE) FROM IRAQ

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Perileptus jeanneli Jedlicka was described from Iraq as a new species among the Collection of the Natural History Museum of Hungary in Budapest. The new species was erected on one example (Holotype) from Iraq, Jedlicka (1952).

Unfortunately Jedlicka's name is preoccupied by **Perileptus jeanneli** Darlington which was erected originally for a new species **Perileptus** Shaum from Jamaica, Darlington (1934).

According to the rules of Nomenclature and to avoid confusion, therefore I propose the name **jedlickai** nom. nov. for the Iraqi species described by Jedlicka (1952).

Perileptus jedlickai nom. nov. was the only species of this genus to be recorded from Iraq, Ali (1974), it is nearest to **P. areolatus** Creutz, from which it may be separated by its smaller head and considerably flat eyes and somewhat longer pronotum with relatively narrow and longer elytra. The elytra are narrowest at the base and gradually widened behind. Striae are fine with finer punctures and completely flat intervals.

Perileptus jedlickai could be easily separated from **P. jeanneli** Darlington that the latter is more depressed, piceous, mouth, bases of antennae, palpi, legs are rufescent to testaceous, the presence of three dorsal punctures on position of the obsolete third stria and having the prothorax cordate and strongly constricted at base.

ACKNOWLEDGEMENT

I take great pleasure in expressing my thanks to Dr. P. Freeman for his kind invitation to study in the Department of Entomology of the British Museum (N.H.).

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خلاصة

يشمل هذا البحث اعطاء اسم جديد لحشرة عراقية اكتشفت من قبل عالم هنغاري وذلك حسب قوانين التسمية العلمية والاسم الجديد هو :

Perileptus jedlickai Ali

Bull. Basrah nat. Hist. Mus.
Vol. 3, October 1976

SOME OBSERVATIONS ON THE BEHAVIOUR OF INCUBATING CHARADRIUS ALEXANDRINUS ON HOT SUMMER DAYS

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The midsummer, June to August, in Iraq is without rain and is featured by high temperature and low relative humidity. The habit of nesting in open dry areas and the rather tame nature of Kentish Plover **Charadrius alexandrinus** makes it an ideal subject for field study. Finding of Kentish Plover nesting in June provided us an opportunity to make some general observations on its adaptations for breeding in desert environment.

No previous study on the behavioural adjustments of Kentish Plover to a hot-climate-nesting exists other than that of Dharmakumarsinhji (1964). He recorded for the first time the wetting of belly feathers: "In the hot hours, the change over of duties at the nest was frequent and the bird taking over would often have its breast wet to keep the eggs moist." and the bird on nest calling characteristically, which was replied by the mate and change over taking place immediately.

Our study shows that almost all the methods known to reduce heat stress in birds are exploited by Kentish Plover nesting in arid-zone.

The Kentish Plover, a cosmopolitan species, breeds in Iraq from March to July, inclusive (Marchant 1963). Two nests were located on 23 June 1972 at Rashidiya, near Baghdad in a dried up portion of a temporarily flooded area by the side of Baghdad-Baquba road. The soil, a mixture of sand and silt, was grey. Although the area was dry during daytime, late at night and early morning many portions looked wet from the rising of subsoil water. Bushes 1 to 1.5 m high were growing scattered (Fig. 1). One nest was in open (Fig. 2), the other under a bush (Fig. 3); the latter was completely in shade from sun till 1100. Both contained the usual clutch of three eggs. The eggs in open nest at the time of finding (0800) were partially covered with loose sand but when examined on the same day at 1400 and 1830 all the eggs were exposed. Collared Pratincoles **Glareola pratincola** and Little Terns **Sterna albifrons** were nesting (incubating) at the time of our observation. Used nests of Blackwinged Stilts **Himantopus himantopus** were present.

Males of both nests were distinguishable from females in having black lores, ear-coverts, and a band below eye. These regions in females were lighter (Figs. 9 & 10). We made the observation between 23 and 30 June from hides using 7 x 30 binoculars and 40 x 60 telescope.

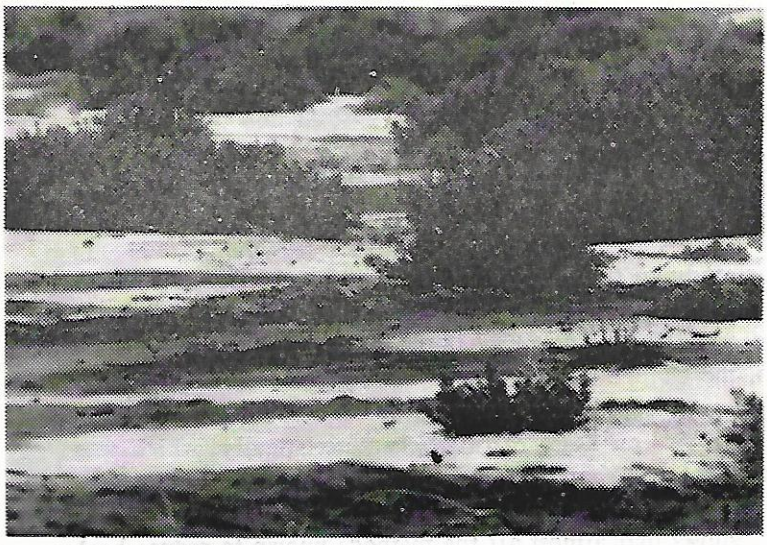

Fig. 1. Breeding area of Kentish Plover, Rashidiya, Baghdad.

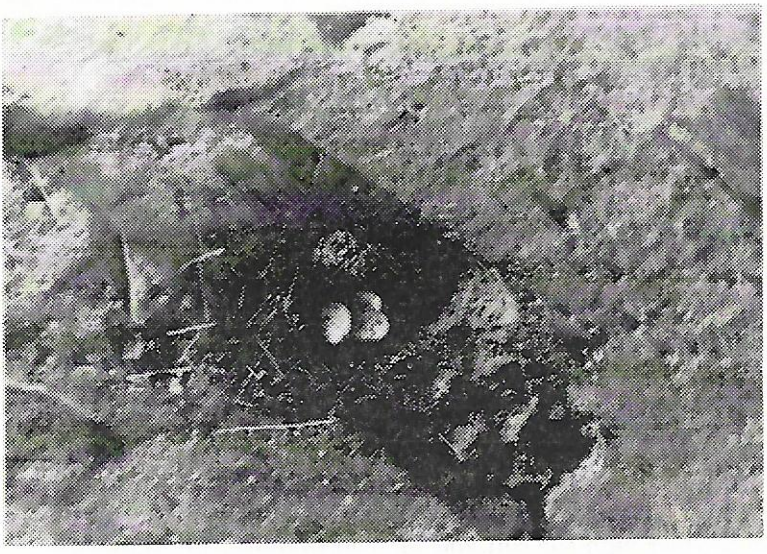

Fig. 2. Nest in open with the usual clutch of three eggs.

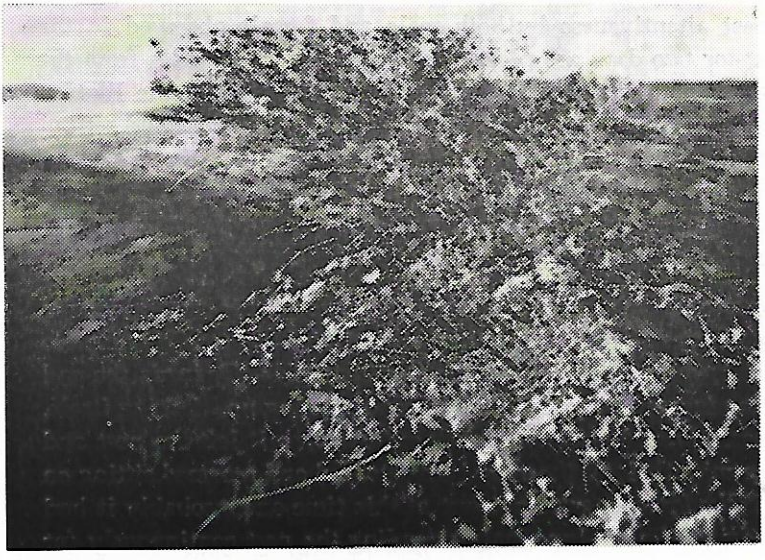

Fig. 3. Nest under bush (= shaded nest) with a clutch of three eggs.

The soil temperature was taken by piercing a mercury thermometer into the sand till the mercury bulb was completely in, near the hide in an area exposed to direct sun. The shade air temperature was measured about one metre above ground close to hide.

RESULTS

Our observations are limited to the general activities of the incubating bird from late after sunrise till soon after the eggs were left unattended in the evening.

Except for the short absences caused by disturbances, the eggs were continuously covered by one of the parents till evening. The change over was close hence the eggs were exposed to sun only for a short time. During the heat of the day the bird coming for incubation had its belly soaked in water, and panting and gular fluttering a regular feature in the sitting bird. In the evening when the intensity of solar radiation was reduced together with the soil and air temperatures, the eggs were left unattended. On all the four occassions, covering both nests, female was on nest for the last evening sitting.

NEST ATTENTIVENESS

The nest attentiveness by both male and female observed in the shaded nest for two days are plotted in Fig. 4. Short absences from the nest owing to disturbances (such as a pratincole call and the like) during which the bird was making repeated attempts to come and settle - are not considered as inattentiveness for the present study. The nest attentiveness for the above nest for two days and one day for open nest during the observed period was cent percent excepting the three instances mentioned below of the former nest.

On two occasssions we had the chance to note what would happen in case the partner fails to relieve the sitting bird. On 30 June female was on nest in one stretch for 86 minutes from 1614. Towards the end it was getting increasingly restless by way of getting up, shaking itself, changing position and orientation in nest. At 1740 it left the nest and flew off. Ten minutes later the same bird returned and resumed sitting on eggs. The belly feathers were not wet at this time and probably it had gone for a drink. On 28 June male attending the nest continuously for 85 minutes left it at 1710 and flew off. Its partner did not come for

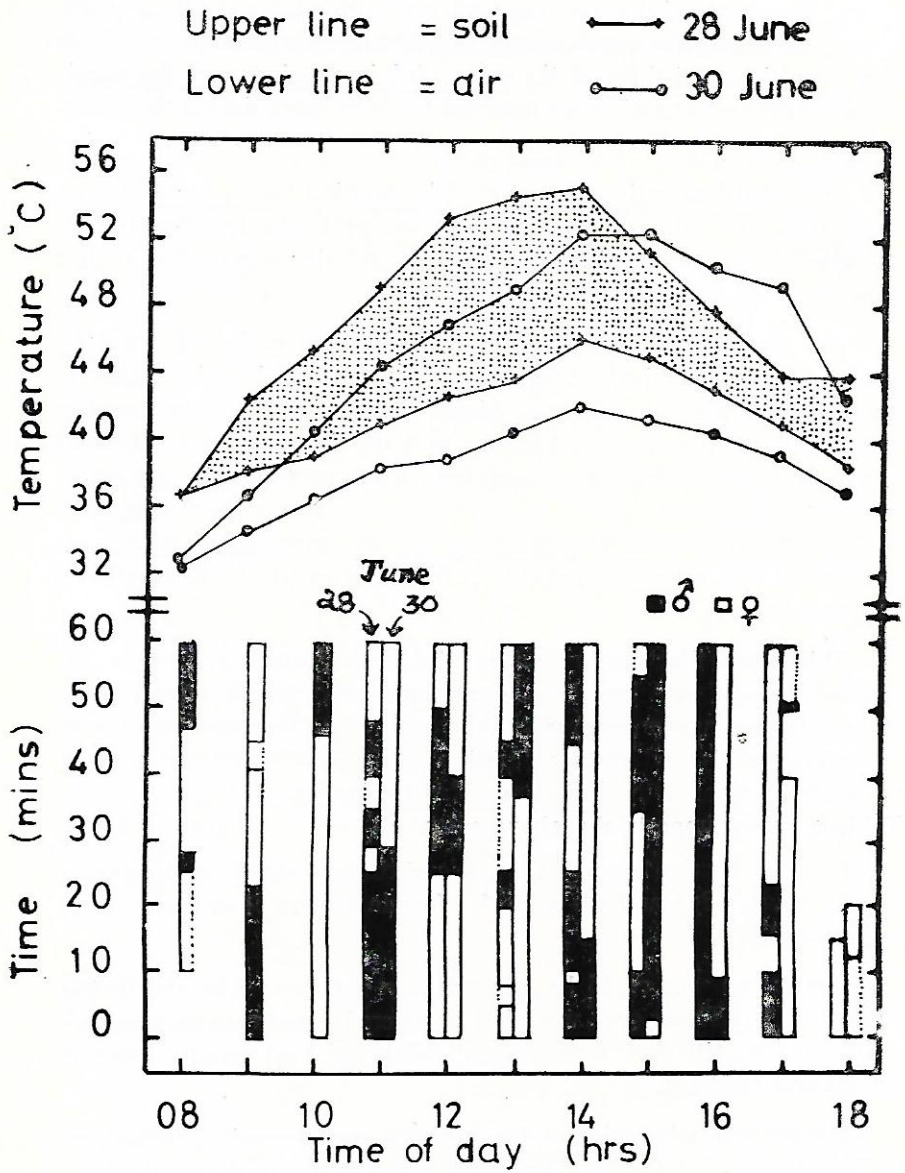

Fig. 4. The nest attentiveness of a pair of Kentish Plover in a shaded nest on 23 (left side) and 30 (right side) June together with soil and air temperatures. dots = bird in nest vicinity, black = male, white = female.

relief. The same bird came back after six minutes and sat on eggs. Seven minutes later female came and change over took place. These two penultimate sittings of the same bird in evening were the maximum single nest attentiveness recorded for both sexes during the observation.

The third inattentiveness occurred in morning for 19 minutes from 0828 when the male attending the nest was probably disturbed by the observer. The eggs were in shade, the soil and air temperatures at that time were 35° and 34°C respectively.

The attentiveness in shaded nest for the same period of two days with different ambient temperatures, Ta, are given in Table 1. On 28 June, when the Ta was higher than on 30 June, the number of attentive periods increased from 4 to 8 and the average duration of single nest attentiveness decreased from 43 to 29.5 minutes by male. The same for female was 5 to 7 and 53.4 to 27.5 respectively. The male's attentiveness on 30 June of 36.3% was increased to 54.2% on 28 June, which releived the load on female from 61.4% to 44.4% on 28 June.

This shows that the incubating birds adjust themselves to an increased Ta by decreasing the average duration of single attentiveness and by increasing the number of changeover. The increased number of attentive periods and shorter duration of single attentiveness seen in open nest compared to shaded nest for the same period and day (see Table 2) also supports the above view.

Overall results show that male's sitting averaged 26.0 minutes (n 28, range 3-85) and the same for female was 29.8 minutes (n 27. range 4-86).

One or two eggs could be seen at times not covered by the sitting bird (Fig. 5). These eggs were left uncovered sometimes as much as eight minutes, till they were brought below the bird usually when it got up and resettled.

The general orientation of the bird on eggs was with its back to the sun. Feathers of the back and nape were opened up during the heat of the day when there was refreshing wind. On the contrary, when the wind blowing was a hot one the bird did not open up the feathers. The bringing down of both wings to the ground to protect the eggs from hot

Table 1. Nest attentiveness (in minutes) for the same period of two days with different ambient temperatures* in a shaded nest.

	1100 to 1815	
	28 June	30 June
Total for male	236 (54.2%)	158 (36.3%)
No. of periods	8	4
Average	29.5	43.0
Range	7-85	20-71
Total for female	193 (44.4%)	267 (61.4%)
No. of periods	7	5
Average	27.5	53.4
Range	4-52	30-86

* see Fig. 8.

Table 2. Comparison of nest attentiveness in open and shaded nests.

	28 June ; 1100 to 1545	
	Open*	Shaded
Total for male	117 (47.4%)	144 (50.5%)
No. of periods	8	6
Average	14.6	24.0
Range	3-27	19-25
Total for female	130 (52.6%)	141 (49.5%)
No. of periods	8	6
Average	16.2	23.5
Range	8-23	4-37

* with one break in observation from 1305 to 1346.

wind as well to shade them from sun resulted in exposing the white side of tail (Fig. 6) which was normally covered by wing tips.

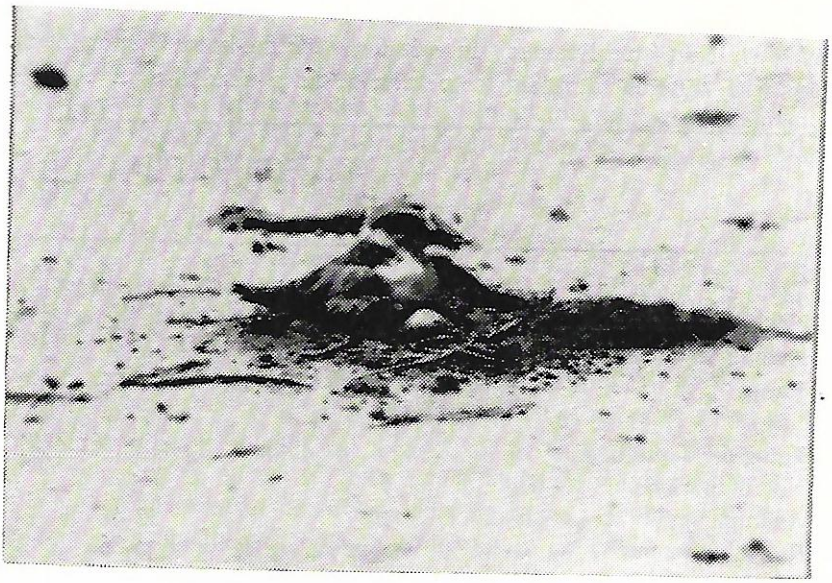

Fig. 5. One or two eggs were occasionally left uncovered while bird sat on eggs. These were brought under the bird when it got up and resettled.

Fig. 6. During the heat of the day the bird on nest brought wings to the ground which resulted in exposing the white of tail.

While on nest the sitting bird got up many times, shook the body with feathers partly raised, and settled. Changing of position was also common. During the day from morning till evening the eyes of the sitting bird were wide open and on alert. But by evening after days strenuous work, when solar radiation, air and ground temperatures were subsided, the sitting bird looked tired, at times eyes closed, most of the time winking.

WETTING OF BELLY FEATHERS, PANTING, AND GULAR FLUTTERING

Open Nest

On 28 June when observation started at 0835 no birds were around the nest, probably moved away by being disturbed by our erecting of hide. At 0910 male arrived, after several hesitated attempts, settled on nest, when the belly feathers were soaked in water. From 0930 the bill was partly opened. At 0950 female with wet belly took over the incubation. The panting and gular fluttering noticed while the bird was settling on eggs were stopped after a few minutes. By 1010 male came with wet belly and sat on eggs, started open-bill panting and gular fluttering. Thereafter inclusive of the last changeover at 1750 by female, the incoming bird (for incubating) invariably had belly feathers soaked in water. The open-bill panting (Fig. 7) and gular fluttering were continuous in the bird on eggs till evening. We have no notes at what time these activities were discontinued on this evening.

Five days prior to the above observation we recorded the termination of panting and gular fluttering in the evening . The penultimate sitting in evening by male with wet belly began at 1545. Fast gular pulsation and open-bill panting were observed till 1655, thereafter the intensity of gular flutter appeared to have decreased. However, these were present even when the female with wet belly took over at 1633. Gular fluttering was clearly visible till 1713, and a few minutes later panting stopped, although the bill was more often kept open till 1723.

Shaded Nest

The female, which was continuously on nest for fifty minutes, started panting at 1035 and soon gular fluttering followed. At 1046 male with wet belly (first bird to arrive so) took over duty on nest.

After twenty-nine minutes open-bill panting began, and sixteen minutes later at 1145 gular fluttering started. Thereafter open-bill panting and gular fluttering were continuous in the bird on nest till evening and invariably the incoming bird had belly feathers soaked in water. The last wetting was at 1614 when female came for attending the nest. The last gular flutter on record was at 1632 and the panting at 1655.

During the continuous open-bill panting and gular fluttering the lower bill, kept slightly downturned, had a drop of watery liquid. When the size of this drop increased and on the verge of falling, it was brought back in the bill by the snapping movement and ?slight rai ing of bill. This drop did not seem to have taken in.

Open-bill panting started first followed sooner or later by gular fluttering ; the latter stopped first followed by the former. Soaking of belly feathers occurred either before the start of the above activities as in open nest, or after as in shaded nest (Fig. 8). Both male and female soaked their belly feathers (Figs. 9 & 10). The soaking of belly and subsequent sitting on ground nest resulted in giving a soiled isabelline tinge to the white ventral feathers. In the only two instances we have on record it was the male to arrive first with wet belly.

Fig. 7. Open-bill panting and gular fluttering were a regular feature in incubating bird during the hotter part of the day.

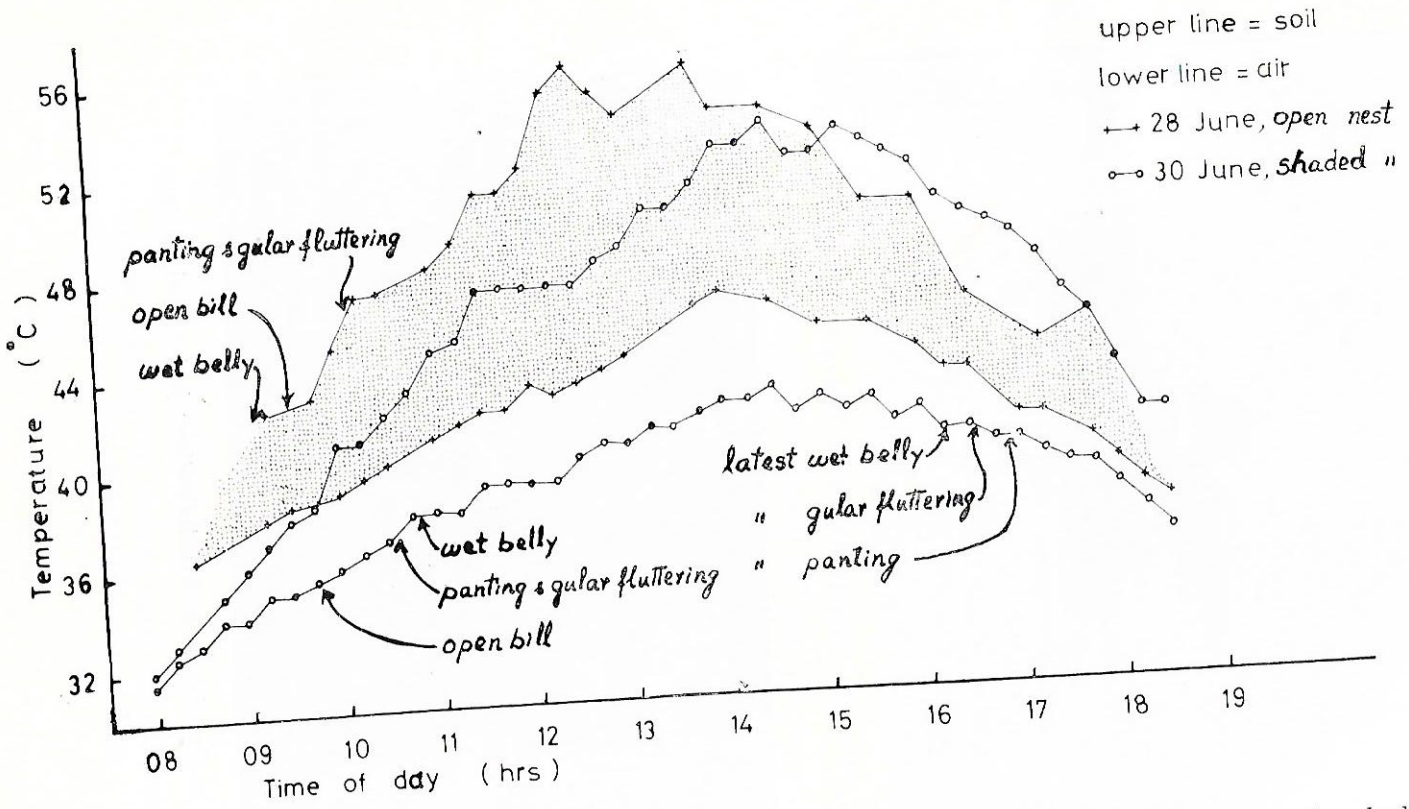

Fig. 8. The onset and termination of panting, gular fluttering, and wetting of belly feathers in an open and a shaded nests on 28 and 30 June respectively with soil and air temperatures.

Fig. 9. Male with belly feathers soaked in water settling on eggs.

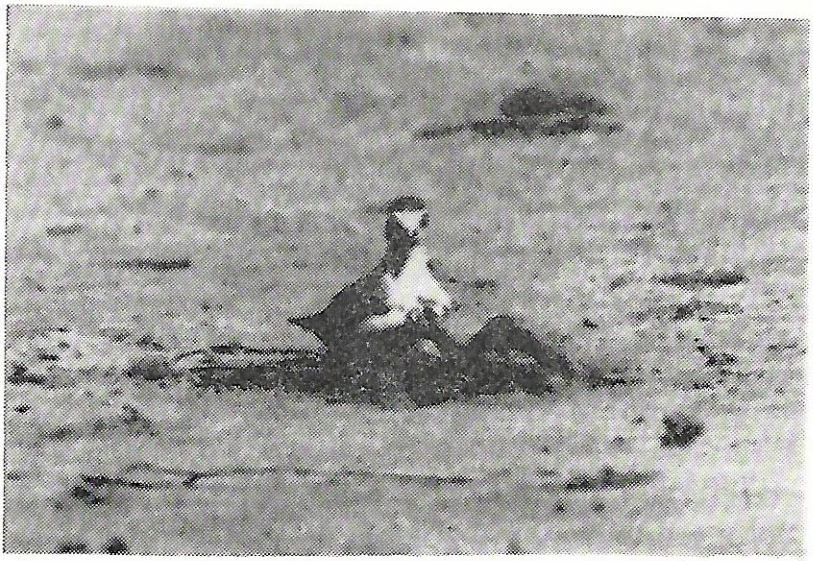

Fig. 10. Female with soaked belly feathers just settled on eggs.

NEST RELIEF

The nest relief was a simple one typical of Charadriiformes. The incoming bird landed at a distance and walked or ran to nest, when close to nest the sitter got up walked or ran a few steps and took to wings calling out a few times. The female of shaded nest many times landed close to nest and scared the male to jump out from nest. During changeover no physical contact of sexes noticed in open nest, however, the female of shaded nest coming for incubation on several occassions pushed male with bill before taking over duty. Although the sitter left nest usually after the close approach of its mate, on a hot day female attending shaded nest for 51 and 61 minutes left it when incoming male was about 15 and 20m away respectively from nest. This happened around noon and on both occassions male rushed to nest and covered eggs.

NEST MAKING

On all the four occassions the female, which was on nest for the last evening sitting, when terminated the attentiveness picked up items like dried vegetable bits and threw them over the back towards nest while walking away from nest. This side throwing was not observed on the part of outgoing bird at any other time.

In the afternoon on a few times female sitting on nest picked up nest materials within the reach of its bill from the side of or near nest and dropped them in nest or from one side to other. Once it occurred in morning. The male did nest making only once (open nest) at the close of a long sitting around noon.

NEST TEMPERATURE

On 23 June at 1400, soon after the bird left nest, a mercury thermometer placed in between eggs-the mercury bulb resting on nest material-in open nest showed 44°C. Then the mercury bulb pierced completely into the compact sand close to nest recorded 54°C.

DISCUSSION

Exposed ground nesting of Kentish Plover in arid-zone with its attendant intense solar radiation and high environmental temperature

calls for utmost vigilance on the part of birds. The eggs face death if left exposed even for a short time. This makes continuous coverage of eggs a necessity. As a result cent percent nest attentiveness is noted during day (Fig. 4) Similar complete coverage has been eariler reported for open ground nesting Charadriiformes . **C. alexandrinus** (Rittinghaus 1956), **C. tricollaris** (Macdonald 1957, quoted by Serventy 1971), **Stiltia isabella** (Maclean 1976), **Vanellus indicus** (Naik **et al.** 1961), **Rhinoptilus africanus** (Maclean 1967), **Sterna fuscata** (Howell & Bartholomew 1962) and **Larus argentatus** (Drent 1970). Norton (1972) found the same nest coverage in the single-sex incubating **Calidris melanotos,** two-sex incubating **C. alpina, C. bairdi,** and **C. pusilla** in 24-hour-sunlight arctic summer at night where the eggs are to be protected from chilling in the extreme cold.

The daytime maximum single nest attentiveness recorded by us for both sexes (female 86 minutes, male 85 minutes) are very low compared to the same observed in France (between 0915 and 2115 with mid-day temperature 10.2°C; female over ten hours. male six hours, Rittinghaus 1956). This shows that although the birds are capable of longer sitting at a lower Ta, the prevailing extreme Ta in arid-zone makes it impossible for them doing so.

At the nesting ground the daytime Ta (soil 32-56°C, air 32-46°C, Fig. 8) was much higher than the body temperature of Kentish Plover, which is assumed to be close to that of related Ringed Plover **C. hiaticula** 40.0°C (Udvardy 1953). Keeping eggs at its optimum developing temperature (34-39°C, Drent 1975) and regulating bird's own temperature in an extremely high Ta, when radiational gain also occur, are extremely vulnerable problems to be confronted by the incubating bird. Practically all the mechanisms which are known to reduce heat stress in birds, namely panting, gular fluttering, wetting of belly feathers. opening of wing bend, raising of scapular and nape feathers, and sitting with back to the sun (Dawson & Hudson 1970) . are utilized by Kentish Plover sitting on eggs.

The first visible response to heat stress was the open-bill panting. This was sooner or later followed by gular fluttering and wetting of belly feathers. In the case of open nest soaking of belly feathers occurred first and possibly this delayed the onset of panting and gular fluttering. It appeared that the bird was unable to withstand the thermal stress by panting and gular fluttering alone and therefore had

to resort to the soaking of belly feathers. The gular fluttering does not appear to have been reported earlier for Kentish Plover.

J. Walters (per. comm.) of the Netherlands - who had made extensive study on the breeding biology of Kentish Plover by capturing and marking them, making some hundred hours of observation from hide on breeding birds - informs us that he has not observed the belly feathers wet or anything resembling wetting of feathers. However, there is an important observation by Gatter (1971) in West Germany on Little Ringed Plover **C. dubius** carrying water (in soaked belly feathers) to young hatched on a 'very hot' German day with 29.2°C, which is suggestive of the existence of wetting tendency even in European breeding population.

Other activities which augment heat dissipation noted in the incubating Kentish Plover were the opening of wing bend, scapular, and nape feathers, and the general orientation of the sitting bird facing away from the sun. Although the scapular and nape feathers were opened up in refreshing wind, these were kept closed in hot wind.

To cope with the extreme Ta, despite all the above heat dissipating methods, Kentish Plover also had to make constant changeover and to shorten the duration of average single nest attentiveness, as evidenced by the data on shaded nest for two days with different Ta (Table 1), and on open and shadad nest for the same period and day (Table 2).

The nest material seems to serve a dual insulative role by preventing the excessive soil temperature reaching the eggs during day and at night loosing of heat from eggs to soil, when soil temperature is lower than that of eggs under incubation.

It is apparent that only at night and in the cooler part of morning the bird applies heat to eggs, rest of the time it tries either to shade or take away the above-normal heat from eggs.

SUMMARY

Observations on the daytime activities of incubating Kentish Plovers **Charadrius alexandrinus** in an open and a shaded nests in an arid-zone are presented and discussed.

In addition to the major sources of evaporative cooling by panting and gular fluttering, Kentish Plover also soaks the belly feathers prior to incubation to withstand the extreme thermal stress in its nest microclimate. Further to augment heat dissipation the bird opens up wing bend, scapular and nape feathers, and sit on nest with back to the sun.

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الخـلاصـــــة

يتناول هذا البحث عرض ومناقشة لفعاليات طير الزقزاق الاسكندرانى **(Charadrius alexandrinus)** خـلال فتـرة الحضانـة تحت تأثـير البيئة الصحراوية الجافـــة .

لقد لوحظ انه بالاضافة الى اللهاث او ارتعاد منطـقة الذقـن والزور كوسيلة للتبريد يعمد اليها الطير لتحمل الحرارة العالية فانه يقوم ايضـا بنقع ريش المنطقة البطنية بالماء قبل البدء بالحضانة لنفس الغرض . كمـا ان الزقزاق الاسكندرانى يعمد الى فتح ريش الجناح ، الكتف ومؤخرة العنق والجلوس بالاتجاه المعاكس لاشعة الشمس للتخلص من الحرارة العاليـة .

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PRESENCE OF DOWN-LIKE NESTLING PLUMAGE IN PALLID SWIFT, APUS PALLIDUS

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In Apodiformes the presence of down-like nestling plumage has been reported for **Cypseloides niger** (Dixon 1935), **C. rutilus** (Snow 1962), **Cypselus parvus** (= **Cypsiurus parvus;** Moreau 1941), **Micropus caffer** (= **Apus caffer;** Moreau 1942a), and **Colletoptera affinis** (= **Apus affinis;** Moreau 1942b). It is present in all the three species of **Hemiprocne,** namely **H. longipennis, H. mystacea,** and **H. comata** (Lack 1956).

Collins made detailed study on the down-like plumage of **Cypseloides niger, C. rutilus** (1963) and **Cypsiurus parvus** (1965), and has shown that these plumage consists of plumaceous semiplume portion of the first teleoptile plumage. Siddiqui (1968) has described the same of **Apus affinis.**

The down-like plumage in the Pallid Swift **Apus pallidus** nestling (Fig. 1) has not been previously reported and hence worth recording. This plumage in **A. pallidus** is confined to trunk region mostly in apteria of dorsal and ventral sides. Unlike **Cypseloides rutilus, C. niger,** and **Cypsiurus parvus** these semiplumes are absent from neck and head in the Pallid Swift. A preliminary study on the general distribution of nestling down in **A. pallidus** shows that it resembles **A. affinis** but for the absence of crural tract, which is reported so far only in **A. affinis.**

A search through the literature reveals that the presence of down-like nestling plumage has also been shown in **A. apus** (Weitnauer 1947) and **A. melba** (Arn 1960).

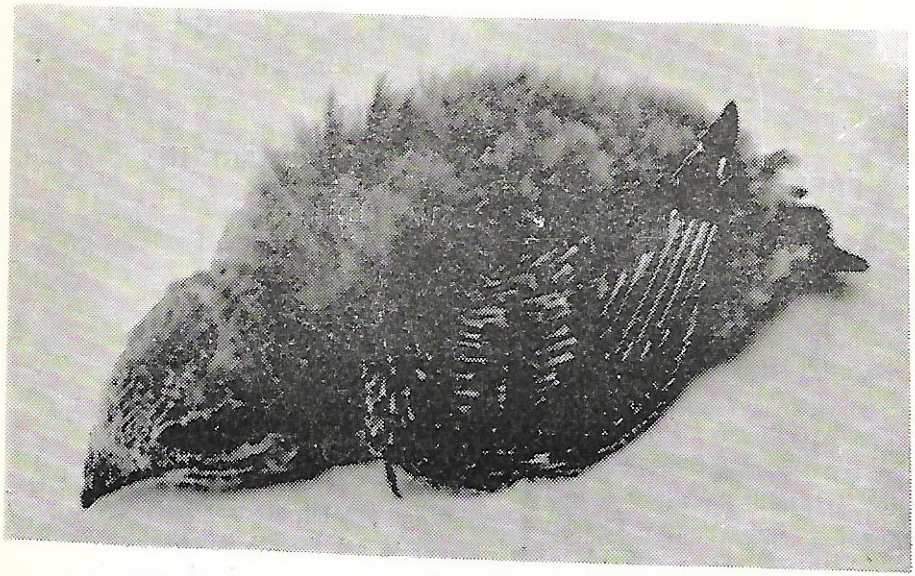

Fig. 1. The Pallid Swift **Apus pallidus** nestling about sixteen-day-old with down-like nestling plumage. (George Kainady)

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الخـلاصـــــة

يعرض هذا البحث ولاول مرة وجود مايشابه ريش الزغب فى كساء طـير السمامه الباهته **(Apus pallidus)**

NOTICE TO CONTRIBUTORS

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