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Chemical Analyses of Some Sri Lanka Fishes—3

by

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INTRODUCTION

Chemical analysis of fishes found in Sri Lanka were initiated by Lantz and Gunasekera (1957), who presented data from examination of 30 different species of fishes. Later Peiris and Grero (1972) published the analysed data of 5 more species. The present paper continues the analyses and the results obtained from 10 more varieties of fishes are given below.

The calorific value shown in the tables is the gross value. The coefficients of assimilation on consumption will average 0.91 for fish fats and 0.96 for fish proteins.

The ten species analysed here are marine forms. The samples were obtained from trawler landings (Wadge and Pedro Banks) of the Ceylon Fisheries Corporation and from coastal fisheries around the island.

The sampling and the method of analyses follow the same pattern as that described in the authors' previous work (1972).

Proximate Chemical Analysis

Proximate chemical analysis is the determination of certain groups of substances without detailed investigation into various constituents composing each group. Proximate components of fish are moisture, ash or mineral matter, fat (oil) and protein. The amount of carbohydrates present in fish is very small. The proximate components will total roughly 100 per cent.

Sampling of Fishes for Analyses

The number of fishes taken for analyses varied with the size of the species concerned. As it will appear in the tables the number taken for analyses varied from 2 to 20. Within each group, emphasis was paid to select fishes of approximately similar sizes.

To enhance the usefulness of the analyses, fishes have been further divided into six parts, namely, (*a*) edible flesh (*b*) skins from edible flesh (*c*) heads (*d*) bones, fins, tails and scales (*e*) viscera without liver (*f*) liver.

Each part was then weighed separately and the percentage represented by the part was calculated. During the analyses samples were stored under refrigeration.

Analysis of Samples

Each part was ground and homogenized and sub–samples were taken and analysed for moisture, ash, fat and protein separately.

The moisture content was determined by subjecting the material to driage at 105°–110° C to a constant weight. The total volatile matter lost at this temperature was taken as the moisture content.

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A sample was gradually heated to 750°–800° C and allowed to stand a few hours to a constant weight. Resideu left was taken as the mineral matter or ash content.

To estimate the amount of fat, the sample was digested with conc. HCl on a boiling water bath for a few hours, till tissues broke down. Oily parts present in the fragmented tissues were then extracted with a good fat (oil) solvent such as petroleum ether. Certain other fat—like substances such as unsaponifiable matter also got extracted by ether. The total ether extractable matter was taken as the fat content.

To determine the protein content total nitrogen obtainable from the sample was multiplied by the universally used conversion factor 6.25. The total nitrogen was estimated by the Kjeldahl's procedure.

Methods of analyses used were those described in the A. O. A. C. (1950).

Calorific value of Fish

Capacity of a substance to yield heat energy is termed as the calorific value of that substance. The amount of carbohydrates present in fish is very small. Heat energy contribution from carbohydrates was therefore taken as negligible.

Conversion factors for fat and protein as given by Schmidt (1948) are 1 gm of fat (oil) as equivalent to 9.3 Calories and 1gm of protein as equivalent to 4.1 Calories. These two factors were adopted in calculating calorific values.

Application of Results

Fishes are commercially classified into edible and inedible varieties. Edible varieties in turn are classified into popular and unpopular varieties on the basis of consumer acceptance. In the fresh condition edible popular varieties do find a ready market while the edible unpopular varieties do not find such a ready market. In order to enrich our local diet with protein these unpopular varieties should be converted into acceptable, palatable products.

Dried fish, salted fish, canned fish, fish sausages, etc., are acceptable to present day market. To solve the problem of possible utilization of fishes we lack the knowledge of quantitative chemical constituents of fishes.

The moisture content will indicate the amount of drying necessary to obtain a stable product. Oils in dried fishes tend to give unpleasent odours, colours and tastes with time. Hence less oily fishes are suitable for drying, whole oily fishes may be suitable for canning.

Conversion of fish wastes and unpopular fishes into fish meal is very important. Mostly fish meal is used for animal feeding. But suitable methods can be adopted to obtain fish meal acceptable for human consumption.

Final meal should contain the least amount of oil, since oil in the meal gets rancid on storage. Meal should be pressed sufficiently to remove oil. Experimental results will give the amount of oil present in the raw material. Moisture content will indicate the driage necessary. Hence the manufacturer will be in a position to determine the type of equipment and the method of processing best suited to obtain a final stable meal.

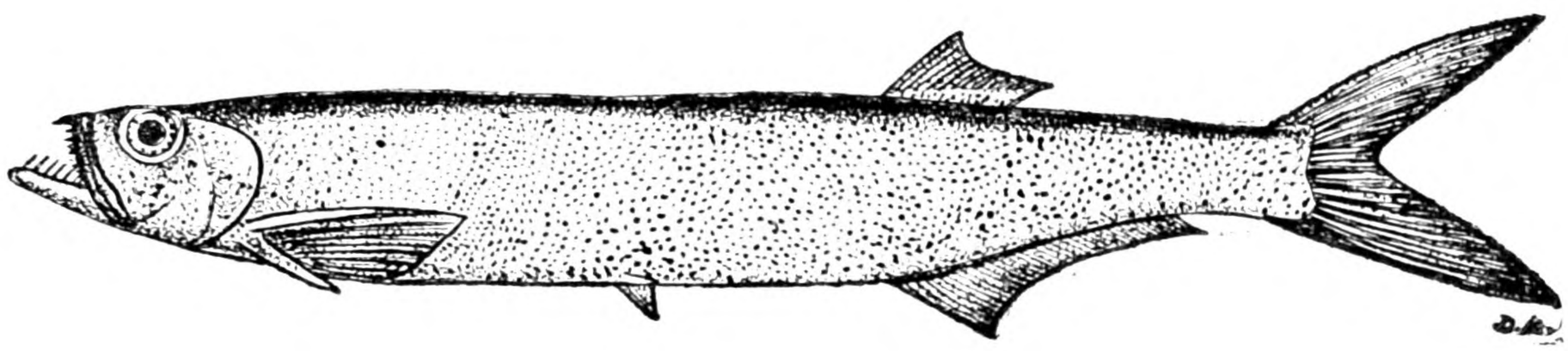
Briefly, the present investigation will assist the manufacturers of fish by-products.

ACKNOWLEDGEMENT

The drawings appearing in this text (except, No. 6 page 8) were reproduced from " The Marine and Fresh Water Fishes of Ceylon ", by Ian S. R. Munro (1955). This paper closely follows the pattern set by the earlier authors (Lantz and Gunasekera, 1957). Thanks are extended to Mr. Dharmasiri Kariyawasam, Departmental artist, who made these excellent drawings.

Tables of Analytical Results

Systematically tabulated analytical results of 10 species investigated are given in subsequent pages.



1. *Chirocentrus dorab* **(Forskal)**

Dorab, Wolf herring (E)*
Pat katuvalla (S)*
Kuru vallai (T)*

Sample :—4 ungutted fishes weighing. 2 kg. 41gm.
Average weight 510 gm.

Part	*Per cent. Fish*	*Per cent. Moisture*	*Per cent. Ash*	*Per cent. Fat*	*Per cent. Protein*	*Cal/* 100 gm.
(*a*) Edible flesh	49.9	75.5	1.0	1.8	22.3	108
(*b*) Skins	3.5	76.0	0.5	1.3	23.3	108
(*c*) Heads	8.7	69.5	6.0	3.4	20.3	115
(*d*) Bones, fins, tails and scales	12.1	70.0	4.0	4.1	20.0	120
(*e*) Viscera	8.7	78.5	2.0	2.8	16.0	92
(*f*) Livers	5.5	73.0	1.5	5.3	22.4	141
(*g*) Roe	8.0	71.5	1.0	2.1	26.0	126
(*h*) Whole fish	—	73.6	2.3	4.1	21.5	126
(*i*) Whole fish calculated	—	72.7	2.3	3.0	21.5	116

Notes.—(1) Total weight : 2kg. 41 gm.

(2) Loss on dismembering : 3.6 per cent.

(3) Inhabits : Coastal waters.

(4) Vitamin A in liver oil : 3000 I.U./gm.

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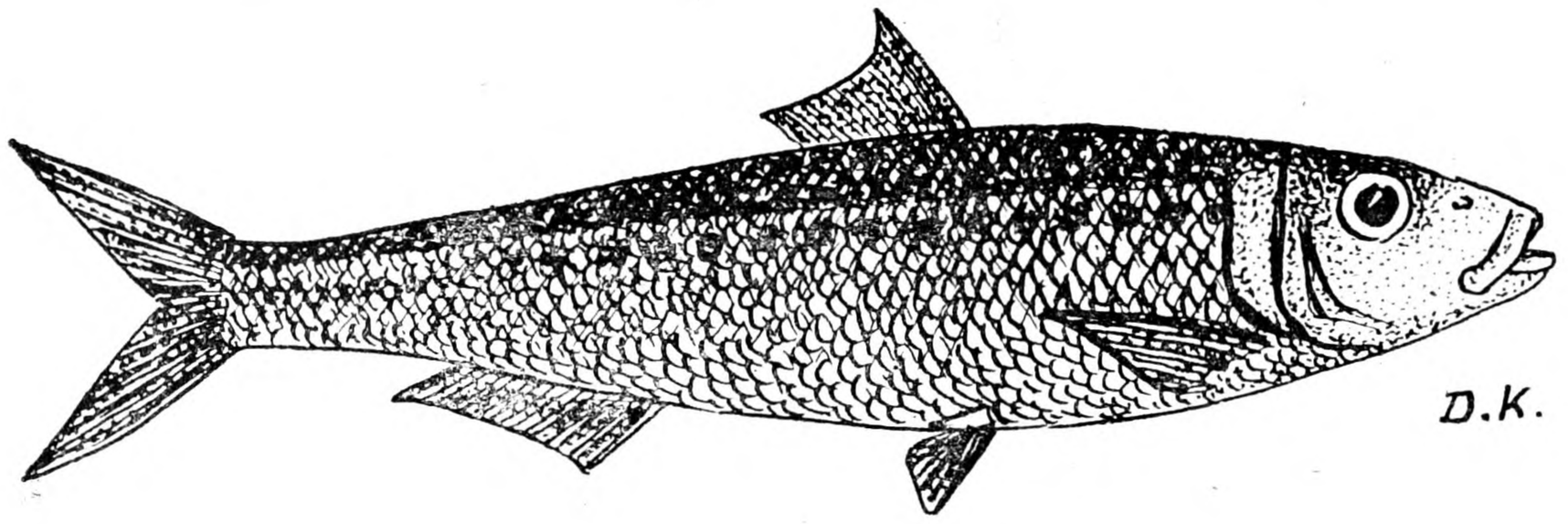
* English (E), Sinhala (S), Tamil (T).



2. *Clupeiodes* (*Amblygaster*) *sirm* **(Walbaum)**

Herring (E)*

Hurrulla (S)*

Kirimeen chalai (T)*

Sample :—6 ungutted fishes weighing: 510 gm.

Average weight: 58 gm.

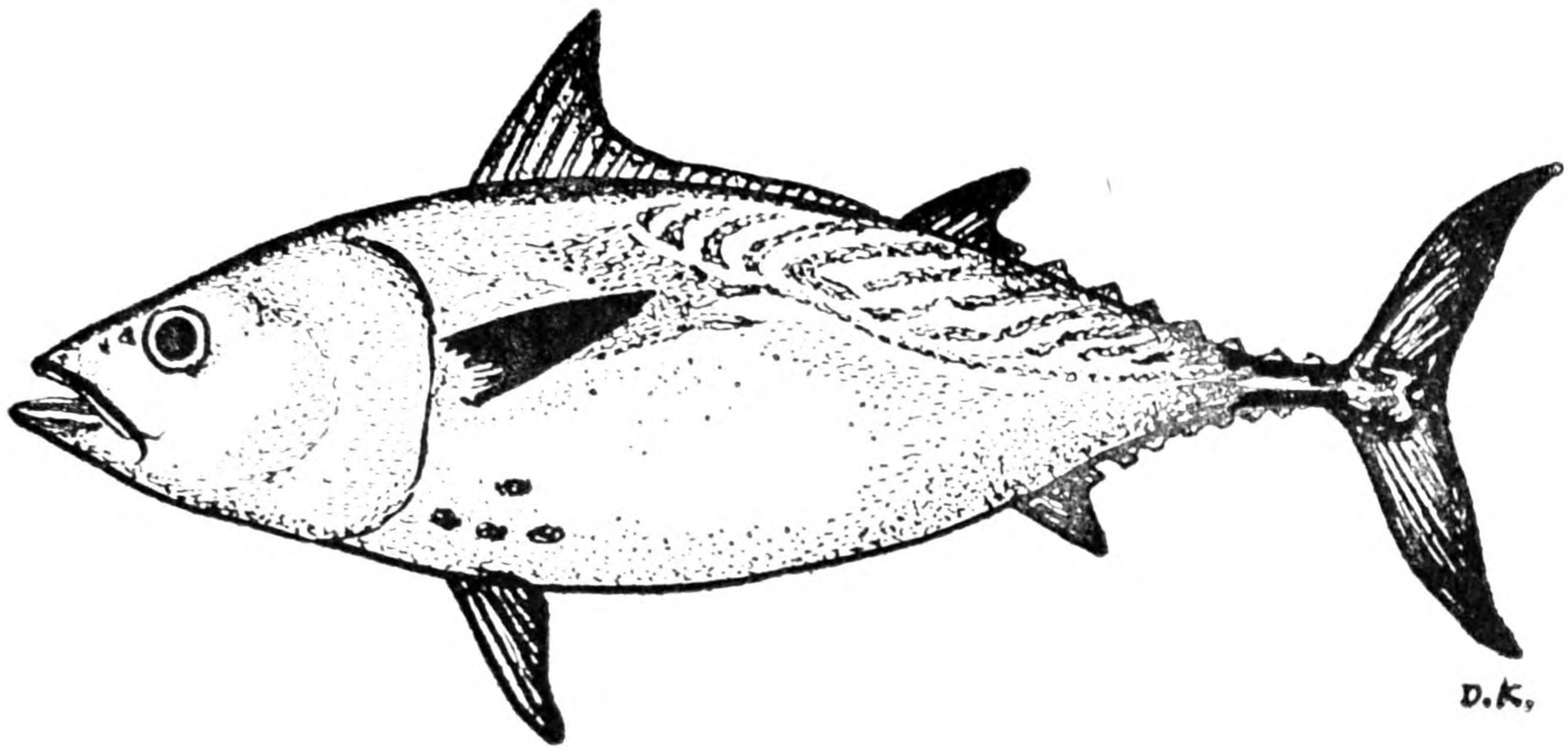
Part	*Per cent. Fish*	*Per cent. Moisture*	*Per cent. Ash*	*Per cent. Fat*	*Per cent. Protein*	*Cal/100 gm.*
(*a*) Edible flesh	50.0	76.0	2.0	5.0	19.2	125
(*b*) Skins	8.1	76.5	2.5	3.5	18.0	106
(*c*) Heads	19.3	71.5	4.0	7.5	17.3	141
(*d*) Bones, fins tails, and scales	13.8	66.0	9.5	2.8	21.2	113
(*e*) Viscera and Livers	5.5	68.5	4.0	6.3	20.0	141
(*f*) Whole fish calculated	—	71.7	4.4	5.0	19.2	125

Notes.—(1) Total weight : 510 gm.

(2) Loss on dismembering : 3.3 per cent.

(3) Inhabits : Coastal waters.

(4) Vitamin A in Liver oil : about 1000 I.U/gm.



3. *Euthynnus affinis* **(Cantor)**

Lesser bonito, Mackerel tuna (E)

Atavalla, Ragoduva (S)

Shurai (T)

Sample :—2 ungutted fishes weighing 1kg. 474 gm.

Average weight 737 gm.

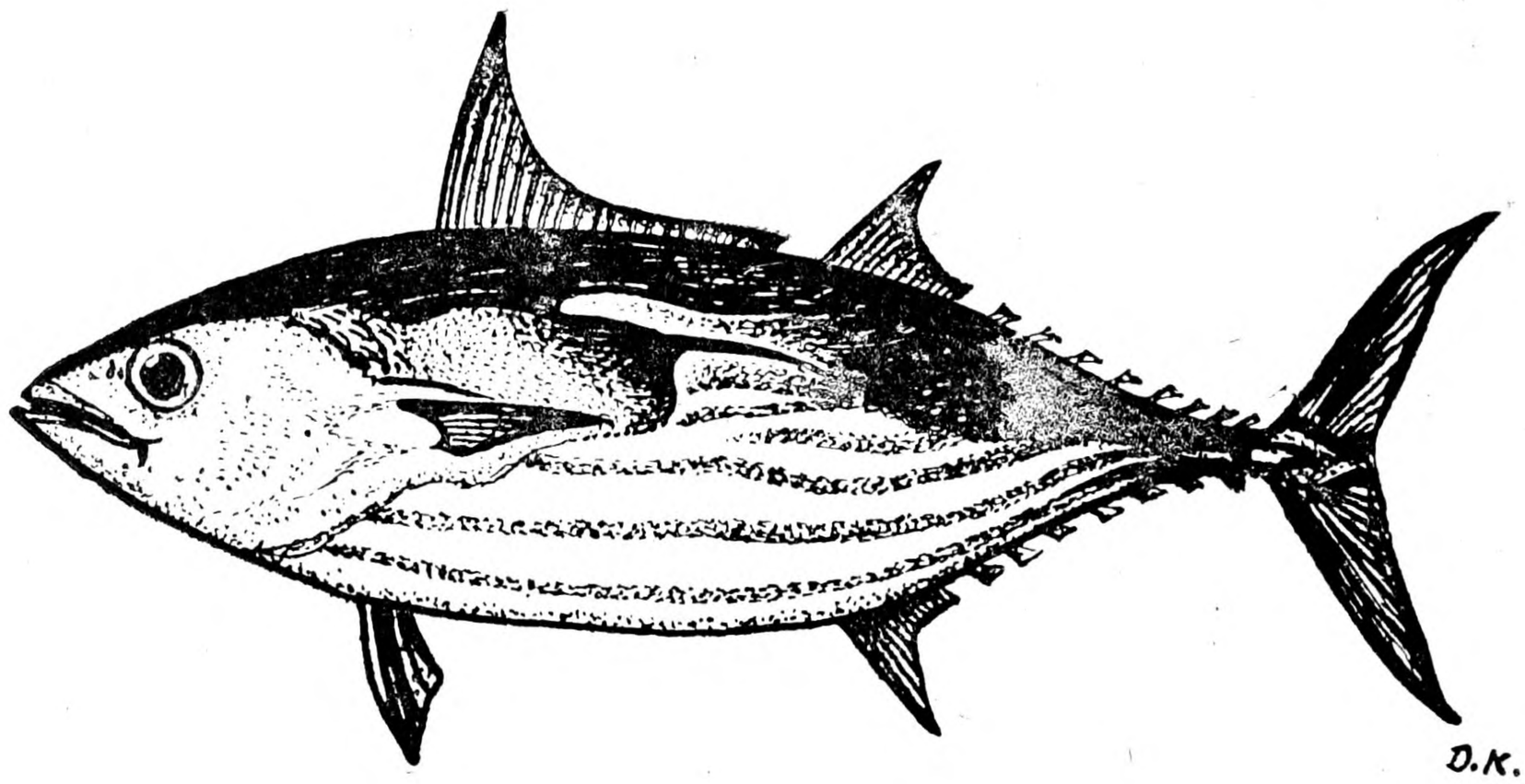
Part	*Per cent. Fish*	*Per cent. Moisture*	*Per cent. Ash*	*Per cent. Fat*	*Per cent. Protein*	*Cal/100 gm.*
(*a*) Edible flesh	53.8	73.0	2.0	2.3	20.2	104
(*b*) Skins	5.8	59.5	1.5	12.5	26.3	224
(*c*) Heads	19.2	67.5	7.0	7.3	17.9	141
(*d*) Bones, fins, tails and scales	11.5	59.0	12.5	6.1	21.8	146
(*e*) Viscera	5.8	72.0	1.5	3.1	23.0	123
(*f*) Livers	1.9	75.5	1.0	1.0	21.4	97
(*g*) Whole fish	—	68.0	5.3	4.2	20.0	121
(*h*) Whole fish calculated	—	67.7	4.3	5.4	21.7	139

Notes.—(1) Total weight : 1 kg. 474 gm.

(2) Loss on dismembering : 2.0 per cent.

(3) Inhabits : Coastal waters.

(4) Vitamin A in liver oil : 2000 I.U./gm.



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4. *Euthynnus pelamis* **(Linnaeus)**

Albacore, Skipjack, Striped tuna (E)

Alagoduva, Baleya (S)

Sample :—14 ungutted fishes weighing: 4 kg. 338 gm.

Average weight: 292 gm.

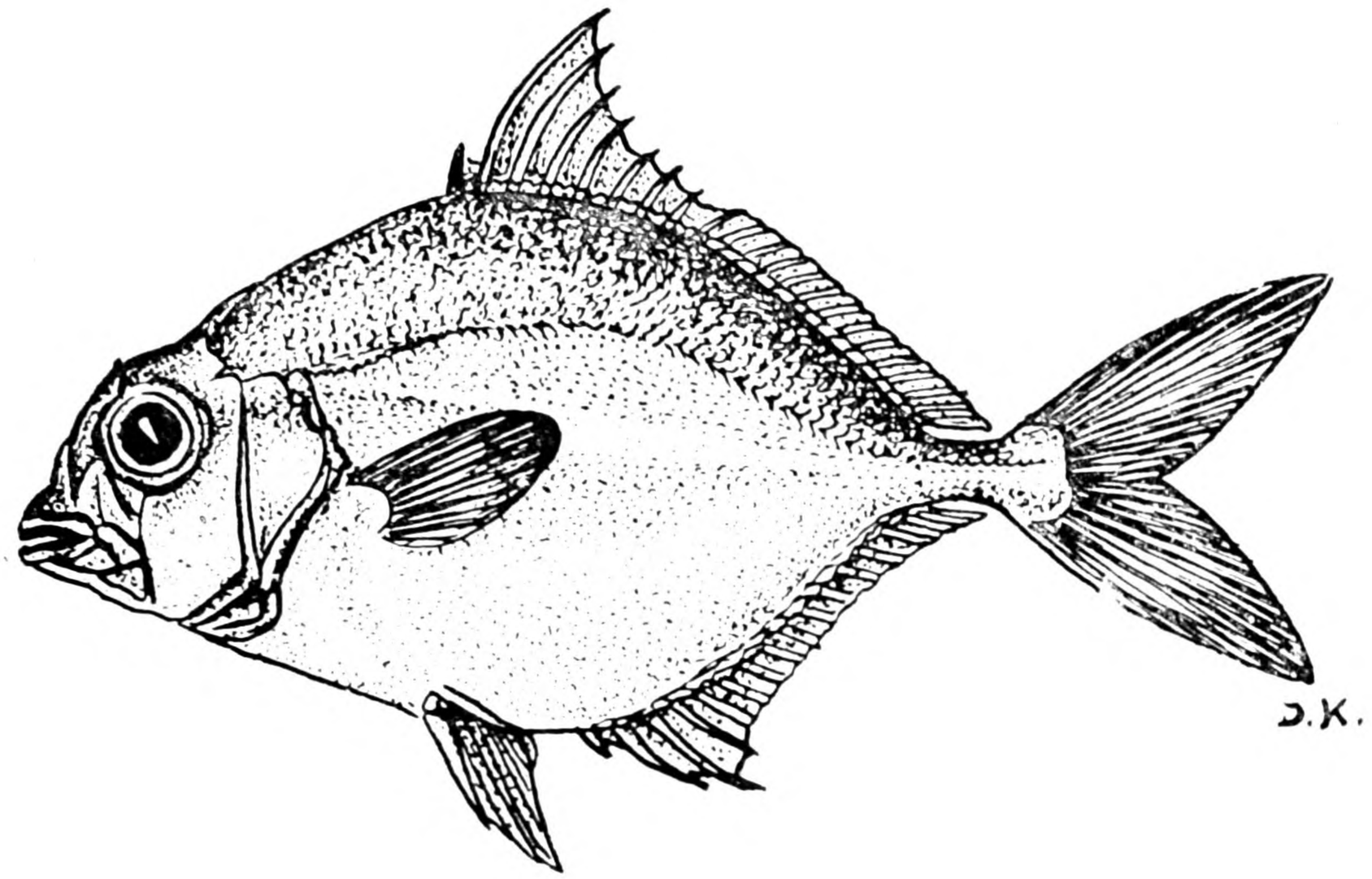
Part	*Per cent. Fish*	*Per cent. Moisnure*	*Per cent. Ash*	*Per cent. Fat*	*Per cent. Protein*	*Cal/100 gm.*
(*a*) Edible flesh	46.5	76.0	1.5	1.1	20.6	**95**
(*b*) Skins	8.4	69.0	1.5	3.6	25.5	**138**
(*c*) Heads	18.7	73.5	6.5	2.6	18.7	**101**
(*d*) Bones, fins, tails and scales	16.6	72.0	6.0	2.4	20.4	**106**
(*e*) Viscera	6.2	74.5	2.5	1.5	21.2	**101**
(*f*) Livers	2.1	76.0	1.0	1.3	24.4	**111**
(*g*) Whole fish	—	72.0	3.0	2.0	21.0	**105**
(*h*) Whole fish calculated	—	73.5	3.2	2.1	21.8	**109**

Notes.—(1) Total weight : 4 kg. 338 gm.

(2) Loss on dismembering : 1.5 per cent.

(3) Inhabits : Coastal waters.

(4) Vitamin A in liver oil : 5000 I.U./gm.



5. *Gazza minuta* **(Bloch)**

Slimy, Toothed pony fish (E)

Mas karalla, Mas panna, Pulunu karalla (S)

Samples :—20 ungutted fishes weighing : 680 gm.

Average weight : 34 gm.

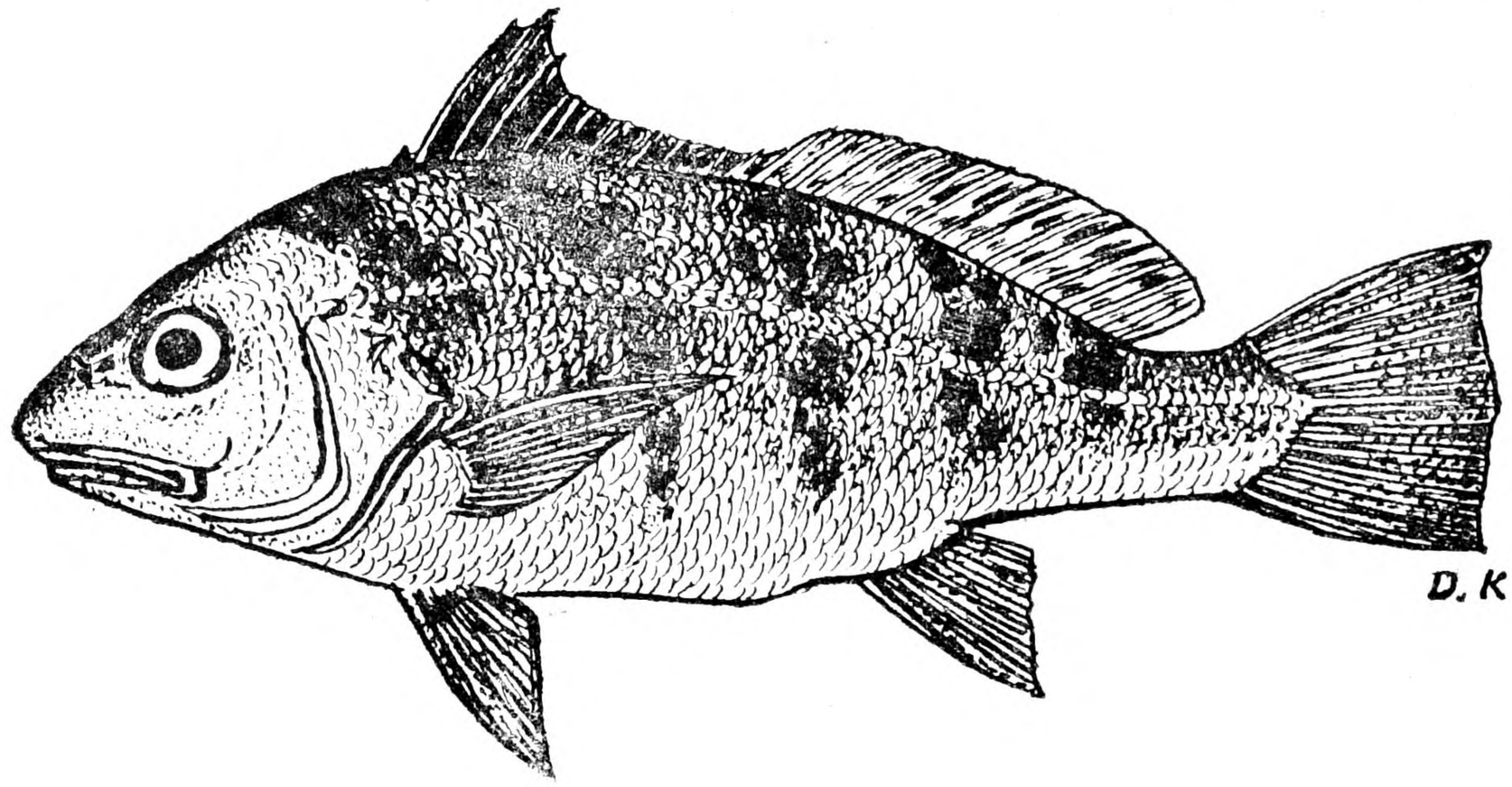
Part	*Per cent. Fish*	*Per cent. Moisture*	*Per cent. Ash*	*Per cent. Fat*	*Per cent. Protein*	*Cal/100 gm.*
(*a*) Edible flesh	35.4	78.5	0.5	0.5	20.3	88
(*b*) Skins	4.1	84.0	1.0	2.1	13.9	77
(*c*) Heads	29.2	76.5	3.0	3.7	16.4	102
(*d*) Bones, fins, tails and scales	16.6	79.0	2.5	1.8	16.2	83
(*e*) Viscera and Livers	12.5	73.0	1.5	4.0	22.8	131
(*f*) Whole fish	—	80.0	1.5	1.5	17.3	85
(*g*) Whole fish calculated	—	78.2	1.7	2.4	17.9	96

Notes.—(1) Total weight : 680 gm.

(2) Loss on dismembering : 2.2 per cent.

(3) Inhabits : Pearl banks, trawling grounds.

(4) Vitamin A in liver and viscera oil : about 1000 I.U./gm.



6. *Johnius maculatus* **(Schneider)***

Cob, Jew fish, Black banded Jew fish (E)

Katala (S)

Sample :— 4 ungutted fishes weighing : 454 gm.

Average weight :— 113 gm.

Part	*Per cent. Fish*	*Per cent. Moisture*	*Per cent. Ash*	*Per cent. Fat*	*Per cent. Protein*	*Cal/100 gm.*
(*a*) Edible flesh	31.2	78.5	1.0	2.0	19.7	99
(*b*) Skins	12.5	74.5	1.0	5.1	20.2	130
(*c*) Heads	25.0	74.0	6.0	2.1	16.5	87
(*d*) Bones, fins, tails and scales	18.7	69.5	6.5	3.1	20.7	114
(*e*) Viscera	6.3	82.5	5.1	2.2	13.1	74
(*f*) Livers	3.2	88.0	0.5	1.0	12.8	62
(*g*) Whole fish calculated	—	77.8	2.8	2.6	17.2	94

Notes.—(1) Total weight : 454 gm.

(2) Loss on dismembering :— 3.1 per cent.

(3) Inhabits : Coastal waters.

(4) Vitamin A in liver oil : 500 I.U./gm.

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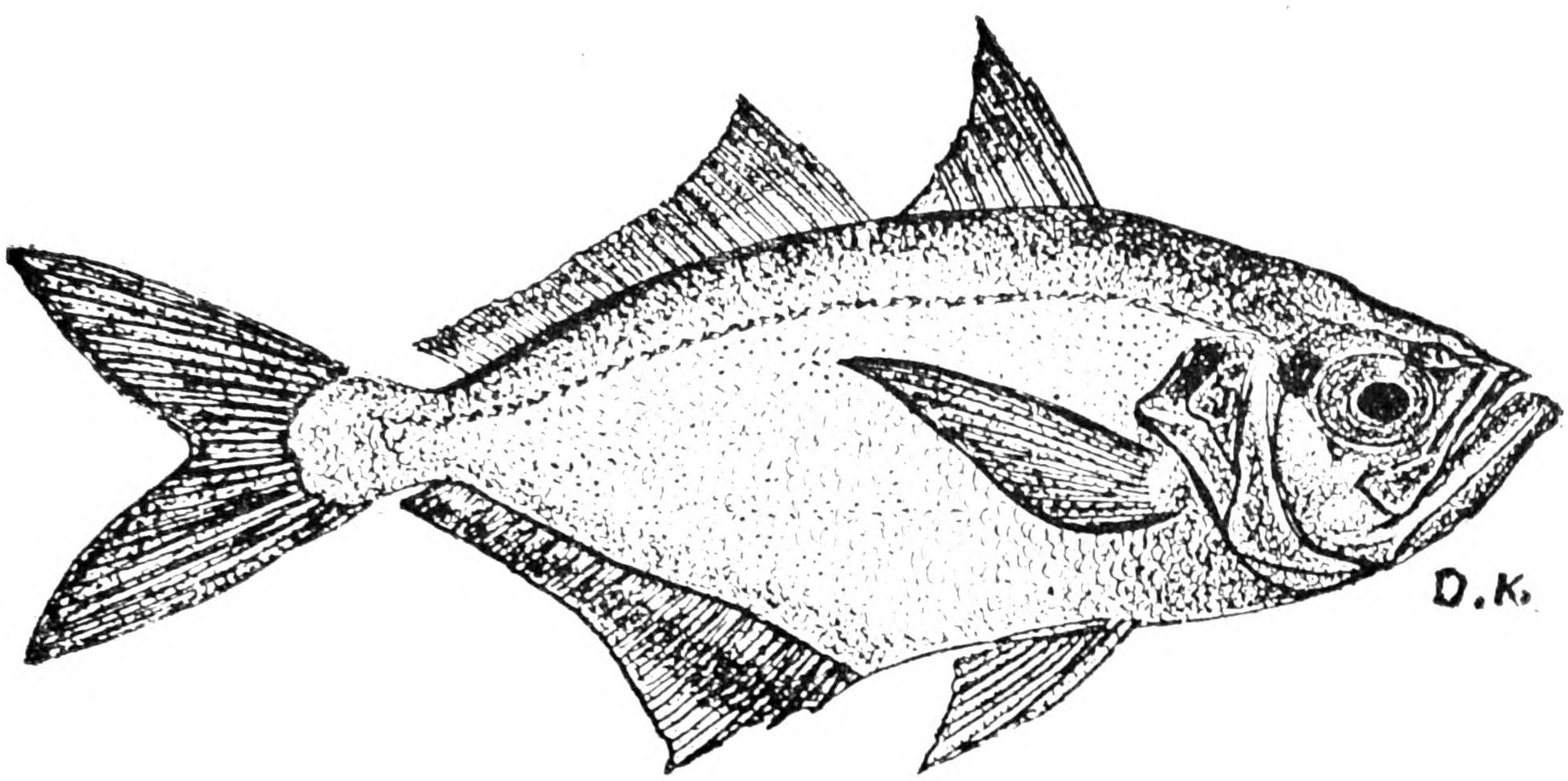
* The illustration shown above was prepared for this paper from a fish used in the analyses.



7. *Lactarius lactarius* **(Schneider)**

White fish (E)

Pulunna (S)

Samples :—13 ungutted fishes weighing —1 kg. 760 gm.

Average weight 135 gm.

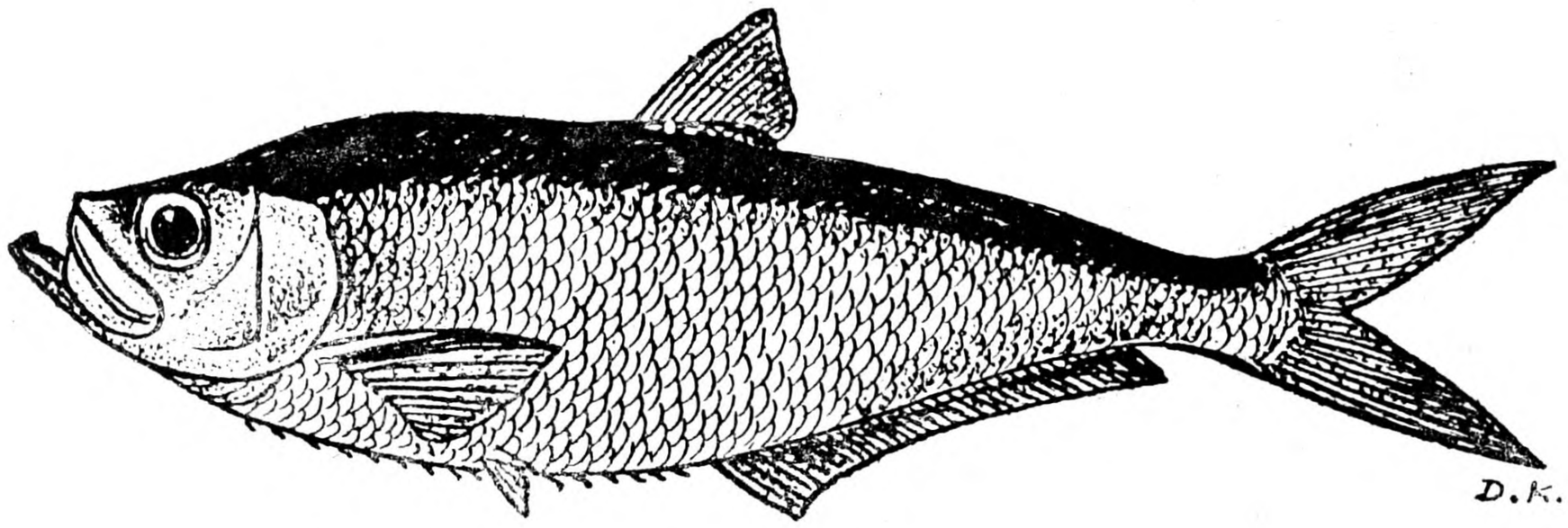
Average length 23 cm.

Part	*Per cent. Fish*	*Per cent. Moisture*	*Per cent. Ash*	*Per cent. Fat*	*Per cent. Protein*	*Cal/100 gm.*
(*a*) Edible flesh	48.8	71.9	1.1	0.9	22.0	99
(*b*) Skins with scales	3.4	60.0	5.5	6.8	26.1	170
(*c*) Heads	19.3	67.1	6.7	5.8	19.9	136
(*d*) Bones, fins and tails	21.9	63.0	7.6	6.3	20.9	144
(*e*) Viscera	3.4	72.9	1.1	4.1	19.5	118
(*f*) Livers	1.1	75.8	3.7	2.5	16.4	90
(*g*) Whole fish	—	70.1	5.1	3.4	20.3	115
(*h*) Whole fish calculated	—	68.3	4.3	4.4	20.8	126

Notes.—(1) Total weight : 1 kg. 760 gm.

(2) Loss on dismembering : 2.2 per cent.

(3) Inhabits : Coastal waters and trawling grounds.



8. *Pellona elongata* (Bennett)

Straight backed herring (E)

Puvaliya (S)

Puvali (T)

Sample :—4 ungutted fishes weighing —1 kg 814 gm.

Average weight : 453 gm.

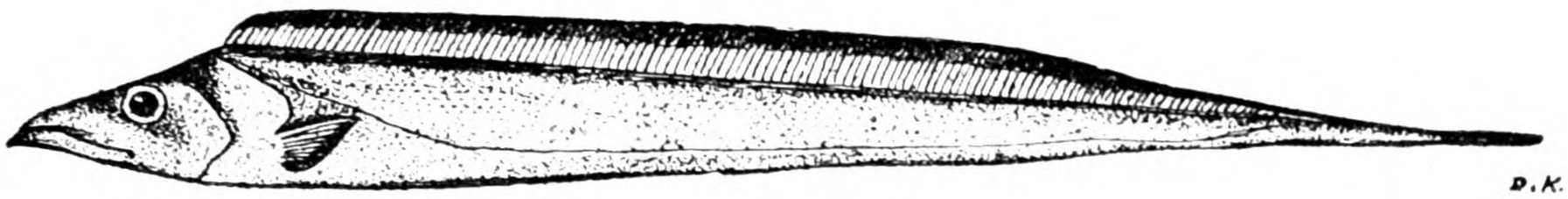
Part	*Per cent. Fish*	*Per cent. Moisture*	*Per cent. Ash*	*Per cent. Fat*	*Per cent. Protein*	*Cal/100 gm.*
(*a*) Edible flesh	43.7	76.1	1.0	1.5	22.7	107
(*b*) Skins	3.2	75.0	1.0	1.3	22.9	106
(*c*) Heads	12.5	72.0	5.5	3.1	20.4	112
(*d*) Bones, fins, tails and scales	25.0	62.5	6.5	3.7	26.0	141
(*e*) Viscera	9.4	79.0	1.0	1.4	20.4	97
(*f*) Livers	1.6	81.0	1.5	2.2	16.9	90
(*g*) Whole fish calculated	—	74.3	2.8	2.2	21.6	109

Notes.—(1) Total weight : 1 kg 814 gm.

(2) Loss on dismembering : 4.6 per cent.

(3) Inhabits : Coastal waters.

(4) Vitamin A in liver oil : 1000 I.U/gm.



9. *Trichiurus haumela* (Forskal)

Scabbard fish, Ribbon fish, Hair tail (E)

Savalaya (S)

Savalai (T)

Sample :—14 ungutted fishes weighing—2 kg 930 gm.

Average weight 207 gm.

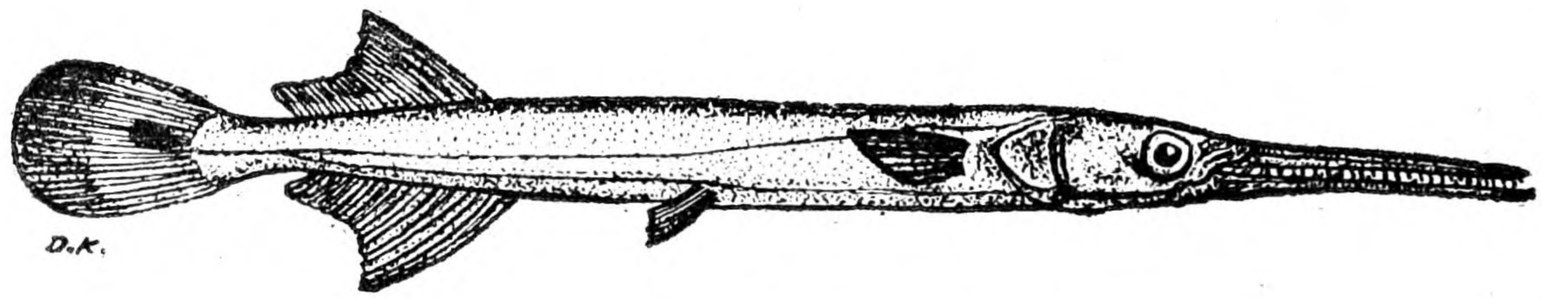
Part	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Per cent.*	*Cal/100 gm.*
	Fish	*Moisture*	*Ash*	*Fat*	*Protein*	
(*a*) Edible flesh	42.7	78.0	0.5	1.8	19.8	96
(*b*) Skins	5.4	70.0	1.0	10.0	19.8	169
(*c*) Heads	19.4	69.0	9.5	4.0	16.5	103
(*d*) Bones, fins, and tails	25.2	77.0	4.5	3.6	15.5	96
(*e*) Viscera	1.9	80.0	3.5	1.5	14.0	70
(*f*) Livers	0.5	79.0	2.0	6.3	12.8	109
(*g*) Whole fish	—	78.5	1.0	3.4	19.9	111
(*h*) Whole fish calculated	—	75.5	3.5	4.5	16.4	107

Notes.—(1) Total weight .: 2 kg 920 gm.

(2) Loss on dismembering : 4.9 per cent.

(3) Inhabits : Coastal waters and trawling grounds.

(4) Vitamin A in liver oil : 6000 I.U/gm.



10. *Tylosurus storngylurus* **(Van Hasselt)**

Garfish, Snake gar, round-tail alligator gar (E)

Dhiya moralla (S)

Pambu mural (T)

Samples :—4 ungutted fishes weighing —453 gm.

Average weight 113 gm.

Part	*Per cent. Fish*	*Per cent. Moisture*	*Per cent. Ash*	*Per cent. Fat*	*Per cent. Protein*	*Cal/100 gm.*
(*a*) Edible flesh	44.1	79.5	0.5	0.5	20.2	88
(*b*) Skins	6.3	79.0	1.5	2.0	17.9	92
(*c*) Heads	18.9	73.0	6.5	2.0	18.2	93
(*d*) Bones, fins, tails and scales	18.9	73.5	4.0	4.2	21.5	127
(*e*) Viscera	3.2	75.0	2.0	3.5	18.9	110
(*f*) Livers	3.2	75.0	1.5	4.7	19.1	122
(*g*) Whole fish calculated	—	75.8	2.7	2.8	19.3	105

Notes.—(1) Total weight : 453 gm.

(2) Loss on dismembering : 5.4 per cent.

(3) Inhabits ; Marine waters, entering estuaries.

(4) Vitamin A in liver oil : about 500 I.U/gm.

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