TABLES

Table 1 OUTLINE OF SELECTED RIVER BASINS FOR INTERVIEW SURVEY (1/2)

River		Condition[1] of Main Land Use	Existing[2] Factories	Dams[3] or Weirs	Water[4] Quality (mg/ℓ)	
Kedah	Upper :	F,(R)	-	ID	pH :	3.75<
	Middle:	F	SF	IW	SS :	360 >
	Lower :	P	FF	TB	BOD:	464 >
					NH_4^+:	1.4 >
Muda	Upper :	F,(R)	-	ID,WD	pH :	≒ 7
	Middle:	R	TM		SS :	125 >
	Lower :	R,P	-	TB	BOD:	8 >
					NH_4^+:	6.6 >
Kerian	Upper :	F,(R)	-		pH :	4.2<
	Middle:	R,(S)	RF	IW ?	SS :	90 >
	Lower :	P,R,C	P&RF	TF	BOD:	4 >
					NH_4^+:	0.7
Kurau	Upper :	F,(R)	-	WD	pH :	5.6<
	Middle:	F,S,R	RF	ID	SS :	100 >
	Lower :	P,O.R.C	RF	-	BOD:	8 >
					NH_4^+:	1.0 >
Perak	Upper :	F,(R)	TM	HD	pH :	8.5 >
	Middle:	MR	TM	HD	SS :	4645
	Lower :	O,P,S	P&RF	IW	BOD:	280 >
					NH_4^+:	2.8 >
Melaka	Upper :	F,R	-	WD	pH :	3.1 <
	Middle:	R	-	IB	SS :	$10x10^3$>
	Lower :	R,P	RF	TB	BOD:	7 >
					NH_4^+:	7.4 >
Muar	Upper :	F,(R,O)	-	-	pH :	3.5<
	Middle:	R,(O)	P&RF	-	SS :	945 >
	Lower :	R(O,S)	P&RF	-	BOD:	9 >
					NH_4^+:	0.4 >
Johor	Upper :	F,O	TM	-	pH :	3.95 <
	Middle:	R,O,(S)	P&RF	-	SS :	$4x10^3$>
	Lower :	R(O,S)	P&RF	-	BOD:	$7x10^3$ >
					NH_4^+:	14 >
Endau	Upper :	F,R,O	PF	-	pH :	≒ 7
	Middle:	F(R,O)	-	-	SS :	135 >
	Lower :	S,F	-	-	BOD:	96 >
					NH_4^+:	0.5 >

Table 2 OUTLINE OF SELECTED RIVER BASINS FOR INTERVIEW SURVEY (2/2)

River		Condition of Main Land Use [1/]	Existing Factories [2/]	Dams or Weirs [3/]	Water Quality (mg/ℓ) [4/]
Rompin	Upper :	F,P	PF	-	pH : 4.5 <
	Middle:	F	-	-	SS : $5x10^3$ >
	Lower :	S,F	-	-	BOD: $5x10^3$ >
					NH_4^+: 3.7 >
Pahang	Upper :	F,(O,R)	TM	HD	pH : 4.6 <
	Middle:	F,O,R	P&RF	-	SS : 337 >
	Lower :	F,S	-	-	BOD: 150 >
					NH_4^+: 0.4 >
Kuantan	Upper :	F	M	-	pH : 3.8
	Middle:	F,M	TM	-	SS : 380
	Lower :	O,S,(R)	P&RF	-	BOD: 4
					NH_4^+: 0.5
Trengganu	Upper :	F	-	HD	pH : ≒ 7
	Middle:	F	-	-	SS : $1.1x10^3$ >
	Lower :	R,P	RF	-	BOD: 4 >
					NH_4^+: 0.4 >
Kelantan	Upper :	F	TM	-	pH : ≒ 7
	Middle:	F,R	RF	-	SS : 210 >
	Lower :	R,P	RF	-	BOD: 4 >
					NH_4^+: 0.4 >

Remarks; 1/ Referred from Land Use Map in 1975.
Main land use is expressed by the following symbols;
F(Forest), S(Swamp), R(Rubber), O(Oil palm), P(Paddy),
SC(Sugar cane), C(Coconut) and M(Mining).

2/ Expressed by the following symbols;
PF(Palm oil), RF(Rubber), SF(Sugar), FF(Fertilizer) and
TM(Tin mining).

3/ Expressed by the following symbols;
HD(Hydroelectric power), ID(Irrigation), WD(Water supply),
TB(Tidal) and IW(Irrigation Weir).

4/ Water Quality data prepared by DOE in 1978.
Those are maximum values during the survey period.

Table 3 LOCATION OF VILLAGES INTERVIEWED (1/2)

Code of Location	Villages Interviewed	Tributary/River	Code of DOE St.[1/]
Ked.1	Baharu	Kedah	
Ked.2	Tongkang Yard	Kedah	6103601[2/]
Ked.3	Wang Tepus	Kedah	6204620[3/]
Ked.4	Pdg. Sanai	Pdg. Sanai/Kedah	6306612
Ked.5	Baru Naka	Tekai/Kedah	
Ked.6	Bahna	Bata/Kedah	
Ked.7	Banggol Tengah	Pendang/Kedah	6103613[3/]
Mud.1	Seberang Terus	Muda	5503601
Mud.2	Pinang Tinggal	Muda	5505603[2/]
Mud.3	Simpang Pasir	Muda	5806614[2/]
Mud.4	Nami Lemo	Muda	6007608
Mud.5	Baling	Ketil/Muda	
Ker.1	Sg. Udang	Kerian	5104601
Ker.2	Raja	Kerian	5104604
Ker.3	Kuala Dingin	Kerian	5306607[3/]
Ker.4	Sg. Bayor	Bayor/Kerian	5105606
Ker.5	Bagan Baharu	Ijok/Kerian	
Kra.1	Simpang Tiga	Kurau	5004601[2/]
Kra.2	Kedah	Kurau	5005602
Kra.3	Bt. Merah	Kurau	5006604[4/]
Kra.4	Yaman	Ara/Kurau	423
Kra.5	Perak	Kurau	5007622
Per.1	Bangam Datok	Perak	3907641
Per.2	Sg. Dulang	Perak	3908602
Per.3	Batok Rabit	Perak	4010604[3/]
Per.4	Pdg. Tenggala	Perak	4209607[3/]
Per.5	Guar Petai	Perak	4508610[2/]
Per.6	Lubuk Chaping	Perak	4809613
Per.7	Suak Mingak	Chenderoh Dam Site	
Per.8	Labit	Perak	5009614
Per.9	Pdg. Grik	Perak	5411446
Per.10	Lalang	Rui/Perak	
Per.11	Changkat Tin	Kinta/Perak	4410465[2/]
Per.12	Kolam	Kinta/Perak	4611663[3/]
Per.13	Dipang	Kampar/Perak	4311060[3/]
Per.14	Lubok Katan	Batang Padang/Perak	4112656
Per.15	Ct. Jong	Sungkai/Bidol/Perak	3911457[2/]
Per.16	Air Hitam	Bidor/Perak	4012652
Per.17	Guntong	Sungkai/Perak	
Mlk.1	Pasir Putih	Batu Berendam/Melaka	2222605[3/]
Mlk.2	Dalong	Melaka	2422611[2/]

Table 4 LOCATION OF VILLAGES INTERVIEWED (2/2)

Code of Location	Villages Interviewed	Tributary/River	Code of DOE St. [1/]
Mua.1	Jorak	Muar	2126604
Mua.2	Durian Condong	Muar	2328609
Mua.3	Buloh Kasap	Muar	2527611
Mua.4	Rompin	Muar	2725615 [3/]
Mua.5	Kuala Jumpol	Muar	2724616 [3/]
Mua.6	Tg. Limau	Terachi/Muar	
Mua.7	Sg. Gatom	Labis/Muar	
Joh.1	Tg. Nam Heng	Johor	1639603 [2/]
Joh.2	Semangar	Semangar/Johor	1737606 [3/]
Joh.3	Melayu/Layang[2]	Sayong/Johor	1834609
End.1	Labong	Labong/Endau	2636601
End.2	Kahang	Semberong/Endau	
Rom.1	Leban Chondong	Rompin	2832604
Pah.1	Tg. Medang	Pahang	3534601 [3/]
Pah.2	Kuala Lepar	Pahang	3527604 [2/]
Pah.3	Paya Pasir	Pahang	
Pah.4	Tg. Kubu	Pahang	3823611 [2/]
Pah.5	Binjai	Lipis/Pahang	4220616 [3/]
Kua.1	Batu Sawar	Kuantan	3831603 [2/]
Kua.2	Sg. Rimau	Lembing	401 [4/]
Trng.1	Pulau Rusa	Trengganu	5230601
Trng.2	Pauh	Trengganu	5030635 [3/]
Trng.3	Menerong	Ulu Brang/Trengganu	
Kltn.1	Kemubu	Kelantan	
Kltn.2	Kusial Baharu	Kelantan	5721442 [3/]
Kltn.3	Bekok	Lebir/Kelantan	5521644
Kltn.4	Relak	Pergau/Kelantan	
Kltn.5	Jeli	Pergau/Kelantan	448 [4/]

Remarks; 1/ Code number of water quality stations operated by DOE in 1978-1979, corresponding to villages interviewed.

2/ A little upstream of the village interviewed.

3/ A little downstream of the village interviewed.

4/ Code of discharge station of DID.

Table 5 DISTANCE OF VILLAGES INTERVIEWED FROM THE RIVER MOUTH

Distance (km)	Code of Location
0-10	Ked.1, Ked.2, Mud.1, Ker.1, Kra.1, Per.1, Mlk.1, Trng.1
11-30	Ked.7, Mud.2, Ker.2, Kra.2, Per.2, Joh.1, End.1, Rom.1, Pah.1, Kua.1
31-50	Ked.6, Per.3, Mlk.2, Mua.1, Pah.2, Trng.2, Kltn.1
51-70	Ked.3, Ker.3, Ker.4, Kra.3, Joh.2, Kua.2 1/, Trng.3, Kltn.2
71-90	Mud.3, Mud.5, Mud.6, Ker.5 1/, Kra.4, Kra.5, Per.15
91-110	Ked.4, Ked.5, Per.14, Per.16, End.2, Joh.3, Pah.3, Kltn.3
111-130	Mud.4, Per.4, Per.11, Per.13, Per.17, Mua.2
131-150	Per.5, Per.12 1/, Mua.3
151-170	Mua.7, Kltn.4
171-190	Per.6
191-210	Per.7 2/, Mua.4, Pah.4, Kltn.5 1/,
211-230	Per.8
231-250	Mua.5
251-270	Mua.6 1/
271-290	Per.9
291-310	-
311-330	Per.10 1/, Pah.5

Remarks; 1/ : These are located in the lower-middle or middle-upper zones (Tables 7 to 9).

2/ : At the mouth of Chenderoh Dam reservoir.

Table 6 ZONING OF RIVERS INTERVIEWED [1/] (1/2)

Code of Location	Mean Gradient [2/]	Zone
Ked.1	2.2	Lower Zone
Ked.2	2.2	Lower Zone
Ked.3	2.2	Lower Zone
Ked.4	2.2	Lower Zone
Ked.5	2.2	Lower Zone
Ked.6	2.2	Lower Zone
Ked.7	2.2	Lower Zone
Mud.1	2.2	Lower Zone
Mud.2	2.2	Lower Zone
Mud.3	2.2	Lower Zone
Mud.4	2.2	Lower Zone
Mud.5	2.2	Lower Zone
Mud.6	2.2	Lower Zone
Ker.1	2.2	Lower Zone
Ker.2	2.2	Lower Zone
Ker.3	2.2	Lower Zone
Ker.4	2.2	Lower Zone
Ker.5	1.0 - 3.7	Lower - Middle Zone
Kra.1	2.2	Lower Zone
Kra.2	2.2	Lower Zone
Kra.3	2.2	Lower Zone
Kra.4	2.2	Lower Zone
Kra.5	2.2	Lower Zone
Per.1	2.2	Lower Zone
Per.2	2.2	Lower Zone
Per.3	2.2	Lower Zone
Per.4	2.2	Lower Zone
Per.5	2.2	Lower Zone
Per.6	2.2	Lower Zone
Per.7	Chenderoh Dam Reservoir	
Per.8	2.2	Lower Zone
Per.9	2.2	Lower Zone
Per.10	1.04 - 2.6	Lower - Middle Zone

Remarks; 1/: Zonation of the river is taken the classification method based on mean gradient (Ref. 2).
The river is zoned by the following range of mean gradient:

%		%
78.0	Upper Tributaries	
4.7	Upper Zone	78.0
2.2	Middle Zone	4.7
	Lower Zone	2.2

2/: Mean gradient = Elevation(m)/Distance(km)

Table 7 ZONING OF RIVERS INTERVIEWED [1/] (2/2)

Code of Location	Mean Gradient [2/]	Zone
Per.11	2.2	Lower Zone
Per.12	1.8 - 3.3	Lower - Middle Zone
Per.13	2.2	Lower Zone
Per.14	2.2	Lower Zone
Per.15	2.2	Lower Zone
Per.16	2.2	Lower Zone
Per.17	2.2	Lower Zone
Mlk.1	2.2	Lower Zone
Mlk.2	2.2	Lower Zone
Mua.1	2.2	Lower Zone
Mua.2	2.2	Lower Zone
Mua.3	2.2	Lower Zone
Mua.4	2.2	Lower Zone
Mua.5	2.2	Lower Zone
Mua.6	3.0 - 10.3	Middle - Upper Zone
Mua.7	2.2	Lower Zone
Joh.1	2.2	Lower Zone
Joh.2	2.2	Lower Zone
Joh.3	2.2	Lower Zone
End.1	2.2	Lower Zone
End.2	2.2	Lower Zone
Rom.1	2.2	Lower Zone
Pah.1	2.2	Lower Zone
Pah.2	2.2	Lower Zone
Pah.3	2.2	Lower Zone
Pah.4	2.2	Lower Zone
Pah.5	2.2	Lower Zone
Kua.1	2.2	Lower Zone
Kua.2	1.83 - 2.3	Lower - Middle Zone
Trng.1	2.2	Lower Zone
Trng.2	2.2	Lower Zone
Trng.3	2.2	Lower Zone
Kltn.1	2.2	Lower Zone
Kltn.2	2.2	Lower Zone
Kltn.3	2.2	Lower Zone
Kltn.4	2.2	Lower Zone
Kltn.5	2.8	Middle Zone

Remarks; 1/, 2/: Same as in Table 6

Table 8 FISHES LISTED BY INTERVIEW SURVEY (1/6)

Code	Scientific Name	Local Name
	Osteoglossiformes	
	Osteoglossidae	
A1	Scleropages formosus (Muller & Schlegel)	Kelesa, Kelisa
	Notopteridae (Feather-backs)	
B1.1	Notopterus chitalia (Hamilton)	Belida
B1.2	N. Notopterus (Pallas)	Belida
B1.3	N. sp.	Kotok, Selat
	Synbranchiformes	
	Synbranchidae	Swamp-eels
C1	Fluta alba (Ziew)	Belut
	Cypriniformes	
	Cyprinidae	Carps
	Barbinae	
D1.1	Acrossocheilus deauratus (C. & V.)	Daun, Tengas daun
D1.2	A. hexagonolepis	Tengas, Kejor
D2	Balantiocheilus melanopqerus (Bleeker)	Hangus, Arang ekor
D3	Barbichthys laevis (C. & V.)	Batu Ulu, B. Hulu, Bentulu
D4	Cyclocheilichthys apogon (Valenciennus)	Temperas
D5	Epalzeorhynchus sp.	
D6	Hampala macrolepidota (Van Hasselt)	Sebarau, Barau-barau
D7.1	Labiobarbus curieri (C. & V.)	Kawan
D7.2	L. ocellatus (Heckel)	Lemak, Lomok, Loma
D8	Labocheilus sp.	Peridong
D9	Leptobarbus hoeveni (Bleeker)	Jelawat
D10	Morulius chrysophekadion (Bleeker)	Junkus, Junkua, B. Basong
D11	Mystacoleucus marginatus (C. & V.)	Sia
D12.1	Osteochilus hasselti (C. & V.)	Terbol, Terbui
D12.2	O. kelabau Paptu	Kelabu, Kelabau
D12.3	O. melanopleura (Bleeker)	Ara, Hara
D12.4	O. vittatus (C. & V.)	Rong
D13	Probarbus jullieni (Sauvage)	Temoleh, Temilian
D14.1	Puntius Binotatus (Valenciennes)	Putih, Tebal sisek
D14.2	P. bulu (Bleeker)	Tengalan, Temigalang
D14.3	P. daruphani (H.M. Smith)	Kerai Kunyit
D14.4	P. sp.	K. Keranji
D14.5	P. sp.	K. Jelawat
D14.6	P. sp.	K. Putieh

Table 9 FISHES LISTED BY INTERVIEW SURVEY (2/6)

Code	Scientific Name	Local Name
D14.7	Puntius gonionotus (Valenciennes)	Lampan Jawa
D14.8	P. schwanefeldi (Bleeker)	Lampan sungai, Kepiat, Piat, Tengadak, Tengahak
D14.9	P. sp.	Lampan Siam
D14.10	P. lateristriga (C. & V.)	Bagoh
D14.11	P. orphoides	Pipi Merah
D14.12	P. tetrazona partipentazona (Fowler)	Pelampong jaring
D15	Tor tambroides (C. & V.)	Kelah, (Kerang)
	Danioinae	
D16	Barilius guttatus Day	Sikang
D17	Luciosoma Setigerum (C. & V.)	Nyuar, Nenyar
D18.1	Rasbora eithoveni (Bleeker)	Susur batang
D18.2	R. elegans (Vols)	Seluang
D18.3	R. sp.	Bada, Bada seluang
	Cultrinae	
D19	Macrochirichthys macrochirus (C. & V.)	Parang
D20.1	Oxygaster anomalura (Van Hasselt)	Lalang, Lang
D20.2	O. sp.	Bulu ayam
	(Imported Carps)	
D21.1	Cyprinus carpio (Linn.)	Lee Koh
D21.2	C. carpio specularis	Kap. Cermin
D22	Arichtys nobilis (Richardson)	Kap. kepala besar
D23	Ctenopharyaodon idellus (C. & V.)	Kap. Rumput
	Cobitidae	Laoches
E1	Any cobitid other than Botia, such as Acantopsis choirorhynchos (Bleeker)	Tali, Pasir
E2	Botia sp.	Lali, L. pelandok
	Homalopteridae	Loaches
F1	Homaloptera sp.	Susoh batu, Puting beliong
	Siluriformes	
	Siluridae	Catfishes
G1.1	Kryptopterus sp.	Lais (small)
G1.2	K. sp.	Begahak (medium)
G1.3	K. sp.	Sengarat (big)
G2	Ompok bimaculatus (Bloch)	Tapah bemban
G3.1	Wallagonia tweodiei (Hora & Misra)	Tapah
G3.2	Wallagonia attu (BL. Schn.)	Tapah

Table 10 FISHES LISTED BY INTERVIEW SURVEY (3/6)

Code	Scientific Name	Local Name
	Clariidae (Catfish)	
H1.1	Clarias batrachus (Linn.)	Keli
H1.2	C. nieuheli (C. & V.)	Lembat, Limbat
	Bagridae (Catfish)	
I1.1	Mystus numurus (Valenciennus)	Baung
I1.2	M. wycky	Tengku lolah
	Pangasiidae (Catfish)	
J1.1	Pangasius micronemus (Bleeker)	Lawang
J1.2	P. pangasius (Ham)	Patin, Buah
J1.3	P. ponderosus (H. & M.)	Patin, Buah
J1.4	P. sp.	Patin lawas
J1.5	P. sp.	Patin muchong
J1.6	P. sp.	Juara
	Sisolidae	
K1	Bagarius bagarius (Hamilton)	Tinggang, Kenderap Kenjang, Kenjing, Lenjing
	Channiformes	
	Channidae	Snake-heads
L1.1	Channa lucius (C. & V.)	Bujok, Bujok Ubi
L1.2	C. marulioides (Bleeker)	Jalai, Jaloi
L1.3	C. micropeltes (Cuvier)	Toman
L1.4	C. striatus (Bloch)	Aruan, Haruan, Taman paya
	Artheriniformes	
	Hemiramphidae	Garfishes
M1	Hemiramphodon pogonognatus (Bleeker)	Sembir
	Belonidae	
M2	Xenentodon canciloides	Todak
	Perciformes	
	Gobiidae	Gobies
N1	Oxyeleotris marmoratus	Ketutu, Ubi, Belontok
	Anabantidae	Goramies
O1	Anabas testudineus (Bloch)	Puyu, Betok
	Belontidae	
O2	Betta splendens (Bleeker)	Pala, Pelaga, Belaga, Sepilai
O3.1	Trichogaster pectoralis	Sepat Siam
O3.2	T. trichopterus	Sepat padi, S. ronggeng

Table 11 FISHES LISTED BY INTERVIEW SURVEY (4/6)

Code	Scientific Name	Local Name
O4	Trichopsis vittatus	Karim
O5	Helostoma temmincki	Temakang, Tembakang Tebakang
	Osphronemidae	
O6	Osphronemus goramy	Kalui
	Toxotidae	
P1	Toxotes jaculatus	Sumpit-sompit
	Centropomidae	
Q1	Lates calalifer	Siakap putih
	Pristolepidae	Jewel-fish
R1	Pristolepis fasciatus (Bleeker)	Patong, Kepar, Kepor
	Mastacembelidae	Spiny-eels
S1	Mastacembelus maculatus	Tilan
	Scatophagidae	
T1	Scatophagus argus	Kitang, Ketang
	Cichlidae (Tilapia)	
U1	Tilapia mossanbica (Peters)	Tilapia
	Megalopidae (Tarpon)	
V1	Megalops cyprinoides (Brouss)	Bulan
	Carangidae (Trevally)	
W1	Caranx speciosus	Cermin sungai
X1	Mugilidae (Mullets)	Belanak
X1.1	Mugil borneensis, M. macrolepis	Anding
X1.2	M. dussumierii M. macrolepis	Bakan, Bakong
X1.3	M. longimanus, M. Macrolepis	Kedera putih
X1.4	M. planiceps	Jumpul
X1.5	M. screli, M. our	Anging, Rapang
X1.6	M. tade, M. vaigiensis	Tamok
X1.7	M. vaigiensis	Pelong
X1.8	M. sp.	Kemura

Following local names are not identified by scientific names. Some of them are considered to overlap to other names.

Y1	Lea (Kerau River)
Y2	Londo (Melaka River)
Y3	Lundu (Johor River)
Y4	Stem (Endau River)
Y5	Seliacol (Endau River)

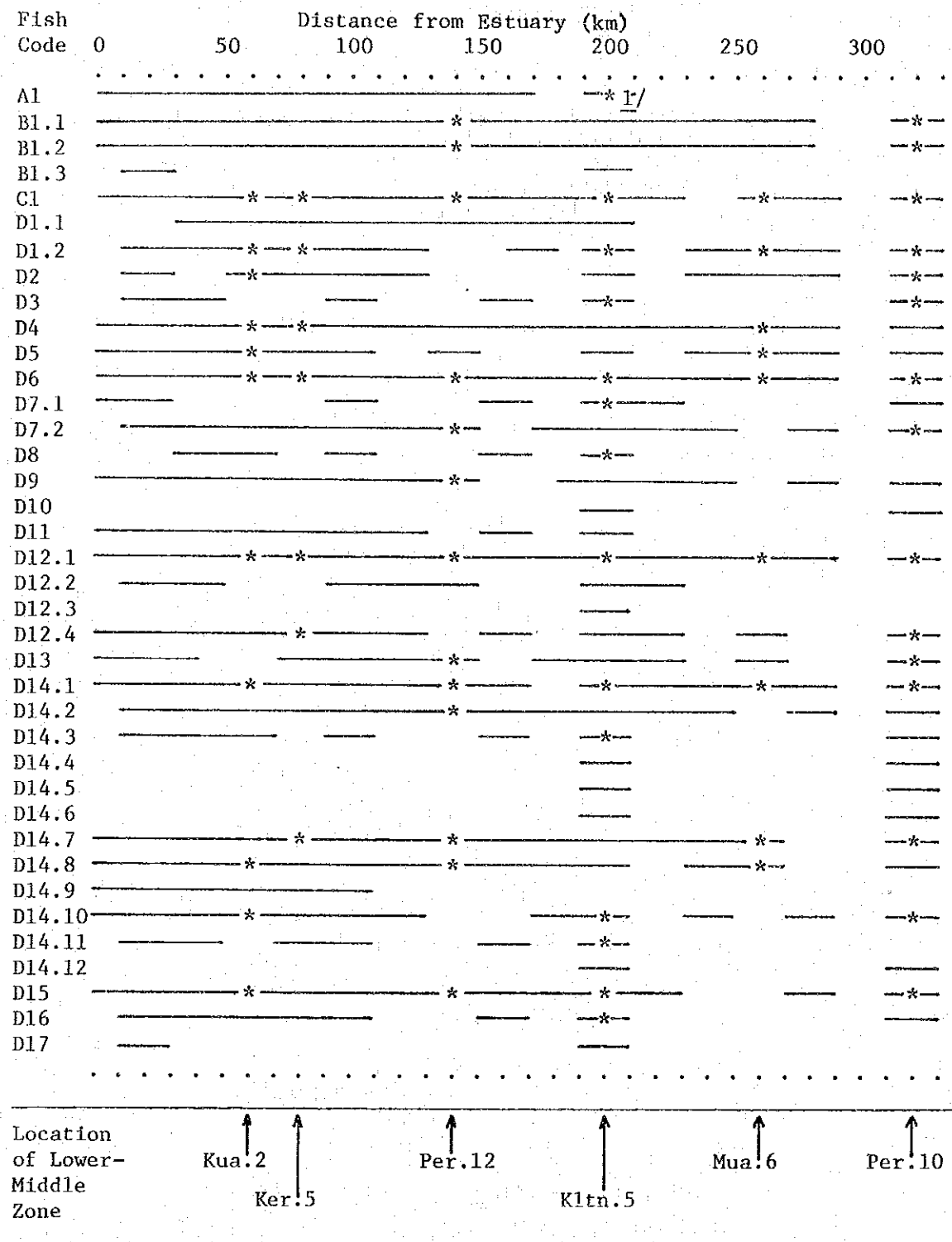
Table 12 FISHES LISTED BY INTERVIEW SURVEY (5/6)

Code	Scientific Name	Local Name
Y6		Lenjua (Endau River)
Y7		Temenggal (Endau River)
Y8		Gohak (Rompin River and Pahang River)
Y9		Jaling (Rompin)
Y10		Gendang (Pahang River)
Y11		Jalir (Pahang River)
Y12		Kelulang (Pahang River)
Y13		Mali (Pahang River)
Y14		Motan (Pahang River)
Y15		Perul (Pahang River)
Y16	?	Reriyu (Pahang River)
Y17		Senggirek (Pahang River)
Y18		Siar (Pahang River0
Y19	Achiroides achira ?	Sisa Nabi, Sebelah
Y20		Nundu (Trengganu River)
Y21		Tambun (Trengganu River)
Y22	Luciocephalus pulcher ?	Tembok tebing
Y23	Barynotus microlepis ?	Umut-umut
	Followings are shells, crabs and shrimps which can be caught by riverine fishing.	
YY1	species ? (Shells)	Siput
YY2	Portunus pelagicus (Crabs) or Scylla serrata (Crabs)	Ketam
YY3	Macrobrachium rosenbergii (Giant Malaysian Prawn)	Udang Galah
YY4	Species ? (Shrimps)	Udang Kecil
	Followings are marine or brackish water fishes which can be caught by riverine fishing.	
Z1	Order. Asterospondyli (Sharks)	Yu
Z2	Order. Tetraodontoidei (Boxfishes, Pufferfishes)	Buntal
Z3	Family Hemirhamphidae (Halfbeaks)	Jolong-Jolong
Z4	Family Histiophoridae (Sailfishes, Marlines)	Tumbok banir
Z5	Serranidae (Groupers, Seabass, Cods)	Kerapu
Z6	Tachysuridae (Marine catfish)	Duri
Z7	Trygonidae (Rays)	Pari
Z8	Arius sp. (Marine catfish)	Gagok
Z9	Chanos chanos (Milkfish)	Jengas bandang, Belanak sembawa
Z10	Leiognatus sp. (Ponyfish)	Kekek

Table 13 FISHES LISTED BY INTERVIEW SURVEY (6/6)

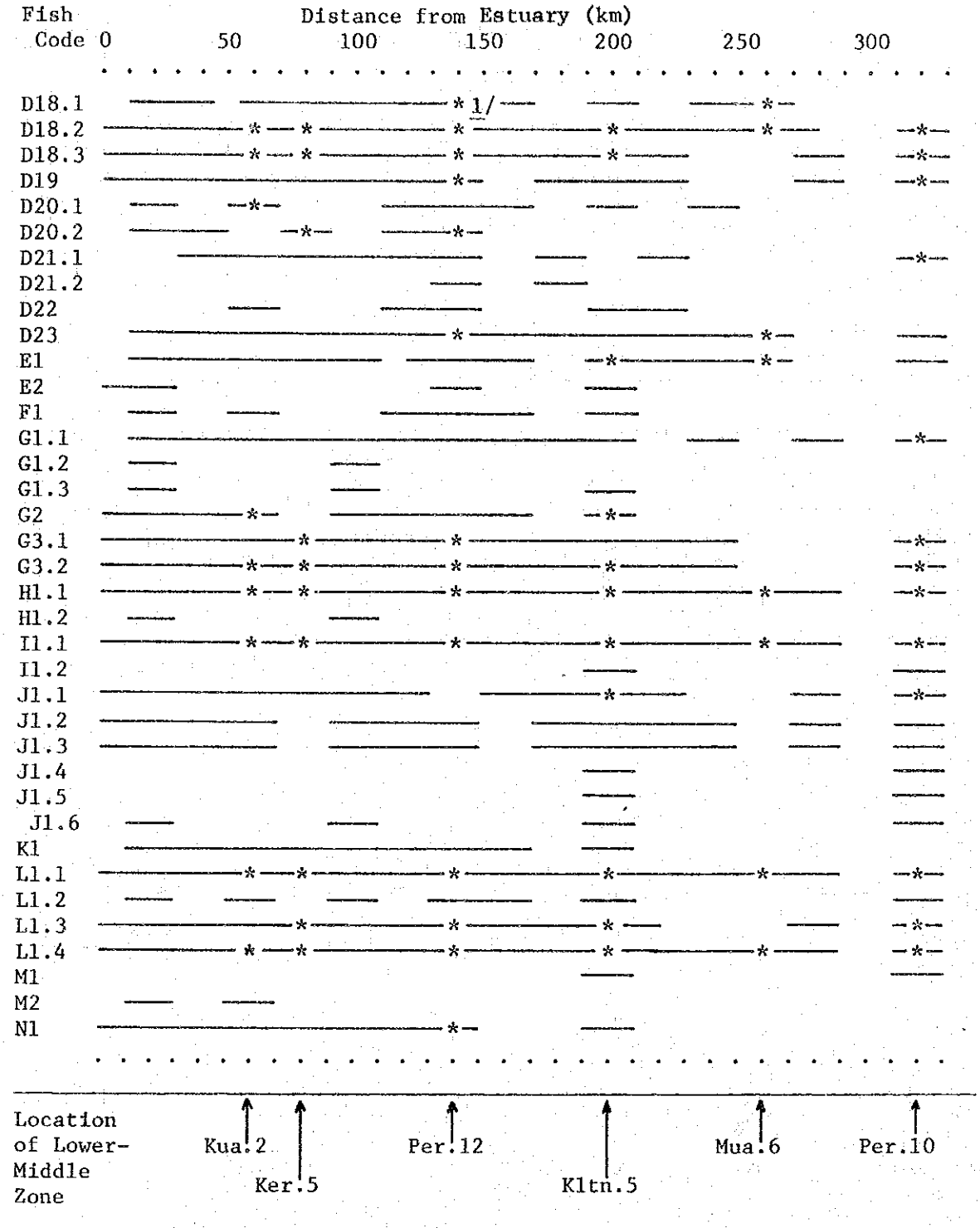
Code	Scientific Name	Local Name
Z11	Paraplotosus anguillaris (Catfish-eel)	Sembilang, S. Karang
Z12	Saurida undosquamis (Lizardfish)	Belukor, Belungkor
Z13	Sciaena russelli (Jewfish)	Gelama
Z14	Selaroides leptolepis (Yellow-banded Trevally)	Selar kuning
Z15	Sillago sihama (Silver whiting)	Puting damar
Z16	Sparus hasta (Bream)	Kuku
Z17	Tachyaurus leiotetacephalus (Marine catfish)	Belukang

Table 14 LONGITUDINAL DISTRIBUTION OF FISHES INTERVIEWED (1/4)



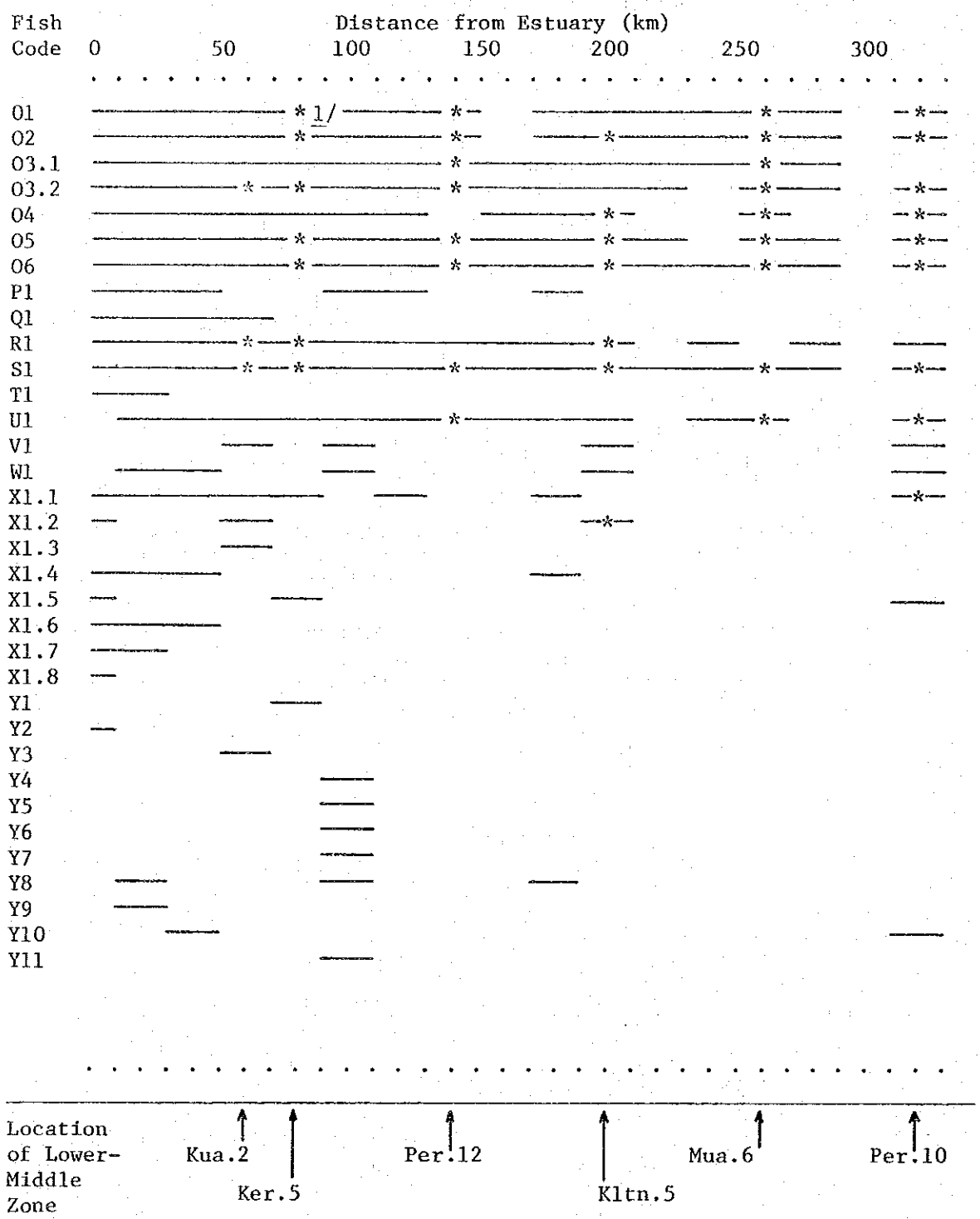
Remarks; 1/ : Locations where the fish appears at the lower-middle zone of each river.

Table 15 LONGITUDINAL DISTRIBUTION OF FISHES INTERVIEWED (2/4)



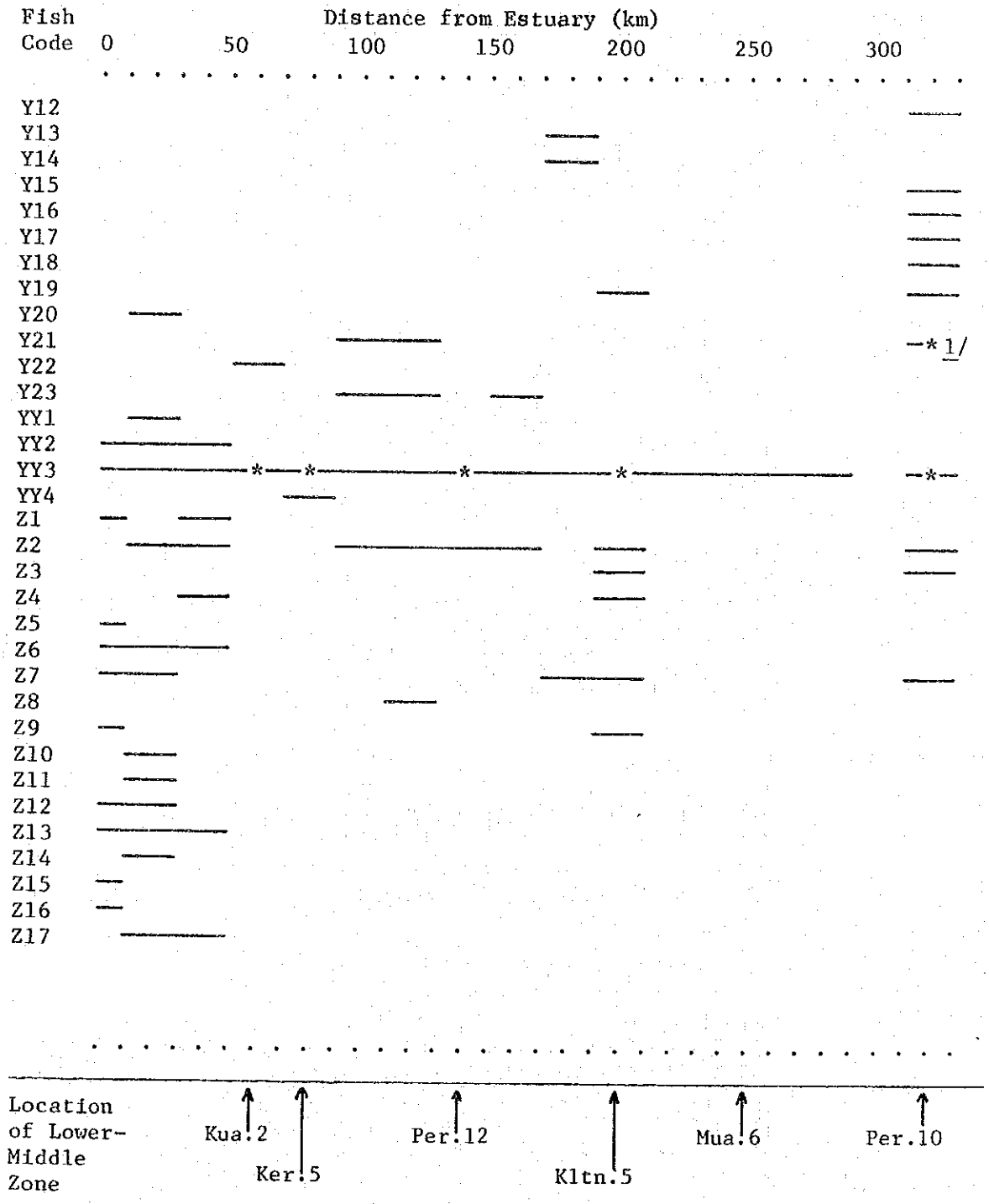
Remarks; 1/ : Locations where the fish appears at the lower-middle zone of each river.

Table 16 LONGITUDINAL DISTRIBUTION OF FISHES INTERVIEWED (3/4)



Remarks; 1/ : Locations where the fish appears at the lower-middle zone of each river.

Table 17 LONGITUDINAL DISTRIBUTION OF FISHES INTERVIEWED (4/4)



Remarks; 1/ : Locations where the fish appears at the lower-middle zone of each river.

Table 18 FISH FAUNA OF EACH RIVER BASIN (1/3)

River	Code of Fish 1/	No. of Species
Kedah	C1, D1.1, D1.2, D4, D5, D6, D7.1, D12.1, D12.4, D14.1, D14.7, D14.9, D14.10, D15, D18.1, D18.2, D18.3, D19, D21.1, D23, E1, G1.1, H1.1, I1.1, J1.1, L1.1, L1.4, O1, O2, O3.1, O4, O5, O6, P1, R1, S1, U1, X1.1, YY3, Z6.	41
Muda	B1.1, B1.3, C1, D1.1, D1.2, D2, D4, D5, D6, D7.2, D9, D11, D12.1, D12.4, D13, D14.1, D14.2, D14.7, D14.8, D14.9, D14.10, D14.11, D15, D16, D18.1, D18.2, D18.3, D19, D20.2, D23, E1, E2, G1.1, G3.1, H1.1, I1.1, L1.1, L1.3, L1.4, N1, O1, O2, O3.1, O3.2, O4, O6, R1, S1, U1, X1.1, X1.5, YY3, Z6, Z9.	54
Kerian	A1, B1.1, C1, D1.1, D14.1, D1.2, D4, D5, D6, D11, D12.1, D12.4, D14.7, D14.9, D18.1, D18.2, D18.3, D15, D21.1, D22, D23, E1, G1.1, G3.1, G3.2, H1.1, I1.1, L1.1, L1.3, L1.4, N1, O1, O2, O3.1, O3.2, O4, O6, Q1, R1, R1, S1, U1, V1, X1, X1.1, X1.5, YY3, Z6.	47
Kurau	A1, B1.1, C1, D1.1, D1.2, D4, D5, D6, D9, D11, D12.1, D12.4, D14.1, D14.7, D14.8 D14.9, D14.10, D15, D18.1, D18.2, D18.3, D21.1, D23, E1, E3, G1.1, G3.1, H1.1, I1.1, K1, L1.1, L1.3, L1.4, N1, O1, O2, O3.1, O3.2, O4, O6, R1, S1, U1, Y1, YY3, YY4.	46
Perak	A1, B1.1, B1.3, C1, D1.1, D1.2, D2, D4, D5, D6, D7.1, D7.2, D9, D11, D12.1, D12.2, D12.4, D13, D14.1, D14.2, D14.7, D14.8, D14.9, D14.10, D15, D18.1, D18.2, D18.3, D19, D20.2, D21.1, D21.2, D22, D23, E1, E2, F1, G1.1, G2, G3.1, H1.1, I1.1, J1.1, J1.2, L1.1, L1.3, L1.4, N1, O1, O2, O3.1, O3.2, O4, O5, O6, P1, Q1, R1, S1, U1, X1, X1.1, X1.4, X1.6, YY3, Z6, Z7, Z15.	68

Remarks; 1/ : Excluding unidentified types of fishes

Table 19 FISH FAUNA OF EACH RIVER BASIN (2/3)

River	Code of Fish 1/	No. of Species
Melaka	B1.1, C1, D4, D5, D6, D9, D11, D12.1, D14.1, D14.7, D14.9, D18.2, D18.3, E1, E2, G2, G3.1, H1.1, I1.1, L1.1, L1.3, L1.4, N1, O1, O2, O3.1, O3.2, O5, O6, S1, T1, U1, YY3, Zy	34
Muar	A1, B1.1, C1, D1.2, D4, D5, D6, D7.2, D9, D11, D12.1, D12.2, D13, D14.1, D14.2, D14.7, D14.8, D14.10, D18.1, D18.2, D18.3, D19, D20.1, D20.2, D21.1, D21.2, D23, E1, E3, G1.1, G2, G3.1, H1.1, I1.1, J1.2, K1, L1.1, L1.2, L1.3, L1.4, N1, O1, O2, O3.1, O4, O5, O6, P1, R1, S1, U1, X1, YY2, YY3, Z1, Z2, Z6, Z8, Z15.	60
Johor	A1, B1.1, C1, D4, D6, D9, D12.1, D12.2, D14.1, D14.7, D14.8, D14.10, D14.11, D18.1, D18.2, D18.2, D19, D20.1, E1, G2, G3.1, H1.1, H1.2, I1.1, L1.1, L1.4, M2, N1, O1, O2, O3.2, O5, O6, P1, Q1, S1, T1, X1, X1.4, X1.6, YY2, YY3, Z5, Z6, Z7, Z12, Z15, Z19.	48
Endau	A1, B1.1, C1, D4, D5, D6, D7.1, D9, D12.1, D12.2, D12.4, D13, D14.1, D14.2, D14.8, D14.9, D14.10, D14.11, D15, D18.1, D18.2, D18.3, D19, D20.1, D20.2, D21.1, E1, F1, G1.1, G1.2, G1.3, G3.1, H1.1, I1.1, J1.2, J1.6, L1.1, L1.2, L1.3, L1.4, O1, O3.1, O3.2, O4, O6, P1, Q1, R1, S1, T1, U1, V1, W1, X1, X1.1, YY3, Z2, Z6, Z12, Z15, Z19.	61
Rompin	A1, B1.1, C1, D1.2, D4, D5, D6, D7.1, D7.2, D11, D12.1, D12.2, D13, D14.1, D14.2, D14.7, D14.8, D14.9, D15, D18.2, D18.3, D19, D20.1, G1.1, G1.2, G1.3, G3.1, H1.1, I1.1, J1.6, K1, L1.1, L1.3, L1.4, M2, O1, O2, O3.2, O4, O5, O6, P1, Q1, R1, S1, T1, X1, X1.1, X1.6, X1.7, YY3, Z2, Z6.	53

Remarks; 1/ : Same as Table 18

Table 20 FISH FAUNA OF EACH RIVER BASIN (3/3)

River	Code of Fish [1/]	No. of Species
Pahang	A1, B1.1, C1, D1.2, D2, D3, D4, D5, D6, D7.1, D7.2, D9, D10, D12.1, D12.2, D12.4, D13, D14.1, D14.2, D14.3, D14.4, D14.5, D14.6, D14.7, D14.8, D14.10, D14.12, D15, D16, D17, D18.1, D18.2, D18.3, D19, D20.1, D20.2, E1, E2, F1, G1.1, G1.3, G2, G3.1, H1.1, I1.1, I1.2, J1.1, J1.2, J1.4, J1.5, J1.6, K1, L1.1, L1.2, L1.3, L1.4, M1, M2, N1, O1, O3.1, O3.2, O4, O5, O6, Q1, R1, S1, V1, W1, X1.5, YY1, YY2, YY3, Z2, Z3, Z4, Z6, Z7, Z9, Z11, Z16.	82
Kuantan	A1, B1.1, C1, D1.1, D1.2, D4, D5, D6 D12.1, D12.4, D14.1, D14.8, D14.10, D15, D18.2, D18.3, D20.1, E1, G2, G3.1, H1.1, I1.1, J1.2, K1, L1.1, L1.3, L1.4, O1, O2, O3.2, O4, O6, P1, R1, S1, X1, YY3.	37
Trengganu	A1, B1.1, B1.3, C1, D1.1, D1.2, D4, D5, D6, D7.1, D7.3, D11, D12.1, D12.4, D14.1, D14.7, D14.8, D14.10, D15, D16, D18.1, D18.2, D18.3, D19, E1, G2, G3.1, H1.1, I1.1, K1, L1.1, L1.2, L1.3, L1.4, N1, O1, O2, O3.2, O4, O5, O6, Q1, R1, S1, T1, X1.1, X1.2, X1.3, X1.4, X1.5, YY1, YY3, Z1, Z2, Z4, Z12, Z18.	59
Kelantan	A1, B1.1, C1, D1.1, D1.2, D3, D4, D6, D7.1, D7.2, D8, D9, D11, D12.1, D12.4, D14.1, D14.2, D14.3, D14.7, D14.8, D14.9, D14.10, D14.11, D15, D16, D18.1, D18.2, D18.3, D19, E1, G1.1, G2, G3.1, H1.1, I1.1, J1.1, J1.2, K1, L1.1, L1.3, L1.4, O1, O2, O3.2, O4, O6, Q1, R1, S1, U1, X1.2, X1.4, X1.8, YY3, Z2, Z13.	56

Remarks; [1/] : Same as Table 18

Table 21 TROPHIC POSITION OF FISHES LISTED

Dominant Feeding Category	Code of Fish 1/
HERBIVORES	D3, (D5), D7.1, D7.2, (D8), D10, D12.1, (D12.2), D12.3, D12.4, D23, (O3.1), (O3.2), O5
OMNIVORES	
1. Herbivore dominant	D1.1, D1.2, D14.7, D15, D18.1-D18.3, D22, O6, X1-X1.8,
2. Predator dominant	(D2), D11, D13, D14.2-D14.6, D14.8-D14.12, D21.2, D21.2, E1, (T1), U1, V1, W1, YY1-YY4 2/
CARNIVORES	
1. Exogenous arthropods, Endogenous invertebrales	(A1), C1, D4, D9, D14.1, D20.1, D20.2, E2, F1, I1.1, I1.2, K1, M1, M2, O2, O4, P1, R1, S1
2. Crustacea, Fish, etc.	B1.1-B1.3, D6, D16, (D17), D19, G1.1-G1.3, (G2), G3.1, G3.2, H1.1, (H1.2), J1.1-J1.6, L1.1-L1.4, N1, O1, Q1

Source; Ref. 2

Remarks; 1/ : Unidentified freshwater fish and seafish are not included.

2/ : Shrimps and shells are categorized here for the convenience of the study discussion.

Table 22 FISHES CLASSIFIED BY "BASIC FAUNA"

Basic Fauna	Code of Fish Types
1. Cypriniformes	D1.1, D1.2, D2, D3, D4, D5, D6, D7.1, D7.2, D8, D9, D10, D11, D12.1 - D12.4, D13, D14.1 - D14.12, D15, D16, D17, D18.1 - D18.3, D19, D20.1, D20.2, D21.2, D21.2, D22, D23, E1, E2, F1
2. Siluriformes	G1.1 - G1.3, G2, G3.1, G3.2, H1.1, H1.2, I1.1, I1.2, J1.1 - J1.6, K1
3. Non-Ostaryophsi	A1, B1.1 - B1.3, C1, L1.1 - L1.4, M1, M2, N1, O1, O2, O3.1, O3.2, O4, O5, O6, P1, Q1, R1, S1, T1, U1, V1, W1, X1.1 - X1.8, YY3

Table 23 FISH FAUNA BY FOOD HABIT FOR THE KEDAH RIVER

Food Habit	Fish Fauna	1	2	3	4	5	6	7
H	D 5	o	.	.	.	.	.	.
	D 7.2	.	.	.	.	.	.	o
	D 12.1	.	.	o	.	.	.	o
	D 12.4	o	.	.	.	.	.	.
	D 23	.	.	o	.	.	o	.
	O 3.1	o	o	o	o	o	o	o
	O 3.2	o	.	o	o	o	o	o
	O 5	o	.	.	.	.	.	.
OH	D 1.1	.	.	.	o	.	.	.
	D 1.2	.	.	.	o	.	.	.
	D 14.7	.	o	A	A	o	o	o
	D 15	.	.	o	.	o	.	.
	D 18.1	.	.	o	o	.	o	.
	D 18.2	.	o	o	o	o	o	o
	D 18.3	.	.	o	o	o	o	o
	O 6	.	.	o	o	o	o	.
	X 1.1	.	.	o	.	.	.	.
OC	D 14.9	.	.	o	.	o	.	.
	D 14.10	o	.	.	o	o	.	.
	D 21.1	.	.	A	.	.	.	o
	E 1	.	.	.	o	.	.	.
	U 1	.	.	.	.	.	o	.
	YY 3	o	o	o	.	x	x	o
C	C 1	.	.	o	o	o	o	o
	D 4	o	o	o	o	.	.	.
	D 14.1	.	.	o	o	o	o	o
	I 1.1	.	x	o	o	o	o	o
	O 2	.	o	o	o	o	o	o
	O 4	.	o	o	o	o	o	o
	P 1	o	o	.	.	.	.	.
	R 1	.	.	o	o	o	.	.
	S 1	o	.	o	o	o	o	.
CP	D 6	o	.	o	o	o	o	.
	D 19	o	.	.	.	.	.	.
	G 1.1	.	.	o	o	.	o	o
	H 1.1	o	o	o	o	o	o	o
	J 1.1	.	o	.	.	o	.	.
	L 1.1	o	x	o	o	.	o	o
	L 1.4	o	o	o	o	o	o	o
	O 1	o	o	o	o	o	o	o
	Z 6	o	x	.	.	.	.	.

Remarks; o : Existing species
x : Recently disappeared
A : Recently appeared

Table 24 FISH FAUNA BY FOOD HABIT FOR THE MUDA RIVER

Food Habit	Fish Fauna	Location 1	2	3	4	5
H	D 5	o	.	.	.	.
	D 7.2	.	.	.	.	x
	D 12.1	.	o	o	o	o
	D 12.4	.	o	.	.	o
	D 23	.	.	o	.	x
	O 3.1	o	o	o	.	.
	O 3.2	o	o	o	.	o
OH	D 1.1	o	o	o	x	.
	D 1.2	.	o	o	o	o
	D 14.7	.	o	o	.	o
	D 15	.	o	o	x	.
	D 18.1	.	o	o	o	o
	D 18.2	.	.	o	o	o
	D 18.3	.	o	o	o	o
	O 6	.	.	o	.	o
	X 1.1	.	.	o	.	.
OC	D 2	.	.	o	.	.
	D 11	o	o	.	.	o
	D 14.2	.	.	o	.	.
	D 14.8	.	.	.	o	.
	D 14.9	.	o	.	.	.
	D 14.10	.	.	o	o	.
	D 14.11	.	.	.	.	A
	E 1	.	.	o	.	.
	U 1	.	o	o	.	.
	YY 3	o	o	o	.	x

Food Habit	Fish Fauna	Location 1	2	3	4	5
C	C 1	.	o	o	o	.
	D 4	.	o	o	o	o
	D 9	.	o	o	o	.
	D 14.1	.	o	o	o	o
	D 20.2	.	.	o	.	.
	E 2	.	o	.	.	.
	I 1.1	x	o	o	o	o
	O 2	.	.	o	.	o
	O 4	.	.	o	o	o
	R 1	.	.	o	o	.
	S 1	.	o	o	o	o
CP	B 1.1	.	o	o	.	.
	B 1.3	.	o	.	.	.
	D 6	.	o	o	o	o
	D 16	.	.	o	.	.
	D 19	.	.	o	.	.
	G 1.1	.	o	.	.	o
	G 3.1	.	o	.	.	.
	H 1.1	o	o	o	o	o
	L 1.1	.	o	o	.	o
	L 1.3	.	o	o	o	.
	L 1.4	o	o	o	o	o
	N 1	.	.	o	.	.
	O 1	o	o	o	.	o
	Z 6	o	.	.	.	.
	Z 9	o	.	.	.	.
	Z 19	o	x	.	.	.

Remarks; o : Existing species
x : Recently disappeared
A : Recently appeared

Table 25 FISH FAUNA BY FOOD HABIT
FOR THE KERIAN RIVER

Food Habit	Fish Fauna	Location 1	2	3	4	5
H	D 5	o	.	.	.	.
	D 12.1	x	o	o	o	o
	D 12.4	.	.	o	o	o
	D 23	.	.	o	.	.
	O 3.1	o	o	o	o	.
	O 3.2	o	o	o	o	o
OH	D 1.1	.	.	o	.	.
	D 1.2	.	.	x	o	o
	D 14.7	.	o	o	o	o
	D 15	.	o	x	o	.
	D 18.1	.	o	o	o	.
	D 18.2	.	o	.	.	o
	D 18.3	.	o	o	o	o
	D 22	.	.	o	.	.
	O 6	.	o	o	o	o
	X 1.1	o	.	o	o	.
	X 1.5	o	.	.	.	.
OC	D 11	o	o	.	.	.
	D 14.9	.	.	o	o	.
	D 21.1	.	.	o	.	.
	E 1	.	.	o	.	.
	U 1	.	.	o	.	.
	V 1	.	.	.	o	.
	YY 3	o	o	o	x	.

Food Habit	Fish Fauna	Location 1	2	3	4	5
C	A 1	.	o	o	.	.
	C 1	o	o	o	o	o
	D 4	x	o	o	o	o
	D 14.1	.	o	o	o	.
	D 20.2	.	.	.	.	o
	I 1.1	o	o	o	o	o
	O 2	.	o	o	o	o
	O 4	.	o	o	o	o
	R 1	.	.	.	o	o
	S 1	.	o	o	o	o
CP	B 1.1	.	o	.	o	.
	D 6	.	o	o	o	o
	G 1.1	.	o	o	o	.
	G 3.1	.	.	o	.	.
	H 1.1	o	o	o	o	o
	L 1.1	o	o	o	o	o
	L 1.3	.	o	.	o	o
	L 1.4	o	o	o	o	o
	N 1	.	o	.	.	o
	O 1	o	o	o	o	o
	Q 1	o	o	.	.	.
	Z 6	o	.	.	.	.

Remarks; o : Existing species
x : Recently disappeared
A : Recently appeared

Table 26 FISH FAUNA BY FOOD HABIT
FOR THE KURAU RIVER

Food Habit	Fish Fauna	Location 1	2	3	4	5
H	D 5	.	.	.	.	.
	D 12.1	o	o	o	o	o
	D 12.4	.	.	.	o	o
	D 23	.	.	o	.	.
	O 3.1	o	o	o	o	o
	O 3.2	o	o	o	o	.
OH	D 1.1	.	.	o	.	.
	D 1.2	.	o	x	x	o
	D 14.7	.	o	o	.	o
	D 15	.	.	.	x	.
	D 18.1	.	.	o	.	.
	D 18.2	.	o	o	o	o
	D 18.3	o	o	o	o	o
	O 6	.	o	o	o	o
OC	D 11	.	o	.	.	.
	D 14.8	.	.	o	o	.
	D 14.9	o	.	.	.	.
	D 14.10	o	.	.	.	.
	D 14.11	.	A	.	.	.
	D 21.1	.	.	.	.	o
	E 1	.	.	.	o	o
	U 1	.	.	o	.	o
	YY 3	.	x	.	.	.
	YY 4	.	.	.	.	o

Food Habit	Fish Fauna	Location 1	2	3	4	5
C	A 1	.	o	o	x	.
	C 1	o	o	o	o	o
	D 4	o	o	o	o	o
	D 9	.	.	o	.	.
	D 14.1	.	.	.	o	o
	F 1	.	.	o	.	.
	I 1.1	o	o	o	o	o
	K 1	.	.	.	.	o
	O 2	o	o	o	o	o
	O 4	o	.	o	o	o
	R 1	.	.	.	o	o
	S 1	.	o	o	x	o
CP	B 1.1	.	o	.	o	.
	D 6	.	o	o	o	o
	G 1.1	.	.	o	o	.
	G 3.1	.	o	o	.	.
	H 1.1	o	o	o	o	o
	L 1.1	.	o	o	o	o
	L 1.3	.	o	o	o	o
	L 1.4	o	o	o	o	o
	N 1	.	o	.	.	.
	O 1	o	o	o	o	o

Remarks; o : Existing species
x : Recently disappeared
A : Recently appeared

Table 27 FISH FAUNA BY FOOD HABIT FOR THE PERAK RIVER (1/2)

Food Habit	Fish Fauna	Location 1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
H	D 5	o	o	o	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	D 7.1	.	.	.	.	.	.	.	o	.	.	.	.	.	.	.	.	.
	D 7.2	.	.	x	o	x	o	o	o	o	o	o	o	.	.	o	o	.
	D 12.1	o	.	.	o	o	o	o	o	o	o	.	o	o	o	o	o	o
	D 12.4	o	.	.	.	.	.	o	o	o	o	.	.	.	x	.	.	x
	D 23	.	.	.	o	o	o	o	o	.	o	o	o	o	o	o	o	o
	O 3.1	o	o	.	o	o	o	o	.	.	.	o	o	.	.	o	o	.
	O 3.2	o	o	o	o	o	o	o	o	o	o	o	o	o	.	o	o	.
	O 5	o	.	.	o	x	o	.	.	.	.	o	.	.	.	o	o	.
OH	D 1.1	.	.	o	o	o	o	o	.	.	.	.	.	.	.	.	.	.
	D 1.2	.	.	.	.	.	.	o	.	o	o	.	.	o	o	o	.	o
	D 14.7	o	.	.	.	o	o	o	o	o	o	o	A	.	o	o	o	.
	D 15	o	.	.	o	.	o	o	o	o	o	.	o	o	o	o	o	o
	D 18.1	.	.	.	o	o	.	o	.	.	.	.	o	o	.	o	.	o
	D 18.2	.	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
	D 18.3	o	o	o	.	o	o	o	o	o	o	.	o	.	o	o	o	o
	D 22	.	.	.	.	o	.	o	o	.	.	.	.	.	.	.	.	.
	O 6	.	.	.	o	o	o	o	o	o	o	o	o	o	.	o	o	o
	X 1	o	.	o	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	X 1.1	.	.	.	.	.	o	.	.	.	o	.	.	.	.	.	.	o
	X 1.4	.	.	.	.	.	o	.	.	.	.	.	.	.	.	.	.	.
	X 1.6	o	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
OC	D 2	.	.	.	.	o	.	.	.	o	o	.	.	.	.	.	.	.
	D 11	o	.	x	o	.	.	.	.	.	.	.	.	.	.	.	.	.
	D 13	o	.	.	o	o	o	o	o	o	.	.	o	.	.	.	o	o
	D 14.2	.	.	.	o	o	o	o	o	o	.	o	o	.	o	.	o	o
	D 14.8	o	.	.	o	.	.	.	.	.	.	.	o	o	.	o	.	.
	D 14.9	.	.	.	.	.	.	.	.	.	.	.	.	.	.	o	o	.
	D 14.10	o	.	.	o	.	o	.	.	o	o	.	.	.	.	.	.	o
	D 21.1	.	.	.	.	o	o	o	o	.	o	o	.	o	.	o	o	A
	D 21.2	.	.	.	.	.	o	.	.	.	.	.	.	.	.	.	.	.
	E 1	.	.	.	.	o	.	.	o	.	.	.	.	.	.	.	.	.
	U 1	.	.	.	o	o	o	o	.	.	o	o	o	o	o	o	.	o
	YY 3	o	o	o	.	o	o	o	x	.	o	o	o	x	.	o	o	x

Remarks; o : Existing species

x : Recently disappeared

A : Recently appeared

Table 28 FISH FAUNA BY FOOD HABIT
FOR THE PERAK RIVER (2/2)

Food Habit	Fish Fauna	Location																
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17
C	A 1	o	.	.	.	x	.	o	.	o	.	.	.	.	.	o	.	.
	C 1	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	.	o
	D 4	o	.	.	o	o	o	o	o	o	.	.	.	o	.	o	o	o
	D 9	.	.	.	o	o	o	o	o	o	.	o	o	.	.	x	o	.
	D 14.1	o	.	.	o	o	.	o	o	o	o	.	o	o	o	o	o	o
	D 20.2	.	.	.	.	.	.	.	.	.	.	o	o	.	.	.	.	.
	E 2	.	.	.	.	.	.	.	.	.	.	.	o	.	.	.	.	.
	F 1	.	.	.	.	o	.	.	.	.	.	.	o	.	.	.	.	x
	I 1.1	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
	O 2	o	o	o	o	o	o	.	o	o	o	o	o	.	o	x	o	o
	O 4	o	o	o	o	o	.	.	.	.	o	.	.	.	o	.	o	.
	P 1	.	.	.	.	.	o	.	.	.	.	.	.	.	.	.	.	.
	R 1	.	.	.	o	o	o	o	.	o	.	o	.	o	.	o	.	o
	S 1	o	.	.	o	o	o	o	o	o	o	o	o	o	.	o	o	o
CP	B 1.1	.	.	o	o	o	o	o	o	o	o	o	o	.	.	o	o	o
	B 1.3	.	.	.	.	.	.	o	.	.	.	.	.	.	.	.	.	.
	D 6	o	.	o	o	o	o	o	o	o	o	o	o	.	o	o	o	o
	D 19	o	.	x	o	o	o	o	o	.	.	o	o	.	.	.	.	.
	G 1.1	.	.	.	o	.	o	o	.	o	o	o	.	o	o	o	o	o
	G 2	.	.	.	.	.	.	.	.	.	.	o	.	.	.	.	.	.
	G 3.1	o	.	.	o	o	o	o	o	.	o	o	o	.	x	x	o	o
	H 1.1	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
	J 1.1	o	.	o	o	o	o	.	o	o	o	o	.	.	.	x	o	.
	J 1.2	.	.	o	o	o	o	o	o	o	o	o	.	.	.	.	o	x
	L 1.1	o	o	.	o	o	o	o	o	o	o	o	o	x	o	o	o	o
	L 1.3	o	.	.	o	o	o	o	o	o	o	o	o	o	x	x	o	o
	L 1.4	o	.	o	o	o	o	o	o	o	o	o	o	.	o	o	o	o
	N 1	.	.	x	.	o	.	.	.	o	.	o	o	o	.	o	o	o
	O 1	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o	o
	Q 1	.	.	o	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Z 6	o	o	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Z 7	o	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.	.
	Z 15	o	.	o	.	.	.	.	.	.	.	.	.	.	.	.	.	.

Remarks; o : Existing species
x : Recently disappeared
A : Recently appeared

Table 29 FISH FAUNA BY FOOD HABIT FOR THE KELANG RIVER

Food Habit	Fish Fauna	Location 1	2
H	D 12.1	.	o
	O 3.2	.	o
OH	D 1.1	.	o
	D' 15	.	o
	D' 18	.	o
	D 18.2	.	.
	D 18.3	.	.
	O 6	.	.
OC	1	o	o
	1'	.	o
	D 11	.	o
	YY 3	.	.
C	2	.	o
	3	.	o
	4	.	o
	C 1	.	o
	D 4	.	.
	D 14.1	.	o
	I 1.1	.	.
	M 1	.	o
	O 2	.	o
	S 1	.	o
CP	5	.	o
	D 6	.	o
	H' 1	.	o
	H 1.1	.	o
	L' 1	.	o
	L" 1	.	o
	L 1.1	.	o
	L 1.4	.	o
	O 1	.	o

Source; Ref. 2

Remarks;
1 : Glypotothorax major
1' : G. platypogonoides
2 : Dermogenys sp.
3 : Doryichthys sp.
4 : Poecilia sp.
5 : Macrones wyckii
o : Existing species
x : Recently disappeared
A : Recently appeared

Table 30 FISH FAUNA BY FOOD HABIT
FOR THE MELAKA RIVER

Food Habit	Fish Fauna	Location 1	2
H	D 5	.	o
	D 12.1	o	o
	O 3.1	o	A
	O 3.2	o	o
	O 5	o	.
OH	D 14.7	o	o
	D 18.2	o	o
	D 18.3	.	o
	O 6	o	o
OC	D 11	x	.
	D 14.9	.	o
	E 1	x	o
	T 1	x	.
	U 1	.	o
	YY 3	x	o
C	C 1	o	o
	D 4	.	o
	D 9	A	.
	D 14.1	o	o
	E 2	o	.
	I 1.1	x	o
	O 2	o	o
	S 1	x	o
CP	B 1.1	.	A
	D 6	x	o
	G 2	.	o
	G 3.1	.	o
	H 1.1	o	o
	L 1.1	o	o
	L 1.3	o	o
	L 1.4	o	o
	N 1	o	.
	O 1	o	o
	Z 6	x	.

Remarks; o : Existing species
x : Recently disappeared
A : Recently appeared

Table 31 FISH FAUNA BY FOOD HABIT
FOR THE MUAR RIVER

Food Habit	Fish Fauna	Location 1	2	3	4	5	6	7
H	D 5	.	.	o	.	o	o	.
	D 7.2	.	o	o	o	o	.	.
	D 12.1	o	o	o	o	o	o	o
	D 12.2	.	o	o	.	.	.	.
	D 23	.	o	o	o	o	o	o
	O 3.1	.	o	o	o	o	o	o
	O 3.2	.	A	.	o	.	o	o
	O 5	.	o	o	o	o	.	o
OH	D 1.2	.	.	.	.	o	o	.
	D 14.7	o	A	o	o	o	o	o
	D 15	o	.	.	.	.	.	.
	D 18.1	.	o	o	o	.	o	o
	D 18.2	o	o	o	o	o	o	o
	D 18.3	o	.	o	o	.	.	o
	O 6	o	o	o	o	o	o	o
	X 1	o	.	.	.	.	.	o
OC	D 11	o	.	.	.	.	.	.
	D 13	.	.	.	.	o	.	.
	D 14.2	o	o	o	x	o	.	.
	D 14.8	o	o	o	o	o	o	o
	D 14.10	.	.	.	o	o	.	o
	D 21.2	.	.	A	.	.	.	.
	E 1	.	.	o	o	o	o	o
	U 1	.	.	.	A	o	o	o
	YY 2	o	.	.	.	.	.	.
	YY 3	o	o	o	o	o	x	o

Food Habit	Fish Fauna	Location 1	2	3	4	5	6	7
C	A 1	o	o	o	o	.	o	o
	C 1	o	o	o	o	.	o	.
	D 4	.	o	o	o	o	o	.
	D 9	o	o	o	x	o	.	.
	D 14.1	o	o	o	o	o	o	o
	D 20.1	.	o	o	o	o	.	o
	D 20.2	o	.	.	.	.	.	.
	F 1	.	.	x	o	.	.	o
	I 1.1	o	o	o	o	o	o	o
	K 1	.	o	o	.	.	.	o
	O 2	.	o	o	o	.	o	o
	O 4	.	.	.	.	.	o	.
	P 1	o	o	.	.	.	.	.
	R 1	o	o	o	o	o	.	o
	S 1	o	o	o	o	o	o	o
	Z 1	o	.	.	.	.	.	.
CP	B 1.1	o	o	o	o	o	.	.
	D 6	o	o	o	o	o	o	o
	D 19	o	o	o	o	.	.	.
	G 1.1	o	o	o	o	o	.	o
	G 2	.	o	o	o	.	.	o
	G 3.1	o	o	o	A	o	.	o
	H 1.1	o	o	o	o	o	o	o
	J 1.2	o	o	o	o	o	.	.
	L 1.1	o	o	o	o	o	o	o
	L 1.2	.	o	o	.	.	.	o
	L 1.3	o	x	.	.	.	.	o
	L 1.4	o	o	o	.	o	o	o
	N 1	o	.	.	.	.	.	.
	O 1	.	o	o	o	o	o	o
	Z 2	.	o	o	.	.	.	o
	Z 6	o	.	.	.	.	.	.
	Z 8	.	o	.	.	.	.	.
	Z 15	o	.	.	.	.	.	.

Remarks; o : Existing species
x : Recently disappeared
A : Recently appeared

Table 32 FISH FAUNA BY FOOD HABIT
FOR THE JOHOR RIVER

Food Habit	Fish Fauna	Location 1	2	3
H	D 12.1	.	o	o
	D 12.2	x	.	.
	O 3.2	.	o	.
	O 5	.	o	o
OH	D 14.7	.	A	A
	D 18.1	o	o	.
	D 18.2	.	o	o
	D 18.3	x	o	.
	O 6	.	o	o
	X 1	o	.	.
	X 1.4	o	.	.
	X 1.6	o	.	.
OC	D 14.8	.	o	o
	D 14.10	.	o	.
	D 14.11	.	.	o
	E 1	.	.	o
	T 1	.	.	.
	YY 3	o	o	o
C	A 1	x	o	.
	C 1	.	.	o
	D 4	o	o	o
	D 9	o	o	.
	D 14.1	o	o	o
	D 20.1	o	o	.
	I 1.1	o	o	o
	M 2	.	o	.
	O 2	.	o	.
	P 1	.	.	.
	S 1	o	o	o
	Z 5	o	.	.
	Z 6	o	.	.
CP	B 1.1	o	o	.
	D 6	x	o	o
	D 19	x	o	.
	G 2	.	o	.
	G 3.1	o	o	o
	H 1.1	o	o	o
	H 1.2	.	.	o
	L 1.1	.	o	o
	L 1.4	.	o	o
	N 1	o	.	.
	O 1	.	o	o
	Q 1	.	.	.
	Z 7	o	.	.
	Z 12	o	.	.
	Z 15	o	.	.
	Z 19	o	.	.

Remarks; o : Existing species
x : Recently disappeared
A : Recently appeared

Table 33 FISH FAUNA BY FOOD HABIT FOR THE ENDAU AND ROMPIN RIVERS

Food Habit	Fish Fauna	Location		
		Rompin	Endau	
		1	1	2
H	D 5	o	o	.
	D 7.1	o	o	.
	D 7.2	o	.	.
	D 12.1	o	o	o
	D 12.2	o	o	o
	D 12.4	.	o	.
	O 3.1	.	o	.
	O 3.2	o	o	.
	O 5	o	.	.
OH	D 1.2	o	.	.
	D 14.7	o	.	.
	D 15	o	o	o
	D 18.1	.	o	o
	D 18.2	o	o	o
	D 18.3	o	o	.
	O 6	o	o	o
	X 1	o	o	.
	X 1.1	o	o	.
	X 1.6	o	.	.
	X 1.7	o	.	.
OC	D 9	.	.	.
	D 11	o	.	.
	D 13	o	o	.
	D 14.2	o	o	.
	D 14.7	.	.	o
	D 14.8	o	o	o
	D 14.9	o	o	.
	D 14.10	.	o	o
	D 14.11	o	.	.
	D 21.1	.	.	o
	E 1	.	o	o
	T 1	.	o	.
	U 1	o	.	o
	V 1	.	.	o
	W 1	.	.	o
	YY 3	o	o	o

Food Habit	Fish Fauna	Location		
		Rompin	Endau	
		1	1	2
C	A 1	o	o	o
	C 1	o	o	.
	D 4	o	o	.
	D 9	.	.	o
	D 14.1	o	o	o
	D 20.1	o	o	o
	D 20.2	.	o	.
	F 1	.	o	.
	I 1.1	o	o	o
	K 1	o	.	.
	M 2	.	.	.
	O 2	o	.	.
	O 4	o	o	.
	P 1	.	o	o
	R 1	o	o	.
	S 1	o	o	o
	Z 2	o	o	o
	Z 6	o	.	.
CP	B 1.1	o	o	o
	D 6	o	o	o
	D 19	o	o	o
	G 1.1	o	o	o
	G 1.2	o	o	o
	G 1.3	o	.	o
	G 3.1	o	o	o
	H 1.1	o	o	.
	J 1.2	o	o	o
	J 1.3	o	.	.
	J 1.6	o	o	.
	L 1.1	o	o	o
	L 1.2	.	o	o
	L 1.3	.	o	o
	L 1.4	o	o	.
	O 1	o	o	.
	Q 1	.	o	.
	Z 6	.	o	.
	Z 12	.	o	.
	Z 15	.	o	.
	Z 16	o	.	.
	Z 19	.	o	.

Remarks; o : Existing species
x : Recently disappeared
A : Recently appeared

Table 34 FISH FAUNA BY FOOD HABIT
FOR THE PAHANG RIVER

Food Habit	Fish Fauna	Location 1	2	3	4	5
H	D 3	o	o	o	.	o
	D 5	.	o	o	o	o
	D 7.1	.	.	.	o	o
	D 7.2	o	.	.	o	.
	D 10	.	.	.	o	o
	D 12.1	o	o	.	o	x
	D 12.2	o	.	.	o	.
	D 12.4	.	o	.	o	.
	O 3.1	o	.	.	.	.
	O 3.2	o	o	.	.	.
	O 5	o	o	.	.	.
OH	D 1.2	.	.	.	o	o
	D 14.7	.	.	.	.	A
	D 15	o	o	.	o	o
	D 18.1	o	o	o	o	.
	D 18.2	o	o	o	o	o
	D 18.3	o	o	o	o	o
	O 6	o	o	o	o	o
	X 1.5	.	.	.	.	o
OC	D 2	o	.	.	o	.
	D 13	o	o	o	o	o
	D 14.2	o	o	o	o	o
	D 14.3	o	o	o	o	o
	D 14.4	.	.	.	o	o
	D 14.5	.	.	.	o	o
	D 14.6	.	.	.	o	o
	D 14.8	o	o	o	o	o
	D 14.10	.	o	.	.	o
	D 14.12	.	.	.	o	o
	E 1	.	.	.	o	o
	V 1	.	.	.	o	o
	W 1	o	o	.	o	o
	YY 1	.	.	.	.	o
	YY 2	.	.	.	.	o
	YY 3	o	o	o	o	o
	Z 2	o	.	.	o	o
C	A 1	o	o	o	o	.
	C 1	.	.	.	.	o
	D 4	o	o	o	o	o
	D 9	o	o	o	o	o

Food Habit	Fish Fauna	Location 1	2	3	4	5
	D 14.1	.	.	o	o	o
	D 20.1	o	.	o	o	.
	D 20.2	.	o	.	.	.
	E 2	o	.	.	o	o
	F 1	.	.	.	o	.
	I 1.1	o	o	o	o	o
	I 1.2	.	.	.	o	o
	K 1	.	o	o	o	o
	M 1	.	.	.	o	o
	M 2	o	.	.	.	.
	O 4	o	o	.	.	.
	R 1	o	.	.	o	o
	S 1	o	o	o	o	o
	Z 3	.	.	.	o	o
	Z 4	.	.	.	o	.
	Z 6	o	.	.	.	.
CP	B 1.1	o	o	o	o	o
	D 6	o	o	o	o	o
	D 16	o	o	o	o	o
	D 17	o	.	.	o	.
	D 19	o	o	o	o	x
	G 1.1	o	o	o	o	.
	G 1.3	o	.	.	o	.
	G 2	o	o	.	o	o
	G 3.1	o	o	x	o	o
	H 1.1	o	o	.	.	o
	J 1.1	o	o	.	o	o
	J 1.2	o	o	o	o	o
	J 1.4	.	.	.	o	o
	J 1.5	.	.	.	o	o
	J 1.6	.	.	o	o	o
	L 1.1	o	o	.	o	o
	L 1.2	.	.	o	o	o
	L 1.3	o	o	.	o	o
	L 1.4	o	.	.	o	o
	N 1	.	.	o	o	.
	O 1	o	o	.	.	.
	Q 1	o	.	.	.	.
	Z 7	.	.	.	o	o
	Z 9	.	.	.	o	.
	Z 11	o	.	.	.	.
	Z 16	o	.	.	.	.

Remarks; o : Existing species
x : Recently disappeared
A : Recently appeared

Table 35 FISH FAUNA BY FOOD HABIT FOR THE KUANTAN RIVER

Food Habit	Fish Fauna	Location 1	Location 2
H	D 5	.	o
	D 12.1	o	o
	D 12.4	o	.
	O 3.2	o	o
OH	D 1.1	.	o
	D 1.2	o	o
	D 15	o	o
	D 18.2	o	o
	D 18.3	.	o
	O 6	o	.
	X 1	o	.
OC	D 14.8	o	o
	D 14.10	o	o
	E 1	o	.
	YY 3	o	o
C	A 1	o	.
	C 1	o	o
	D 4	o	o
	D 14.1	o	o
	D 20.1	o	o
	I 1.1	o	o
	K 1	o	.
	O 2	o	.
	O 4	o	.
	P 1	o	.
	R 1	o	o
	S 1	o	o
CP	B 1.1	o	.
	D 6	o	o
	G 2	o	o
	G 3.1	o	.
	H 1.1	o	o
	J 1.2	o	.
	L 1.1	o	o
	L 1.3	o	.
	L 1.4	o	o
	O 1	o	.

Remarks; o : Existing species
x : Recently disappeared
A : Recently appeared

Table 36 FISH FAUNA BY FOOD HABIT
FOR THE TRENGGANU RIVER

Food Habit	Fish Fauna	Location 1	2	3
H	D 5	.	o	.
	D 7.1	o	.	.
	D 7.2	.	.	o
	D 12.1	o	o	o
	D 12.4	.	o	o
	O 3.2	.	o	o
	O 5	.	A	o
OH	D 14.7	A	A	.
	D 15	o	o	o
	D 18.1	.	.	o
	D 18.2	o	o	o
	D 18.3	.	.	o
	O 6	o	o	o
	X 1	o	.	.
	X 1.1	.	.	.
	X 1.2	o	.	o
	X 1.3	.	.	o
	X 1.4	o	.	.
	X 1.5	o	.	.
	X 1.7	o	.	.
OC	D 1.1	.	o	o
	D 1.2	.	o	o
	D 11	.	o	o
	D 14.8	o	o	o
	D 14.10	.	o	o
	E 1	.	o	o
	T 1	.	o	.
	YY 1	.	o	.
	YY 3	o	o	o

Food Habit	Fish Fauna	Location 1	2	3
C	A 1	.	o	o
	C 1	.	o	o
	D 4	.	o	o
	D 14.1	.	o	o
	I 1.1	o	o	o
	K 1	.	o	o
	O 2	.	o	o
	O 4	.	o	.
	R 1	.	o	o
	S 1	o	o	o
	Z 1	o	.	.
CP	B 1.1	o	o	.
	B 1.3	.	o	.
	D 6	o	o	o
	D 16	.	o	o
	D 19	o	.	.
	G 2	o	o	o
	G 3.1	o	o	o
	H 1.1	o	o	o
	L 1.1	o	o	o
	L 1.2	.	.	o
	L 1.3	o	o	o
	L 1.4	o	o	o
	N 1	o	.	o
	O 1	o	o	o
	Q 1	o	o	o
	Z 2	.	o	.
	Z 4	.	o	.
	Z 12	o	.	.
	Z 18	o	.	.

Remarks; o : Existing species
x : Recently disappeared
A : Recently appeared

Table 37 FISH FAUNA BY FOOD HABIT
FOR THE KELANTAN RIVER

Food Habit	Fish Fauna	Location 1	2	3	4	5
H	D 3	o	.	o	o	o
	D 7.1	.	.	o	o	o
	D 7.2	.	o	.	.	.
	D 8	o	o	o	o	o
	D 12.1	o	o	o	.	o
	D 12.4	.	.	o	o	o
	O 3.2	.	o	.	x	.
OH	D 1.1	o	.	o	o	o
	D 1.2	.	o	o	o	o
	D 14.7	o	o	.	.	.
	D 15	o	o	.	o	o
	D 18.1	.	.	o	.	.
	D 18.2	o	o	o	o	o
	D 18.3	o	.	.	.	o
	O 6	o	o	o	o	o
	X 1.2	.	o	.	.	o
	X 1.4	o	.	.	.	.
	X 1.8	o	.	.	.	.
OC	D 11	.	.	o	o	o
	D 14.2	o	o	o	o	.
	D 14.3	.	o	o	.	o
	D 14.8	o	o	o	o	o
	D 14.9	.	o	.	.	.
	D 14.10	.	.	o	.	o
	D 14.11	o	.	o	o	o
	E 1	.	o	.	o	o
	U 1	x	.	.	.	.
	YY 3	o	o	o	o	o

Food Habit	Fish Fauna	Location 1	2	3	4	5
C	A 1	.	o	o	o	o
	C 1	o	o	.	o	o
	D 4	.	o	o	.	.
	D 9	o	.	.	.	.
	D 14.1	o	o	o	o	o
	I 1.1	o	o	o	o	o
	K 1	o	o	o	o	.
	O 2	.	o	.	o	o
	O 4	o	.	.	.	o
	R 1	o	.	o	o	o
	S 1	o	o	o	o	o
CP	B 1.1	o	o	o	o	.
	D 6	.	o	o	o	o
	D 16	o	.	o	o	o
	D 19	o	o	.	.	.
	G 1.1	.	o	o	.	.
	G 2	o	o	o	.	o
	G 3.1	.	o	o	o	.
	H 1.1	o	o	o	o	o
	J 1.1	o	o	o	o	o
	J 1.2	o	o	o	o	.
	L 1.1	o	o	.	o	o
	L 1.3	.	o	o	.	o
	L 1.4	o	o	.	o	o
	O 1	o	o	.	.	.
	Q 1	.	o	.	.	o
	Z 2	.	.	.	o	.
	Z 13	o	.	o	.	.

Remarks; o : Existing species
x : Recently disappeared
A : Recently appeared

Table 38 ECOLOGICAL CONDITION OF FISH FAUNA (1/3)

Location	No. of Fish Types	Of[1/] (%)	Oh[2/] (%)	Nh(≧12)[3/]	Food Habit not Existing
Kedah R.	40	-	-	-	-
Ked. 1	16	40	29	9	Cyp.:OH, Sil.:C, N-O.:OH
Ked. 2	12	30	17	8	Cyp.:H,OC, Sil.:C, N-O.:OH
Ked. 3	28	70	58	12	-
Ked. 4	25	63	46	10	Cyp.:OH, N-O.:OC
Ked. 5	21	53	38	10	Cyp.:H, N-O.:OC
Ked. 6	21	53	38	11	Cyp.:OC
Ked. 7	19	48	33	10	Cyp.:CP, N-O.:OH
Muda R.	50	-	-	-	-
Mud. 1	9	18	23	7	Cyp.:C,CP, Sil,:C, N-O.:OH,C
Mud. 2	31	62	54	11	N-O.:OH
Mud. 3	39	78	73	12	-
Mud. 4	19	38	19	9	N-O.:H,OH,OC
Mud. 5	22	44	42	11	N-O.:OC
Kerian R.	45	-	-	-	-
Ker. 1	14	31	29	9	Cyp.:OH,C,CP
Ker. 2	29	64	46	12	-
Ker. 3	32	71	71	12	-
Ker. 4	29	64	54	12	-
Ker. 5	22	49	33	10	-
Kurau R.	46	-	-	-	-
Kra. 1	14	30	25	9	Cyp.:P, N-O.:OH,CP
Kra. 2	25	54	42	11	-
Kra. 3	29	63	50	12	-
Kra. 4	24	52	54	11	-
Kra. 5	28	61	54	12	-

Remarks; 1/ : Occupation rate of fish types at a location in a river

2/ : Occupation rate of fish types of herbivores and omnivores at a location out of those totals in a river

3/ : No. of types of food habit

Table 39 ECOLOGICAL CONDITION OF FISH FAUNA (2/3)

Location	No. of Fish Types	Of[1] (%)	Oh[2] (%)	Nh(≧12)[3]	Food Habit not Existing
Perak R.	65	-	-	-	-
Per. 1	33	51	46	12	-
Per. 2	13	20	17	8	Cyp.:OC,C,CP, O-N.:OH
Per. 3	19	29	20	10	Cyp.:OC,C
Per. 4	39	60	51	12	-
Per. 5	40	62	51	12	-
Per. 6	41	63	60	12	-
Per. 7	40	62	57	12	-
Per. 8	35	54	49	11	N-O.:OC
Per. 9	34	52	40	11	N-O.:OC
Per. 10	34	54	49	12	-
Per. 11	33	51	34	12	-
Per. 12	35	54	46	12	-
Per. 13	22	34	31	12	-
Per. 14	21	32	29	11	N-O.:H
Per. 15	33	51	51	12	-
Per. 16	36	55	49	12	-
Per. 17	31	48	40	11	N-O.:H
Melaka R.	33	-	-	-	-
Mlk. 1	18	55	47	8	Cyp.:OC,CP, Sil.:C, O-N:OC
Mlk. 2	27	82	80	12	-
Muar R.	55	-	-	-	-
Mua. 1	32	58	46	11	N-O.:H
Mua. 2	38	69	54	12	-
Mua. 3	40	73	65	12	-
Mua. 4	35	64	62	12	-
Mua. 5	33	60	65	12	-
Mua. 6	25	45	50	12	-
Mua. 7	35	64	62	12	-

Remarks; 1/ : Occupation rate of fish types at a location in a river

2/ : Occupation rate of fish types of herbivores and omnivores at a location out of those totals in a river

3/ : No. of types of food habits

Table 40 ECOLOGICAL CONDITION OF FISH FAUNA (3/3)

Location	No. of Fish Types	Of[1/] (%)	Oh[2/] (%)	Nh(≧12)[3/]	Food Habit not Existing
Johor R.	41	-	-	-	-
Joh. 1	13	32	28	8	Cyp.:H,CP, N-O.:H,OC
Joh. 2	29	71	61	12	-
Joh. 3	21	51	50	12	-
Endau R.	56	-	-	-	-
End. 1	49	88	82	12	-
End. 2	33	59	56	11	N-O.:H
Rom. 1	50	89	78	12	-
Pahang R.	74	-	-	-	-
Pah. 1	46	62	54	12	-
Pah. 2	39	53	51	12	-
Pah. 3	28	38	31	11	N-O.:H
Pah. 4	58	78	74	11	N-O.:H
Pah. 5	51	69	74	11	N-O.:H
Kuantan R.	37	-	-	-	-
Kuant. 1	34	92	80	12	-
Kuant. 2	23	62	73	11	N-O.:H
Trengganu	54	-	-	-	-
Treng. 1	27	50	45	10	Cyp.:C, N-O.:H
Treng. 2	40	74	62	12	-
Treng. 3	40	74	66	12	-
Kelantan R.	54	-	-	-	-
Klnt. 1	34	63	54	11	N-O.:H
Klnt. 2	38	70	57	12	-
Klnt. 3	34	63	61	11	N-O.:H
Klnt. 4	32	59	54	11	N-O.:H
Klnt. 5	36	67	68	11	N-O.:H

Remarks; 1/ : Occupation rate of fish types at a location in a river

2/ : Occupation rate of fish types of herbivores and omnivores at a location out of those totals in a river

3/ : No. of types of food habits

Table 41 PROBABLE CAUSES FOR THE RECENT CHANGE OF THE RIVER FLOW PATTERN (1/3)

Code of Location	Recent River Flow Pattern Compared with Last Time	
	Pattern 1/ :	Probable Cause
Ked.1	RFI	: ?
Ked.2	FS	: Construction of tidal barrage at upstream
Ked.3	FS	: Construction of irrigation canals
Ked.4	RFI	: ?
Ked.5	N	: -
Ked.6	(Water level decrease faster because of dredging and broadening)	
Ked.7	FS	: Cleaning of irrigation canals (No more floods in September and October)
Mud.1	FS	: Construction of tidal barrage
Mud.2	RFD, DFD	: Water use of irrigation upstream and decrease in rainfall
Mud.3	DFD	: Construction of dam upstream
Mud.4	FS	: ?
Mud.5	FS	: Construction of dam upstream
Ker.1	FS	: ?
Ker.2	FS	: Construction of tidal barrage at downstream
Ker.3	RFI, FU	: Getting shallower (Collapse of river banks)
Ker.4	FS	: Clearing of river from bushes and trees
Ker.5	FS	: Clearing and cleaning of river from bushes and trees
Kra.1	RFI	: ?
Kra.2	RFI	: ?
Kra.3	N	: -
Kra.4	RFI, DFD	: Getting shallower (Collapse of river banks)
Kra.5	DFD, FU	: Construction of irrigation canals and JKR water supply

Remarks; 1/ : Recent river flow patterns are expressed by the following symbols:
RFI: In rainy season, the flow has increased more.
RFD: In rainy season, the flow has decreased less.
DRI: In dry season, the flow has increased more.
DFD: In dry season, the flow has decreased less.
FS : The flow has become more stable than before.
FU : The flow has become more unstable than before, and
N : The flow pattern has not ever changed.

Table 42 PROBABLE CAUSES FOR THE RECENT CHANGE OF THE RIVER FLOW PATTERN (2/3)

Code of Location	Recent River Flow Pattern Compared with Last Time	
	Pattern 1/ :	Probable Cause
Per.1	N	: -
Per.2	FS	: ? (Seldom flood nowadays)
Per.3	N	: -
Per.4	RFD, FS	: Construction of Temenggor Dam
Per.5	RFD, FS	: ?
Per.6	FS	: ? (Less flood nowadays)
Per.7	FS	: Construction of Chenderoh Dam
Per.8	FS	: Construction of Temenggor Dam
Per.9	RFI, DFD	: Logging and land clearing upstream
Per.10	FS	: Construction of dam upstream
Per.11	RFI	: ?
Per.12	RFI, DFD	: ?
Per.13	RFI	: ?
Per.14	FS	: Two dams are existing (H.E.P. and municipal supply)
Per.15	N	: -
Per.16	FS	: ?
Per.17	FS	: Construction of dam upstream (H.E.P.)
Mlk.1	FRD	: ?
Mlk.2	FS	: Getting deeper (River bed no longer sandy)
Mua.1	RFI	: ?
Mua.2	N	: -
Mua.3	RFI	: Getting shallower
Mua.4	RFI, DFD	: Erosion
Mua.5	RFI, DFD	: ?
Mua.6	RFI, FU	: Diversion of upstream river course
Mua.7	DFD	: Land clearing
Joh.1	RFI	: ?
Joh.2	RFD	: ?
Joh.3	RFD	: No longer flooded nowadays
End.1	N	: -
End.2	RFI (Quick change of water level)	: Getting shallower
Rom.1	RFI	: ?

Remark; 1/ : Same as Table 41

Table 43 PROBABLE CAUSES FOR THE RECENT CHANGE OF THE RIVER FLOW PATTERN (3/3)

Code of Location	Recent River Flow Pattern Compared with Last Time	
	Pattern [1/] :	Probable Cause
Pah.1	RFI, DFD	: Getting shallower
Pah.2	RFI	: Getting shallower
Pah.3	RFI	: Getting shallower
Pah.4	RFI	: Getting shallower
Pah.5	RFI	: Getting shallower
Kua.1	RFI	: Getting shallower (Easily flooded nowadays)
Kua.2	DFD	: ?
Trng.1	RFI	: Getting shallower
Trng.2	RFI, DFD	: ?
Trng.3	RFI, DFD	:
Kltn.1	RFI, DFD	: Getting shallower
Kltn.2	RFI, DFD	: ?
Kltn.3	RFI, DFD	: Getting shallower (Easily flooded nowadays)
Kltn.4	RFI	: Getting shallower
Kltn.5	RFI	: Getting shallower

Remark; 1/ : Same as Table 41

Table 44 PROBABLE CAUSES FOR THE RECENT DECREASE OF FISH CATCH (1/3)

Code of Location	Trend of Fish Catch During Recent 10 Years: Fish Catch 1/	Probable Causes
Ked.1	CD, ATD	: Tidal barrage (Accumulation of water from paddy field; Discharge from fertilizer (factory).
Ked.2	CD, STD	: Tidal barrage (Odor of water inside the barrage).
Ked.3	CD, NTA	: Pedu Dam (Discharge of sugar factory is not diluted during dry season).
Ked.4	CD, STD, STA	: Pedu Dam (No longer fish migration; Discharge from sugar factory).
Ked.5	CD, ATD	: ? (Fishing is not particularly important here).
Ked.6	CD	: - (Fishing is part-time occupation)
Ked.7	CD, NTA	: Discharge from fertilizer factory? (Priority is paddy planting).
Mud.1	CD, ATD	: Construction of Muda Dam.
Mud.2	CD, STI	: Increase in fishing population; Application of pesticide to paddy field.
Mud.3	CD, STD	: Construction of Muda Dam (Decrease of river flow); Discharge from rubber factory.
Mud.4	CD, ATD	: ? (Fishing is only part-time activity).
Mud.5	CD, STI, STD	: Construction of dam; Increase in fishing population.
Ker.1	CD, ATD	: Construction of dam; Discharge from factories; Pesticide in paddy field.
Ker.2	CD, ATD	: Construction of irrigation weir; Discharge from oil palm factory.
Ker.3	CD, STD, STE	: Discharge from mining and rubber factory.
Ker.4	CD, STD, STA	: Application of pesticide to paddy field.
Ker.5	CD, ATD	: Application of pesticide; Siltation; Clearing bushes in river.

Remarks; 1/ : Recent trend of fish catch by riverine fishing is expressed by the following symbols;

CI : Fish catch has increased in recent 10 years.
CD : Fish catch has decreased in recent 10 years.
N : No change.
STI : Some types of fish have increased.
STD : Some types of fish have decreased.
ATD : All types of fish have decreased.
NTA : New types of fish have appeared.
STE : Some types of fish have extinguished.

Table 45 PROBABLE CAUSES FOR THE RECENT DECREASE OF FISH CATCH (2/3)

Code of Location	Trend of Fish Catch During Recent 10 Years	
	Fish Catch 1/	Probable Causes
Kra.1	CD, STD, STA	: Application of pesticide to paddy field (Priority is paddy planting).
Kra.2	CI, STI, STD	: ? (Shrimp decline caused by application of fertilizer and pesticide).
Kra.3	CD, ATD, STE	: Application of poison to reservoir and pesticide to paddy field.
Kra.4	CD, ATD, STE	: Getting shallower; Discharge from rubber factory; Pesticide.
Kra.5	CD, ATD	: Decrease of river flow; Application of pesticide and Tuba poison for fishing.
Per.1	CD, ATD	: Application of pesticide and fertilizer; Increase of turbidity.
Per.2	N	: -
Per.3	CD, ATD, STE	: ?
Per.4	CD, STD, STA	: Decrease of river flow caused by dam construction; Usage of Tuba poison (No longer); Application of fertilizer to paddy field.
Per.5	CD, STD, STE	: Decrease of river flow.
Per.6	CD, ATD	: Intensity of mining; Increase of fishing population; Less food in river.
Per.7	CD, STD, STA	: Increase in turbidity.
Per.8	CD, STD, STE	: Construction of dam (Prevent fish from immigration
Per.9	CD, STD	: Construction of dam; Collapse of river bank; Logging (River bed covered by mud/silt).
Per.10	CD, STD	: Mining activity (Increase in turbidity).
Per.11	CD, ATD	: Mining activity (Much fish mortality).
Per.12	CD, STD, STA	: Land clearing for farming (Siltation increased).
Per.13	CD, STE	: Tin mining.
Per.14	CD, STD, STE	: Increase of fishing population; Chlorine discharge from JKR.
Per.15	CD, STD, STE	: Discharge from palm oil factory.
Per.16	CD, ATD	: Application of pesticide to paddy field.
Per.17	CD, STD, STE	: Construction of dam.
Mlk.1	CD, STE, STA	: Discharge of rubber factory; Tidal barrage.
Mlk.2	CD	: ?

Remark; 1/ : Same as Table 44

Table 46 PROBABLE CAUSES FOR THE RECENT DECREASE OF FISH CATCH (3/3)

Code of Location	Trend of Fish Catch During Recent 10 Years: Fish Catch 1/	Probable Causes
Mua.1	CD	?
Mua.2	CD, ATD, STA	Discharge from palm oil mill (Once a month).
Mua.3	CD, ATD, STA	?
Mua.4	CD, ATD, STD	Application of poison for fishing.
Mua.5	CD, ATD, STA	?
Mua.6	CD, STD	Clearing of river.
Mua.7	CD	?
Joh.1	CD, ATD	Discharge of palm oil factory.
Joh.2	N	-
Joh.3	CD, ATD	?
End.1	CI	Usage of modern fishing gear.
End.2	CD, ATD,	?
Roml	CD	? (Much fish mortality once a year, started from 1976).
Pah.1	CD, ATD	?
Pah.2	CD, ATD	?
Pah.3	CD, ATD	Getting shallower (since 10 years ago).
Pah.4	CD, STD	Getting shallower; Application of poison for fishing.
Pah.5	CD, ATD	Application of poison for fishing.
Kua.1	CD, ATD	?
Kua.2	CD, ATD	?
Trng.1	CD, ATD	?
Trng.2	CD, ATD	Construction of Dam; Logging upstream.
Trng.3	CD, ATD	?
Kltn.1	CD, STD, STI	Change of river bed (No more spawning place).
Kltn.2	CI, STI	No more application of explosives for fishing.
Kltn.3	CI, STI	?
Kltn.4	CD, ATD	Getting shallower (No more spawning place).
Kltn.5	CD, ATD	Getting shallower; Increase of fishing population.

Remark; 1/ : Same as Table 44

Table 47 DEVELOPMENT ACTIVITIES ALONG THE RIVERS (1/3)

Code of Location	Development Activities Along the Rivers[1/]					
	D	B	Irr.	Min.	Fac.	Lgg.
Ked. 1	ID(?)	(?)	(?)	-	-	-
Ked. 2	ID(3-10)	TB(10)	(3-10)	-	RF(5-10)	(10)
Ked. 3	ID(3-10)	IB(?)	(10)	-	SF	(no longer)
Ked. 4	-	-	-	-	SF(?)	(10)
Ked. 5	-	-	-	-	-	(2-5)
Ked. 6	ID(3-10)	?	(0-2)	-	-	-
Ked. 7	ID(3-10)	TB(10)	(?)	-	-	(10)
Mud. 1	ID(3-10)	TB(5-10)	(10)	-	-	-
Mud. 2	ID(10)	TB(10)	(10)	-	-	(10)
Mud. 3	ID(10)	-	(10)	-	-	(no longer)
Mud. 4	ID(3-10)	-	(2-10)	-	-	(no longer)
Mud. 5	-	-	-	M(10)	-	(no longer)
Mud. 6	WD(0-3)	-	-	-	-	(10)
Ker. 1	ID(10)	TB(2-5)	(10)	-	P&RF(10)	-
Ker. 2	-	TB(2-5)	(2-10)	(10)	PF(0-2)	(2-5)
Ker. 3	D(3-10)	-	-	M(2-10)	R(10)	(no longer)
Ker. 4	ID(10)	-	(?)	-	-	(10)
Ker. 5	-	-	(10)	-	-	(0-2)
Kra. 1	ID(10)	-	(10)	-	-	(10)
Kra. 2	IWD(10)	-	-	-	PF(2-5)	-
Kra. 3	-	IW(10)	(10)	-	-	-
Kra. 4	ID(3-10)	-	(10)	-	RF(5-10)	(10)
Kra. 5	WD(0-3)	construction	(10)	-	-	-

Remarks; 1/: Items of development activities relating to water use development are expressed by the following symbols together with years of the activity period in parenthesis;

D: Dam (HD = Hydroelectric dam, FD = Flood Control dam, ID = Irrigation dam, and WD = Water Supply dam)

B: Barrage (TB = Tidal barrage, IB = Irrigation intake)

Irr: Big scale irrigation area

Min: Minins (TM = Tin mining)

Fac: Factory (PF = Palm oil factory, RF = Rubber factory, SF = Sugar factory and IF = Other industrial factory)

Lgg: Logging upstream

Table 48 DEVELOPMENT ACTIVITIES ALONG THE RIVERS (2/3)

Code of Location	Development Activities Along the Rivers 1/					
	D	B	Irr.	Min.	Fac.	Logg.
Per. 1	-	-	(10)	-	PF(10)	(?)
Per. 2	D(?)	-	-	?	-	?
Per. 3	-	-	-	-	P&IF(10)	(10)
Per. 4	HD(10)	(?)	(10)	-	-	(10)
Per. 5	(?)	-	(10)	construction	-	(10)
Per. 6	HD(10)	-	-	TM(10)	PF(5-10)	(10)
Per. 7	HD Site(10)	-	-	?	-	(10)
Per. 8	HD(3& 10)	-	-	-	-	(10)
Per. 9	HD(3-10)	-	-	TM(10)	-	(10)
Per. 10	D(?)	-	-	TM(10)	-	-
Per. 11	D(3-10)	?	-	TM(2-10)	?	?
Per. 12	D(3-10)	-	-	TM(10)	-	(no longer)
Per. 13	HD(10)	-	-	TM(10)	-	-
Per. 14	D(10)	-	-	?	-	(10)
Per. 15	-	-	(10)	-	P&RF(5-10)	(no longer)
Per. 16	-	-	(10)	TM(10)	-	(0-2)
Per. 17	D(10)	-	-	-	-	(no longer)
Mlk. 1	WD(10)	TB(-)	-	-	RF(5-10)	-
Mlk. 2	WD(10)	?	-	-	-	-
Mua. 1	-	-	-	?	P&RF(10)	(no longer)
Mua. 2	-	-	-	-	P&RF(10)	(no longer)
Mua. 3	-	-	-	-	P&RF(10)	(5-10)
Mua. 4	-	?	-	-	P&RF(10)	(10)
Mua. 5	-	-	(2-10)	-	RF(10)	-
Mua. 6	-	-	-	-	-	(10)
Mua. 7	-	-	-	-	RF(10)	-
Joh. 1	-	-	-	TM(10)	PF(10)	(10)
Joh. 2	?	-	-	TM(?)	P&RF(?)	?
Joh. 3	-	-	-	-	RF(10)	?
End. 1	-	-	(10)	TM(10)	PF(10)	(0-2)
End. 2	-	-	(10)	-	PF(2-5)	(10)
Rom. 1	-	-	-	(?)	PF(?)	(?)
Pah. 1	-	-	-	-	-	(10)
Pah. 2	-	-	?	-	P&RF(10)	(5-10)
Pah. 3	-	-	?	-	P&RF(?)	(10)
Pah. 4	-	-	-	-	P&RF(10)	(10)
Pah. 5	-	-	-	M(?)	RF(10)	(10)
Kua. 1	-	-	-	TM(10)	P&RF(10)	(10)
Kua. 2	-	-	-	TM(10)	-	-

Remarks; 1/ : Same as Table 47

Table 49 DEVELOPMENT ACTIVITIES ALONG THE RIVERS (3/3)

Code of Location	Development Activities Along the Rivers 1/					
	D	B	Irr.	Min.	Fac.	Lgg.
Trng. 1	HD(0-3)	-	(10<)	-	RF(5-10)	(10<)
Trng. 2	HD(0-3)	-	-	-	-	(10<)
Trng. 3	-	(?)	-	-	-	(10<)
Kltn. 1	-	-	(2-10)	-	-	(10<)
Kltn. 2	-	-	-	-	RF(10<)	(10<)
Kltn. 3	-	-	-	-	RF(5-10)	(10<)
Kltn. 4	-	-	-	-	RF(10<)	(5-10)
Kltn. 5	-	-	-	-	-	(10<)

Remarks; 1/ : Same as Table 47

Table 50 WATER QUALITY OF RIVERS INTERVIEWED[1/] (1/3)

Code of Location	pH	Suspended Solid (mg/lit)	BOD (mg/lit)	Ammonial Nitrogen (mg/lit)	Nitrate Nitrogen (mg/lit)
Ked. 1	-	-	-	-	-
Ked. 2	5.8-7.0	25-100	2-10	Nil-0.67	Nil-0.65
Ked. 3	6.3-7.5	10-55	2-4	Nil-0.21	Nil-0.40
Ked. 4	6.3-7.4	5-155	1-3	Nil-0.14	Nil-0.60
Ked. 5	-	-	-	-	-
Ked. 6	-	-	-	-	-
Ked. 7	-	-	-	-	-
Mud. 1	6.5-6.8	15-110	Nil-2	Nil-1.0	Nil-0.45
Mud. 2	6.0-6.7	35-50	1-6	Nil-0.03	Nil-0.40
Mud. 3	6.2-6.6	5-90	1-2	Nil-0.05	0.2-0.4
Mud. 4	6.4-6.7	20-80	Nil-4	Nil-0.03	0.05-0.46
Mud. 5	-	-	-	-	-
Mud. 6	-	-	-	-	-
Ker. 1	5.4	5	2	0.12	0.05
Ker. 2	5.0	10	3	0.08	0.10
Ker. 3	-	-	-	-	-
Ker. 4	4.9	40	4	0.05	0.05
Ker. 5	-	-	-	-	-
Kra. 1	7.6	2,040	1.6	1.03	1.08
Kra. 2	7.0	1,135	1.0	0.20	2.09
Kra. 3	7.1	15	2.0	0.01	0.69
Kra. 4	-	-	-	-	-
Kra. 5	7.4	5	0.4	0.01	0.54

Remarks; 1/ : Water quality data prepared by DOE in 1978 (Ref. 1)

Table 51 WATER QUALITY OF RIVERS INTERVIEWED[1/] (2/3)

Code of Location	pH	Suspended Solid (mg/lit)	BOD (mg/lit)	Ammonial Nitrogen (mg/lit)	Nitrate Nitrogen (mg/lit)
Per. 1	6.9-7.7	105-995	1.3-1.8	0.02-0.16	-
Per. 2	7.3-7.5	95-170	0.4-1.3	0.04-1.14	-
Per. 3	6.7-7.5	175-370	0.8-1.3	0.05-0.12	-
Per. 4	7.3-7.5	20-65	1.0-4.5	0.04-1.47	-
Per. 5	7.3-7.6	25-65	0.4-5.7	0.04-0.16	-
Per. 6	7.5-7.9	5-80	0.7-2.0	0.02-0.33	-
Per. 7	-	-	-	-	-
Per. 8	7.5-7.7	15-75	1.1-3.4	0.05-0.14	-
Per. 9	(7.8)	20-100	0.5-3.7	0.06-0.51	-
Per. 10	-	-	-	-	-
Per. 11	7.1-8.0	395-2005	3.0-3.1	0.02-0.64	-
Per. 12	5.5-7.5	5-25	0.7-4.4	0.02-0.59	-
Per. 13	6.3-7.9	20-2690	1.3-4.4	0.05-0.64	-
Per. 14	-	-	-	-	-
Per. 15	-	-	-	-	-
Per. 16	-	-	-	-	-
Per. 17	-	-	-	-	-
Mlk. 1	5.1-6.5	5-25	1.1-2.1	0.3-1.5	0.02-0.6
Mlk. 2	5.7-6.5	10-285	0.7-2.8	0.02-0.48	0.54-2.4
Mua. 1	4.0-6.3	10-200	1	0.02-0.16	0.06-0.38
Mua. 2	5.7-6.8	15-30	1-9	0.04-0.18	0.08-0.53
Mua. 3	5.8-6.7	15-100	1-4	0.10-0.26	0.02-0.36
Mua. 4	6.1-7.4	15-130	Nil-3	0.01-0.13	0.22-0.44
Mua. 5	6.3-7.2	15-35	Nil-5	0.01-0.08	0.20-0.44
Mua. 6	-	-	-	-	-
Mua. 7	-	-	-	-	-
Joh. 1	6.9-7.4	-	1-2	0.02-0.08	0.06-0.34
Joh. 2	6.8	-	Nil-3	0.01-0.24	0.04-0.62
Joh. 3	6.2	-	Nil-14	0.19-1.4	0.04-1.0
End. 1	6.3-7.7	20-355	1.8-5.1	0.14-0.19	0.06-0.54
End. 2	-	-	-	-	-
Rom. 1	-	-	-	-	-

Remarks; 1/ : Same as in Table 50

Table 52 WATER QUALITY OF RIVERS INTERVIEWED[1/] (3/3)

Code of Location	pH	Suspended Solid (mg/lit)	BOD (mg/lit)	Ammonial Nitrogen (mg/lit)	Nitrate Nitrogen (mg/lit)
Pah. 1	5.9-7.6	5-76	0.5-2.5	0.02-0.12	0.12-1.08
Pah. 2	6.4	40-55	1.7	Nil	0.75
Pah. 3	-	-	-	-	-
Pah. 4	6.1-7.0	6-30	0.7-2.1	0.04-0.07	0.15-0.78
Pah. 5	6.1-6.8	7-191	0.5-1.9	0.02-0.20	0.02-0.42
Kua. 1	5.6	9-30	0.4-1.1	0.02-0.1	-
Kua. 2	-	-	-	-	-
Trng. 1	-	-	-	-	-
Trng. 2	6.2-7.7	5-55	0.1-1.4	Nil-0.26	0.26-0.50
Trng. 3	-	-	-	-	-
Kltn. 1	-	-	-	-	-
Kltn. 2	7.3-8.2	35-70	0.2-0.9	Nil-0.04	0.15-1.3
Kltn. 3	7.0-8.1	15-220	0.1-1.6	Nil-0.13	0.15-0.3
Kltn. 4	-	-	-	-	-
Kltn. 5	-	-	-	-	-

Remarks; 1/ : Same as in Table 50

Table 53 COMPLAINTS ABOUT PRESENT RIVER CONDITION (1/3)

Code of Location	Complaints about Present River Condition	
	Complaints[1/]	Action against it
Ked. 1	IF,TB (Its discharge killed fish 4 months ago)	none
Ked. 2	TB (Fish catch has declined sharply)	none
Ked. 3	SF,ID (Its discharge killed fish)	Complaint made
Ked. 4	ID,SF (River water uses were interrupted)	Complaint made
Ked. 5	None	-
Ked. 6	None	-
Ked. 7	If ? (Decrease of fish catch)	none
Mud. 1	ID ? (Decrease of fish catch	none
Mud. 2	ID,RF (Decrease of fish catch)	none
Mud. 3	ID,RF (River water uses were interrupted since 7 years ago. Decrease of fish catch)	Complaint made
Mud. 4	None	-
Mud. 5	RF (River water uses were interrupted since 6 years before)	?
Mud. 6	WD ?	
Ker. 1	PF,TB (Decrease of fish catch)	Complaint made
Ker. 2	TM,TB (River water uses were interrupted because of heavy siltation since 4 years before)	Complaint made
Ker. 3	TM (Fishes were kiled. Water is oily, muddy and smelly since 4 years before)	Complaint made
Ker. 4	Irr. (Decrease of fish catch)	none
Ker. 5	Irr. (Decrease of fish catch)	none

Remarks; 1/ : Complaints of the present river condition are expressed by the following symbols:

D: Dam (HD = Hydroelectric dam, FD = Flood Control dam, ID = Irrigation dam, and WD = Water Supply dam)
B: Barrage (TB = Tidal barrage, IB = Irrigation barrage)
Irr: Big scaled irrigation area
Min: Mining (TM = Tin Mining)
Fac: Factory (PF = Palm oil factory, RF = Rubber factory, SF = Sugar factory and IF = Other industrial factories)
Lgg: Logging upsteam
O: Others

Table 54 COMPLAINTS ABOUT PRESENT RIVER CONDITION (2/3)

Code of Location	Complaints about Present River Condition	
	Complaints[1/]	Action against it
Kra. 1	Irr.O (Pumped up water from irrigation is not including live fish)	none
Kra. 2	Irr. (Decrease of shrimp catch	none
Kra. 3	O (Application of poison to fish. But no longer)	none
Kra. 4	RF (Water became bad odor since 5 years before)	Complaint made
Kra. 5	O (Application of pesticide and poison for fishing)	none
Per. 1	Irr.O (Water has become dirty and turbid. Collapse of river bank)	none
Per. 2	None	-
Per. 3	PF (River water uses were interrupted since three years before)	Complaint made
Per. 4	D,Lgg.	none
Per. 5	O (River flow has decreased. Insufficient for paddy cultivation since 10 years before)	none
Per. 6	TM	none
Per. 7	None	-
Per. 8	D (Decrease of fish catch)	none
Per. 9	D,Lgg. (Decrease of fish catch)	none
Per. 10	TM (River water uses were interrupted since 5 years before)	?
Per. 11	TM (Fish catch decreased since 10 years before	none
Per. 12	O (Discharge of cow dung. River water uses were interrupted since 5 years before)	?
Per. 13	TM (River water uses were interrupted since more than 10 years before)	Complaint made
Per. 14	None	-
Per. 15	PF (Fish were killed. Started 5 years ago)	Complaint made
Per. 16	Irr. (Decrease of fish catch)	none
Per. 17	D (Decrease of fish catch)	none
Mlk. 1	RF (Much fish killed. River became dirty)	none
Mlk. 2	WD (River flow has decrease. Not much water for irrigation)	none

Remarks; 1/ : Same as in Table 53

Table 55 COMPLAINTS ABOUT PRESENT RIVER CONDITION (3/3)

Code of Location	Complaints about Present River Condition	
	Complaints[1/]	Action against it
Mua. 1	None	-
Mua. 2	FF (Water has become dirty since 3 years before)	none
Mua. 3	PF (Water has become dirty and smelly since three years before	none
Mua. 4	None	-
Mua. 5	None	-
Mua. 6	None	-
Mua. 7	None	-
Joh. 1	PF (Recent fish catch is only 25% of that of last time)	Complaint made
Joh. 2	None	-
Joh. 3	None	-
End. 1	None	-
End. 2	PF (Water has become dirty. Fish were killed 3 times a year)	none
Rom. 1	None	-
Pah. 1	None	-
Pah. 2	None	-
Pah. 3	None	-
Pah. 4	Application of poison to fishing	none
Pah. 5	Application of poison to fishing	none
Kua. 1	None	-
Kua. 2	None	-
Trng. 1	None	-
Trng. 2	HD,Lgg. (Decrease of fish catch)	none
Trng. 3	None	-
Kltn. 1	None	-
Kltn. 2	0 (River bank collapsed by using explosives for fishing)	none
Kltn. 3	FF (River water uses were interrupted since 1 year before)	none
Kltn. 4	None	-
Kltn. 5	None	-

Remarks; 1/ : Same as in Table 53

Table 56 RELATION BETWEEN DEVELOPMENT ACTIVITIES AND FISH FAUNA OF THE KEDAH RIVER

Indexes/1	Ked.1	Ked.2	Ked.3	Ked.4	Ked.5	Ked.6	Ked.7
A. Condition of Fish Fauna/2							
Of (%)	40	30	70	63	53	53	48
Oh (%)	29	17	58	46	38	38	33
Nh (No. ≦ 12)	9	8	12	10	10	11	10
B. Development Activities	TB,I	TB,ID I,F	ID,IW I	F,L	L	IW,I	I,F
C. Water Quality	-	BOD 2-10 ppm	BOD 2-4 ppm	-	-	-	-
D. Information Obtained by Interview Survey	-	stable	stable	unstable	-	stable	stable
a. River flow change & probable causes		TB	ID,I	?		RI	RI
b. Fish catch decrease & probable causes	TB,F	TB	ID,F	ID,F	?	?	F
c. Complaints about fish catch decrease & domestic water use (BOD)	(TB,F)	(TB)	ID,F	F	-	-	(F)

Remarks; /1: Indexes are expressed by the following symbols;
TB (Tidal barrage), ID (Irrigation dam), HD (Hydropower dam), WD (Water supply dam), IW (Irrigation weir), I (Irrigation water intake and canal), RI (River improvement), RD (River diversion), M (Mining), F (Factory discharge), LO (Land opening), HW (Highway construction), L (Logging), AC (Agricultural chemicals), S (River is getting shallow), ST (Siltation), P (Poison application), T (Turbidity)

/2: Of: Occupation of fish types out of those in a whole river
Oh: Occupation of herbivorous and omnivorous fishes out of those in a whole river
Nh: No. of types of food habit in the basic fish fauna

/3: Complaints in parenthesis were not taken any actions to the Government.

Table 57 RELATION BETWEEN DEVELOPMENT ACTIVITIES AND FISH FAUNA OF THE MUDA RIVER

Indexes /1	Mud.1	Mud.2	Mud.3	Mud.4	Mud.5
A. Condition of Fish Fauna /2					
Of (%)	18	62	78	38	44
Oh (%)	23	54	73	19	42
Nh (No. ≦ 12)	7	11	12	9	11
B. Development Activities	TB, ID I	TB, ID I	ID, IF	ID, I	WD, L F
C. Water Quality	Nil	BOD 1-6 ppm	Nil	BOD 1-4 ppm	-
D. Information Obtained by Interview Survey	stable	stable	stable	stable	stable
a. River flow change & probable causes	TB	ID	ID	ID	WD
b. Fish catch decrease & probable causes	ID	AC	ID, F	?	WD
c. Complaints about fish catch decrease & domestic water use (BOD)	(ID)	(ID, F)	ID, F	-	WD, F

Remarks; /1: Indexes are expressed by the following symbols;
TB (Tidal barrage), ID (Irrigation dam), HD (Hydropower dam), WD (Water supply dam), IW (Irrigation weir), I (Irrigation water intake and canal), RI (River improvement), RD (River diversion), M (Mining), F (Factory discharge), LO (Land opening), HW (Highway construction), L (Logging), AC (Agricultural chemicals), S (River is getting shallow), ST (Siltation), P (Poison application), T (Turbidity)

/2: Of: Occupation of fish types out of those in a whole river
Oh: Occupation of herbivorous and omnivorous fishes out of those in a whole river
Nh: No. of types of food habit in the basic fish fauna

/3: Complaints in parenthesis were not taken any actions to the Government.

Table 58 RELATION BETWEEN DEVELOPMENT ACTIVITIES AND FISH FAUNA OF THE KERIAN RIVER

Indexes/1	Ker.1	Ker.2	Ker.3	Ker.4	Ker.5
A. Condition of Fish Fauna/2					
Of (%)	31	64	71	64	49
Oh (%)	29	46	71	54	33
Nh (No. ≦ 12)	9	12	12	12	10
B. Development Activities	TB, I F	TB, I F, M	F, M	ID, I L	I, L
C. Water Quality	pH 5.4	pH 5.0	-	pH 4.9	-
D. Information Obtained by Interview Survey	stable	stable	unstable	stable	stable
a. River flow change & probable causes	?	TB	S	RI	RI
b. Fish catch decrease & probable causes	TB, F AC	TB, F	M, F	RI, AC, ST	AC
c. Complaints about fish catch decrease & domestic water use (BOD)	TB, F	TB, M	M	(I)	(I)

Remarks; /1: Indexes are expressed by the following symbols;
TB (Tidal barrage), ID (Irrigation dam), HD (Hydropower dam), WD (Water supply dam), IW (Irrigation weir), I (Irrigation water intake and canal), RI (River improvement), RD (River diversion), M (Mining), F (Factory discharge), LO (Land opening), HW (Highway construction), L (Logging), AC (Agricultural chemicals), S (River is getting shallow), ST (Siltation), P (Poison application), T (Turbidity)

/2: Of: Occupation of fish types out of those in a whole river
Oh: Occupation of herbivorous and omnivorous fishes out of those in a whole river
Nh: No. of types of food habit in the basic fish fauna

/3: Complaints in parenthesis were not taken any actions to the Government.

Table 59 RELATION BETWEEN DEVELOPMENT ACTIVITIES AND FISH FAUNA OF THE KURAU RIVER

Indexes/1	Kra.1	Kra.2	Kra.3	Kra.4	Kra.5
A. Condition of Fish Fauna/2					
Of (%)	30	54	63	52	61
Oh (%)	25	42	50	38	54
Nh (No. ≦ 12)	9	11	12	11	12
B. Development Activities	ID, I	ID, F	ID, I	IW, I F, L	WD, I
C. Water Quality	SS 2,040ppm	SS 1,135ppm	Nil	-	Nil
D. Information Obtained by Interview Survey	stable	stable	stable	unstable	stable
a. River flow change & probable causes	ID	ID	ID	S	I, WD
b. Fish catch decrease & probable causes	AC	AC	AC	AC, F S	AC
c. Complaints about fish catch decrease & domestic water use (BOD)	(I)	(I)	(AC, P)	F	(AC, P)

Remarks; /1: Indexes are expressed by the following symbols;
TB (Tidal barrage), ID (Irrigation dam), HD (Hydropower dam), WD (Water supply dam), IW (Irrigation weir), I (Irrigation water intake and canal), RI (River improvement), RD (River diversion), M (Mining), F (Factory discharge), LO (Land opening), HW (Highway construction), L (Logging), AC (Agricultural chemicals), S (River is getting shallow), ST (Siltation), P (Poison application), T (Turbidity)

/2: Of: Occupation of fish types out of those in a whole river
Oh: Occupation of herbivorous and omnivorous fishes out of those in a whole river
Nh: No. of types of food habit in the basic fish fauna

/3: Complaints in parenthesis were not taken any actions to the Government.

Table 60 RELATION BETWEEN DEVELOPMENT ACTIVITIES AND FISH FAUNA OF THE PERAK RIVER (1/3)

Indexes/1	Per.1	Per.2	Per.3	Per.4	Per.5	Per.6	Per.7
A. Condition of Fish Fauna/2							
Of (%)	51	20	29	60	62	63	62
Oh (%)	46	17	20	51	51	60	57
Nh (No. ≦ 12)	12	8	10	12	12	12	12
B. Development Activities	F, I	-	F	HD,I	HD,I L	HD,F M,L	HD,L
C. Water Quality	SS 105-995 ppm	SS 95-170 ppm	SS 175-370 ppm	BOD 1-45 ppm	Nil	Nil	-
D. Information Obtained by Interview Survey							
a. River flow change & probable causes	no change	stable ?	no change	stable HD	stable HD	stable HD	stable HD
b. Fish catch decrease & probable causes	AC,T	no change	?	HD,AC P	HD	HD,M	T
c. Complaints about fish catch decrease & domestic water use (BOD)	(T)	-	F	(HD,I)	(HD)	(M)	-

Remarks; /1: Indexes are expressed by the following symbols;
TB (Tidal barrage), ID (Irrigation dam), HD (Hydropower dam), WD (Water supply dam), IW (Irrigation weir), I (Irrigation water intake and canal), RI (River improvement), RD (River diversion), M (Mining), F (Factory discharge), LO (Land opening), HW (Highway construction), L (Logging), AC (Agricultural chemicals), S (River is getting shallow), ST (Siltation), P (Poison application), T (Turbidity)

/2: Of: Occupation of fish types out of those in a whole river
Oh: Occupation of herbivorous and omnivorous fishes out of those in a whole river
Nh: No. of types of food habit in the basic fish fauna

/3: Complaints in parenthesis were not taken any actions to the Government.

Table 61 RELATION BETWEEN DEVELOPMENT ACTIVITIES AND FISH FAUNA OF THE PERAK RIVER (2/3)

Indexes/1	Per.8	Per.9	Per.10	Per.11	Per.12	Per.13	Per.14
A. Condition of Fish Fauna/2							
Of (%)	54	52	54	51	54	34	32
Oh (%)	49	40	49	34	46	31	29
Nh (No. ≦ 12)	11	11	12	12	12	12	11
B. Development Activities	HD,L	HD,L M	HD,M	M	WD?, M	HD,M M	HD,WD, L
C. Water Quality	BOD 1.1-3.4 ppm	BOD 0.5-3.7ppm SS20-100ppm	-	BOD 3.0-3.1ppm SS395-2005ppm	BOD 0.7-4.4ppm pH5.5-7.5	BOD 1.3-4.4ppm SS20-2690ppm	-
D. Information Obtained by Interview Survey							
a. River flow change & probable causes	stable HD	un-stable L,LD	stable HD	un-stable ?	un-stable ?	stable ?	stable HD,WD
b. Fish catch decrease & probable causes	HD	HD,L ST	M	M	LO,ST	T	?
c. Complaints about fish catch decrease & domestic water use (BOD)	(HD)	(HD,L)	(M)	(M)	-	M	-

Remarks; /1: Indexes are expressed by the following symbols; TB (Tidal barrage), ID (Irrigation dam), HD (Hydro-power dam), WD (Water supply dam), IW (Irrigation weir), I (Irrigation water intake and canal), RI (River improvement), RD (River diversion), M (Mining), F (Factory discharge), LO (Land opening), HW (Highway construction), L (Logging), AC (Agricultural chemicals), S (River is getting shallow), ST (Siltation), P (Poison application), T (Turbidity)

/2: Of: Occupation of fish types out of those in a whole river
Oh: Occupation of herbivorous and omnivorous fishes out of those in a whole river
Nh: No. of types of food habit in the basic fish fauna

/3: Complaints in parenthesis were not taken any actions to the Government.

Table 62 RELATION BETWEEN DEVELOPMENT ACTIVITIES AND FISH FAUNA OF THE PERAK RIVER (3/3)

Indexes/1	Per.15	Per.16	Per.17
A. Condition of Fish Fauna/2			
Of (%)	51	55	48
Oh (%)	51	49	40
Nh (No. ≦ 12)	12	12	11
B. Development Activities	F, I	I, L, M	HD
C. Water Quality	-	-	-
D. Information Obtained by Interview Survey			
a. River flow change & probable causes	stable	stable ?	stable HD
b. Fish catch decrease & probable causes	F	AC	HD?
c. Complaints about fish catch decrease & domestic water use (BOD)	F	(I)	(HD?)

Remarks; /1: Indexes are expressed by the following symbols;
TB (Tidal barrage), ID (Irrigation dam), HD (Hydropower dam), WD (Water supply dam), IW (Irrigation weir), I (Irrigation water intake and canal), RI (River improvement), RD (River diversion), M (Mining), F (Factory discharge), LO (Land opening), HW (Highway construction), L (Logging), AC (Agricultural chemicals), S (River is getting shallow), ST (Siltation), P (Poison application), T (Turbidity)

/2: Of: Occupation of fish types out of those in a whole river
Oh: Occupation of herbivorous and omnivorous fishes out of those in a whole river
Nh: No. of types of food habit in the basic fish fauna

/3: Complaints in parenthesis were not taken any actions to the Government.

Table 63 RELATION BETWEEN DEVELOPMENT ACTIVITIES AND FISH FAUNA OF THE MELAKA AND JOHOR RIVERS

Indexes/1	Mlk.1	Mlk.2	Joh.1	Joh.2	Joh.3
A. Condition of Fish Fauna/2					
Of (%)	55	82	32	71	51
Oh (%)	47	80	28	61	50
Nh (No. ≦ 12)	8	12	8	12	12
B. Development Activities	TB, F	WD, IW	M, F	M, F	F
C. Water Quality	pH5.1-6.5	pH5.7-6.5 SS 10-285 ppm	Nil	BOD Nil-3 ppm	BOD Nil-14 ppm
D. Information Obtained by Interview Survey					
a. River flow change & probable causes	stable ?	syable WD?	?	stable	stable ?
b. Fish catch decrease & probable causes	TB, F	?	F	no change	?
c. Complaints about fish catch decrease & domestic water use (BOD)	(F)	(WD)	F	-	-

Remarks; /1: Indexes are expressed by the following symbols; TB (Tidal barrage), ID (Irrigation dam), HD (Hydropower dam), WD (Water supply dam), IW (Irrigation weir), I (Irrigation water intake and canal), RI (River improvement), RD (River diversion), M (Mining), F (Factory discharge), LO (Land opening), HW (Highway construction), L (Logging), AC (Agricultural chemicals), S (River is getting shallow), ST (Siltation), P (Poison application), T (Turbidity)

/2: Of: Occupation of fish types out of those in a whole river
Oh: Occupation of herbivorous and omnivorous fishes out of those in a whole river
Nh: No. of types of food habit in the basic fish fauna

/3: Complaints in parenthesis were not taken any actions to the Government.

Table 64 RELATION BETWEEN DEVELOPMENT ACTIVITIES AND FISH FAUNA OF THE MUAR RIVER

Indexes /1	Mua.1	Mua.2	Mua.3	Mua.4	Mua.5	Mua.6	Mua.7
A. Condition of Fish Fauna /2							
Of (%)	58	69	73	64	60	45	64
Oh (%)	46	54	65	62	65	50	62
Nh (No. ≦ 12)	11	12	12	12	12	12	12
B. Development Activities	F	F	F, L	F, L	F	I, L RD	F
C. Water Quality	pH4.0 -6.3 SS 10-200ppm	pH5.7 -6.8 BOD 1-9ppm	pH5.8 -6.7 BOD 1-4ppm	BOD Nil-3 SS 15-130ppm	BOD Nil-5	-	-
D. Information Obtained by Interview Survey							
a. River flow change & probable causes	un-stable ?	no change	un-stable S	un-stable S	un-stable S	un-stable S	un-stable S
b. Fish catch decrease & probable causes	?	F	?	P	?	LO	?
c. Complaints about fish catch decrease & domestic water use (BOD)	-	(F)	(F)	-	-	-	-

Remarks; /1: Indexes are expressed by the following symbols;
TB (Tidal barrage), ID (Irrigation dam), HD (Hydro-power dam), WD (Water supply dam), IW (Irrigation weir), I (Irrigation water intake and canal), RI (River improvement), RD (River diversion), M (Mining), F (Factory discharge), LO (Land opening), HW (Highway construction), L (Logging), AC (Agricultural chemicals), S (River is getting shallow), ST (Siltation), P (Poison application), T (Turbidity)

/2: Of: Occupation of fish types out of those in a whole river
Oh: Occupation of herbivorous and omnivorous fishes out of those in a whole river
Nh: No. of types of food habit in the basic fish fauna

/3: Complaints in parenthesis were not taken any actions to the Government.

Table 65 RELATION BETWEEN DEVELOPMENT ACTIVITIES AND FISH FAUNA OF THE ENDAU AND ROMPIN RIVERS

Indexes[1]	End.1	End.2	Rom.1
A. Condition of Fish Fauna[2]			
Of (%)	88	59	89
Oh (%)	82	56	78
Nh (No. ≦ 12)	12	11	12
B. Development Activities	I, L	F, I, L	F, L
C. Water Quality	BOD 1.8-5.1 ppm SS 70-355 ppm	-	-
D. Information Obtained by Interview Survey			
a. River flow change & probable causes	no change	unstable S	unstable ?
b. Fish catch decrease & probable causes	-	?	?
c. Complaints about fish catch decrease & domestic water use (BOD)	-	(F)	-

Remarks; /1: Indexes are expressed by the following symbols; TB (Tidal barrage), ID (Irrigation dam), HD (Hydropower dam), WD (Water supply dam), IW (Irrigation weir), I (Irrigation water intake and canal), RI (River improvement), RD (River diversion), M (Mining), F (Factory discharge), LO (Land opening), HW (Highway construction), L (Logging), AC (Agricultural chemicals), S (River is getting shallow), ST (Siltation), P (Poison application), T (Turbidity)

/2: Of: Occupation of fish types out of those in a whole river
Oh: Occupation of herbivorous and omnivorous fishes out of those in a whole river
Nh: No. of types of food habit in the basic fish fauna

/3: Complaints in parenthesis were not taken any actions to the Government.

Table 66 RELATION BETWEEN DEVELOPMENT ACTIVITIES AND FISH FAUNA OF THE PAHANG RIVER

Indexes/1	Pah.1	Pah.2	Pah.3	Pah.4	Pah.5
A. Condition of Fish Fauna/2					
Of (%)	62	53	38	78	69
Oh (%)	54	51	31	74	74
Nh (No. ≦ 12)	12	12	11	11	11
B. Development Activities	-	F, L	F, L	F, L	M, F, L
C. Water Quality	Nil	Nil	-	Nil	SS 7-191 ppm
D. Information Obtained by Interview Survey					
a. River flow change & probable causes	unstable S	unstable S	unstable S	unstable S	unstable S
b. Fish catch decrease & probable causes	?	?	S	S, P	P
c. Complaints about fish catch decrease & domestic water use (BOD)	-	-	-	(P)	(P)

Remarks; /1: Indexes are expressed by the following symbols;
TB (Tidal barrage), ID (Irrigation dam), HD (Hydropower dam), WD (Water supply dam), IW (Irrigation weir), I (Irrigation water intake and canal), RI (River improvement), RD (River diversion), M (Mining), F (Factory discharge), LO (Land opening), HW (Highway construction), L (Logging), AC (Agricultural chemicals), S (River is getting shallow), ST (Siltation), P (Poison application), T (Turbidity)

/2: Of: Occupation of fish types out of those in a whole river
Oh: Occupation of herbivorous and omnivorous fishes out of those in a whole river
Nh: No. of types of food habit in the basic fish fauna

/3: Complaints in parenthesis were not taken any actions to the Government.

Table 67 RELATION BETWEEN DEVELOPMENT ACTIVITIES AND FISH FAUNA OF THE KUANTAN AND TRENGGANU RIVERS

Indexes/1	Kuant.1	Kuant.2	Treng.1	Treng.2	Treng.3
A. Condition of Fish Fauna/2					
Of (%)	92	62	50	74	74
Oh (%)	80	73	45	62	66
Nh (No. ≦ 12)	12	11	9	12	12
B. Development Activities	M, F, L	M	-	HD, L	L
C. Water Quality	pH 5.6	-	-	Nil	-
D. Information Obtained by Interview Survey					
a. River flow change & probable causes	unstable S	unstable ?	unstable S	unstable ?	unstable ?
b. Fish catch decrease & probable causes	?	?	?	HD, L	?
c. Complaints about fish catch decrease & domestic water use (BOD)	-	-	-	(HD, L)	-

Remarks; /1: Indexes are expressed by the following symbols; TB (Tidal barrage), ID (Irrigation dam), HD (Hydropower dam), WD (Water supply dam), IW (Irrigation weir), I (Irrigation water intake and canal), RI (River improvement), RD (River diversion), M (Mining), F (Factory discharge), LO (Land opening), HW (Highway construction), L (Logging), AC (Agricultural chemicals), S (River is getting shallow), ST (Siltation), P (Poison application), T (Turbidity)

/2: Of: Occupation of fish types out of those in a whole river
Oh: Occupation of herbivorous and omnivorous fishes out of those in a whole river
Nh: No. of types of food habit in the basic fish fauna

/3: Complaints in parenthesis were not taken any actions to the Government.

Table 68 RELATION BETWEEN DEVELOPMENT ACTIVITIES AND FISH FAUNA OF THE KELANTAN RIVER

Indexes/1	Klnt.1	Klnt.2	Klnt.3	Klnt.4	Klnt.5
A. Condition of Fish Fauna/2					
Of (%)	63	70	63	59	67
Oh (%)	54	57	61	54	68
Nh (No. ≦ 12)	11	12	11	11	11
B. Development Activities	I	F, L	F, L	F, L, HW	L, HW
C. Water Quality	-	Nil	SS 15-220 ppm	-	-
D. Information Obtained by Interview Survey					
a. River flow change & probable causes	unstable S	unstable ?	unstable S	unstable S	unstable S
b. Fish catch decrease & probable causes	S, ST	-	?	S	S
c. Complaints about fish catch decrease & domestic water use (BOD)	-	-	(F)	-	-

Remarks; /1: Indexes are expressed by the following symbols;
TB (Tidal barrage), ID (Irrigation dam), HD (Hydropower dam), WD (Water supply dam), IW (Irrigation weir), I (Irrigation water intake and canal), RI (River improvement), RD (River diversion), M (Mining), F (Factory discharge), LO (Land opening), HW (Highway construction), L (Logging), AC (Agricultural chemicals), S (River is getting shallow), ST (Siltation), P (Poison application), T (Turbidity)

/2: Of: Occupation of fish types out of those in a whole river
Oh: Occupation of herbivorous and omnivorous fishes out of those in a whole river
Nh: No. of types of food habit in the basic fish fauna

/3: Complaints in parenthesis were not taken any actions to the Government.

FIGURES

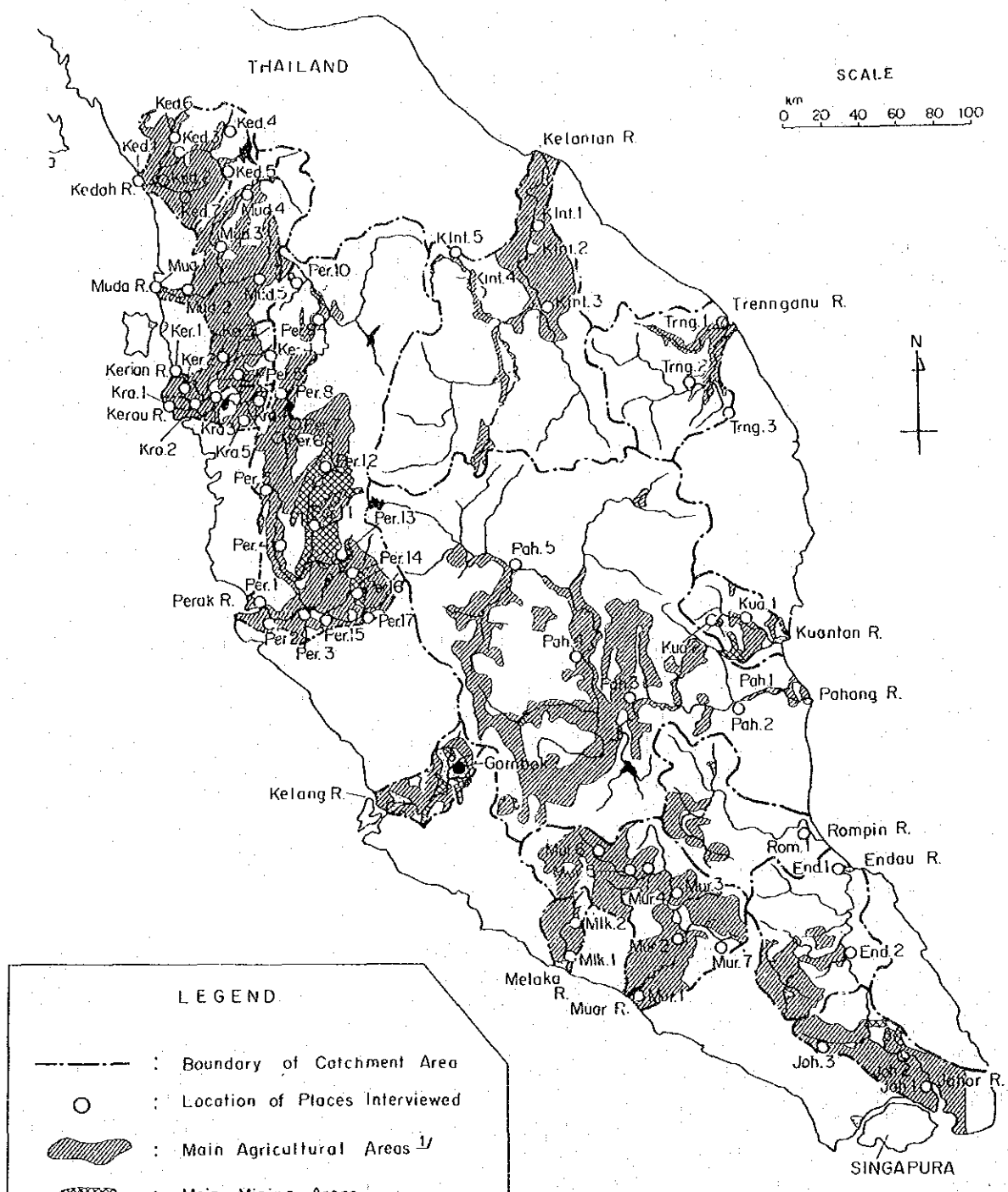


Fig. 1 Location of Rivers and Villages Interviewed and Outline of Land Use

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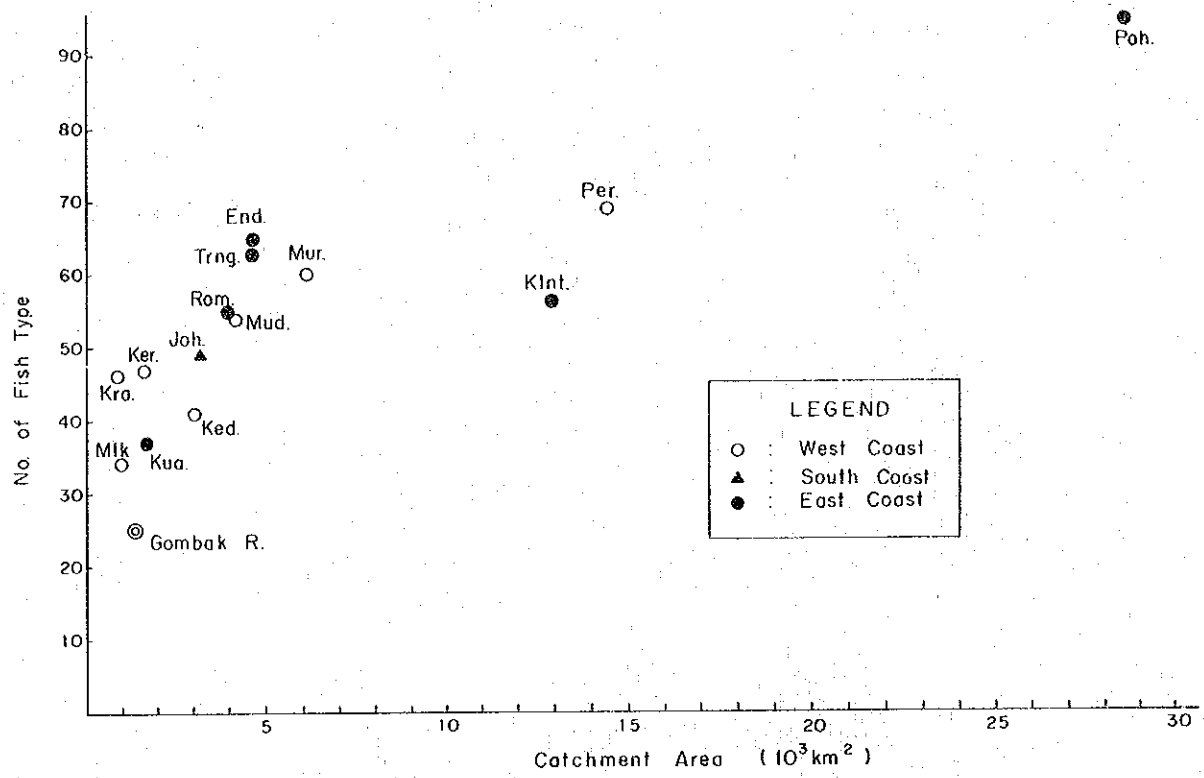
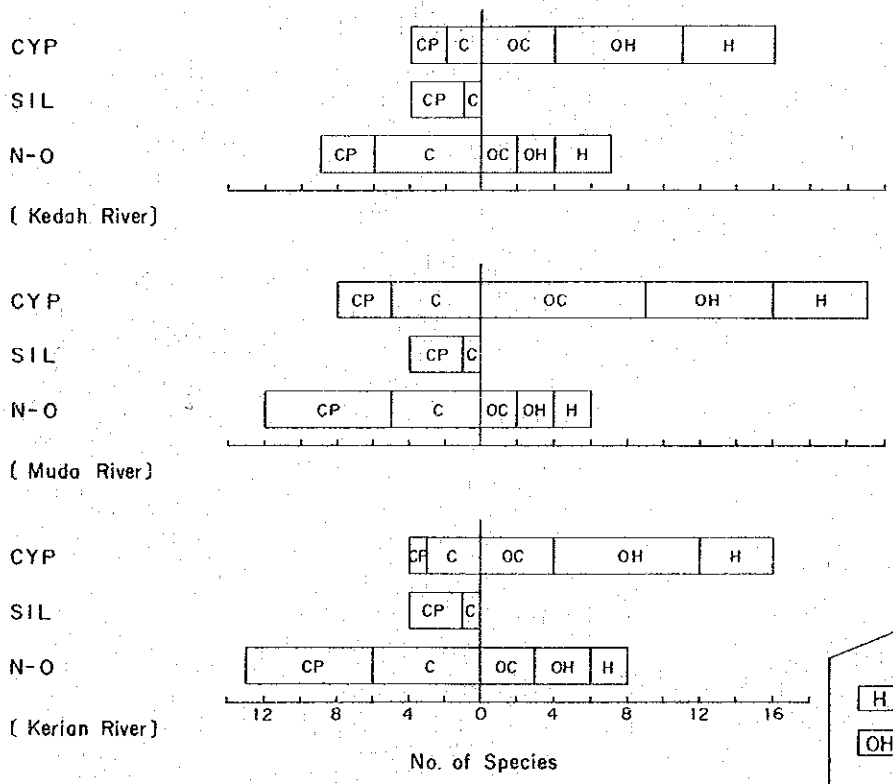


Fig. 2 Relation of Fish Fauna with the Area of River Basins



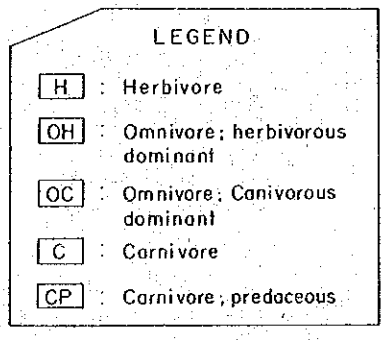


Fig. 3 Basic Fauna of the River Interviewed (1/3)

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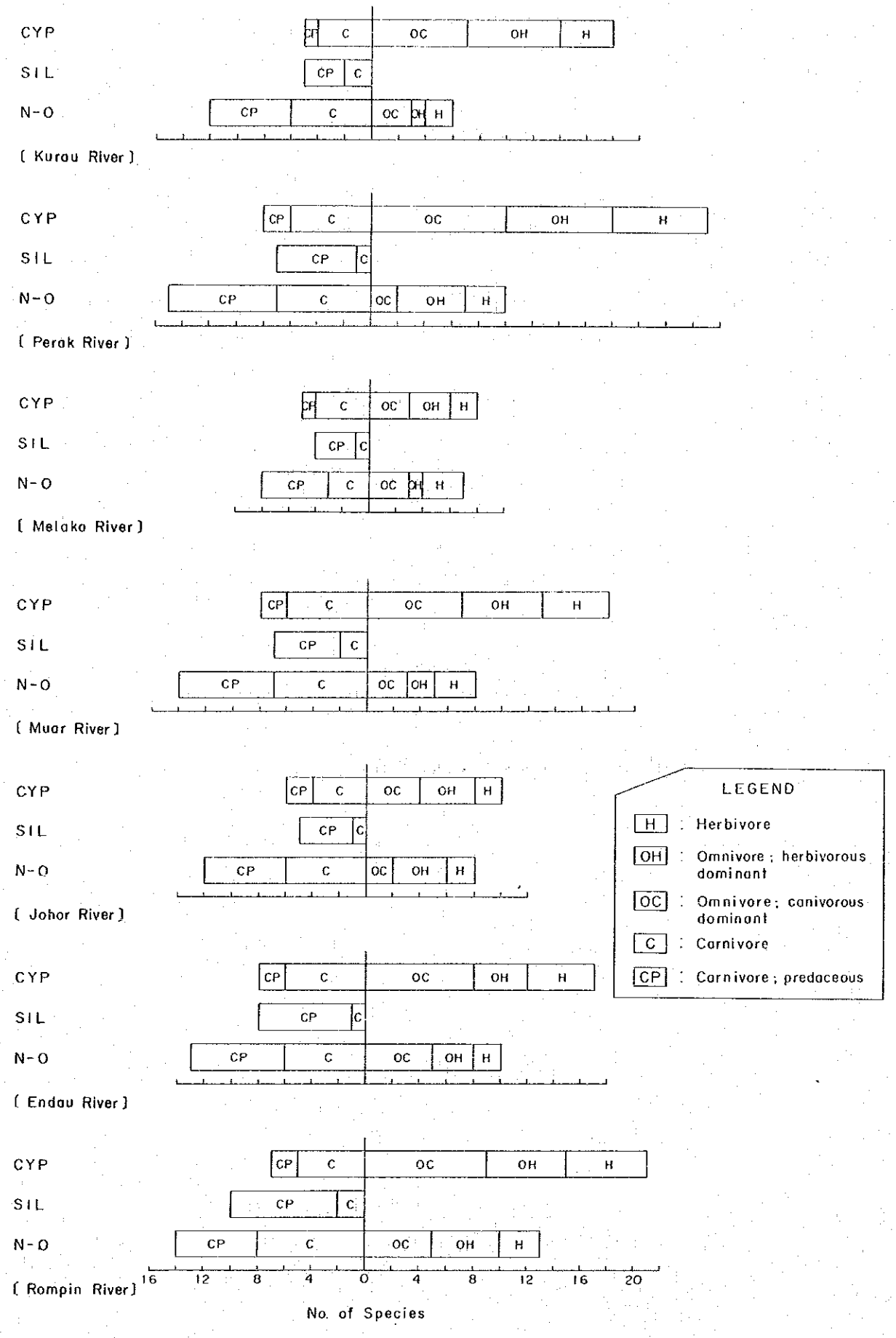

Fig.4 Basic Fauna of the River Interviewed (2/3)

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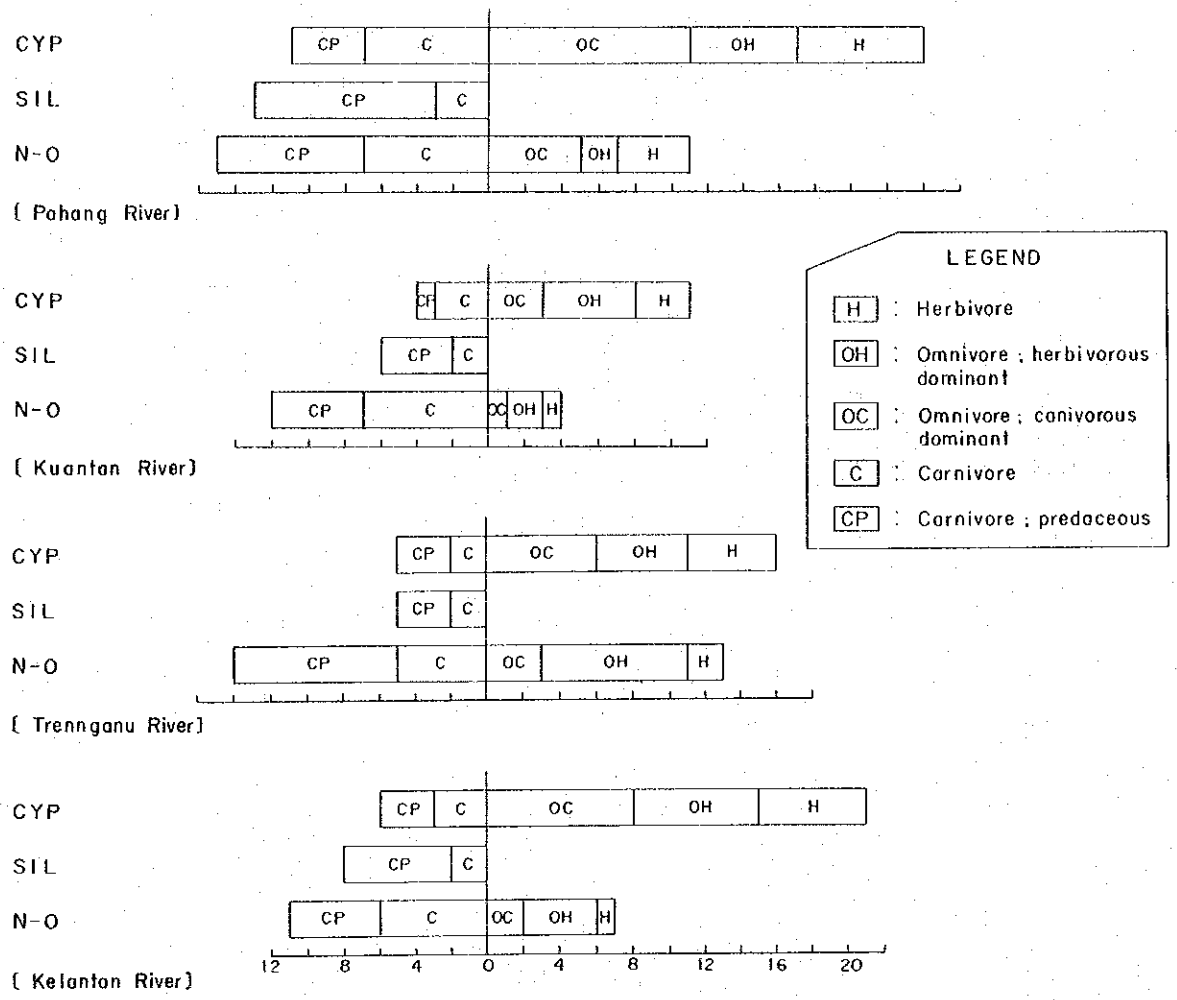

Fig.5 Basic Fauna of the River Interviewed (3/3)

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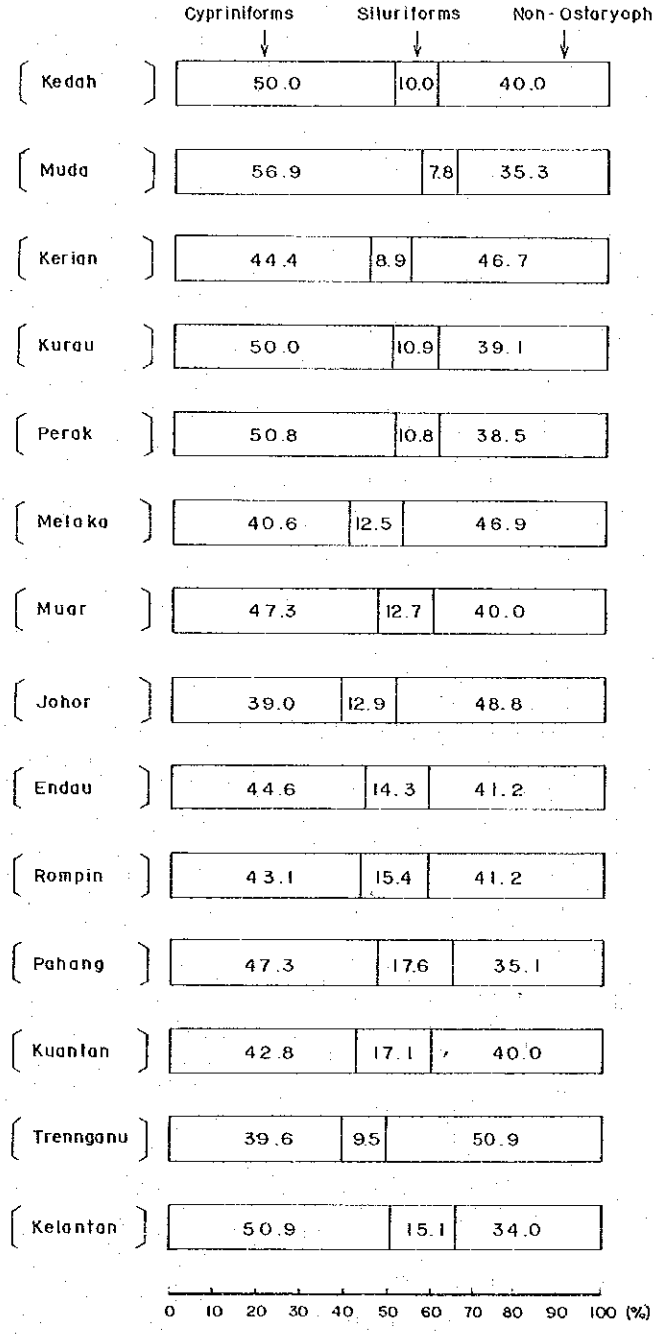

Fig. 6 Composition of Basic Fauna in Each River

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PART 2

SABAH AND SARAWAK

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1. INTRODUCTION

The objective of this Study is to find out the probable influences of future activities for water resources development upon the riverine aqua ecology in Sabah and Sarawak.

The Study was prepared not for the general description of aqua ecology but for clarification of probable influences by water resources development. To explain the macroscopic characteristics under the present condition of riverine aqua ecology, fish fauna was selected as a main aqua ecological factor and studied through interviews to the local people who have been living along the rivers and usually go fishing.

Several study reports on fresh-water fishes in Sabah and Sarawak were obtained and referred to the discussion of this Study (Refs. 1 to 9). However, scientific linkage between river conditions and the influence to fish fauna was not referred in this Study because of the lack of data.

For the interview survey, seven rivers were selected from 47 rivers in Sabah and Sarawak, based on geographical features and scale of each river basin. The monitoring results of water quality by the Federal DOE were not taken into consideration in this Study, because these monitoring works have been newly started in both the States and the results do not seem to indicate any conspicuous resume in respect of ecological features of rivers monitored.

The rivers selected are the Sugut, Labuk and Padas rivers as well as the Moyog river, a tributary of the Putatan river, in Sabah, and the Rajang, Sarawak and Kayan rivers in Sarawak. The fish faunas of the Baram river and of the upstream of the Rajang river, which were recently listed by other study teams (Refs. 4 & 5), were referred for the comparisons with fish fauna obtained by the interview survey.

The interviews were carried out at 19 villages located along the selected rivers. Those names and locations are as shown in Table 1 and Fig. 1. Distances from river mouths are as shown in Table 2 and zoning by longitudinal gradient are as shown in Table 3.

2. PRESENT CONDITION OF AQUA ECOSYSTEM OF THE SELECTED RIVERS

2.1 Fish Fauna

2.1.1 Macro-characteristics

Through the interviews, several salient facts on the fish fauna were found out at each interview site along the selected rivers.

Total 242 types of fishes and animals were listed up with local names as shown in Tables 4 to 12. Among them, 160 types were identified as freshwater or brackish water fishes and prawns with scientific names. Another 53 types of fishes could not be identified and 14 types were shells, crabs, shrimps, turbles and tortoises. The remining 16 types were clarified as sea fishes.

Fish faunas of all the rivers consist of the following basic groups:

(a) Cypriniforms: Carps,

(b) Siluriforms: Catfishes, and

(c) Non-ostaryophysi: Fishes which do not have Weberian Apparatus.

Total number of fish types including unidentified fish types in each river is 39 in the Sugut river, 47 in the Labuk river, 62 in the Padas river and 23 in the Moyog river in Sabah, and 72 in the Baram river, 93 in the Rajang river, 45 in the Sarawak river and 49 in the Kayan river in Sarawak.

Longitudinal distribution of the identified fishes as shown in Tables 13 to 16 indicates that 60 fish types and one freshwater prawn widely distribute from upper middle to lower zones in the selected rivers. Other 75 types limitedly distribute in the lower zones, but some of them are observed in the reach of more than 200 km from river mouths. Among the remaining fish types, 30 types distribute only in upper middle zones and 12 types only in lower zones within the reach of 50 km from river mouths.

The fish faunas identified in each river are as shown in Tables 17 and 18. The food habits of these fishes are as shown in Table 19. Taxonomically, these identified fishes are classified in the following three basic groups of fish fauna, as shown in Table 20, together with 12 types of food habit in total:

(a) Cypriniforms with five types of food habit such as herbivores (H), omnibores: herbivore dominant (OH), omnibores: predator dominant (OC), carnivores: arthropods and invertebrates feeder (C), crustacea and fish feeder (CP);

(b) Siluriforms with three types of H, C and CP; and

(c) Non-ostaryophysi with four types of OH, OC, C and CP.

The proportion of basic fish fauna in each selected river is illustrated in Fig. 2. The Cypriniforms occupies 62% of the total fish fauna in the Sugut river and more than 50% in the Moyog and Labuk rivers. On the other hand, its share ranges between 25% and 40% in the Kayan, Rajang, Padas and Sarawak rivers. The maximum proportion of Siluriforms among all the rivers is 30% in the Sugut river, while the minimum is 6% in the Moyog river. The proportion of Non-ostaryophysi group shows the highest level of 53% in the Kayan river and the lowest of 8% in the Sugut river. The similar proportion of these three basic groups are observed in the Padas and Rajang rivers.

The three basic groups of fish fauna in the selected rivers were classified by referring to the type of food habit as illustrated in Fig. 3.

2.1.2 Micro-characteristics

(1) Sugut river

The observed characteristics of fish fauna at the interview sites are as shown in Tables 21 and 22 and summarized hereinunder.

The interviews were carried out at three places in the upper reach of the Sugut river. The Mamut copper mining is located in the upstream area from these interview sites.

At the interview site of S-III which is located at the lowest point among the three sites, the fish fauna is well balanced. Out of 37 fish types identified in the Sugut river, 32 types were listed at this site. Among 18 herbivorous and omnivorous species identified in the Sugut river, 15 species were listed as shown in Table 30. As for the food habit by the basic group, type H of Siluriforms and type OH of Non-ostaryophysi were not found.

At the site of S-I and S-II, the people were warned by the Government not to use the river water and not to catch fish since the start of mining operation at Mamut. Accordingly, the fish faunas obtained by the interview at these locations are based on the previous river condition. The number of fish types identified was 17 under the above-mentioned condition. The identified number of herbivorous and omnivorous species was nine. As for the food habit by the basic group, type H of Siluriforms and types H and OC were not found.

The fish fauna at the interview site of S-I being located at the most upper point among the three sites indicated the same condition as that at the site of S-II. Its number of fish types identified is 12 including five herbivorous and omnivorous species. Out of 12 types of food habit, five were not found.

(2) Labuk river

The observed characteristics of fish fauna at the interview sites are as shown in Tables 21 and 22 and summarized hereinunder.

The interviews were undertaken at three places along the upper to middle reaches of the Labuk river.

The fish fauna at the interview site of L-III, the lowest point among three, seems to be well balanced with 26 fish types out of 42 types identified in the Labuk river. Among 19 herbivorous and omnivorous species identified in the Labuk river, 11 species were found as shown in Table 30. As for the food habit by the basic group, two types were not found.

At the interview site of L-II, the fish fauna was counted at 22 fish types including 12 herbivorous and omnivorous species. Only one type of food habit by the basic group was not found.

The interview site of L-I is located at the most upper point. The number of fish fauna declined to 17 and that of herbivorous and omnivorous species was eight. As for the food habit by the basic group, type OC of Cypriniforms, type H of Siluriforms and types OH, OC and C of Non-ostaryophysi were not found through the interview.

(3) Padas river

The observed characteristics of fish fauna at the interview sites are as shown in Tables 23 and 24 and summarized hereinunder.

The interviews were conducted at five sites along the Padas river.

The fish fauna identified along the downstream of the Padas gorge were rather rich in number having 33 fish types at each interview site among 55 types listed in the Padas river. The number of herbivorous and omnivorous species was 12 at the site of P-IV and 14 at the site of P-V, respectively, as shown in Table 30. Out of 12 types of food habit by the basic group, both types H of Cypriniforms and Siluriforms were not found at the site of P-IV, and type C of Cypriniforms and type H of Siluriforms were not found at the site of P-V, respectively.

The interview sites of P-I to P-III are located along the Pegalan river, one of the main tributaries of the Padas river. The number of fish fauna identified at these three sites ranged between 17 and 21 including herbivorous and omnivorous species with the number of four at the site of P-I, nine at the site of P-II and six at the site of P-III. As for the food habit by the basic group, type H of Siluriforms was not found at the three interview sites. Type OC of Non-ostaryophysi at the sites of P-I and P-III and type H of Cypriniforms at the site of P-III were also not found.

(4) Moyog river

The observed characteristics of fish fauna at the interview sites are as shown in Tables 23 and 24 and summarized hereinunder.

The interviews were made at two sites along the Moyog river, a main tributary of the Putatan river.

The fish fauna identified at each interview sites was counted at 12 among the total fish fauna of 18. The identified number of herbivorous and omnivorous species was eight at the site of M-I and seven at the site of M-II as shown in Table 30. The following types of food habit by the basic group were not found; types H and CP of Siluriforms at both the sites, type CP of Cypriniforms, type C of Siluriforms and type OH of Non-ostaryophysi at the site of M-I, and type CP of Non-ostaryophysi at the site of M-II.

(5) Baram river

The characteristics of fish fauna in the Baram river is referred to the results of previous survey (Refs. 3 & 4). The summary of survey results is as shown in Tables 25 to 27 and is described hereinunder.

The fish faunas identified in the Baram river are very rich in number. At the survey sites of B-I and B-II, 40 to 43 fish types are found among the total fish types of 69. The observed number of herbivorous and omnivorous species are 23 at the site of B-I and 14 at the site of B-II as shown in Table 30. As for the food habit by the basic group, type H of Siluriforms and type OC of Non-ostaryophysi at the site of B-I and type CP of Cypriniforms at the site of B-II were not found.

(6) Rajang river

The observed characteristics of fish fauna at the interview sites are as shown in Tables 25 to 27 and summarized hereinunder. The fish fauna of R-I is referred to the study (Ref. 5).

The interviews were carried out at three sites along the Rajang river downstream from Kapit.

The fish fauna of this river is as rich as that of the Baram river. The fish fauna found was 34 fish types at the interview site of R-I, 52 types at the site of R-II and 48 types at the site of R-III among the total fish types of 71. The number of herbivorous and omnivorous species ranged from 12 to 20 as shown in Table 30. Only type H of Siluriforms was not found at the interview sites of R-I and R-II.

(7) Sarawak river

The observed characteristics of fish fauna at the interview sites are as shown in Tables 28 and 29 and summarized hereinunder.

The interviews were undertaken at two sites along the Sarawak river.

The fish fauna identified was composed of 24 types including six herbivorous and omnivorous species at the site of Sa-I and 31 types with 16 herbivorous and omnivorous species at the site of Sa-II as shown in Table 30. As for the food habit by the basic group, type H of Siluriforms and type OH of Non-ostaryophysi were not found at the site of Sa-I and types H and CP of Siluriforms at the site of Sa-II.

(8) Kayan river

The observed characteristics of fish fauna at the interview sites are as shown in Tables 28 and 29 and summarized hereinunder.

The interviews were done at the three sites along the Kayan river.

The fish fauna was identified at 28 types at the interview site of K-I, 14 types at the site of K-II and 18 types at the site of K-III, respectively. The number of herbivorous and omnivorous species was limited at five to seven at all the interview sites as shown in Table 30. The fish fauna of each site shows lack of the food habit by the basic group; types H and CP of Siluriforms and type OH of Non-ostaryophysi at the site of K-I, type H of Cypriniforms, types H and CP of Siluriforms and type OH of Non-ostaryophysi at the site of K-II, and types of OC, C and CP of Cypriniforms and type OH of Non-ostaryophysi at the site of K-III.

2.2 Ecological Condition of Rivers

2.2.1 Macro-characteristics

Informations on the following ecological conditions of the seven rivers were obtained through the interview survey:

(1) Change of river flow pattern during the last 20 years including fluctuation of river flow discharge and water level, flood frequency, sediment materials and river bed condition as shown in Table 31; and

(2) Trend of fish catch by fishing during the last 20 years as shown in Table 32.

Generally, all the rivers in Sabah and Sarawak are still kept in the natural condition with the following characteristics:

(1) The water levels at the interview sites fluctuate at some ranges by the surface runoff after rainfalls. No conspicuous change of this condition has been observed during the last 20 years at all the sites except for the site of P-III;

(2) Flood frequency has recently increased at the six sites out of the 19 interview sites. River bed have recently been covered with silt at six sites and have become shallower at eight sites while become deeper at three sites; and

(3) Fish catch at all the interviewed sites except for the sites of P-I and Sa-II has considerably decreased in recent years. At four sites, fishing has already been suspended. The cause of decrease in fish catch is said to be increase in siltation at 11 sites and increase in fish catch population or overfishing at five sites.

2.2.2 Micro-characteristics

(1) Sugut river

At the three interview sites, no conspicuous change of river flow pattern has occured during the last 20 years.

The river bed at the site of S-II was severely affected by the siltation from the Mamut copper mining located upstream and lost its undulation. Flood frequency increased from one a 10 years to every two or three years. The river bed at the site of S-I shows a typical characteristics of upstream with stones of various sizes, but siltation has recently increased and can be observed between stones. The water color has become milky since the start of mining activities.

At the sites of S-I and S-II, fishing has already been suspended by two reasons: one is the decrease in fishes and the other is the warning by the Government not to eat fishes contaminated by discharge from the said mining. Fish catch at the site of S-III is only 1 to 2 kg/d, which was 50 to 60 kg/d before the start of the mining.

(2) Labuk river

At all the interview sites, no conspicuous change of river flow patterns has occurred during the last 20 years. The river bed at the site of L-I is still composed of stones and gravels. That at the site of L-II has recently become shallower. River bed materials have changed from stones and gravels to gravels and sand. Flood frequency shows no change at all the interview sites.

Though no conspicuous change of river circumstances has occurred in the Labuk river, fish catch at all the sites has considerably decreased in recent years. At the site of L-I, it decreased from 6 to 7 kg/d to 1 to 2 kg/d, and at the sites of L-II and L-III to 3 to 4 kg/d, because of the increase in siltation and fish catch population.

(3) Padas river

At the site of P-III, the river bed is of gravels and has risen by sedimentation. Flood frequency has also recently increased at the sites of P-III to P-V. Fish catch at the sites of P-II to P-V decreased from 20 to 50 kg/d to 1 to 7 kg/d, while fish catch was not reported at the site of P-I.

(4) Moyog river

Heavy siltation was reported at the site of M-II as the conspicuous change of the river environment. The river was of stones before 1970, and thereafter it has been covered with sand. At present, nobody goes fishing to the river.

(5) Baram river

According to the previous study (Ref. 4), the survey site of B-I has a river bed covered with pebbles. The river bed at the survey site of B-II is silty sand.

(6) Rajang river

As illustrated in Fig. 4, fluctuation of river water by tidal effect is observed at the site of R-II. The river bed materials have recently become sandy at the site of R-II, and sandy and silty at the site of R-III. Flood frequency is the same as before. Fish catch at the sites of R-II and R-III has decreased by about half. As the cause of decrease in fish catch, siltation increase, overfishing and sawdust by logging are reporetd.

(7) Sarawak river

No change in river flow patterns at the sites of Sa-I and Sa-II have been observed during the last 20 years. The river bed at the site of Sa-I was completely covered with sand and silt by the landslide from shifting cultivation area along the river caused by heavy rainfall in 1963. Since then, flood frequency has increased at Sa-II. Fishing activities were also stopped because of the change of river bed condition. The river bed at the site of Sa-II was not affected by the flood in 1963 and is of sandy to silty materials. Due to quarrying of sand, the river bed has deepened. No conspicuous change of flood frequency and fish catch has been observed at this site.

(8) Kayan river

No conspicuous change of river flow pattern has been observed at all the interview sites of K-I to K-III. The river bed materials are composed of sand at the site of K-I and sand and silt at the site of K-II. Flood frequency is reported to have increased at the site of K-II. Fish catch has recently declined by half to a quarter at all the sites.

3. RELATIONS BETWEEN AQUA ECOSYSTEM AND DEVELOPMENT ACTIVITIES

3.1 General

The influences of various kinds of development activities such as irrigation water intake, plantation, logging and sawing, mining, processing factories for agricultural products and shifting cultivation were analyzed based on the following informations:

(a) Ecological condition of fish fauna at each interview site as shown in Table 30,

(b) Probable causes of the recent change of river flow pattern as shown in Table 31,

(c) Probable causes of the recent decrease in fish catch as shown in Table 32,

(d) Development activities along the selected rivers as shown in Table 33, and

(e) Complaints about present river conditions as shown in Table 34.

Relations between development activities and fish fauna at each interview site are summarized in Table 35 and 36.

3.2 Macro-characteristics

Relations between various development activities and aqua ecology observed through the interview survey are analyzed from macroscopic view point. The results are as follows:

(1) Generally, rivers in Sabah and Sarawak are still in the natural conditions and their fish faunas could be said to be rich to some extent. In the lower reaches of the Rajang river, the whole types of food habit can still be observed; and

(2) As for fish productivity, all the rivers seem to have recently decreased their productivity mainly caused by siltation and overfishing. The siltation in the case observed at the site of L-II seems to occur in the process of natural degradation, while those in other sites of S-I to S-III, P-III, P-IV, M-I, M-II, R-II, Sa-I, K-I and K-II seem to be triggered by the human activities such as logging and sawing, shifting cultivation and mining.

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