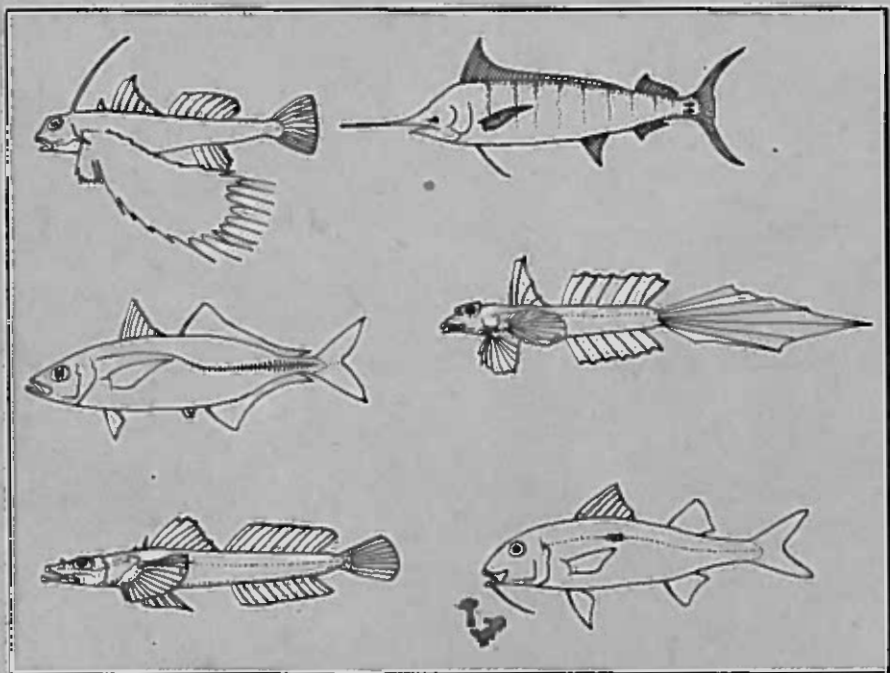


A KEY TO THE FAMILIES OF FISHES AS RECORDED FROM GUAM

ROBERT S. JONES and HELEN K. LARSON



UNIVERSITY OF GUAM MARINE LABORATORY

Technical Report No. 10

May 1974

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INTRODUCTION

It is not really possible at this time to make a complete key to the families of fishes of Guam. The reason being that we do not yet know all of the families that most likely occur here. For instance Gosline and Brock (1960) in their Handbook of Hawaiian Fishes, list over 150 families and 584 species. Our list of fishes collected from Guam (Kami, et al 1968 and Kami, 1971) includes only 90 families and 598 species. Guam, because of its geographic location near the Indo-Pacific center of radiation of species, would be expected to have a more diverse ichthyofauna than the Hawaiian Islands. However, the latter fish community has been far more extensively collected than has Guam's. This is particularly true of deeper water forms. Considerable deep water trawling, trapping and handline fishing in Hawaii have produced a good many families not yet recorded from Guam. It is quite likely that in due time, the Guam records will exceed those from Hawaii and this key to the families of Guam fishes will need considerable revision. Should you find a fish which fails to fit the key, don't be surprised, just elated for you may have added a new family.

The reader will note that this key to Guam fish families contains 99 instead of 90 families. We were not able to resist listing certain families which we have reason to believe are commonly found here but have thus far eluded our museum bottles. In addition, some families have been added since the original work by Kami and his colleagues was done.

HOW TO USE THE KEY

Believe it or not, with a little practice, you will be able to recognize most fish families at a glance. The characters you use in your mind may not be anything you can explain but rather "just the way it looks". Until this talent is acquired, you may as well learn how to "key" them out.

Most taxonomic keys are laid out as couplets. The couplets are alternative statements and are numbered in such a way that you are led through the key characters, couplet by couplet, until you have your fish identified.

Figure 1 is a generalized fish drawing to show you what some of these characters are. If you learn the names of each part and each character so that it is second nature to you, you can then proceed rapidly through the key.

The key follows the style of and uses many of the couplets found in Gosline and Brock (1960).

Serious students of fish studies may wish to go from this family key to the work of Schultz *et al* (1953, 1960, 1966). This three volume work is useful in identifying many of the Guam fishes to species.

Fish sketches are by Larson.

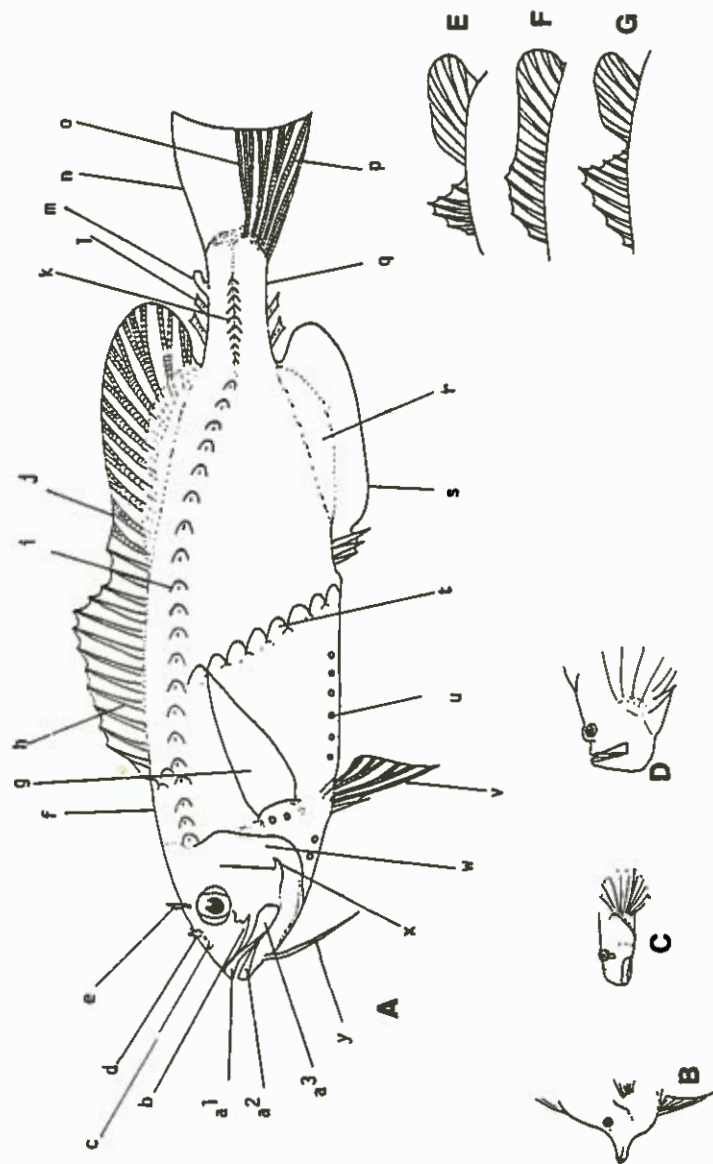


Fig. 1 A-Superfish, a¹-premaxillary, a²-dentary, a³-maxillary, b-preorbital, c-anterior nostril (tubular), d-posterior nostril (nasal tentacle), e-orbital cirrus, f-nape, g-pectoral fin, h-spinous dorsal fin, i-lateral line scale with pore, j-soft dorsal fin, k-scuttle, l-finlet, m-adipose fin, n-caudal fin, o-branched ray, p-unbranched ray, q-caudal peduncle, r-scale sheath on fin, s-anal fin, t-transverse scale row, u-photophore, v-pelvic fin, w-opercle, x-preopercular spine, y-barbel, z-terminal mouth, C-Subterminal mouth, D-Supratemporal mouth, E-Divided dorsal, F-Single dorsal, G-Notched dorsal.

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- _____, I. I. Ikehara, and F. P. DeLeon. 1968. Check-List of Guam Fishes. *Micronesica* 4(1): 95-131.
- Schultz, L. P., E. S. Herald, E. A. Lachner, A. D. Weiland and L. P. Woods. 1953. Fishes of the Marshall and Marianas Islands. Vol. 1. U. S. National Museum Bull. 202: 685 pp.
- _____, W. M. Chapman, E. A. Lachner and L. P. Woods. 1960. Fishes of the Marshall and Marianas Islands. Vol. 2. U. S. National Museum Bull. 202: 438 pp.
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KEY TO THE FAMILIES OF FISHES

As Recorded from Guam

Those families of fishes whose presence has been reported by residents of Guam but which are unrepresented by museum specimens are marked with an asterisk(*), those entirely restricted to deep water are marked with a double asterisk(**), and those largely or entirely limited to fresh water are marked with a triple asterisk(***)

- | | | |
|------|--|---|
| 1 | A single gill opening on each side..... | 12 |
| | Five or six external gill slits on each side..... | 2 |
| 2(1) | Body strongly flattened..... | 10 |
| | Body more or less cylindrical in cross section..... | 3 |
| 3(2) | Five external gill slits on each side; two separate dorsal fins..... | 4 |
| | Six external gill slits on each side; a single dorsal fin..... | Fig. 2 HEXANCHIDAE**
(Six gill or cowsharks) |

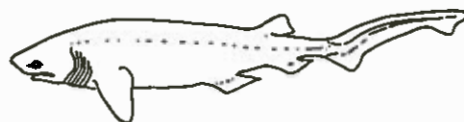


Fig. 2 *HEXANCHUS GRISEUS*

- | | | |
|------|--|---|
| 4(3) | Base of first dorsal fin terminates over or ahead of origin of pelvic fins, as in Figs. 6-9..... | 5 |
|------|--|---|

Base of first dorsal fin at least partly behind

base of pelvic fins; caudal fin large, the
upper lobe extending almost vertically;

size large, to over 30 feet..... Fig. 3 RHINCODONTIDAE*
(Whale sharks)

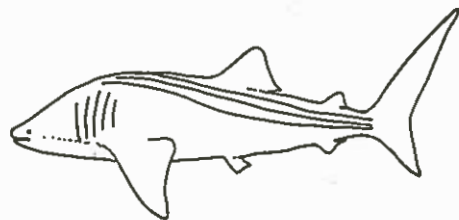


Fig. 3 RHINCODON TYPUS

5(4) Head of normal shape, not expanded laterally.....

Head greatly expanded laterally Fig. 4 SPHYRNIIDAE
(Hammerhead sharks)



Fig. 4 SPHYRNA LEWINI

6(5) No elongate nasal barbel.....

An elongate nasal barbel reaching to or nearly to

the mouth..... Fig. 5 ORECTOLOBIDAE
(Carpet or nurse sharks)



Fig. 5 GINGLYMOSTOMA FERRUGINEUM

7(6) Caudal fin not lunate, the upper lobe extending $\frac{1}{2}$
behind the lower, as in Figs. 7-9.....

Caudal fin lunate, the upper lobe not extending much
farther posteriorly than the lower.....

..... Fig. 6 ISURIDAE (=Lamnidae*)
(Mackerel or mako sharks, includes great white shark)

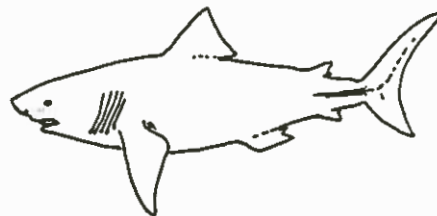


Fig. 6 CARCHARODON CARCHARIAS

8(7) Caudal fin much shorter than the body, as in Figs.

8 and 9.....

Caudal fin nearly as long as the body or longer.....

..... Fig. 7 ALOPIIDAE
(Thresher sharks)

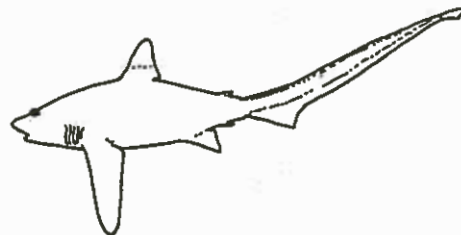


Fig. 7 ALOPIAS PELAGICUS

- 9(8) Teeth low, with three or more cusps, and with several series functional simultaneously Fig. 8 TRIAKIDAE (Smooth dogfishes)

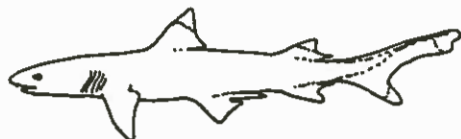


Fig. 8 *TRIAENODON OBESUS*

- Teeth blade-like, with a single cusp and never with more than two series functional simultaneously.....
..... Fig. 9 CARCHARHINIDAE (Requiem or gray sharks)

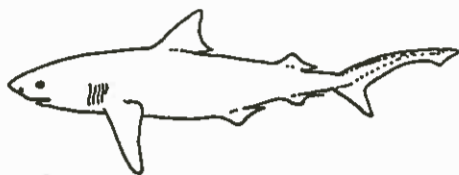


Fig. 9 *CARCHARHINUS AMBLYRHYNCHOS*

- 10(2) Head and eyes ahead of the level of the arc made by the front borders of the pectoral fin, as in Figs. 11 and 12; pectoral wings ending in an acute point laterally..... 11

- Head and eyes behind the level of the arc made by the front borders of the pectoral fins; pectorals rounded laterally..... Fig. 10 DASYATIDAE (Stingrays)

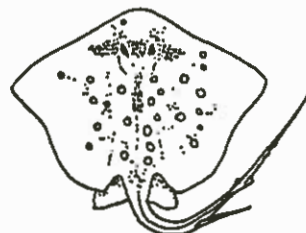


Fig. 10 *DASYATIS KUHLLII*

- 11(10) No flipper-like folds extending forward from each side of the head..... Fig. 11 MYLIOBATIDAE (Eagle rays)

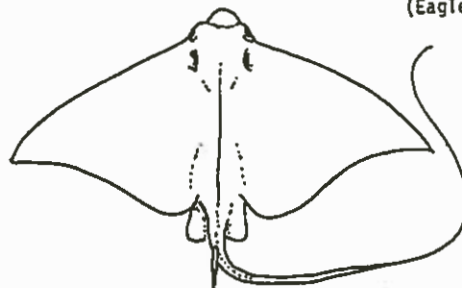


Fig. 11 *AETOBATUS MARINARI*

- A flipper-like fold extending forward from either side of the head..... Fig. 12 MOBULIDAE* (Manta rays)

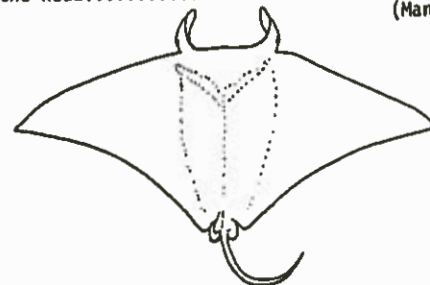
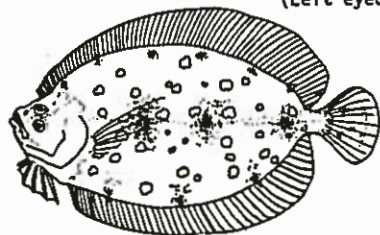
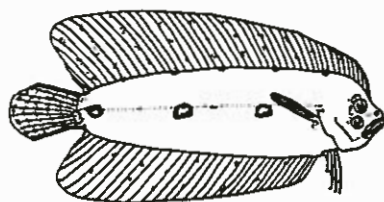


Fig. 12 *MANTA BIROSTRIS*

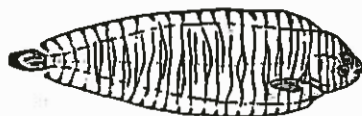
- 12(1) One eye on each side of the head..... 15
 Both eyes on the same side of the head..... 13
- 13(12) Eyes on right side of the fish's head..... 14
 Eyes on the left side of the fish's..... Fig. 13 BOTHIDAE
 (Left eyed flounders)

Fig. 13 *BOTHUS MANCUS*

- 14(13) Pectoral fins present..... Fig. 14 PLEURONECTIDAE*
 (Right eyed flounders)

Fig. 14 *SAMMARISCUS TRIOCELLATUS*

- Pectoral fins absent..... Fig. 15 SOLEIDAE
 (Soles)

Fig. 15 *AESOPIA HETERORHINOS*

- 15(12) Either the gill openings are in front of the
 pectoral bases or the pectoral fins are absent..... 16
 Gill openings behind the level of the pectoral
 bases..... Fig. 16 ANTENNARIIDAE
 (Frogfishes)

Fig. 16 *ANTENNARIUS ALTIPINNIS*

- 16(15) Pelvic fins present, though sometimes rudimentary or
 highly modified..... 17
 Pelvic fins totally absent..... SUBKEY D (page 40)
- 17(16) The two pelvic fins separate from one another..... 19
 The innermost rays of the two pelvic fins attached
 to one another by a membrane which may or
 may not extend the full length of the rays..... 18
- 18(17) The pelvic fins joined to form a prominent fleshy
 adhesive disk; dorsal fin spineless, consisting
 only of unbranched rays; always scaleless;
 anterior part of head depressed...Fig. 17 GOBIESOCIDAE
 (Clingfishes)

Fig. 17 *LEPADICHTHYS MINOR*

The pelvic fins joined but not forming a prominent, fleshy adhesive disk; dorsal fin always with some spines; scales present or absent; anterior part of head not notably depressed..... Fig. 18 GOBIIDAE (Gobies)



Fig. 18 *BATHYGOBIUS FUSCUS*

- 19(17) Pelvic fins with five or fewer soft rays..... 20
 Pelvic fins with more than five soft rays..... SUBKEY A (page 9)
- 20(19) Dorsal fin composed of two or more completely separate parts..... SUBKEY B (page 16)
- A single dorsal fin which may be more or less subdivided, but if so the sections connected by at least a basal membrane..... SUBKEY C (page 24)

SUBKEY A

Pelvic Fins With More Than Five Soft Rays

- 1 No stiff, sharp spines at the front of the anal fin..... 2
 One or more stiff, sharp spines at the front of the anal fin..... 16
- 2(1) Adipose fin present..... 3
 No adipose fin present..... 5
- 3(2) Sides of body without photophores..... 4
 Sides of body with photophores..... Fig. 19 MYCTOPHIDAE (Lanternfishes)

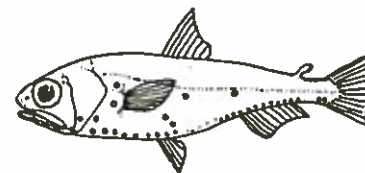


Fig. 19 *MYCTOPHUM* sp.

- 4(3) Pectoral fins reaching to or beyond the level of the base of the pelvic fins..... Fig. 20 SYNODONTIDAE (Lizardfishes)



Fig. 20 *SAURIDA GRACILIS*

Pectoral fins ending far short of the base of the
pelvic fins..... Fig. 21 PARALEPIDIDAE**



Fig. 21 *LESTIDIUM NUDUM*

- 5(2) Snout elongate, tubular, with small mouth at
the tip..... 6
- Snout not in the form of an elongate tube with a
small mouth at its tip..... 8
- 6(5) No free spines along back; no barbel on chin..... 7
- Soft dorsal preceded by a series of small, free
spines, chin with a barbel..... Fig. 22 AULOSTOMIDAE
(Trumpetfishes)



Fig. 22 *AULOSTOMUS CHINENSIS*

- 7(6) Caudal with a median filament..... Fig. 23 FISTULARIDAE
(Cornetfishes)

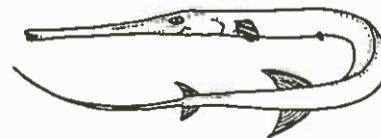


Fig. 23 *FISTULARIA PETIMBA*

- Caudal without a median filament.... Fig. 24 SOLENOSTOMIDAE
(Dragonfishes)



Fig. 24 *SOLENOSTOMUS* sp.

- 8(5) Barbels, if present, four or fewer..... 9
- A series of six or more barbels around mouth, dorsal
with about 50 rays..... Fig. 25 CLARIIDAE***
(Walking catfishes)



Fig. 25 *CLARIAS FUSCUS*

9(8) A separate, well-developed caudal fin..... 10

No separate, well-developed caudal fin; the body

tapering to a point posteriorly.. Fig. 26 MACROURIDAE**
(Grenadiers)

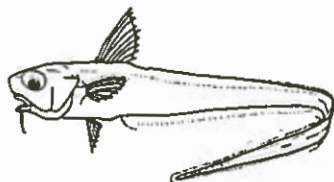


Fig. 26 *MALACOCEPHALUS* sp.

10(9) Lateral line, if present, running along the middle
of the sides or above..... 13

Lateral line running very low along sides, commencing
below the base of the pectoral fin..... 11

11(10) Pectorals not winglike; one or both jaws produced..... 12

Pectorals winglike; neither jaw produced.....

..... Fig. 27 EXOCOETIDAE
(Flyingfishes)

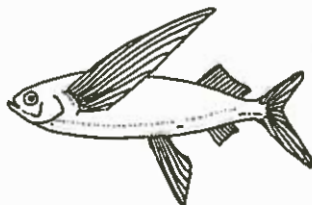


Fig. 27 *CYPSSELURUS ANTONICHI*

12(11) Both jaws produced into a long, sharp beak.....

..... Fig. 28 BELONIDAE
(Needlefishes)

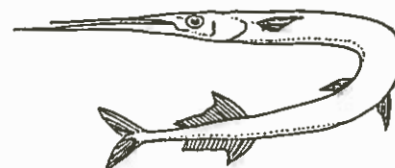


Fig. 28 *BELONE PLATYURA*

Only the lower jaw produced..... Fig. 29 HEMIRAMPHIDAE
(Halfbeaks)



Fig. 29 *HYPORHAMPHUS DUSSUMIERI*

13(10) Lateral line well developed..... 14

No lateral line..... 15

14(13) Mouth small, not extending behind eye..... Fig. 30 CHANIDAE
(Milkfishes)

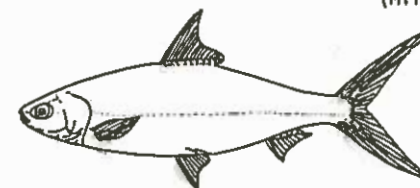


Fig. 30 *CHANOS CHANOS*

Mouth large, extending behind the eye..... Fig. 31 ELOPIDAE
(Ten pounders or tarpons)

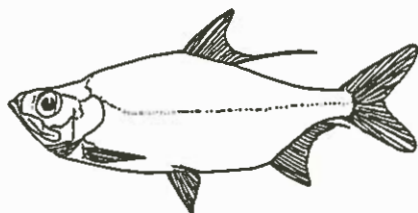


Fig. 31 *MEGALOPS CYPRINOIDES*

15(13) Mouth inferior to the overhanging snout.....

..... Fig. 32 ENGRAULIDAE
(Anchovies)



Fig. 32 *THRISSINA BAELENA*

Mouth terminal..... Fig. 33 DUSSUMIERIDAE
(Round herrings)



Fig. 33 *SPRATELLOIDES DELICATULUS*

16(1) No barbels on chin.....

17

A pair of large barbels on chin..... Fig. 34 POLYMIXIIDAE
(Beardfishes)

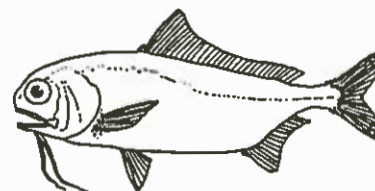


Fig. 34 *POLYMIXIA JAPONICA*

17(16) First dorsal consists of a single filamentous spine;

a pair of dermal folds along each side of the

midventral line..... Fig. 35 BREGMACEROTIDAE

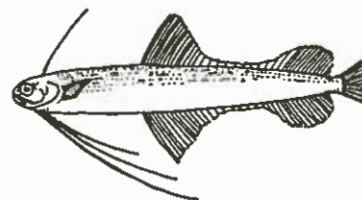


Fig. 35 *BREGMACEROS MACCLELLANDI*

First dorsal fin with 10 or more spines.....

..... Fig. 36 HOLOCENTRIDAE
(Squirrelfishes)

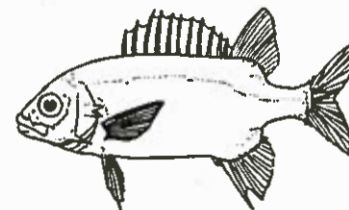


Fig. 36 *HOLOCENTRUS TIERE*

SUBKEY B

Pelvic Fins Present, With Five Or Fewer Soft Rays.
Dorsal Fin Composed Of Two Or More Completely Separate Parts.

- 1 No evertible subocular luminous organ present..... 2
An evertible subocular luminous organ present; abdomen
usually with a median series of ridged or serrated
scales..... Fig. 37 ANOMALOPIDAE
(Lantern-eyes)



Fig. 37 ANOMALOPS KAPTROPTON

- 2(1) First dorsal not composed of a single long ray
originating on the top of the head..... 3
First dorsal consisting of a single long ray originating
on the top of the head; pectorals expanded,
winglike..... Fig. 38 DACTYLOPTERIDAE
(Flying gurnards)



Fig. 38 DACTYLOPTENA ORIENTALIS

- 3(2) Upper jaw not projecting as a tapering, bony spear..... 4
Upper jaw projecting as a tapering bony spear;
first dorsal long, size large.... Fig. 39 ISTIOPHORIDAE
(tarlins, sailfish)



Fig. 39 MAKAIRA AUSTRALIS

- 4(3) The two pelvic fins not fused to one another across
the midventral line..... 5
The two pelvic fins fused to one another across the
midventral line..... Fig. 38 GOBIIDAE
(Gobies)

- 5(4) No spiny ridge running horizontally across cheek to
meet the preopercular border; no backwardly
projecting spines on top of head behind eye..... 6

- A serrate or spiny ridge running horizontally across
cheek to meet the preopercular border; top of
head with backwardly projecting spines; anal
fin with no spines..... Fig. 40 PLATYCEPHALIDAE
(Flatheads)



Fig. 40 SUGGRUNDUS HARRISII

- 6(5) Pectoral fin without a separate section below made up of free rays..... 7
- Pectoral fin with a separate section made up of six free rays Fig. 41 POLYNEMIDAE (Threadfins)



Fig. 41 *POLYDACTYLUS SEXFILIS*

- 7(6) Soft dorsal fin followed by one to several more or less separate finlets; or anal preceded by free spines..... 8
- Soft dorsal fin not followed by finlets; and not preceded by free spines..... 10
- 8(7) Anal fin not preceded by two free spines..... 9
- Anal fin preceded by two small, sharp spines that are ahead of and free from the soft portion of the fin..... Fig. 42 CARANGIDAE (Jackfishes)

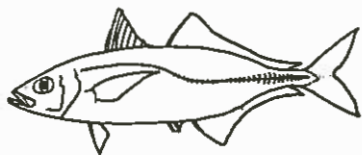


Fig. 42 *TRACHURUS CRUMENOPHTHALMUS*

- 9(8) Soft dorsal fin followed by five or many finlets; lateral line not undulating widely, but remaining on upper half of body; lateral keels present on caudal peduncle..... Fig. 43 SCOMBRIDAE (Tunas)



Fig. 43 *KATSUWONUS PELAMIS*

- Soft dorsal fin followed by one, two, or five or more finlets; lateral line may be absent, double, or undulating well down onto lower half of body in places; no lateral keels on peduncle except in one rare species..... Fig. 44 GEMPYLIDAE (Snake mackerels)

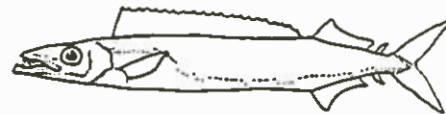


Fig. 44 *PROMETHICTHYS PROMETHEUS*

- 10(7) Two dorsal fins present..... 11

Three dorsal fins present, the first two joined at base; pelvics with fewer than five rays; size small, to about two inches.....Fig. 45 TRIPTERYGIIDAE



Fig. 45 *TRIPTERYGION BRACHYLEPIS*

11(10) Separate first dorsal fin composed of more than two rays.... 12

Separate first dorsal fin composed of two rays on top of head; lateral line with sharp downward jog under the soft dorsal..... Fig. 46 LABRIDAE (part) (Wrasses)

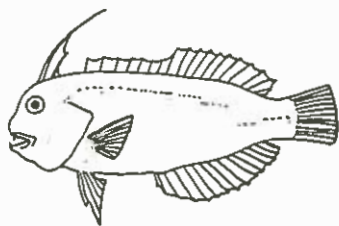


Fig. 46 *INIISTIUS PAVONINUS*

12(11) Body scaled 13

Body completely naked, an enlarged preopercular spine, opercular spineless..... Fig. 47 CALLIONYMIDAE

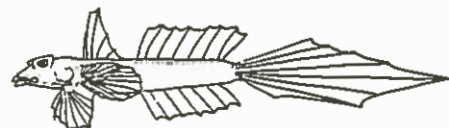


Fig. 47 *CALLIONYMUS XANTHOSEMEION*

13(12) No pair of barbels under chin..... 14

A pair of large barbels under chin Fig. 48 MULLIDAE (Goatfishes)

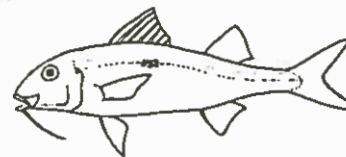


Fig. 48 *MULLOIDICHTHYS SAMOENSIS*

14(13) Distance between the dorsal fins less than the length of the first dorsal fin base..... 17

Distance between the dorsal fins greater than the length of the first dorsal fin base; pelvic fins inserted behind the level of the pectoral fin bases..... 15

15(14) Lateral line absent, teeth small; scales moderate or large..... 16

Lateral line present; teeth large; scales small.....

..... Fig. 49 SPHYRAENIDAE
(Barracudas)



Fig. 49 SPHYRAENA BARRACUDA

16(15) Anal fin with about 17 soft rays; sides with a

silvery lateral stripe in life.... Fig. 50 ATHERINIDAE
(Silversides)



Fig. 50 PRANESUS INSULARUM

Anal fin with 10 or fewer soft rays; sides without

a silvery lateral stripe..... Fig. 51 MUGILIDAE
(Mulletts)

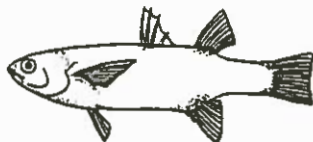


Fig. 51 CHELON VAIGIENSIS

17(14) Lateral line single or absent; one or more anal

spines present..... 18

Two lateral lines present on body with branches above

and below; anal spine weak or absent.....

..... Fig. 52 CHAMPSODONTIDAE

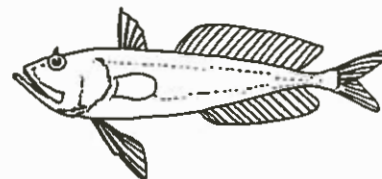


Fig. 52 CHAMPSODON VORAX

18(17) Two anal spines present; maxillary exposed, prominent;

lateral line usually present..... Fig. 53 APOGONIDAE
(Cardinalfishes)

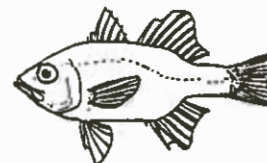


Fig. 53 APOGON NOVENFASCIATUS

One anal spine present; maxillary usually concealed;

lateral line absent..... Fig. 54 ELEOTRIDAE
(Gudgeons)



Fig. 54 ASTERROPTERYX SEMIPUNCTATUS

SUBKEY C

Pelvic Fins Present, With Five Or Fewer Soft Rays.

A Single Dorsal Fin Present, Which May Be More Or Less Subdivided, But If So The Sections Are Connected By A Basal Membrane.

- 1 Pelvic fins normal to filamentous, but the longest ray always more than an eye diameter in length..... 3
- Pelvic fins reduced, less than an eye diameter in length.... 2
- 2(1) Body covered with papillae giving a furry appearance; strong preorbital spine present; size small, living in corals..... Fig. 55 CARACANTHIDAE



Fig. 55 *CARACANTHUS MACULATUS*

Body not covered with papillae, but normally scaled; body deep, compressed and silvery, larger, free-swimming..... Fig. 56 MONODACTYLIDAE (Moonfish)

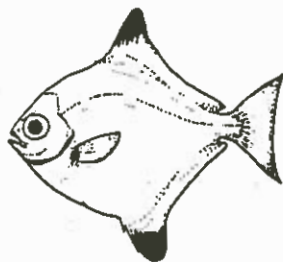


Fig. 56 *MONODACTYLUS ARGENTUS*

- 3(1) Body scaled; if scaleless then gill openings not restricted to width of pectoral base or lower jaw projecting..... 4
- Body scaleless; gill openings restricted to width of pectoral base; mouth terminal or inferior..... Fig. 57 BLENNIIDAE (Blennies)

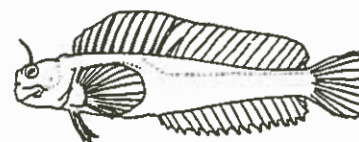


Fig. 57 *ENTOMACRODUS DECUSSATUS*

- 4(3) Lateral line present at least forward; or if not the lower jaw does not form part of the dorsal profile of the head..... 6
- Lateral line absent; lower jaw projecting and forming part of the dorsal profile of the head; pelvics with inner rays longest, the fins may or may not be cupshaped; slender burrowing forms..... 5
- 5(4) First four to six dorsal rays are nonstriated or feeble spines followed by about 13 to 18 soft rays; tongue bilobed..... Fig. 58 KRAEMERIIDAE (Sandfishes)



Fig. 58 *KRAEMERICUS* sp.

First 12 to 22 dorsal rays are nonstriated or feeble
spines, closely followed by about 22 to 55
soft rays; tongue simple..... Fig. 59 MICRODESMIDAE
(Wormfishes)



Fig. 59 *GUNNELLICHTHYS PLEUROTAENIA*

- 6(4) Pelvic fins not reduced to one or two filaments..... 7
Pelvic fins reduced to one or two filaments; a
single long dorsal fin present; dorsal and
anal more or less confluent with the caudal
fin..... Fig. 60 BROTLIDAE
(Brotulas)



Fig. 60 *DINEMATICHTHYS ILUOCOETOIDES*

- 7(6) No forwardly-projecting dorsal spines; each pelvic
fin with only one spine..... 8

A forwardly-projecting dorsal spine lying flat on top
of head; two pelvic spines in each fin, one
before and one behind, with three rays in
between..... Fig. 61 SIGANIDAE
(Rabbitfishes)

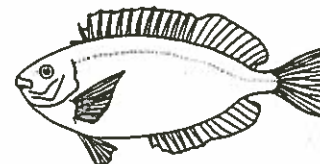


Fig. 61 *SIGANUS SPINUS*

- 8(7) Gill openings reaching throat..... 10
Gill openings not reaching throat, restricted to
sides of head..... 9
9(8) One or a pair spines or bucklers on the sides of
the caudal peduncle (spine may be partly concealed
in groove); first few dorsal spines not greatly
prolonged..... Fig. 62 ACANTHURIDAE
(Surgeonfishes)

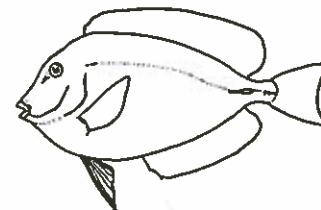


Fig. 62 *ACANTHURUS TRIOSTEGUS*

No spines or bucklers on the caudal peduncle; the

first few dorsal spines greatly elongated.....

..... Fig. 63 ZANCLIDAE
(Moorish idols)

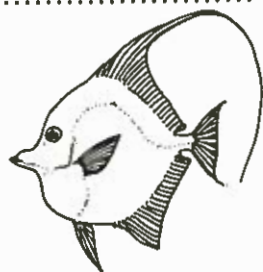


Fig. 63 ZANCLUS CORNUTUS

10(8) Caudal peduncle without a series of platelets or

scutes; anterior dorsal and anal rays not

forming long, separate streamers..... 11

A series of small scutes along the middle of each

side of the caudal peduncle; anterior dorsal

and anal rays may be prolonged into long,

separate streamers..... Fig. 64 CARANGIDAE (part)
(Jackfishes)

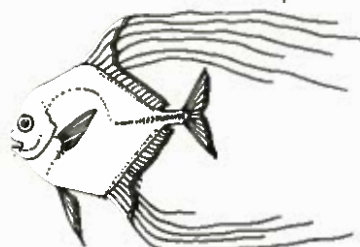


Fig. 64 ALECTIS CILIARIS

11(10) No sucking disc on top of head..... 12

A sucking disc present on top of head.... Fig. 65 ECHENEIDAE
(Remoras)



Fig. 65 REMORA REMORA

12(11) No spiny ridge running horizontally across cheek

below eye; no backwardly-projecting spines

on top of head behind eye..... 13

A spiny or rough ridge running across cheek below

eye and joining the preopercle at nearly

right angles; backwardly projecting spines

present on top of head behind eyes.....

..... Fig. 66 SCORPAENIDAE
(Scorpionfish)

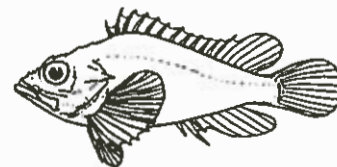


Fig. 66 SCORPAENODES GUAMENSIS

13(12) Lateral line nowhere running below middle of body;

jaws about equal or the lower projecting..... 14

Lateral line descending posteriorly to just above
the posterior portion of the anal base; snout
extending considerably in front of the lower
jaw..... Fig. 67 TRICHONOTIDAE
(Sand-divers)



Fig. 67 *CHALINODYTES TAUENSIS*

14(13) Anterior nostrils without a small, fringed tentacle..... 15

Anterior nostrils with a small, fringed tentacle;
lower pectoral rays unbranched and somewhat
swollen, their tips projecting beyond the
interradial membranes..... Fig. 68 CIRRHITIDAE
(Hawkfishes)

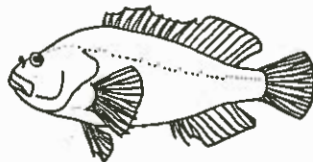


Fig. 68 *PARACIRRHITES FORSTERI*

15(14) Anal spines, if present, not separated from the soft
portion of the fin; no short, partly concealed
spine at the upper end of the preopercular border..... 16

Anal spines separate from soft portion of fin or
by a low membrane, a short, partly concealed
spine at the upper end of the preopercular
border; lateral line either incomplete or
discontinuous..... Fig. 69 PSEUDOCROMIDAE
(Basslets)



Fig. 69 *PSEUDOCROMIS TAPEINOSOMA*

16(15) A single, sharp, more or less conical spine on the
opercle; anal without spines and with 18 or
more soft rays..... 17

No. single, sharp, more or less conical spine on the
opercle..... 18

17(16) Anal fin with 40 to 50 rays; dorsal fin outline
smooth, continuous; pelvics inserted under
pectoral base..... Fig. 70 MALACANTHIDAE
(Tilefishes)



Fig. 70 *MALACANTHUS LATOVITTATUS*

Anal fin with about 20 rays or less; spinous dorsal
differentiated from soft dorsal; pelvics
inserted before pectoral base.... Fig. 71 MUGILOIDIDAE
(Sandperches)



Fig. 71 *PARAPERCIS CEPHALOPUNCTATA*

18(16) Two nostrils present, two on each side of head..... 20
One nostril present on each side of head..... 19

19(18) Lateral line discontinuous..... Fig. 72 CICHLIDAE***
(Tilapia)

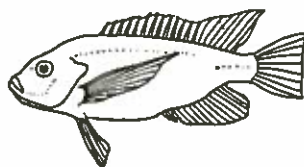


Fig. 72 *TILAPIA MOSSAMBICA*

Lateral line more or less continuous...Fig. 73 POMACENTRIDAE
(Damselfishes)

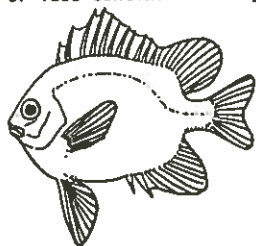


Fig. 73 *DASCYLLUS ARUANUS*

20(18) Dorsal rays fewer than 25..... 23
Dorsal rays greater than 25..... 21

21(20) Dorsal with fewer than 50 rays; body not elongate
with long continuous dorsal profile..... 22

Dorsal long and continuous, with more than 50 rays;
body elongate..... Fig. 74 CORYPHAENIDAE
(Mahimahi)



Fig. 74 *CORYPHAENA HIPPURUS*

22(21) Five to seven dorsal spines present, confluent with soft
dorsal; scales small, smooth; lateral line distinct;
dorsal and anal high, especially so in young;
pelvics elongate..... Fig. 75 PLATACIDAE
(Batfishes)

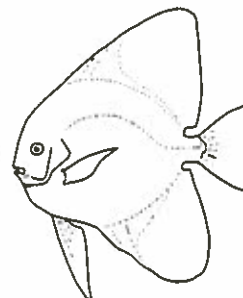


Fig. 75 *PLATAX ORBICULARIS*

Usually 3 dorsal spines present, the rest articulated rays; lateral line indistinct and may be absent in adults; if dorsal and anal high the pelvic^s not elongate.....

..... Fig. 76 BRAMIDAE (Fanfishes)

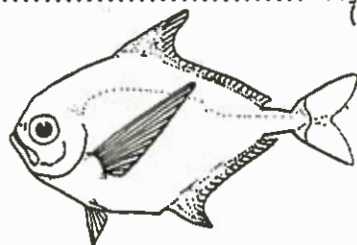


Fig. 76 *EUMEGISTIS ILLUSTRIS*

23(20) Body not tapering posteriorly but with a distinct peduncle or dorsal fin not far forward..... 24

Body tapering posteriorly with long anal fin (18 to 42 rays); dorsal fin very short, high, set far forward, almost over pectoral base; eye large..... Fig. 77 PEMPHERIDAE (Sweepers)

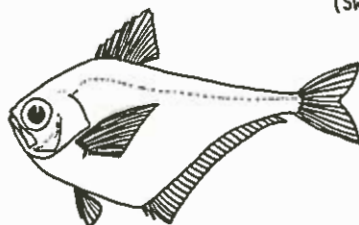


Fig. 77 *PEMPHERIS OVALENSIS*

24(23) Branched caudal rays about 15; gill covers attached to the isthmus far forward or entirely free..... 26

Branched caudal rays 11 or 12; gill covers broadly attached to the isthmus or to one another by a membrane across it..... 25

25(24) Jaws with a single series of separate teeth in front..... Fig. 78 LABRIDAE (Wrasses)

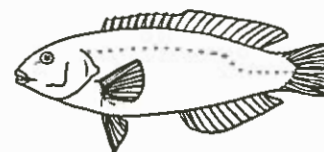


Fig. 78 *HALICHOERES HORTULANUS*

Jaw teeth either fused into a beak-like structure or with two to several series of overlapping incisors in front..... Fig. 79 SCARIDAE (Parrotfishes)

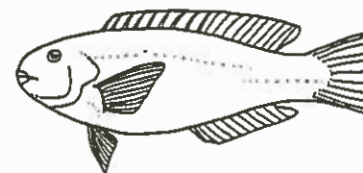


Fig. 79 *SCARUS SORDIDUS*

26(24) Teeth not flexible and comb-like..... 27

Jaws with flexible comblike teeth; deep-bodied

compressed fish..... Fig. 80 CHAETODONTIDAE
(Butterflyfishes)



Fig. 80 CHAETODON AURIGA

27(26) Soft dorsal and anal without a sheath of scales..... 29

Soft dorsal and anal with a variously developed
sheath of scales; pelvics inserted behind
pectoral bases..... 28

28(27) Sheath of scales well-developed covering most of
fin; soft and spinous dorsal continuous,
not notched; teeth incisiform; nostrils in
groove in front of eye..... Fig. 81 KYPHOSIDAE
(Rudderfishes)



Fig. 81 KYPHOSUS VAIGIENSIS

Sheath of scales present along finbases, not covering

most of fin; a deep notch before soft dorsal;

teeth fine and in bands; nostrils not in groove;

small fishes often in estuaries and fresh

water..... Fig. 82 KUHLIIDAE
(Flagtails)



Fig. 82 KUHLIA TAENIURA

29(27) Mouth not extremely protractile..... 30

Mouth extremely protractile; villiform teeth in bands;

small-scaled compressed fish; often in shallow or

estuarine areas..... Fig. 83 LEIOGNATHIDAE
(Soapys or ponyfishes)

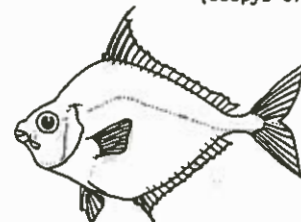


Fig. 83 LEIOGNATHUS EQUULUS

30(29) No scaly process in the pelvic axil, maxillary never
concealed beneath preorbital when mouth closed..... 31

A scaly process usually present in the pelvic fin
axil; maxillary may be partly concealed beneath
the preorbital when mouth closed; one or two
flat spines may be present on the opercle.....

..... Fig. 84 LUTJANIDAE
(Snappers)



Fig. 84 *LUTJANUS VAIGIENSIS*

31(30) Scales very rough and small; pelvic fins attached to
the abdomen by a membrane running along more than 2/3
of the length of the inner ray; mouth oblique; eye large;
color always red ,..... Fig. 85 PRIACANTHIDAE

(Bigeye)

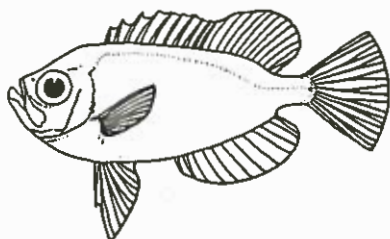


Fig. 85 *PRIACANTHUS CRUENTATUS*

Scales not very rough; pelvic fin not attached to
abdomen by membrane running along more than
2/3 of the length of the inner ray; mouth not
usually oblique; three flat spines on the
opercle; color variable Fig. 86 SERRANIDAE
(Groupers)



Fig. 86 *EPINEPHELUS MERRA*

SUBKEY D

Pelvic Fins Totally Absent

- 1 A separate caudal fin at the end of constricted caudal peduncle as is usual in fishes..... 8
- No separate caudal fin at the end of a constricted caudal peduncle..... 2
- 2(1) Dorsal and anal continuous around the tip of tail..... 3
- Body terminating posteriorly in a sharp, hard, finless point..... Fig. 87 OPHICHTHIDAE (Snake eels)

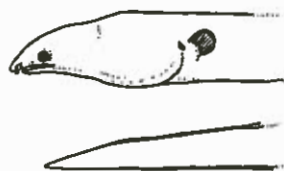


Fig. 87 MYRICHTHYS COLUBRINUS

- 3(2) Gill openings of the two sides of the head well separated, not extending down on to the ventral surface of the body..... 4

- Gill openings of the two sides of the head meeting or very nearly meeting on the mid-ventral line; anus and anal origin below or in front of pectoral fins; gill openings extending up in front of pectoral bases..... Fig. 88 CARAPIDAE (Pearlfishes)



Fig. 88 CARAPUS HOMEI

- 4(3) Body scaleless..... 5
- Scales present, although inconspicuous, occurring in patches at right angles to adjoining patches..... Fig. 89 ANGUILLIDAE*** (Freshwater eels)

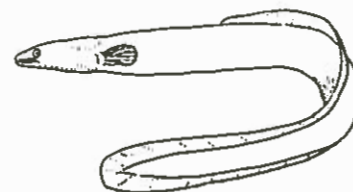


Fig. 89 ANGUILLA MARMORATA

- 5(4) Posterior nasal openings usually over or in front of eye, never in upper lip..... 6

Posterior nasal opening in upper lip, usually
with a valvular flap, directed downward;
anterior nostrils tubular, each side of
tip of snout; pectorals present or
absent.....

Fig. 90 ECHELIDAE
(Worm eels)

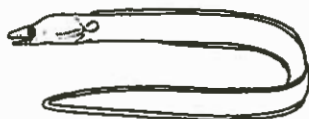


Fig. 90 *KAUPICHTHYS DIODONTUS*

6(5) Lower lip not folded downward on sides of jaw,
anterior nostril tubular near tip of snout..... 7

Lower lip at sides of jaw folded downward and
usually upper lip folded upward, folded
parts of lips not continuous around tip
of snout or tip of lower jaw..... Fig. 91 CONGRIDAE
(Conger eels)



Fig. 91 *CONGER NOORDZIEKI*

7(6) Jaws subequal in length or the lower included
within the tip of the upper..... Fig. 92 MURAENIDAE
(Moray eels)

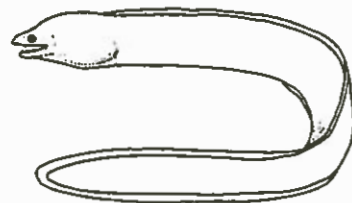


Fig. 92 *GYMNOTHORAX PICTUS*

Lower jaw distinctly protruding; anus well behind
the middle of the body, which is long and
worm-like..... Fig. 93 MORINGUIDAE
(Worm eels)



Fig. 93 *MORINGUA ABBREVIATA*

8(1) Body not contained in a series of bony rings..... 9

Body contained in a series of bony rings; snout
tubular with a small mouth at tip; size small
to about eight inches..... Fig. 94 SYNGNATHIDAE
(Pipefishes)



Fig. 94 *DORYRHAMPHUS MELANOPELURA*

9(8) Snout not sword-like..... 10
Snout projecting in a sword-like fashion.....
..... Fig. 95 XIPHIIDAE
(Swordfishes)



Fig. 95 *XIPHIAS GLADIUS*

10(9) A single dorsal fin composed entirely of soft rays..... 12
Two, well-separated dorsal fins, the first
composed of one or more strong, rough spines..... 11

11(10) Sides somewhat prickly or furry to the touch,
the individual scales not visible;
anterior dorsal spine inserted over eye.....
..... Fig. 96 MONACANTHIDAE
(Filefishes)

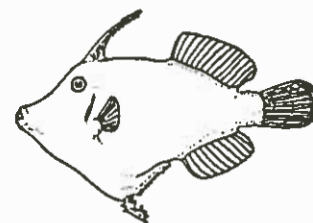


Fig. 96 *PERVAGOR MELANOCEPHALUS*

Sides covered by hard, plate-like scales; anterior
dorsal spine inserted slightly behind eye.....
..... Fig. 97 BALISTIDAE
(Triggerfishes)

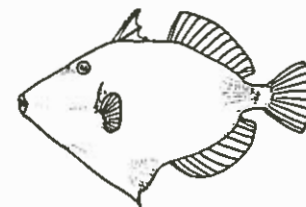


Fig. 97 *BALISTES BURSA*

12(10) Body not enclosed in a bony box; abdomen inflatable..... 13

Body enclosed in a bony box; abdomen not inflatable.....

..... Fig. 98 OSTRACIONTIDAE
(Boxfishes)

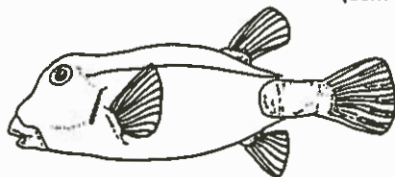


Fig. 98 *OSTRACION CUBICUS*

13(12) Body not covered with sharp erectile spines..... 14

Body covered with sharp erectile spines.....

..... Fig. 99 DIODONTIDAE
(Porcupinefish)

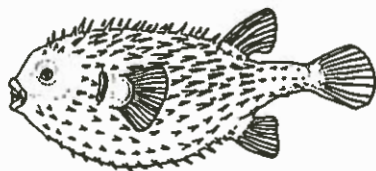


Fig. 99 *DIODON HYSTRIX*

14(13) No pelvic device producing a large ventral flap..... 15

Pelvic device present capable of swinging downward
to produce a huge ventral flap.. Fig. 100 TRIODONTIDAE**



Fig. 100 *TRIDON MACROPTERUS*

15(14) Body about as wide as deep; gill opening extending

more than half way down the pectoral base;

a well-developed narial flap or tube

..... Fig. 101 TETRAODONTIDAE
(Smooth puffers)

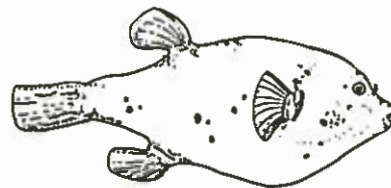


Fig. 101 *AROTHRON NIGROPUNCTATUS*

Body somewhat compressed; gill openings extending

less than half way down the pectoral bases;

nostrils inconspicuous..... Fig. 102 CANTHIGASTERIDAE
(Sharp-backed puffers)



Fig. 102 *CANTHIGASTER AMBOINENSIS*

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