APPENDIX 2 *cont.* Extinct, Extinct in the Wild, Critically Endangered, Vulnerable, and Threatened Marine Species in Thailand.

No.	Type	Scienticific name	Common name	Local name (Thai name)	Status
36	Fishes	*Himantura gerrardi*	White spotted whipray	Krabenjudkao krabenma	VU
37	Fishes	*Aetomylaeus maculatus*	Mottled eagle ray	Krabennokjudkao	VU
38	Fishes	*Aetomylaeus nichofii*	Nieuhof's eagle ray	Krabennokbung	VU
39	Fishes	*Chiloscyllium griseum*	Grey bambooshark	Chalamtookkae chalamkob	VU
40	Fishes	*Stegostoma fasciatum*	Nurseshark, zebrashark	Chalamsuar suartalay	VU
41	Fishes	*Carcharhinus albimarginatus*	Silvertip shark	Chalamplaykeebkao	VU
42	Fishes	*Carcharhinus amboinensis*	Greyreef shark	Chalamtalek	VU
43	Fishes	*Carcharhinus plumbeus*	Sandbar shark	Chalamkradonqsung	VU
44	Fishes	*Rhizoprionodon oligolinx*	Sharpnose shark	Chalamhualeam	VU
45	Fishes	*Rhychobatus australiae*	White-spotted shovelnose ray	Ronunjudkao	VU
46	Fishes	*Rhinobatos schlegelii*	Brown quitarfish	Ronumhuasai	VU
47	Fishes	*Rhinobatos typus*	Giant shovelnose ray	Ronumyak	VU
48	Fishes	*Narcine indica*	Large spotted numbfish	Krabenfirefa indea	VU
49	Fishes	*Narcine prodorsalis*	Tonkin numbfish	Krabenfirefa judlek	VU
50	Fishes	*Temera hardwickii*	Smooth electric ray	Krabenfirefa, plaseal	VU
51	Fishes	*Himantura uarnak*	Reticulate whip ray	Krabenpakleam	VU
52	Fishes	*Aetomylaeus milvus*	Ocellate eage ray	Krabennok	VU
53	Fishes	*Rhinoptera adspersa*	Rough cownose ray	Krabenjamookwua	VU
54	Fishes	*Chirocentrus nudus*	Smooth wolf herring	Dablaosun	VU
55	Fishes	*Setipinna melanochir*	Duskyhairfin anchovy	Meawhudum	VU
56	Fishes	*Narcine brunnea*	Brown electric ray	Krabenfirefaseenumtan	VU
57	Fishes	*Epinephelus coioides*	Orange spotted grouper	Karangjudnumtan	VU
58	Fishes	*Lobotes surinamensis*	Brown tripletail	Kapongkeesao	VU
59	Fishes	*Gymuura poecilura*	Longtail butterfly ray	Krabenpesuar	VU
60	Fishes	*Tetraodon suvatti*	Puffers fish	Pukpao	VU
61	Fishes	*Aetobatus narinari*	Spot eagle ray	Krabenkangkao	TH
62	Fishes	*Carcharhinus leucas*	Bull shark	Chalamhuamart	TH
63	Fishes	*Cromileptes altivelis*	Humpback grouper	Karangnangon	TH
64	Fishes	*Epinephelus lanceolatus*	Queensland grouper, Brindle bass	Mortalay	TH
65	Fishes	*Triaenodon obesus*	Whitetip reef shark	Chalam keepkao	TH
66	Reptile	*Dermochelys coriacea*	Leathery turtle	Taomaphaung	CR
67	Reptile	*Caretta caretta*	Loggerhead turtle	Tao huakon	CR
68	Reptile	*Chelonia mydas*	Green turtle	Tao tanu	EN
69	Reptile	*Eretmochelys imbricata*	Howksbill turtle	Taokra	EN
70	Reptile	*Crocodylys porosus*	Estuarine crocodlie, Salt water crocodile	Jarakaenumkem	EN

Remarks : EX = Extinct
CR = Critically endangered species
EN = Endangered species
VU = Vulnerable species
TH = Threatened species

APPENDIX 3
Fishes Found in Habitats of the Gulf of Thailand

No.	Family	Scientific name	Common name	WL	CR	MG	SG
1	Acanthuridae	*Acanthurus mata* (Cuvier, 1829)	Elongate surgeonfish			x	
2	Acanthuridae	*Naso lituratus*			x		
3	Acropomatidae	*Malakichthys wakiyae*	Temperate Ocean-bass	x			
4	Akysidae	*Akysis macronemus*	Stream Catfish	x			
5	Ambassidae	*Ambassis buruensis* Bleeker, 1857	Buru Glass Perchlet	x		x	
6	Ambassidae	*Ambassis commersoni*	Commerson's Perchlet	x			
7	Ambassidae	*Ambassis dayi*	Perchlet	x			
8	Ambassidae	*Ambassis gymnocephalus* (Lacepede, 1802)	Bald Glassfish	x			
9	Ambassidae	*Ambassis interruptus* Cuvier & Valenciennes, 1828	Longspined perchlet	x		x	x
10	Ambassidae	*Ambassis kopsii* Bleeker, 1858	Freckled Hawkfish	x		x	x
11	Ambassidae	*Ambassis macracanthus* Bleeker, 1849	Bleeker's wasp fish			x	x
12	Ambassidae	*Ambassis ranga*	Indian Glassy Fish	x			
13	Ambassidae	*Ambassis siamensis*	Glassfish	x			
14	Ambassidae	*Ambassis* sp. 1				x	x
15	Ambassidae	*Ambassis urotaenis* Bleeker, 1852	Bunded-tail Glassy Perchlet	x			
16	Ambassidae	*Ambassis vachellii* Richardson, 1846				x	x
17	Ambassidae	*Ambassis wolffii*	Perchlet	x			
18	Amblycipitidae	*Amblyceps* sp.		x			
19	Anabantidae	*Anabas testudineus*	Common Climbing Perch	x			
20	Anabatidae	*Osphronemus goramy*	Giant Gourami	x			
21	Anguillidae	*Anguilla bicolor bicolor* McClelland, 1844	Freshwater Eel	x		x	
22	Apochelidae	*Apocheilus panchax*Day, 1875	Blue Panchax	x		x	
23	Apogonidae	*Apogon aureus* (Lacepede, 1802)	Ring-tailed cardinalfish		x		
24	Apogonidae	*Apogon cf. hyalosoma*			x		
25	Apogonidae	*Apogon cookii*			x		
26	Apogonidae	*Apogon cyanosoma*			x		
27	Apogonidae	*Apogon exostigma*			x		
28	Apogonidae	*Apogon fasciatus* Shaw, 1790			x		x
29	Apogonidae	*Apogon hyalosoma* Bleeker, 1853				x	x
30	Apogonidae	*Apogon kallopterus*			x		
31	Apogonidae	*Apogon kalosoma*			x		
32	Apogonidae	*Apogon Leptacanthus*			x		
33	Apogonidae	*Apogon nigrofasciatus*			x		
34	Apogonidae	*Apogon novemfasciatus*			x		
35	Apogonidae	*Apogon sangiensis*	Sangi Caardinalfish	x			
36	Apogonidae	*Apogon semilineatus* Temmink & Schelgel, 1843	Black-tipped cardinalfish		x		
37	Apogonidae	*Apogon septemstriatus*			x		
38	Apogonidae	*Apogon* sp.1				x	x
39	Apogonidae	*Apogon* spp.	Cardinalfish	x	x		
40	Apogonidae	*Apogon taeniophorus*			x		
41	Apogonidae	*Apogon thermalis* Valenciennes, 1829	Thermal Cardinalfish	x			
42	Apogonidae	*Apogon trimaculatus*			x		
43	Apogonidae	*Cheilodipterus artus*			x		
44	Apogonidae	*Cheilodipterus macrodon*	Eightlined Cardinal	x	x		
45	Apogonidae	*Cheilodipterus quinquelineatus*	Toothed Cardinal	x	x		
46	Apogonidae	*Cheiloprion labiatus*			x		
47	Apogonidae	*Fowleria variegata* (Valenciennes, 1832)					x
48	Ariidae	*Apogon ventrifasciatus* Allen, Kuiter & Randall, 1828					x
49	Ariidae	*Archamia fucata*			x		
50	Ariidae	*Archamia goni*			x		
51	Ariidae	*Arius caelatus* (Cuvier & Valenciennes, 1840)	Engraved catfish	x		x	
52	Ariidae	*Arius gagora*	Seacatfish	x			
53	Ariidae	*Arius maculates* (Thunberg, 1792)	Spotted catfish	x			
54	Ariidae	*Arius sagor* (Buchanan, 1822)	Sagor catfish	x			
55	Ariidae	*Arius* sp.	Seacatfish	x			
56	Ariidae	*Arius* spp.	Seacatfish	x			
57	Ariidae	*Arius thalassinus* (Ruppell, 1837)	Salmon catfish	x			
58	Ariidae	*Batrachocephalus mino*	Frog Seacatfish	x			
59	Ariidae	*Hemiarius stormi*	Seacatfish	x			
60	Ariidae	*Hemipimelodus borneensis*	Sea Catfish	x			
61	Ariidae	*Hemipimelodus* sp.	Sea Catfish	x			
62	Ariidae	*Ketengus typus*	Typus Catfish	x			
63	Ariidae	*Osteogeneiosus nilitaris*	Seacatfish	x			
64	Atherinidae	*Hypoatherina temminckki*			x		
65	Atheriniidae	*Atherinomorus duodecimalis* (Cuvier, 1835)			x	x	x
66	Bagridae	*Bagroides siamensis*	Bagrid Catfish	x			
67	Bagridae	*Batasio tengana*	Bagrid Catfish	x			

Appendix 3 *cont.* Fishes found in habitats of the Gulf of Thailand.

No.	Family	Scientific name	Common name	WL	CR	MG	SG
68	Bagridae	*Hemibagrus bocourti*	Bagrid Catfish	x			
69	Bagridae	*Hemibagrus nemurus*	Yellow Mystus	x			
70	Bagridae	*Hemibagrus wyckii*	Bagrid Catfish	x			
71	Bagridae	*Heterobagrus bocourti*	Bocourt's River Catfish	x			
72	Bagridae	*Leiocassis poecilopterus*	Bagrid Catfish	x			
73	Bagridae	*Leiocassis siamensis*	Siamese Rock Catfish	x			
74	Bagridae	*Mystus cavasius*	Long-fatty Finned Mystus	x			
75	Bagridae	*Mystus gulio* (Hamliton, 1822)	Long Whiskers Catfish	x		x	
76	Bagridae	*Mystus micracanthus*	Twospot Catfish	x			
77	Bagridae	*Mystus mysticetus*	Catfish	x			
78	Bagridae	*Mystus planiceps*	Catfish	x			
79	Bagridae	*Mystus* sp.	Catfish	x			
80	Bagridae	*Mystus vittatus*	Iridescent Mystus	x			
81	Bagridae	*Mystus wolffi*	Catfish	x			
82	Bagridae	*Mystus wyckii*	Bagrid Catfish	x			
83	Balistidae	*Balistoides viridescens*			x		
84	Balitoridae	*Homaloptera orthogoniata*	River Loach	x			
85	Balitoridae	*Homaloptera septemfasciata*	River Loach	x			
86	Balitoridae	*Homaloptera smithi*	River Loach	x			
87	Balitoridae	*Homaloptera* sp.	River Loach	x			
88	Balitoridae	*Homaloptera zollingeri*	River Loach	x			
89	Batrachoididae	*Allenbatrachus grunniens* (Linnaeus, 1758)	Grunting toadfish		x		
90	Batrachoididae	*Batrachus grunniens*	Toad Fish	x			
91	Batrachoididae	*Batrichthys grunniens* (Linnaeus, 1758)				x	
92	Belonidae	*Strongylura strongylura* (Van Hassch, 1823)	Spottail needlefish			x	x
93	Belonidae	*Strongyrura incisa*			x		
94	Belonidae	*Tylosurus acus melanotus*			x		
95	Belonidae	*Tylosurus crocodilus crocodilus* (Peron et Le Sueur, 1821)	Hound needlefish		x	x	x
96	Belonidae	*Tylosurus* sp.			x		
97	Belonidae	*Xenenthodon cancilla*	Round-tailed Garfish	x			
98	Belonidae	*Xenenthodon* sp.	Freshwater Garfish	x			
99	Beloniformes	*Ablennes hians* (Valenciennes, 1846)	Flat needlefish		x		
100	Blenniella	*Istiblennius dussumieri*			x		
101	Blenniella	*Istiblennius edentulus*			x		
102	Blenniidae	*Blenniella bilitonensis*			x		
103	Blenniidae	*Cirripectes filamentosus*			x		
104	Blenniidae	*Enchelyurus kraussi*			x		
105	Blenniidae	*Laiphognathus multimaculatus*			x		
106	Blenniidae	*Omobranchus fasciolatus* Erhenberg, 1839				x	
107	Blenniidae	*Omobranchus ferox* (Herre, 1927)				x	
108	Blenniidae	*Omobranchus punctatus* (Valenciennes, 1836)				x	
109	Blenniidae	*Omox biporos*			x		
110	Blenniidae	*Parenchelyurus hepburni*			x		
111	Blenniidae	*Petrocirtes variabilis* Cantor, 1850					x
112	Blenniidae	*Salarias fasciatus*			x		
113	Bothidae	*Arnoglosus* sp.				x	
114	Bothidae	*Pseudorhombus arsius* (Hamilton, 1822)	Largetooth flounder	x		x	x
115	Bothidae	*Pseudorhombus elevatus* Ogilby, 1912	Deepbody flounder			x	
116	Bothidae	*Pseudorhombus malayanus* Bleeker, 1866	Roughscale flounder			x	
117	Caesionidae	*Caesio caerulaurea*			x		
118	Caesionidae	*Caesio coerulaureus* Lacepede, 1801	Blue and gold fusilier			x	
119	Caesionidae	*Caesio cuning*	Redbelly yellowtail fusilier		x		x
120	Caesionidae	*Caesio lunaris*			x		
121	Caesionidae	*Caesio xanthonotus*	Fusilier	x			
122	Caesionidae	*Pterocaesio chrysozona*			x		
123	Caesionidae	*Pterocaesio tile*			x		
124	Callionymidae	*Callionymus enneactis*			x		
125	Callionymidae	*Callionymus filamentosus*			x		
126	Callionymidae	*Callionymus hindsi* Richardson, 1844				x	
127	Callionymidae	*Callionymus sagitta*	Arrowhead Dragonet	x			
128	Callionymidae	*Callionymus schaapii* Bleeker, 1852	Dragonet			x	x
129	Callionymidae	*Callionymus* spp.			x		
130	Carangidae	*Alectis indicus* (Ruppell, 1828)	Indian threadfin		x		x
131	Carangidae	*Alepes djedaba* (Forsskal, 1775)	Djedaba crevalle/Solar sacd		x	x	
132	Carangidae	*Alepes kleinii* (Bloch, 1793)	Bonded scad			x	x
133	Carangidae	*Alepes vari* (Cuvier, 1833)	Herring scad		x	x	
134	Carangidae	*Atule mate* (Cuvier, 1833)	Yellowtail scad		x	x	x
135	Carangidae	*Carangoides armatus* (Ruppell, 1830)	Longfin trevally		x	x	

Appendix 3 *cont.* Fishes found in habitats of the Gulf of Thailand.

No.	Family	Scientific name	Common name	WL	CR	MG	SG
136	Carangidae	*Carangoides bajad*			x		
137	Carangidae	*Carangoides ferdau* (Forsskal, 1775)	Blue trevally		x		
138	Carangidae	*Carangoides praeustus* Bennett, 1830	Brownback trevally			x	x
139	Carangidae	*Caranx djedaba*	Shrimp scad	x			
140	Carangidae	*Caranx kalla*	Shrimp scad	x			
141	Carangidae	*Caranx sexfasciatus* Quoy & Gaimard, 1824	Bigeye trevally		x	x	x
142	Carangidae	*Caranx* sp.	Shrimp scad	x			
143	Carangidae	*Chorinemus lysan*	Doublespotted Queenfish	x			
144	Carangidae	*Chorinemus tol*	Needlescaled Queenfish	x			
145	Carangidae	*Gnathanodon speciosus*			x		
146	Carangidae	*Scomberoides commersonianus* Laccpede, 1801	Talang queenfish			x	x
147	Carangidae	*Scomberoides lysan*	Double-spotted queenfish			x	x
148	Carangidae	*Scomberoides tol* (Cuvier, 1832)	Needlescales queenfish			x	x
149	Carangidae	*Selaroides leptolepis* (Cuvier, 1833)	Yellow-stripe scad		x		x
150	Carangidae	*Selaroides* sp.	Yellowstripe Scad	x			
151	Carcharhinidae	*Carcharhinus melanopterus*			x		
152	Carcharhinidae	*Carcharhinus* sp.	Requien sharks	x			
153	Centriscidae	*Aeoliscus strigatus* (Gunther, 1860)	Blacklined razorfish				x
154	Centropomidae	*Chanda baculis*		x			
155	Centropomidae	*Chanda siamensis*	Siamese Glassfish	x			
156	Centropomidae	*Chanda* sp.	Asiatic Glassfishes	x			
157	Centropomidae	*Lates calcarifer* (Bloch, 1790)	Giant seaperch	x	x	x	
158	Centropomidae	*Parambassis ranga*	Indian Glassy Fish	x			
159	Centropomidae	*Parambassis siamensis*	Indian Glassy Fish	x			
160	Centropomidae	*Psamoperca waigiensis*			x		
161	Chaetodontidae	*Chaetodon octofasciatus*	Eight-banded Butterflyfish	x	x		
162	Chaetodontidae	*Chaetodon* sp.			x		
163	Chaetodontidae	*Chaetodon wiebeli*			x		
164	Chaetodontidae	*Chelmon rostratus*	Long-nosed Butterflyfish	x	x		
165	Chaetodontidae	*Coradion chrysozonus* (Cuvier, 1831)	Orange-banded coralfish	x	x		
166	Chaetodontidae	*Heniochus acuminatus* (Linnaeus, 1758)	Featherfin Butterflyfish	x	x	x	x
167	Chaetodontidae	*Parachaetodon ocellatus* (Cuvier, 1831)	Ocellated Butterflyfish	x	x	x	x
168	Chaetodontidae	*Pomacanthus annularis*	Six-ined Anglefish	x	x		
169	Chaetodontidae	*Pomacanthus sexstriatus*	Six-banded Anglefish	x	x		
170	Channidae	*Chanda wolffii*		x			
171	Channidae	*Channa limbata*	Red-tailed Shakehead	x			
172	Channidae	*Channa lucius*	Blotched Snake-head Fish	x			
173	Channidae	*Channa micropeltes*	Giant Snake-head Fish	x			
174	Channidae	*Channa siamensis*		x			
175	Channidae	*Channa* sp.		x			
176	Channidae	*Channa striatus*	Striped Snake-head Fish	x			
177	Channidae	*Chanos chanos* (Forsskal, 1775)	Milk fish	x		x	
178	Chirocentridae	*Chirocentrus dorab* (Forsskal, 1775)	Dorab wolf herring			x	x
179	Cichlidae	*Oreochromis mossambica*	Java Tilapia	x			
180	Cichlidae	*Oreochromis nilotica*	Nile Tilapia	x			
181	Clariidae	*Clarias batrachus*	Batrachian Walking Catfish	x			
182	Clariidae	*Clarias macrocephalus*	Gunther's Walking Catfish	x			
183	Clariidae	*Genus prophagorus*	Nieuhof's Walking Catfish	x			
184	Clupeidae	*Amblygaster sirm* (Walbaum, 1792)	Spotted sardinella		x		
185	Clupeidae	*Anodontostoma chacunda* (Hamilton, 1822)	Chacunda gizzaard shad	x		x	x
186	Clupeidae	*Clarias meladerma*	Catfish	x			
187	Clupeidae	*Clupea atricauda*	Bleeker's Blacktip Sardinella	x			
188	Clupeidae	*Clupeichthys aesarnensis*	Thai River Sprat	x			
189	Clupeidae	*Clupeichthys goniognathus*	Sumatran River Sprat	x			
190	Clupeidae	*Clupeoides lile*		x			
191	Clupeidae	*Clupeoides* sp.		x			
192	Clupeidae	*Dussumieria elopsoides* Bleeker, 1849				x	
193	Clupeidae	*Escualosa thoracata* (Valenciennes, 1847)	White sardine			x	x
194	Clupeidae	*Herklotsichthys dispilonotus*	Two Spot Herring	x			
195	Clupeidae	*Herklotsichthys qradrimaculatus*			x		
196	Clupeidae	*Hilsa kelee* (Cuvier, 1829)				x	x
197	Clupeidae	*Sardinella albella* (Valenciennes, 1847)	White sardinella			x	x
198	Clupeidae	*Spratelloides gracilis* (Temminch & Schlegel, 1846)	Striped Roundherring	x	x	x	x
199	Cobitidae	*Acanthopsis choirorhynchos*	Horseface Loach	x			
200	Cobitidae	*Botia beauforti*	Botia	x			
201	Cobitidae	*Botia eos*	Red-tail Botia	x			
202	Cobitidae	*Botia helodes*	Botia	x			
203	Cobitidae	*Botia modesta*	Yellow-tail Botia	x			

Appendix 3 *cont.* Fishes found in habitats of the Gulf of Thailand.

No.	Family	Scientific name	Common name	WL	CR	MG	SG
204	Cobitidae	*Botia sidthimunki*	Aree Botia	x			
205	Cobitidae	*Botia* sp.	Botia	x			
206	Cobitidae	*Cobitophis anguillaris*	Loach	x			
207	Cobitidae	*Lepidocephalichthys* sp.	Loach	x			
208	Cobitidae	*Lepidocephalus octocirrhis*	Loach	x			
209	Cobitidae	*Pangio anguillaris*	Loach	x			
210	Cobitidae	*Pangio kuhlii*	Khuli Loach	x			
211	Cobitidae	*Pangio myersi*	Loach	x			
212	Cobitidae	*Pangio pangia*	Java Loach	x			
213	Coiidae	*Coius microlepis*	Siamese Tiger Fish	x			
214	Coiidae	*Coius quadrifasciatus*	Striped Bass, Rock Bass	x			
215	Cynoglossidae	*Cynoglossus arel* (Schneider, 1801)	Largescale tonguesole			x	
216	Cynoglossidae	*Cynoglossus bilineatus* (Lacepede, 1802)	Fourlined tongue sole			x	
217	Cynoglossidae	*Cynoglossus lida* (Bleeker, 1851)	Twonostrils tongue sole			x	x
218	Cynoglossidae	*Cynoglossus lingua* Hamilton & Buchanan, 1822	Long tongue sole	x		x	
219	Cynoglossidae	*Cynoglossus macrolepidotus*	Largescale tongue sole	x			
220	Cynoglossidae	*Cynoglossus microlepis*	Freshwater Tonguefish	x			
221	Cynoglossidae	*Cynoglossus oligolepis*	Tonguesole	x			
222	Cynoglossidae	*Cynoglossus puncticeps* (Richardson, 1846)	Speckled tonguesole	x		x	x
223	Cynoglossidae	*Cynoglossus semifasciatus* Day, 1878-1888				x	x
224	Cynoglossidae	*Cynoglossus* sp.	Tonguesole	x			
225	Cynoglossidae	*Paraplagusia blochi*	Two Lined Tongue Sole	x			
226	Cyprinidae	*Albulichthys albuloides*	Minnow	x			
227	Cyprinidae	*Amblyrhynchichthys truncatus*	Minnow	x			
228	Cyprinidae	*Balantiocheilos melanopterus*	Black-tipped Silver Shark	x			
229	Cyprinidae	*Bangana behri*		x			
230	Cyprinidae	*Barbichthys laevis*	Golden Carp	x			
231	Cyprinidae	*Barbodes altus*	Red-tail Tinfoil Barb	x			
232	Cyprinidae	*Barbodes goninotus*	Common Silver barb	x			
233	Cyprinidae	*Barbodes schwanenfeldi*	Schwanenfeld's Barb	x			
234	Cyprinidae	*Barillius guttatus*	Barillius	x			
235	Cyprinidae	*Barillius nanensis*	Barillius	x			
236	Cyprinidae	*Barillius ornatus*	Barillius	x			
237	Cyprinidae	*Boraras micros*		x			
238	Cyprinidae	*Catlocarpio siamensis*	Siamese gisnt carp	x			
239	Cyprinidae	*Chela caeruleostigmata*	Leaping Barb	x			
240	Cyprinidae	*Chela laubuca*	Indian Glass Barb	x			
241	Cyprinidae	*Cirrhinus chinensis*	Mud Carp	x			
242	Cyprinidae	*Cirrhinus cryptopogon*	Mud Carp	x			
243	Cyprinidae	*Cirrhinus jullien*	Jullien's Mud Carp	x			
244	Cyprinidae	*Cirrhinus macrosemion*	Mud Carp	x			
245	Cyprinidae	*Cirrhinus microlepis*	Smallscale Mud Carp	x			
246	Cyprinidae	*Cirrhinus prosemion*	Smallscale Mud Carp	x			
247	Cyprinidae	*Cirrhinus spiropleura*	Jullien's Mud Carp	x			
248	Cyprinidae	*Crossocheilus oblongus*	Siamese Flying Fox	x			
249	Cyprinidae	*Crossocheilus reticulatus*	Loach	x			
250	Cyprinidae	*Crossocheilus siamensis*	Hying Fox	x			
251	Cyprinidae	*Cyclocheilichthys apogon*	Indian River Barb	x			
252	Cyprinidae	*Cyclocheilichthys armatus*	River Barb	x			
253	Cyprinidae	*Cyclocheilichthys enoplos*	Soldier River Barb	x			
254	Cyprinidae	*Cyclocheilichthys heteronema*	River Barb	x			
255	Cyprinidae	*Cyclocheilichthys repasson*	River Barb	x			
256	Cyprinidae	*Cyprinus carpio*	Common carp	x			
257	Cyprinidae	*Danio albolineatus*	Danio	x			
258	Cyprinidae	*Danio regina*	Blue Danio	x			
259	Cyprinidae	*Discherodontus schroederi*		x			
260	Cyprinidae	*Epalzeorhynchos bicolor*	Red-tailed Black Shark	x			
261	Cyprinidae	*Epalzeorhynchos frenatus*	Red-finned Black Shark	x			
262	Cyprinidae	*Epalzeorhynchos kallopterus*	Flying Fox	x			
263	Cyprinidae	*Epalzeorhynchos* sp.	Black Shark	x			
264	Cyprinidae	*Esomus metallicus*	Flying Rasbora	x			
265	Cyprinidae	*Garra cambodgiensis*	Stonelapping Ninow	x			
266	Cyprinidae	*Garra fuliginosa*	Loach	x			
267	Cyprinidae	*Garra* sp.	Loach	x			
268	Cyprinidae	*Garra taeniata*	Stonelapping Ninow	x			
269	Cyprinidae	*Hampala diapar*	Eye-spot Barb	x			
270	Cyprinidae	*Hampala macrolepidota*	Transverse-bar-barb	x			
271	Cyprinidae	*Henicorhynchus caudimaculatus*		x			
272	Cyprinidae	*Henicorhynchus cryptopogon*		x			
273	Cyprinidae	*Henicorhynchus siamensis*	Mud Carp	x			

Appendix 3 *cont.* Fishes found in habitats of the Gulf of Thailand.

No.	Family	Scientific name	Common name	WL	CR	MG	SG
274	Cyprinidae	*Hypophthalmichthys molitrix*	Silver Carp	x			
275	Cyprinidae	*Hypophthalmichthys nobilis*	Bighead Carp	x			
276	Cyprinidae	*Hypsibarbus wetmorei*		x			
277	Cyprinidae	*Labeo behri*	Carp	x			
278	Cyprinidae	*Labeo bicolor*	Redtail Sharkminow	x			
279	Cyprinidae	*Labeo dyocheilus*		x			
280	Cyprinidae	*Labeo erythrurus*		x			
281	Cyprinidae	*Labeo rohita*	Rohu	x			
282	Cyprinidae	*Labeo* sp.		x			
283	Cyprinidae	*Labiobarbus burmanicus*	Barb	x			
284	Cyprinidae	*Labiobarbus lineatus*	Carp	x			
285	Cyprinidae	*Labiobarbus* sp.		x			
286	Cyprinidae	*Labiobarbus spilopleura*	Barp	x			
287	Cyprinidae	*Leptobarbus hoeveni*	Hoeven's Slender Carp	x			
288	Cyprinidae	*Lobocheilus gracilis*		x			
289	Cyprinidae	*Lobocheilus quadrilineatus*	Barb	x			
290	Cyprinidae	*Lobocheilus rhabdoura*	Barb	x			
291	Cyprinidae	*Lobocheilus* sp.		x			
292	Cyprinidae	*Luciosoma bleekeri*	Appllo Shark	x			
293	Cyprinidae	*Luciosoma setigerum*		x			
294	Cyprinidae	*Macrochirichthys macrochirus*	Carp	x			
295	Cyprinidae	*Morulius chrysophekadian*	Black Shark	x			
296	Cyprinidae	*Morulius* sp.	Barb	x			
297	Cyprinidae	*Mystacoleucus argenteus*	Barb	x			
298	Cyprinidae	*Mystacoleucus atridorsaliss*		x			
299	Cyprinidae	*Mystacoleucus marginatus*		x			
300	Cyprinidae	*Mystacoleucus* sp.		x			
301	Cyprinidae	*Neolissochilus stracheyi*		x			
302	Cyprinidae	*Osteochilus hasselti*	Barb	x			
303	Cyprinidae	*Osteochilus lini*	Barb	x			
304	Cyprinidae	*Osteochilus melanopleura*	Greater Bony Lipped Barb	x			
305	Cyprinidae	*Osteochilus microcephalus*		x			
306	Cyprinidae	*Osteochilus prosenion*	Mud Carp	x			
307	Cyprinidae	*Osteochilus schlegeli*		x			
308	Cyprinidae	*Osteochilus* sp.	Barb	x			
309	Cyprinidae	*Osteochilus spilopleurus*	Mud Carp	x			
310	Cyprinidae	*Osteochilus vittatus*	Bony Lipped Barb	x			
311	Cyprinidae	*Osteochilus waandersii*	Waander's Bony Lipped Barb	x			
312	Cyprinidae	*Oxygaster maculicauda*		x			
313	Cyprinidae	*Oxygaster oxygastroides*	Glass Fish	x			
314	Cyprinidae	*Oxygaster pointoni*		x			
315	Cyprinidae	*Oxygaster siamensis*	Glassfish	x			
316	Cyprinidae	*Oxygaster* sp.		x			
317	Cyprinidae	*Parachela* sp.		x			
318	Cyprinidae	*Paralaubuca barroni*	Carp	x			
319	Cyprinidae	*Paralaubuca harmandi*		x			
320	Cyprinidae	*Paralaubuca riveroi*	Siamese River Abramine	x			
321	Cyprinidae	*Paralaubuca* sp.		x			
322	Cyprinidae	*Paralaubuca typus*		x			
323	Cyprinidae	*Probarbus jullieni*	Jullien's Golden Price Carp	x			
324	Cyprinidae	*Puntioplites proctozysron*	Barb	x			
325	Cyprinidae	*Raiamas guttatus*	Minnow	x			
326	Cyprinidae	*Rasbora argyrotaenis*	Silver Rasbora	x			
327	Cyprinidae	*Rasbora borapetensis*	Blackline Rasbora	x			
328	Cyprinidae	*Rasbora caudimaculata*	Graeter Scissortail	x			
329	Cyprinidae	*Rasbora dusonensis*	Yellowtail Rasbora	x			
330	Cyprinidae	*Rasbora lateristriata*	Yellow Rasbora	x			
331	Cyprinidae	*Rasbora myersi*	Myer's Silver Rasbora	x			
332	Cyprinidae	*Rasbora retrodorsalis*	Pale Rasbora	x			
333	Cyprinidae	*Rasbora sumatrana*	Giant Scissor-tail	x			
334	Cyprinidae	*Rasbora trilineata*	Three-lined Rasbora	x			
335	Cyprinidae	*Sikukia stejnegeri*	Carp	x			
336	Cyprinidae	*Systomus beasleyi*		x			
337	Cyprinidae	*Systomus binotatus*	Spotted Barb	x			
338	Cyprinidae	*Systomus leiacantus*	Golden Little Barb	x			
339	Cyprinidae	*Systomus orphoides*	Red-cheeked Barb	x			
340	Cyprinidae	*Systomus partipentozona*		x			
341	Cyprinidae	*Systomus somphongsi*		x			

Appendix 3 *cont.* Fishes found in habitats of the Gulf of Thailand.

No.	Family	Scientific name	Common name	WL	CR	MG	SG
342	Cyprinidae	*Systomus* sp.		x			
343	Cyprinidae	*Systomus stolitczkae*		x			
344	Cyprinidae	*Systomus vernayi*		x			
345	Cyprinidae	*Tor soro*	Soro Brook Carp	x			
346	Cyprinidae	*Tor tambroides*	Greater Brook Carp	x			
347	Dasyatidae	*Dasyatis bleekeri*	Freshwater Stingray	x			
348	Dasyatidae	*Himantura chaophraya*	Ray	x			
349	Dasyatidae	*Himantura gerrardi* (Gray, 1851)					x
350	Dasyatidae	*Himantura imbricata* (Bloch & Schneider, 1801)				x	x
351	Dasyatidae	*Taeniura lymma* (FORSSKAL, 1775)	Blue-spotted Fantail Ray	x	x		
352	Diodontidae	*Chilomycterus orbicularis* (Bloch, 1785)	Birdbeak burrfish			x	
353	Diodontidae	*Diodon holocanthus* (Linnaeus, 1758)	Freckled porcupine fish		x		
354	Diodontidae	*Diodon hystrix*Linnaeus, 1758	Porcupine fish		x		
355	Diodontidae	*Diodon liturosus*	Shortspine Ballonfish	x	x		
356	Drepanidae	*Drepane longimana* (Bloch & Schneider, 1801)	Band sicklefish			x	
357	Drepanidae	*Drepane punctata* (Linnaeus, 1758)				x	
358	Echeneidae	*Echenius naucrates* Linnaeus, 1758	Slender suckerfish		x		
359	Eleotridae	*Ophiocara porocephala* (Valenciennes, 1837)	Spangled gukgeon	x		x	
360	Eleotridae	*Prinobutis koilomatodon*		x			
361	Eleotridedae	*Bostrychus sinensis* (Lacepede, 1801)				x	
362	Eleotridedae	*Butis butis* (Hamilton, 1822)	Crimsontip flathead gudgeon			x	x
363	Eleotridedae	*Butis koilomatoton* (Bleeker, 1849)				x	
364	Eleotrididae	*Eleotris melanosoma* Bleeker, 1852				x	
365	Eleotrididae	*Odonteleotris macrodon* (Bleeker, 1583)				x	
366	Elopidae	*Elops machnata* (orsskal, 1775)				x	
367	Engraulidae	*Coilia borneensis*		x			
368	Engraulidae	*Coilia dussumieri*	Goldspotted Grenadier	x			
369	Engraulidae	*Coilia macrognathus*	Moustached Taper-tail	x			
370	Engraulidae	*Coilia* sp.		x			
371	Engraulidae	*Engraulis grayi*	Hamilton's thryssa	x			
372	Engraulidae	*Engraulis mystax*	Moustached Thryssa	x			
373	Engraulidae	*Engraulis* sp.		x			
374	Engraulidae	*Stolephorus baganensis* Hardenberg, 1933				x	
375	Engraulidae	*Stolephorus commersonii*	Anchovy	x			
376	Engraulidae	*Stolephorus indicus* (Van Hasselt, 1823)	Indian anchovy	x		x	x
377	Engraulidae	*Stolephorus insularis* Hardenberg, 1933				x	
378	Engraulididae	*Setipinna taty* (Valenciennes, 1848)	Hairfin anchovy			x	
379	Engraulididae	*Thryssa hamiltonii* (Gray, 1835)	Hanilton's thryssa			x	x
380	Engraulididae	*Thryssa kammalensis* (Bleeker, 1849)	Madura thryssa			x	
381	Engraulididae	*Thryssa setirostris* (Broussonet, 1782)	Longjaw thryssa			x	
382	Ephippidae	*Ephippus orbis* (Bloch, 1787)	Round spadefish			x	x
383	Ephippidae	*Platax orbicularis*	Round Batfish	x			
384	Ephippidae	*Platax teira* (Forsskal, 1775)	Longfin batfiah		x	x	x
385	Fistulariidae	*Fistularia commersonii* Ruppell, 1838	Serrated flutemouth				x
386	Gerreidae	*Gerres abbreviatus* Bleeker, 1850	Deepbody silverbiddy		x	x	x
387	Gerreidae	*Gerres acinaces* (Bleeker, 1854)	Longtail silverbiddy			x	
388	Gerreidae	*Gerres filamemtosus* Cuvier, 1829	Whipfin silverbiddy			x	x
389	Gerreidae	*Gerres lucidus*			x		
390	Gerreidae	*Gerres oblongus* (Cuvier, 1830)	Elongated silverbiddy		x	x	x
391	Gerreidae	*Gerres oyena* (Forsskal, 1775)	Slender silverbiddy		x	x	x
392	Gerreidae	*Gerres poieti* (Cuvier, 1829)	Strongspine silverbiddy			x	x
393	Gerreidae	*Gerres* sp.			x		
394	Gobiesocidae	*Diademichthys lineatus*			x		
395	Gobiesocidae	*Lepadichthys* sp.			x		
396	Gobiidae	*Acentrogobius audax* Smith, 1959				x	
397	Gobiidae	*Acentrogobius caninus* (Cuvier & Valenciennes, 1837)	Dogtooth goby			x	x
398	Gobiidae	*Acentrogobius janthinopterus* (Bleeeker, 1852)				x	
399	Gobiidae	*Acentrogobius viridipunctatus* (Valenciennes, 1837)	Triangle Goby	x		x	
400	Gobiidae	*Amblyeleotris fontanesii* (Bleeker, 1852)			x		
401	Gobiidae	*Amblyeleotris gymnocephalus* (Bleeker, 1853)			x		
402	Gobiidae	*Amblygobius nocturnus* (Herre, 1945)			x		
403	Gobiidae	*Amblygobius phalaena* (Valenciennes, 1837)			x		
404	Gobiidae	*Amoya moloanus* (Herre, 1927)				x	
405	Gobiidae	*Apocryptodon madurensis* (Bleeker, 1849)				x	x
406	Gobiidae	*Aulopareia cyanomos* (Bleeker, 1849)				x	
407	Gobiidae	*Bathygobius fuscus* (Ruppell, 1830)	Brown goby	x	x		x
408	Gobiidae	*Boleophthalmus boddarti* (Pallas, 1770)				x	

Appendix 3 *cont.* Fishes found in habitats of the Gulf of Thailand.

No.	Family	Scientific name	Common name	WL	CR	MG	SG
409	Gobiidae	*Boleophthalmus pectinirostris*	Jumping Goby	x			
410	Gobiidae	*Brachygobius* sp.	Goby	x			
411	Gobiidae	*Brachygobius* sp.1				x	
412	Gobiidae	*Brachygobius* sp.2				x	
413	Gobiidae	*Callogobius* sp.1				x	
414	Gobiidae	*Callogobius* sp.2				x	
415	Gobiidae	*Cristatogobius lophius* Herre, 1927				x	
416	Gobiidae	*Cristatogobius* sp.1				x	
417	Gobiidae	*Cryptocentrus caeruleomaculatus*			x		
418	Gobiidae	*Cryptocentrus cinctus*			x		
419	Gobiidae	*Cryptocentrus fasciatus*			x		
420	Gobiidae	*Cryptocentrus leptocephalus* Bleeker, 1876	Eightband goby		x		x
421	Gobiidae	*Cryptocentrus pavaninoides*			x		
422	Gobiidae	*Cryptocentrus* sp.		x	x		
423	Gobiidae	*Cryptocentrus* sp.1					x
424	Gobiidae	*Cryptocentrus strigilliceps* (Jordan & Seale, 1906)			x		x
425	Gobiidae	*Ctenogobiops pomastictus*			x		
426	Gobiidae	*Ctenogobius cephalopadus*	Goby	x			
427	Gobiidae	*Ctenogobius driengmainensis*	Goby	x			
428	Gobiidae	*Dasson variabilis*	Scabre Toothed Blenny	x			
429	Gobiidae	*Drombus key* (Smith, 1947)				x	x
430	Gobiidae	*Drombus* sp.1				x	
431	Gobiidae	*Drombus triangularis* (Weber, 1909)				x	
432	Gobiidae	*Eviota prasina*			x		
433	Gobiidae	*Eviota qreenslandica*			x		
434	Gobiidae	*Glossogobius bicirrbosus* (Weber, 1894)				x	
435	Gobiidae	*Glossogobius biocellatus* (Valenciennes, 1837)				x	x
436	Gobiidae	*Glossogobius circumspectus* (Macleay, 1883)				x	
437	Gobiidae	*Glossogobius giuris* (Hamilton, 1822)	Flathead goby	x		x	
438	Gobiidae	*Glossogobius* sp.	Goby	x			
439	Gobiidae	*Gobiodon citrinus*	Acroporal	x	x		
440	Gobiidae	*Gobiodon micropus*			x		
441	Gobiidae	*Gobiodon quinquestrigatus*			x		
442	Gobiidae	*Gobiopsis aporia*			x		
443	Gobiidae	*Gobiopsis macrostoma* Steindachner, 1861				x	
444	Gobiidae	*Gobiopsis quinquecincta*			x		
445	Gobiidae	*Gobiopsis woodsi*			x		
446	Gobiidae	*Gobiopterus brachypterus* (Bleeker, 1855)				x	
447	Gobiidae	*Gobiopterus panayensis* (Herre, 1944)				x	
448	Gobiidae	*Gobiopterus* sp.1				x	
449	Gobiidae	*Istigobius ornatus*(Ruppell, 1830)	Ornate goby		x		
450	Gobiidae	*Mahidolia mystacina*			x		
451	Gobiidae	*Mangarinus* sp.1				x	
452	Gobiidae	*Mangarinus waterousi* Herre, 1943				x	
453	Gobiidae	*Mugilogobius rambaiae*		x			
454	Gobiidae	*Mugilogobius* sp.1				x	
455	Gobiidae	*Oxyurichthys microlepis* (Bleeker, 1849)	Smallscale goby			x	x
456	Gobiidae	*Oxyurichthys tentacularis* (Valenciennes, 1837)	Eyebrow goby			x	
457	Gobiidae	*Pandaka lidwilli* (McCulloch, 1917)				x	
458	Gobiidae	*Papillogobius cf punctatus* Gill & Miller,1990					x
459	Gobiidae	*Papillogobius reichei* (Bleeker, 1853)				x	
460	Gobiidae	*Parachaeturichthys polynema* (Bleeker,1853)	Eyetail goby			x	
461	Gobiidae	*Periophthalmus argentilineatus* Valenciennes, 1837				x	
462	Gobiidae	*Periophthalmus barbarus*	Atlantic Mudskipper	x			
463	Gobiidae	*Periophthalmus cantonensis*	Mud Skipper	x			
464	Gobiidae	*Periophthalmus chrysospilos* Bleeker, 1852				x	
465	Gobiidae	*Periophthalmus minutus* Eggert, 1935				x	
466	Gobiidae	*Periophthalmus* sp.	Mud Skipper	x			
467	Gobiidae	*Priolepis nuchifasciatus*			x		
468	Gobiidae	*Priolepis semidoliatus*			x		
469	Gobiidae	*Redigobius bikolanus* Herre, 1927				x	
470	Gobiidae	*Redigobius chrysosoma* (Bleeker, 1875)				x	
471	Gobiidae	*Rhinogobius baliuroides*			x		
472	Gobiidae	*Rhinogobius* sp.	Goby	x			
473	Gobiidae	*Scartelaos cantoris* (Day, 1871)				x	x
474	Gobiidae	*Scartelaos histophorus* (Valenciennes, 1837)				x	
475	Gobiidae	*Stigmatogobius javanicus*	Goby	x			
476	Gobiidae	*Stigmatogobius oligactis*	Goby	x			
477	Gobiidae	*Stigmatogobius sadanundio* (Hamiton, 1822)	Spot goby			x	

Appendix 3 *cont.* Fishes found in habitats of the Gulf of Thailand.

No.	Family	Scientific name	Common name	WL	CR	MG	SG
478	Gobiidae	*Taenioides cirratus* (Blyth, 1860)	Yellow tapering goby			x	
479	Gobiidae	*Trypauchen microcephalus* Bleeker, 1860				x	
480	Gobiidae	*Trypauchen vagina*	Pink Burrowing Goby	x			
481	Gobiidae	*Valenciennea linicola*			x		
482	Gobiidae	*Valenciennea muralis* (Valenciennes,1837)			x		x
483	Gobiidae	*Valenciennea puellaris*			x		
484	Gobiidae	*Valenciennea sexguttata*			x		
485	Gobiidae	*Valenciennea wardii*			x		
486	Gobiidae	*Yongeichthys nebulosus* (Forsskal, 1775)				x	x
487	Grammistidae	*Diploprion bifasciatum* (kuhl & van Hasselt, 1928)	Yellow emperor	x	x		
488	Gyrinocheilidae	*Gyrinocheilus aymonieri*	Siamese Gyrinochellid	x			
489	Haemulidae	*Diagramma pictum* (Thunberg, 1792)	Painted sweetlip		x		x
490	Haemulidae	*Plectorhinchus albovittatus* Ruppell, 1838	Giant sweetlips		x		
491	Haemulidae	*Plectorhinchus chaetodonoides* Lacepede, 1801	Harlequin Sweetlip	x	x		
492	Haemulidae	*Plectorhinchus unicolor*			x		
493	Haemulidae	*Plectorhynchus gibbosus* (Lacepede, 1802)	Harry hotlips		x	x	x
494	Haemulidae	*Plectorhynchus orientalis*	Oriental Sweetlip	x			
495	Haemulidae	*Plectorhynchus picus* (Tortonese, 1936)	Spotted Sweetlip	x			
496	Haemulidae	*Pomadasys kaakan* (Cuvier, 1830)	Javelin grunter			x	x
497	Hemiramphidae	*Hemiramphus dispar*	Wrestling Halfbeak	x			
498	Hemiramphidae	*Hemiramphus far* (Forsskal, 1775)	Spotted halfbeak		x		x
499	Hemiramphidae	*Hemiramphus gaimardi*	Gaimardi's Halfbeak	x			
500	Hemiramphidae	*Hemiramphus melanurus*	Black-tailed Halfbeak	x			
501	Hemiramphidae	*Hyporamphus limbatus* (Valenciennes, 1846)				x	x
502	Hemiramphidae	*Hyporhamphus dussumieri* (Valenciennes, 1846)			x		x
503	Hemiramphidae	*Zenarchopterus disper* (Valenciennes, 1847)				x	x
504	Hemiramphidae	*Zenarchopterus kampei*	Sepile River Halfbeak	x			
505	Hemiramphidae	*Dermogenys pusillus*	Wrestling Half-beak	x			
506	Hemiscylliidae	*Chiloscyllium griseum* Muller & Henle, 1839	Grey bambooshark				x
507	Hemiscylliidae	*Chiloscyllium indicum* (Gmelin, 1789)	Slender Bambooshark	x			
508	Hemiscylliidae	*Chiloscyllium plagiosum* (Bennett, 1830)	Whitespot Bambooshark	x			
509	Hemiscylliidae	*Chiloscyllium punctatum*Muller & Henle, 1818	Brown-band catshark	x			
510	Heteropneustidae	*Heteropneustes fossilis*	Scrobranch Catfish	x			
511	Holocentridae	*Myripristis botche*			x		
512	Holocentridae	*Myripristis hexagona*			x		
513	Holocentridae	*Myripristis murdjan*			x		
514	Holocentridae	*Myripristis violaceus*	Lattice Soldierfish	x	x		
515	Holocentridae	*Sagocentrom rubrum*	Redcoat	x			
516	Holocentridae	*Sargocentron rubrum*			x		
517	Kyphosidae	*Kyphosus cinerascens*			x		
518	Kyphosidae	*Kyphosus vaigiensis*			x		
519	Labridae	*Anampses caeruleopunctatus*			x		
520	Labridae	*Cheilinus chlorourus*			x		
521	Labridae	*Cheilinus fasciatus*	Scarlet-breasted Wrasse	x	x		
522	Labridae	*Cheilinus trilobatus*	Triple-tailed Wrasse	x	x		
523	Labridae	*Choeredon* sp.	Tuskfish		x		
524	Labridae	*Choerodon anchorago* (Bloch, 1791)	Orange-dotted tuskfish		x		
525	Labridae	*Choerodon schoenleinii*			x		
526	Labridae	*Diproctacanthus xanthurus*			x		
527	Labridae	*Epibulus insidiator*	Slingjaw Wrasse	x	x		
528	Labridae	*Halichoeres argus*			x		
529	Labridae	*Halichoeres bicolor* (Bloch & Schneider, 1801)				x	x
530	Labridae	*Halichoeres chlropterus*	Green Spot Wrasse	x	x		
531	Labridae	*Halichoeres dussumieri* (Valenciennes, 1839)					x
532	Labridae	*Halichoeres hoeveni*	Three Eye Wrasse	x			
533	Labridae	*Halichoeres hortulanus*			x		
534	Labridae	*Halichoeres margaritaceus*			x		
535	Labridae	*Halichoeres marginatus*	Speckle Rainbow Wrasse	x	x		
536	Labridae	*Halichoeres melanurus*			x		
537	Labridae	*Halichoeres nebulosus*			x		
538	Labridae	*Halichoeres nigrescens*	Dusky Rainbow Wrasse	x	x		
539	Labridae	*Halichoeres poecilopterus*	Blackline Wrasse	x			
540	Labridae	*Halichoeres purpurascens*			x		
541	Labridae	*Hemigymnus fasciatus*	Barred Thicklip Wrasse	x	x		
542	Labridae	*Hemigymnus melapterus*	Blackeye Thicklip Wrasse	x	x		
543	Labridae	*Labroides dimidiatus* (Valenciennes, 1839)	Bluestreak Wrasse	x	x		
544	Labridae	*Oxychelinus digrammus*			x		
545	Labridae	*Stethojulis bandanensis*			x		
546	Labridae	*Stethojulis interrupta*			x		
547	Labridae	*Stethojulis* sp.			x		

Appendix 3 *cont.* Fishes found in habitats of the Gulf of Thailand.

No.	Family	Scientific name	Common name	WL	CR	MG	SG
548	Labridae	*Stethojulis strigiventer* (Bennett, 1832)	Silver ribbon rainbow				x
549	Labridae	*Stethojulis trilineata*			x		
550	Labridae	*Thalassoma lunare*	Crescent Grunter	x	x		
551	Leiognathidae	*Gazza minuta* (Bloch, 1797)	Toothed ponyfish	x		x	x
552	Leiognathidae	*Leiognathus bindus* (Valenciennes, 1835)	Orangefin slipmouth			x	
553	Leiognathidae	*Leiognathus brevirostis*	Shortnose Slipmouth	x			
554	Leiognathidae	*Leiognathus daura* (Cuvier, 1829)	Goldstripe slipmouth			x	
555	Leiognathidae	*Leiognathus decorus* (De Vis, 1844)				x	x
556	Leiognathidae	*Leiognathus equula* (Forsskal, 1775)	Common slipmouth	x		x	x
557	Leiognathidae	*Leiognathus fasciatus*	Striped Slipmouth	x			
558	Leiognathidae	*Leiognathus insidiator*	Pugnose Pongfish	x			
559	Leiognathidae	*Leiognathus leuciscus* (Gunther, 1860)	Whipfin slipmouth			x	
560	Leiognathidae	*Leiognathus lineolatus*	Line Slipmouth	x			
561	Leiognathidae	*Leiognathus oblongus* (Valenciennes, 1835)				x	
562	Leiognathidae	*Leiognathus pan* (Wongratana, 1988)				x	
563	Leiognathidae	*Leiognathus smithursti* (Ramsay & Ogilby, 1886)	Smithurst's slipmouth			x	
564	Leiognathidae	*Leiognathus splendens* (Cuvier, 1829)	Splendid slipmouth	x		x	
565	Leiognathidae	*Leiognathus stercorarius* (Everman & Seale, 1907)				x	x
566	Leiognathidae	*Secutor insidiator* (Bloch, 1787)	Slender slipmouth			x	x
567	Leiognathidae	*Secutor ruconius* (Hamilton, 1822)	Deeppug nose slipmouth			x	x
568	Lethrinidae	*Gymnocraniius grandoculis*			x		
569	Lethrinidae	*Lethrinus erythropterus*			x		
570	Lethrinidae	*Lethrinus lentjan* (Lacepede, 1802)	Redspot emperor		x	x	x
571	Lethrinidae	*Lethrinus mebulosus*	Spangled Emperor	x			
572	Lethrinidae	*Lethrinus ornatus* (Balenciennes, 1830)	Ornate emperor		x		x
573	Lethrinidae	*Lethrinus* sp.			x		
574	Lobotidae	*Lobotes surinamensis* (Bloch, 1790)	Browm tripletail			x	x
575	Lutjanidae	*Lutjanas argentimaculatus*	Mangrove Redsnapper	x			
576	Lutjanidae	*Lutjanas carponotatus*		x			
577	Lutjanidae	*Lutjanas decussatus*	Crossband Snapper	x			
578	Lutjanidae	*Lutjanas vaigiensis*		x			
579	Lutjanidae	*Lutjanus argentimaculatus* (Forsskal, 1775)	Mangrove red snapper		x	x	
580	Lutjanidae	*Lutjanus biguttatus* (Valenciennes, 1775)	Twospot banded snapper			x	
581	Lutjanidae	*Lutjanus bohar*			x		
582	Lutjanidae	*Lutjanus carponotatus*			x		
583	Lutjanidae	*Lutjanus decussatus*			x		
584	Lutjanidae	*Lutjanus erythropterus*			x		
585	Lutjanidae	*Lutjanus fulviflamma* (Forsskal, 1775)	Blackspot snapper		x	x	x
586	Lutjanidae	*Lutjanus johnii* (Bloch, 1792)	John's snapper	x	x	x	x
587	Lutjanidae	*Lutjanus kasmira*			x		
588	Lutjanidae	*Lutjanus lemniscatus*			x		
589	Lutjanidae	*Lutjanus lunulatus*	Lunartail Snapper	x			
590	Lutjanidae	*Lutjanus lutjanus*	Bigeye snapper		x	x	x
591	Lutjanidae	*Lutjanus madras* (Valenciennes, 1831)				x	
592	Lutjanidae	*Lutjanus monostigmus*	One spot Snapper	x	x		
593	Lutjanidae	*Lutjanus quinquelineatus*			x		
594	Lutjanidae	*Lutjanus russelli* (Bleeker, 1849)	Russell's snapper	x	x	x	x
595	Lutjanidae	*Lutjanus sebae*	Emperor Redsnapper	x	x		
596	Lutjanidae	*Lutjanus timorensis*			x		
597	Lutjanidae	*Lutjanus vitta*			x		
598	Lutjanidae	*Lutjanus vittus*	Brownstripe Snapper	x			
599	Lutjanidae	*Symphorus nematophorus* (Bleeker,1860)	Chinamanfish				x
600	Mastacembelidae	*Macrognathus aculeatus*	Siamensis Lesser Spiny Eel	x			
601	Mastacembelidae	*Macrognathus circumcinctus*	Lesser Spiny Eel	x			
602	Mastacembelidae	*Macrognathus siamensis*	Spotted Spiny Eel	x			
603	Mastacembelidae	*Mastacembelus armatus*	Armed Spiny Eel	x			
604	Mastacembelidae	*Mastacembelus favus*	Spiny Eel	x			
605	Mastacembelidae	*Mastacembelus* sp.		x			
606	Megalopidae	*Megalops cyprinoides* (Broussonet, 1782)	Indo-Pacific tarpon	x		x	
607	Microdesmidae	*Parioglossus formosus*			x		
608	Microdesmidae	*Parioglossus philippinus*			x		
609	Microdesmidae	*Parioglossus* sp.			x		
610	Microdesnidae	*Ptereleotris microlepis*			x		
611	Microdesnidae	*Ptereleotris monoptera*			x		
612	Microdesnidae	*Ptereleotris* sp.			x		
613	Monacanthidae	*Aluterus monoceros* (Linnaeus, 1758)	Unicorn leatherjacket		x		
614	Monacanthidae	*Monacanthus chinensis* (Osbeck, 1765)	Chinese leatherjacket	x	x	x	x
615	Monacanthidae	*Paramonacanthus choirocephalus* (Bleeker, 1852)			x	x	x
616	Monacanthidae	*Pseudomonacanthus macrurus* (Bleeker, 1857)				x	

Appendix 3 *cont.* Fishes found in habitats of the Gulf of Thailand.

No.	Family	Scientific name	Common name	WL	CR	MG	SG
617	Monodactylidae	*Monodactylus argenteus* (Linnaeus, 1758)	Butter fish	x	x	x	
618	Mugilidae	*Atherina valenciennesi*	Sumatran Silverside	x			
619	Mugilidae	*Moolgarda cunnesius* (Valenciennes, 1836)				x	x
620	Mugilidae	*Moolgarda engeli* (Bleeker, 1858)				x	
621	Mugilidae	*Moolgarda pedaraki* (Valenciennes, 1836)			x	x	x
622	Mugilidae	*Moolgarda seheli*			x		
623	Mugilidae	*Mugil borneenis*	Largescale Mullet	x			
624	Mugilidae	*Mugil dussumieri*	Greenback Mullet	x			
625	Mugilidae	*Mugil kelaartii*	Longarm Mullet	x			
626	Mugilidae	*Mugil seheli*	Bluespot Mullet	x			
627	Mugilidae	*Mugil* sp.	Mullet	x			
628	Mugilidae	*Mugil subviridis*	Greenback Mullet	x			
629	Mugilidae	*Mugil tado*	Tade Mullet	x			
630	Mugilidae	*Mugil vaigiensis*	Squaretail Mullet	x			
631	Mugilidae	*Oedalechilus labiosus*			x		
632	Mugillidae	*Chelon macrolepis* (Smith, 1849)				x	
633	Mugillidae	*Chelon parmata* (Cantor, 1849)				x	
634	Mugillidae	*Chelon parsia* (Hamilton, 1822)				x	
635	Mugillidae	*Chelon* spp.			x		
636	Mugillidae	*Chelon subviridis* (Valenciennes, 1836)				x	x
637	Mugillidae	*Ellochelon vaigiensis* (Quoy & Gaimard)			x	x	x
638	Mullidae	*Mulloidichthys flavolineatus* (Lacepede, 1802)	Slender goatfish				x
639	Mullidae	*Mulloidichthys* sp.	Goatfish	x			
640	Mullidae	*Parupeneus heptacanthus* (Lacepede,1801)					x
641	Mullidae	*Parupeneus indicus* (Shaw,1803)	Indian goatfiah		x		x
642	Mullidae	*Upeneus* sp.	Goatfish	x			
643	Mullidae	*Upeneus sulphureus* Cuvier, 1829	Yellow goatfish	x		x	x
644	Mullidae	*Upeneus sundaicus* (Bleeker, 1855)	Ochreband goatfish			x	
645	Mullidae	*Upeneus tragula* (Richarson, 1846)	Freckled goatfish		x		
646	Mullidae	*Upeneus tragula* Richardson, 1846	Freckle goatfish	x		x	x
647	Muraenidae	*Congresox talabon* (Cuvier, 1829)	Yellow Pike-conger	x			
648	Muraenidae	*Gymnothorax boschii* (Bleeker, 1853)			x		
649	Muraenidae	*Gymnothorax* sp.			x		
650	Muraenidae	*Gymnothorax undulatus*			x		
651	Muraenidae	*Siderea delicatula*			x		
652	Muraenidae	*Siderea thyrsoidea*			x		
653	Myliobatidae	*Aetobatus narinari* (Euphrasen, 1790)	Spooted eagle ray		x		
654	Nandidae	*Badis badis*	Badis	x			
655	Nandidae	*Nandus nandus*	Gangetic Leaffish	x			
656	Nandidae	*Nandus nebulosus*	Bornean Leaffish	x			
657	Nandidae	*Pristolepis fasciatus*	Striped Tiger Nandid	x			
658	Nemipteridae	*Nemipterus hexodon*			x		
659	Nemipteridae	*Nemipterus peronii* (Valenciennes, 1830)	Rosy threadfin bream			x	
660	Nemipteridae	*Pentapodus setosus*	Blue Banded Whip Tail	x	x		
661	Nemipteridae	*Scolopsis bilineatus* (Bloch, 1793)	Twolined monoclebream	x	x		x
662	Nemipteridae	*Scolopsis ciliatus* (Lacepede, 1802)	Sawjawed monoclebream	x	x	x	x
663	Nemipteridae	*Scolopsis dubiosus*	Yellowstreak Monoclebream	x			
664	Nemipteridae	*Scolopsis lineatus*			x		
665	Nemipteridae	*Scolopsis margaritifer*			x		
666	Nemipteridae	*Scolopsis monogramma* (Kuhl & van Hasselt, 1830)	Monogrammed monoclebream		x		x
667	Nemipteridae	*Scolopsis* sp.	Threadfin Bream	x			
668	Nemipteridae	*Scolopsis taeniopterus* (Valenciennes, 1830)	Lattice monoclebream		x	x	
669	Nemipteridae	*Scolopsis vasmeri*			x		
670	Notopteridae	*Chitala blanci*	Blanc'a Atriped Feather	x			
671	Notopteridae	*Chitala lopis*	Indonesian Featherback	x			
672	Notopteridae	*Chitala ornata*	Spotted Featherback	x			
673	Notopteridae	*Notopterus notopterus*	Grey Featherback	x			
674	Ophichthidae	*Pisodonophis* sp.	Snake Eel	x			
675	Ophichthidae	*Pisoodonophis cancrivorus* (Richardson, 1844)				x	
676	Ophidiidae	*Dinematichthys ilucoeteoides*	Yellow Brotula	x	x		
677	Oryziidae	*Oryzias javanicus* (Bleeker, 1854)				x	
678	Oryziidae	*Oryzias minutillus*	Dwarf Medaka	x			
679	Oryziidae	*Oryzias* sp.	Ricefish	x			
680	Osteoglossidae	*Scleropages formosus*	Asian Bonytongue	x			
681	Ostraciidae	*Ostracion cubicus*Linnaeus, 1758			x	x	
682	Ostraciidae	*Ostracion nasus*			x		
683	Ostracoiidae	*Lactoria cornuta* (Linnaeus, 1758)	Longhorned cowfish	x	x	x	x
684	Ostracoiidae	*Lactoria diaphana* (Bloch, 1785)				x	

Appendix 3 *cont.* Fishes found in habitats of the Gulf of Thailand.

No.	Family	Scientific name	Common name	WL	CR	MG	SG
685	Ostracoiidae	*Rhynchostracion nasus*	Small-nosed Boxfish	x			
686	Pangasiidae	*Pangasius larnaudii*	Black Ear Catfish	x			
687	Pangasiidae	*Pangasius nasutus*		x			
688	Pangasiidae	*Pangasius pangasius*	Pangas Catfish	x			
689	Pangasiidae	*Pangasius polyuranodon*		x			
690	Pangasiidae	*Pangasius sanitwongsei*	Chao Phraya Gian Catfish	x			
691	Pangasiidae	*Pangasius sutchi*	Striped Catfish	x			
692	Pangasiidae	*Pterois miles* (Bennett, 1828)					x
693	Pangasiidae	*Pteropangasius cultratus*		x			
694	Pangasiidae	*Pteropangasius micronema*		x			
695	Pangasiidae	*Pteropangasius pleurotaenis*	Shark Catfish	x			
696	Pempheridae	*Pempheris adusta*			x		
697	Pempheridae	*Pempheris moluca*			x		
698	Pempheridae	*Pempheris oualensis*	Catalufa Sweeper	x	x		
699	Pempheridae	*Pempheris* sp.	Sweeper	x			
700	Pinguipededae	*Parapercis alboguttata* (Gunther, 1872)	Grubfish			x	
701	Pinguipededae	*Parapercis cf. kamoharai*			x		
702	Pinguipededae	*Parapercis* sp.			x		
703	Pinguipededae	*Parapercis xanthozona*			x		
704	Platycephalidae	*Cociella crocodila* (Tilesius, 1812)	Crocodile flathead				x
705	Platycephalidae	*Grammoplites scaber* (Linnaeus, 1758)	Thorntyscales			x	
706	Platycephalidae	*Hoplichthys* sp.	Ghost Flathead	x			
707	Platycephalidae	*Inegocia japonica* (Tilesius, 1812)				x	x
708	Platycephalidae	*Inegocia* sp.	Flathead	x			
709	Platycephalidae	*Platycephalus indicus* (Linnaeus, 1758)	Bartail flathead	x		x	x
710	Platycephalidae	*Platycephalus scabar*	Round Flathead	x			
711	Platycephalidae	*Platycephalus* spp.	Flathead	x			
712	Platycephalidae	*Thysanophrys carbunculus* (Valenciennes, 1833)	Carbuncle flathead			x	x
713	Plectorhynchidae	*Gaterin diagrammus*	Silver-banded Sweetlip	x			
714	Plesiopidae	*Plesiops coeruleolineatus*			x		
715	Plotosidae	*Plotosus canius* Hamilton, 1822	Lagoon eel catfish	x		x	
716	Plotosidae	*Plotosus lineatus* (Thunberg, 1791)	Striped Eel Catfish	x		x	x
717	Polynemidae	*Eleutheronema tetradactylum* (Shaw, 1804)	Fourfinger threadfin	x		x	
718	Polynemidae	*Polydactylus microstoma* (Bleeker, 1851)				x	
719	Polynemidae	*Polydactylus plebeius* (Broussonet, 1782)				x	
720	Polynemidae	*Polynemus longipectoralis*	Threadfin Bream	x			
721	Polynemidae	*Polynemus paradiseus*	Paradise Threadfin	x			
722	Polynemidae	*Polynemus tetradactylus*	Threadfin, Tessel Fish	x			
723	Pomacanthidae	*Pygoplites diacanthus*	Roysl Anglefish	x	x		
724	Pomacentridae	*Abudefduf bengalensis* (Bloch, 1787)	Sergeant Major	x	x		
725	Pomacentridae	*Abudefduf coelestinus*	Black-banded Demerselfish	x			
726	Pomacentridae	*Abudefduf notatus* (Day, 1869)			x		
727	Pomacentridae	*Abudefduf septemfasciatus* (Cuvier 1830)			x		
728	Pomacentridae	*Abudefduf sexfasciatus* Lacepede, 1802			x		
729	Pomacentridae	*Abudefduf sordidus* Forsskal, 1775	Blackspot sergeant major		x		
730	Pomacentridae	*Abudefduf vaigensis* (Quoy & Gaimard, 1825)	Fivebar Sergeant	x	x		
731	Pomacentridae	*Amblyglyphidodon curacao* (Bloch, 1787)	Blacknout Chromis	x	x		
732	Pomacentridae	*Amblyglyphidodon leucogaster* (Bleeker, 1847)			x		
733	Pomacentridae	*Amphiprion clarkii* (Bennett, 1830)	Whitetip anemone				x
734	Pomacentridae	*Amphiprion perideraion* Bleeker, 1855	Whiteline Anemone	x	x		
735	Pomacentridae	*Amphiprion polymnus* (Linnaeus, 1758)	Saddleband Anemone	x	x		
736	Pomacentridae	*Amphiprion sebae* Bleeker, 1853					x
737	Pomacentridae	*Chromis atripectoralis* Welander and Schultz, 1951			x		
738	Pomacentridae	*Chromis cinerascens* (Cuvier, 1830)			x		
739	Pomacentridae	*Chromis fumea* (Tanaka, 1917)			x		
740	Pomacentridae	*Chromis* sp.	Damselfish	x	x		
741	Pomacentridae	*Chromis viridis* (Cuvier, 1830)			x		
742	Pomacentridae	*Chrysiptera biocellata*			x		
743	Pomacentridae	*Chrysiptera hemicyanea*			x		
744	Pomacentridae	*Chrysiptera leucopoma*			x		
745	Pomacentridae	*Chrysiptera unimaculata*			x		
746	Pomacentridae	*Dascyllus aruamus*	Band Puller	x			
747	Pomacentridae	*Dascyllus reticulatus*			x		
748	Pomacentridae	*Dascyllus trimaculatus*	Whitespot Puller	x	x		
749	Pomacentridae	*Dischistodus melanotus*			x		
750	Pomacentridae	*Hemiplyphidodon plagiometopon*			x		
751	Pomacentridae	*Neoglyphidodon melas*			x		
752	Pomacentridae	*Neoglyphidodon nigroris*			x		
753	Pomacentridae	*Neopomacentrus anabatoides*			x		

Appendix 3 *cont.* Fishes found in habitats of the Gulf of Thailand.

No.	Family	Scientific name	Common name	WL	CR	MG	SG
754	Pomacentridae	*Neopomacentrus azysron*			x		
755	Pomacentridae	*Neopomacentrus bankieri*			x		
756	Pomacentridae	*Neopomacentrus cyanomua*	Violet Damsel	x	x		
757	Pomacentridae	*Neopomacentrus filamentosus*			x		
758	Pomacentridae	*Neopomacentrus nemurus*			x		
759	Pomacentridae	*Neopomacentrus taeniurus*			x		
760	Pomacentridae	*Paraglyphidodon melas*	Zulu Damselfish	x			
761	Pomacentridae	*Paraglyphidodon nigroris*	Black damsel	x			
762	Pomacentridae	*Plectroglyphidodon lacrymatus*	Whitespotted Devil	x	x		
763	Pomacentridae	*Plectroglyphidodon leucozonus*			x		
764	Pomacentridae	*Pomacentrus albimaculus*			x		
765	Pomacentridae	*Pomacentrus alexanderea*			x		
766	Pomacentridae	*Pomacentrus amboinensis*			x		
767	Pomacentridae	*Pomacentrus chrysurus*			x		
768	Pomacentridae	*Pomacentrus coelestis*	Yellow-tailed Damselfish	x	x		
769	Pomacentridae	*Pomacentrus cuneatus*			x		
770	Pomacentridae	*Pomacentrus hardi*	Damselfish	x			
771	Pomacentridae	*Pomacentrus littoralis*			x		
772	Pomacentridae	*Pomacentrus moluccensis*	Yellow Damselfish	x	x		
773	Pomacentridae	*Pomacentrus philippinus*			x		
774	Pomacentridae	*Pomacentrus rhodonotus*	Whitetail Damsel	x			
775	Pomacentridae	*Pomacentrus* sp.			x		
776	Pomacentridae	*Pomacentrus tripunctatus*			x		
777	Pomacentridae	*Stegaster apicalis*	Australian Gregory	x			
778	Pomacentridae	*Stegastes fasciolatus*			x		
779	Pomacentridae	*Stegastes nigricans*			x		
780	Pomacentridae	*Stegastes obreptus*			x		
781	Pomadasyidae	*Pomadasys argyreus* (Valenciennes, 1833)	Silver grunt	x		x	
782	Pomadasyidae	*Pomadasys hasta*	Silver Spotted Grunt	x			
783	Pomadasyidae	*Pomadasys maculatus* (Bloch, 1797)	Saddle grunt	x		x	x
784	Pomadasyidae	*Pomadasys* sp.		x			
785	Pristigasteridae	*Ilisha kampeni* (Weber & Beaufort, 1913)				x	x
786	Pristigasteridae	*Ilisha megaloptera* (Swainson, 1839)	Bigeye ilisha			x	
787	Pristigasteridae	*Ilisha melastoma* (Schneider, 1801)	Indian ilisha			x	
788	Pristigasteridae	*Opisthopterus tardoore* (Cuvier, 1829)	Tardoors			x	
789	Pristigasteridae	*Pellona ditchela* (Valenciennes, 1847)	Indian pellona			x	
790	Pristigasteridae	*Pellona* sp.	Herring	x			
791	Pseodochromidae	*Congrogadus subducens*			x		
792	Psettodidae	*Psettodes erumei* (Schnerder, 1801)	Indian halibut			x	
793	Psettodidae	*Pseudochromis xanthochir*			x		
794	Rachycentridae	*Rachycentron canadum* (Linnaeus, 1766)	Kingfish, Cobia	x			x
795	Scaridae	*Chlorurus sordidus*			x		
796	Scaridae	*Scarus frenatus*			x		
797	Scaridae	*Scarus ghobban* Forsskal, 1775	Yellow-scale parrot	x	x		x
798	Scaridae	*Scarus niger*			x		
799	Scaridae	*Scarus prasiognathos*			x		
800	Scaridae	*Scarus rivulatus*	Rivulated Parrot Fish	x	x		
801	Scaridae	*Scarus rubroviolaceus*			x		
802	Scaridae	*Scarus* sp.	Parrotfish	x	x		
803	Scatophagidae	*Scatophagus argus* (Linnaeus, 1758)	Spade fish, Spotted butter	x		x	
804	Schibeidae	*Eutropiichthys vacha*	Schilbid Catfish	x			
805	Schibeidae	*Laides hexanema*	Catfish	x			
806	Schibeidae	*Platytropius siamensis*		x			
807	Sciaenidae	*Boesemanis microlepis*	Boeseman Coaker	x			
808	Sciaenidae	*Dendrophysa russelli* (Cuvier, 1830)	Goatee croaker			x	x
809	Sciaenidae	*Johnius belangerii* (Cuvier, 1830)	Belanger's croaker	x		x	
810	Sciaenidae	*Johnius* spp.	Croaker	x			
811	Sciaenidae	*Johnius trachycephalus*	Leaftail Croaker	x			
812	Sciaenidae	*Nibea soldado* (Lacepede, 1802)	Soldier Croaker	x		x	
813	Sciaenidae	*Otolithes aeneocorpus*	Slender Croker	x			
814	Sciaenidae	*Otolithes cuvieri* (Trewavas, 1974)	Lessertigertooth croaker			x	
815	Sciaenidae	*Otolithes ruber*	Tigertooth Croaker	x			
816	Sciaenidae	*Pennahia anea* (Bloch, 1773)				x	
817	Sciaenidae	*Pseudosciana soldado*	White Soldier Croaker	x			
818	Sciaenidae	*Pseudoscians* sp.	Croaker	x			
819	Sciaenidae	*Sciaena russelli*	Russell's Jew Fish	x			
820	Sciaenidae	*Sciaena* sp.		x			
821	Scombridae	*Rastrelliger feaughni*	Faughn's Mackerel	x			
822	Scombridae	*Rastrelliger kanagurta* (Cuvier, 1816)	Indian mackerel	x		x	
823	Scombridae	*Rastrelliger neglectus/brachysoma*	Indo-Pacific Mackerel	x			

Appendix 3 *cont.* Fishes found in habitats of the Gulf of Thailand.

No.	Family	Scientific name	Common name	WL	CR	MG	SG
824	Scombridae	*Scomberomorus commerson* (Lacepede, 1800)	Narrow-barred Spanish mackerel	x	x	x	
825	Scorpaenidae	*Parascorpaena picta*			x		
826	Scorpaenidae	*Pterogobius* sp.			x		
827	Scorpaenidae	*Scorpaenopsis cirrhosa*			x		
828	Scorpaenidae	*Scorpaenopsis diabolus*			x		
829	Scorpaenidae	*Scorpaenopsis venosa*			x		
830	Scorpaenidae	*Trachicephalus uranoscopus* (Bloch & Schneider, 1801)				x	
831	Scorpaenidae	*Vespicula trachinoides* (Cuvier & Valenciennes, 1829)	Globinfish			x	x
832	Serranidae	*Aethaloperca rogaa* (Forsskal, 1775)	Redmouth grouper		x		
833	Serranidae	*Anyperodon leucogrammicus* (Valenciennes, 1828)	Slender grouper		x		
834	Serranidae	*Cephalopholis argus*Bloch&Schneider, 1801	Peacock grouper	x	x		
835	Serranidae	*Cephalopholis boenack (*Bloch, 1790)	Chocolate hind	x	x		
836	Serranidae	*Cephalopholis cyanostigma*			x		
837	Serranidae	*Cephalopholis microprion*			x		
838	Serranidae	*Cephalopholis miniata* (Forsskal, 1775)	Coral grouper		x		
839	Serranidae	*Cephalopholis pachycentron*	Brown hind-banded seabass	x			
840	Serranidae	*Cephalopholis sammana*	Seabass	x			
841	Serranidae	*Cephalophotis formosa* (Shaw $ Nodder, 1812)	Bluelined hind		x		
842	Serranidae	*Cromileptes altivelis* (Valencienes, 1828)	Polkadot grouper		x		
843	Serranidae	*Epinephelus areolatus*	Areolated Grouper	x	x		
844	Serranidae	*Epinephelus bleekeri* (Vaillant & Bocourt, 1877)	Duskytail grouper	x	x	x	x
845	Serranidae	*Epinephelus brunneus* (Bloch, 1793)	Mud grouper		x		
846	Serranidae	*Epinephelus caeruleopunctatus*	White-spooted grouper		x		
847	Serranidae	*Epinephelus coioides* (Hamilton, 1822)	Duskytail grouper	x	x	x	x
848	Serranidae	*Epinephelus corallicola*			x		
849	Serranidae	*Epinephelus epistictus* (Temminch & Schlegel, 1842)	Broken-line grouper		x		
850	Serranidae	*Epinephelus erythrurus*			x		
851	Serranidae	*Epinephelus erythrurus* (Valenciennes, 1828)					x
852	Serranidae	*Epinephelus fasciatus* (Forsskal, 1775)	Black-tipped grouper		x		
853	Serranidae	*Epinephelus fuscoguttatus* (Forsskal, 1775)	Brown-marbled grouper		x		
854	Serranidae	*Epinephelus heniochus*			x		
855	Serranidae	*Epinephelus lanceolatus*			x		
856	Serranidae	*Epinephelus latifasciatus*			x		
857	Serranidae	*Epinephelus malabaricus* (Bloch & Schneider, 1801)	Malabar grouper		x		
858	Serranidae	*Epinephelus merra (*Bloch, 1793)	Dwaft-spotted grouper		x		
859	Serranidae	*Epinephelus ongus* (Bloch, 1790)	White-streaked grouper		x		
860	Serranidae	*Epinephelus quoyanus* (Valenciennes, 1830)	Barred-chest grouper		x		x
861	Serranidae	*Epinephelus sexfasciatus* (Valenciennes, 1828)	Six-banded rockcod		x	x	x
862	Serranidae	*Epinephelus* sp.		x	x		
863	Serranidae	*Epinephelus tauvina* (Forssakal, 1775)	Greasy grouper/Reef cod		x		
864	Serranidae	*Plectropomus leopardus*			x		
865	Serranidae	*Plectropomus maculatus*	Spot Coral Trout	x	x		
866	Siganidae	*Siganus canaliculatus* (Park, 1797)	White-spotted Spinefoot	x	x	x	x
867	Siganidae	*Siganus corallinus*			x		
868	Siganidae	*Siganus fuscescens* (Houttuyn, 1782)					x
869	Siganidae	*Siganus guttatus* (Bloch, 1787)	Golednlined spinefoot	x	x	x	
870	Siganidae	*Siganus javus* (Linnaeus, 1766)	Streaked spinefoot	x	x	x	x
871	Siganidae	*Siganus lineatus*			x		
872	Siganidae	*Siganus punctatissimus*	Peppered Spinefoot	x			
873	Siganidae	*Siganus punctatus*			x		
874	Siganidae	*Siganus vermiculatus*			x		
875	Siganidae	*Siganus virgatus*	Doublebarred Spinefoot	x	x		
876	Sillaginidae	*Sillago aeolus* (Jordan & Evermann, 1902)			x	x	x
877	Sillaginidae	*Sillago lutea* (McKay, 1985)					x
878	Sillaginidae	*Sillago sihama* (Forsskal, 1775)	Common whiting	x		x	x
879	Sillaginidae	*Sillago* sp.		x			
880	Siluridae	*Ceratoglanis scleronema*	Sheatfish	x			
881	Siluridae	*Kryptopterus apogon*	Common Sheatfish	x			
882	Siluridae	*kryptopterus bleekeri*	Whisker Sheatfish	x			
883	Siluridae	*Kryptopterus cryptopterus*	Sheatfish	x			
884	Siluridae	*Kryptopterus limpok*	Whisker Sheatfish	x			
885	Siluridae	*kryptopterus* sp.		x			
886	Siluridae	*Ompok bimaculatus*	Butter Catfish	x			
887	Siluridae	*Ompok eugeneiatus*	Sheatfish	x			

Appendix 3 *cont.* Fishes found in habitats of the Gulf of Thailand.

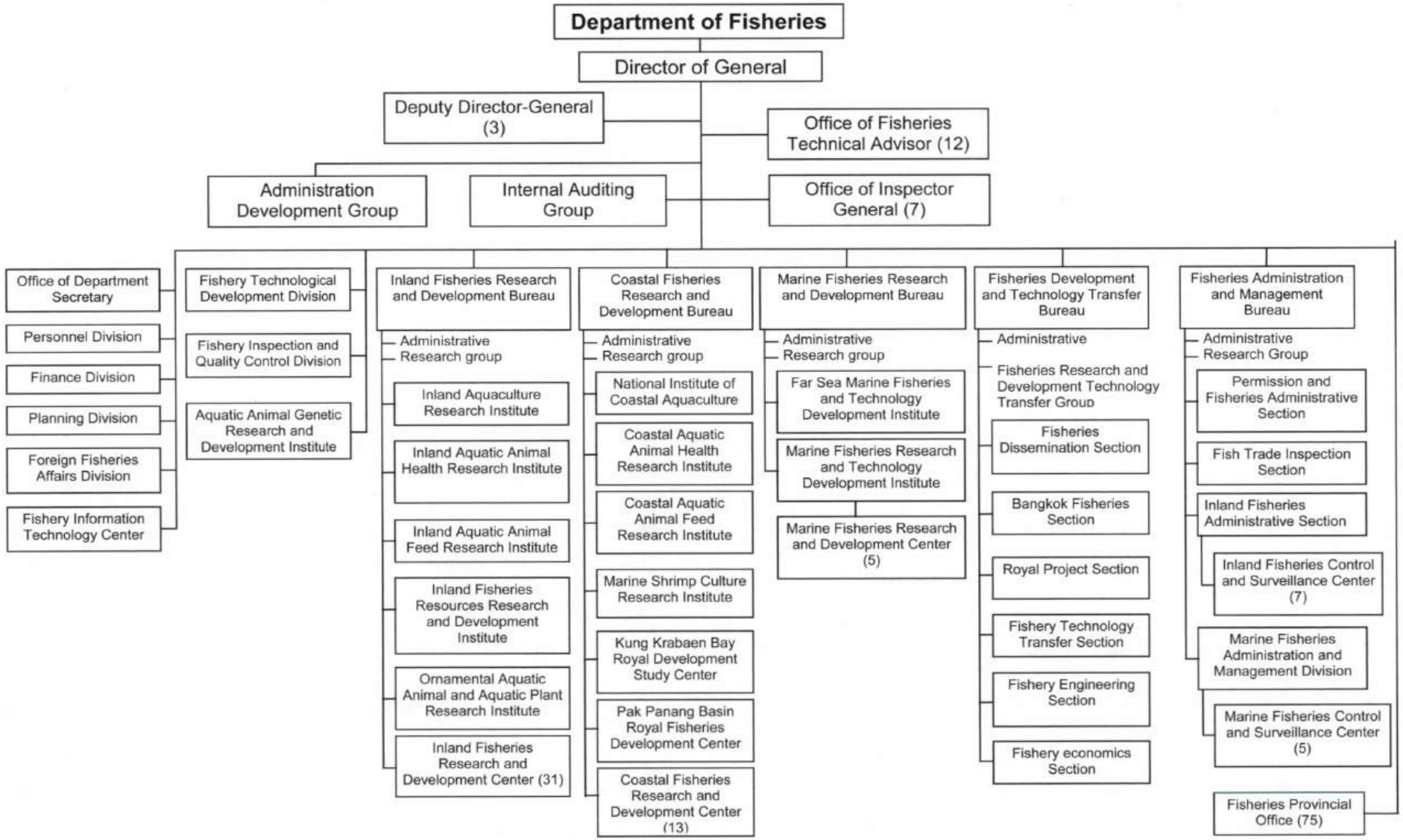
No.	Family	Scientific name	Common name	WL	CR	MG	SG
888	Siluridae	*Ompok hypophthalmus*	Sheatfish	x			
889	Siluridae	*Silurus cochinchinensis*		x			
890	Siluridae	*Wallago dinema*		x			
891	Siluridae	*Wallago leerii*		x			
892	Siluridae	*Wallagonia attu*	Great White Sheatfish	x			
893	Sisoridae	*Bagarius bagarius*	Sisorid Catfish	x			
894	Sisoridae	*Bagarius yarrelli*	Giant Bagarius	x			
895	Sisoridae	*Bagroides macropterus*	Catfish	x			
896	Sisoridae	*Glyptothorax fuscus*	Catfish	x			
897	Sisoridae	*Glyptothorax lampris*	Catfish	x			
898	Sisoridae	*Glyptothorax* sp.	Catfish	x			
899	Sisoridae	*Glyptothorax trilineatus*	Catfish	x			
900	Sisoridae	*Oreoglanis siamensis*	Freshwater Batfish	x			
901	Soleidae	*Pardachirus pavoninus* (Lacepede, 1802)	Broad sole		x		x
902	Soleidae	*Solea ovata* Richardson, 1849	Ovate sole				x
903	Soleidae	*Zebrias quagga* Kaup, 1858	Fringefin zebra sole			x	
904	Sparidae	*Acanthopagrus berda* (Forsskal,1775)	Picnic seabream			x	
905	Sphyraenidae	*Sphyraena baracuda* (Walbaum, 1792)	Great barracuda		x		x
906	Sphyraenidae	*Sphyraena forsteri*			x		
907	Sphyraenidae	*Sphyraena jello* (cuvier, 1829)	Pickhandle barracuda	x		x	x
908	Sphyraenidae	*Sphyraena obtusata* (cuvier, 1829)	Striped barracuda	x	x		x
909	Sphyraenidae	*Sphyraena qenie* (Klunzinger, 1870)			x	x	
910	Sphyraenidae	*Sphyraena* sp.		x	x		
911	Sphyraenidae	*Sphyrna blochii*	Winghead Shark	x			
912	Stromateidae	*Pampus argenteus*	Silver Pomfret	x			
913	Stromateidae	*Pampus chinensis*	Chinese Pomfret	x			
914	Stromateidae	*Pampus* sp.		x			
915	Synbranchidae	*Macrotrema caligans*		x			
916	Synbranchidae	*Monopterus albus*	Swamp Eel	x			
917	Synbranchidae	*Ophisternon bengalense*	Onegilled Eel	x			
918	Syngnathidae	*Choeroichthys brachysoma*			x		
919	Syngnathidae	*Corythoichthys amplexus*			x		
920	Syngnathidae	*Cosmocampus investigatoris*			x		
921	Syngnathidae	*Doryrhamphus excisus excisus*			x		
922	Syngnathidae	*Doryrhamphus janssi*			x		
923	Syngnathidae	*Halicampus grayi*			x		
924	Syngnathidae	*Hippichthys cyanospilus* (Bleeker, 1854)					x
925	Syngnathidae	*Hippichthys heptagonus* (Bleeker, 1853)					x
926	Syngnathidae	*Hippichthys penicillus* (Cantor, 1849)				x	
927	Syngnathidae	*Hippichthys spicifer* (Ruppell, 1840)				x	
928	Syngnathidae	*Phoxocampus belcheri*			x		
929	Syngnathidae	*Syngnathoides biaculeatus* (Bloch, 1875)					x
930	Syngnathidae	*Trachyrhamphus bicoarctatus* (Bleeker, 1857)			x		
931	Synodontidae	*Saurida micropectoralis* Shindo & Yamada, 1972	Shortpectoral fin			x	
932	Synodontidae	*Saurida nebulosa* Valenciennes, 1849				x	x
933	Synodontidae	*Synodus variegatus*			x		
934	Tachysuridae	*Tachysurus* sp.		x			
935	Teraponidae	*Pelates quadrilineatus* (Bloch, 1797) or 1790 check	Fourlined terapon			x	x
936	Teraponidae	*Terapon farbua*			x		
937	Teraponidae	*Terapon jarbua* (Forsskal, 1775)	Crescent grunter			x	x
938	Teraponidae	*Terapon puta* Cuvier & Valenciennes, 1829	Smallscale terapon			x	x
939	Teraponidae	*Terapon theraps* Cuvier, 1829	Threelined terapon		x	x	x
940	Tetraodontidae	*Arothron hispidus* (Linnaeus, 1758)	Bristly puffer				x
941	Tetraodontidae	*Arothron immaculatus* (Bloch & Schneider, 1801)	Innaculate blowfish		x	x	x
942	Tetraodontidae	*Arothron reticularis* (Bloch & schneider, 1801)	Reticulated blowfish			x	
943	Tetraodontidae	*Arothron* sp.			x		
944	Tetraodontidae	*Arothron stellatus* (Bloch&Schneider, 1801)	Star puffer	x	x		
945	Tetraodontidae	*Lagocephalus lunaris* (Bloch & Schneider, 1801)	Spotrugh back blowfish			x	
946	Tetrodontidae	*Chelonodon patoca* (Hamilton, 1822)	Gangetic Blowfish		x	x	x
947	Tetrodontidae	*Chelonodon* sp.	Puffer	x			
948	Tetrodontidae	*Sphoeroides lunaris*		x			
949	Tetrodontidae	*Tetraodon fluviatilis*	Green Pufferfish	x			
950	Tetrodontidae	*Tetraodon leiurus*	Green Blowfish	x			
951	Tetrodontidae	*Tetraodon nigroviridis* Proce, 1822				x	x
952	Tetrodontidae	*Tetraodon* sp.		x			
953	Tetrodontidae	*Tetraodon suvatti*	Puffer	x			
954	Theraponidae	*Therapon jarbua*	Jabua Terapon	x			
955	Toxotidae	*Toxotes chatareus*	Common Archer Fish	x			
956	Toxotidae	*Toxotes jaculatrix* (Pallas, 1766)	Fourspined archer	x		x	
957	Toxotidae	*Toxotes microlepis*	Fiveblotched Archer	x			

Appendix 3 *cont.* Fishes found in habitats of the Gulf of Thailand.

No.	Family	Scientific name	Common name	WL	CR	MG	SG
958	Triacanthidae	*Triacanthus biaculeatus* (Bloch, 1786)	Shortnosed tripodfish	x		x	x
959	Triacanthidae	*Triacanthus bicoarctatus* (Bleeker, 1757)					x
960	Trichiuridae	*Trichiurus lepturus* Linnaeus, 1758	Largehead hairtail		x	x	
961	Tripterygiidae	*Helcogramma obtusirostris*			x		
962	Tripterygiidae	*Tripterygion bapturum*			x		
963	Tripterygiidae	*Tripterygion fasciatum*			x		
964	Tripterygiidae	*Tripterygion* sp.			x		

WL = Wetland
CR = Coral
MG = Mangrove
SG = Seagrass

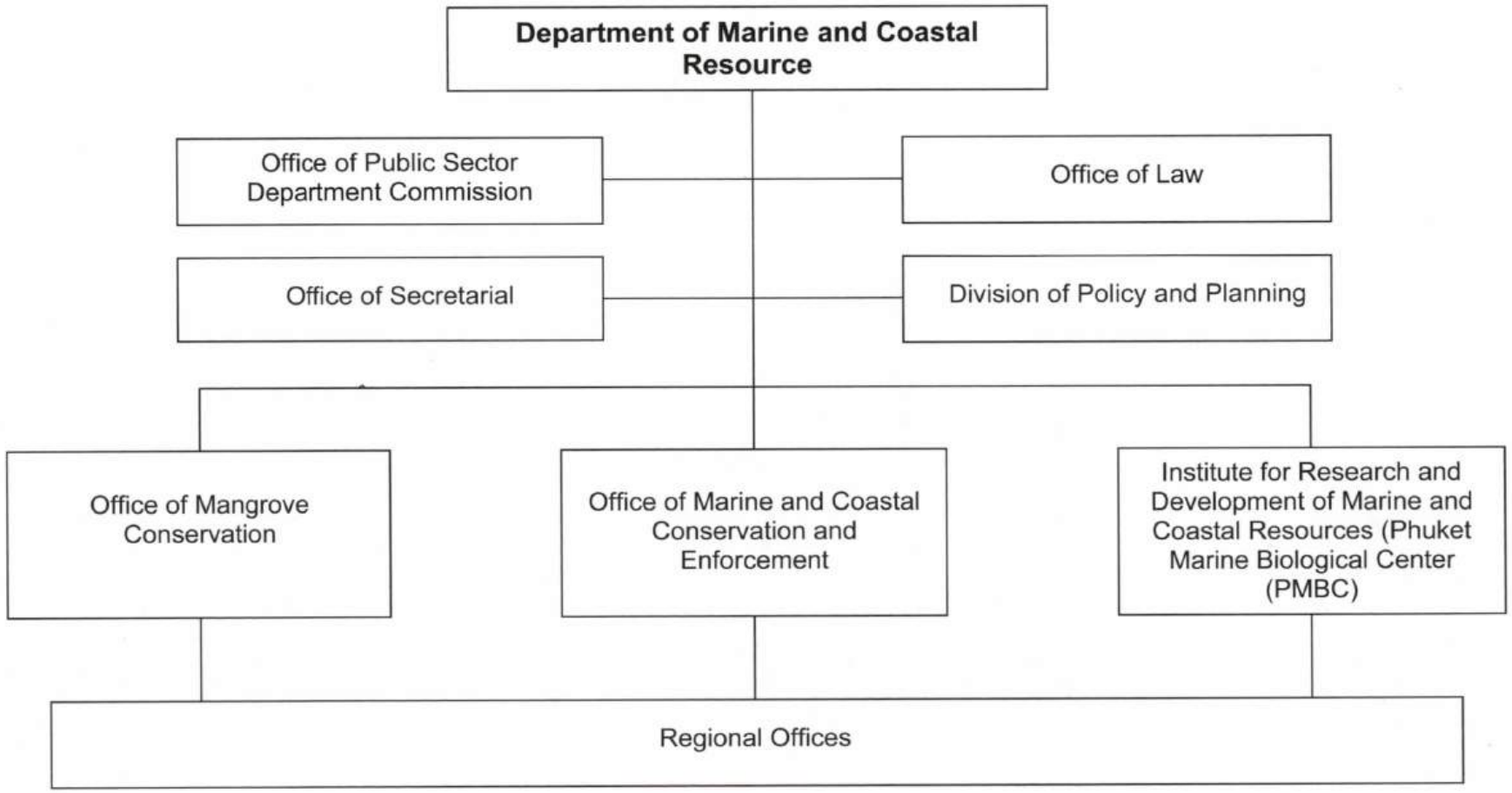
APPENDIX 4
The Organisational Structure of the Department of Fisheries (DOF)



APPENDIX 5

The Organisational Structure of the Department of Marine and Coastal Resources (DMCR)

Structure and Function



United Nations Environment Programme

UNEP/GEF South China Sea Project

Global Environment Facility

NATIONAL REPORT

on

The Fish Stocks and Habitats of Regional, Global and Transboundary Significance in the South China Sea

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1. BACKGROUND

1.1 Overview of the fisheries sector

Viet Nam is situated in the tropical monsoon area of South East Asia. It has a coastline of 3260km and an exclusive economic zone (EEZ) of more than 1 million km^2. At present, the fisheries sector plays an important role in the social and economic development of Viet Nam.

Total fisheries production was estimated at 2,410,900 tonnes in 2002, of which 1,434,800 tonnes was from capture fisheries. Export value in 2002 reached US$2,014 million (MOFI 2003) *(Table 1)*.

Table 1 Total production and export value of fisheries in Viet Nam from 1990 to 2002.

Year	Total catch (tonnes)	Marine capture (tonnes)	Aquaculture (tonnes)	Total export value (Million USD)
1990	1,019,000	709,000	310,000	205.000
1991	1,062,163	714,253	347,910	262.234
1992	1,097,830	746,570	351,260	305.630
1993	1,116,169	793,324	368,604	368.435
1994	1,211,496	878,474	333,022	458.200
1995	1,344,140	928,860	415,280	550.100
1996	1,373,500	962,500	411,000	670.000
1997	1,570,000	1,062,000	481,000	776.000
1998	1,688,530	1,130,660	537,870	858.600
1999	1,827,310	1,212,800	614,510	971.120
2000	2,003,700	1,280,590	723,110	1,402.170
2001	2,226,900	1,347,800	879,100	1,760.600
2002	**2,410,900**	**1,434,800**	**976,100**	**2,014.000**

Source: The Implementation of Work plan 2002 and Fishery Socio-Economic Development Plan 2003, Ministry of Fisheries (2003).

Vietnamese waters have many bays, lagoons, and estuaries, including Ha Long Bay, Bai Tu Long Bay, and Tam Giang lagoon, and over 400,000ha of mangroves. There is huge potential for the development of capture fisheries, marine aquaculture, and other economic sectors, including transportation and tourism.

There are over 2,030 fish species in Vietnamese waters, of which approximately 130 species have economic value, 1,600 crustacean species, 2,500 species of mollusc, and many other kinds of seaweed and seabirds. The standing stock of fisheries resources is estimated to be 3.1 to 3.3 million tonnes, with a potential yield of approximately 1.4 to 1.5 million tonnes (Study on Marine Fishery Resources and Selection of Appropriate Fishing Patten for Development of Offshore Fisheries Dao Manh Son, 2003).

The fisheries sector is currently Viet Nam's third biggest exporting sector, after crude oil and garments. This sector provides about 40% of the animal protein in the diet of Vietnamese people, creates jobs for over 4 million labourers, and provides part time income for millions of people.

However, the fisheries sector is facing many difficulties, largely due to capture fisheries in Viet Nam being mostly small-scale. For instance, 84% of fishing boats have a capacity of less than 90hp, and fishing activities mainly take place in near shore areas causing higher fishing pressure, resulting in the overexploitation and severe decline of living resources. In this setting, the income of fishing boats decreases, and competition among them increases, resulting in resources becoming increasingly exhausted.

Therefore, it is necessary to orient the development of fisheries in the right direction by strengthening coastal fisheries management, and developing offshore fisheries in a sustainable manner.

1.1.1 Total catch of the coastal provinces

Historical total catch by province

As shown in *Table 2,* the coastal provinces of Kien Giang, Ba Ria-Vung Tau, Binh Thuan, and Ca Mau had the highest marine catches, with total catches in 2001 of 256,200 tonnes, 140,180 tonnes, 131,000 tonnes and 125,000 tonnes, respectively.

Main species caught in the fishing grounds:

Among the 2030 marine fish species in Viet Nam's waters, approximately 70% of these are demersal and semi-demersal fish, with the remaining 30% being pelagic species. The distribution of dominant species varies by area. The main species by areas are as follows:

Tonkin Gulf: Ponyfishes (*Leiognathus spp.*), glow-belly (*Acropoma japonicum*), threadfin porgy (*Evynnis cardinalis*), roundscad *(Decapterus maruadsi),* and splendid squid (*Loligo chinensis*).

Central and middle area of the South China Sea: Skipjack tuna *(Katsuwonus pelamis),* yellowfin tuna (*Thunnus albacares*), common dolphinfish *(Coryphaena hyppurus),* bigeye tuna (*Thunnus obessus*), swordfish (*Xiphias gladius*), and silky shark (*Carcharhinus menisorrah*).

Southeast area: Japanese leatherjacket (*Monacanthus nipponensis*), red bigeye (*Priacanthus macracanthus*), bensasi goatfish (*Upeneus bensasi*), cuttlefish (*Sepia spp.*), squid (*Loligo spp.*), and octopus.

Southwest area: Frigate tuna *(Auxis thazard),* short mackerel *(Rastrelliger brachysoma),* goatfish *(Upenus bensasi),* squid, cuttlefish, pike conger and trevallies (*Carangidae spp.*).

Table 2 The catch of marine fish by coastal provinces of Viet Nam from 1991 to 2001. (tonnes)

Provinces	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001
State Enterprises	**9,850**	**10,471**	**8,300**	**7,873**	**3,750**	**4,000**	**3,875**	**3,800**	**3,000**	**3,130**	**1,540**
Local provinces	**702,527**	**700,710**	**789,757**	**882,125**	**950,890**	**958,500**	**1,074,755**	**1,147,600**	**1,209,800**	**1,277,460**	**1,394,243**
Quang Ninh	12,000	10,225	10,850	11,665	12,000	13,300	14,456	15,332	16,300	19,000	20,000
Hai Phong	11,500	11,500	11,150	11,763	13,000	16,500	15,500	17,200	19,000	22,500	27,200
Thai Binh	9,000	7,000	5,000	5,000	7,100	6,500	6,000	11,300	12,200	5,400	5,832
Nam Ha	5,480	5,700	6,935	7,976	9,350						
Nam §inh						7,950	9,050	12,550	14,800	23,500	25,380
Ninh Binh	440	471	570	600	750	600	900	900	1,000	1,100	1,200
Thanh Hoa	18,000	18,178	21,450	21,900	22,050	18,000	25,200	28,500	33,000	34,000	33,405
NgheAn	16,500	17,360	19,120	20,000	22,000	12,000	24,000	25,000	26,500	29,000	30,000
Ha Tinh	11,200	13,700	13,745	14,300	15,000	13,600	14,590	14,600	16,500	21,380	21,000
Quang Binh	9,000	8,900	10,601	11,704	12,000	13,000	13,524	13,572	15,550	17,100	18,212
Quang Tri	5,500	5,000	5,280	7,200	6,600	5,000	7,000	9,541	10,000	10,500	10,300
Thua Thien Hue	9,000	7,750	8,013	11,500	9,100	9,700	11,110	12,800	14,000	12,000	11,414
QNam-§a Nang	30,844	28,100	36,500	37,435	42,300						
§a Nang						42,000	21,000	22,000	24,735	26,200	22,000
Quang Nam							29,500	31,570	32,000	37,000	39,500
Quang Ngai	22,700	25,300	26,400	30,000	38,000	38,000	44,600	47,000	52,000	29,000	28,700
Binh §inh	23,300	23,000	24,926	25,000	28,450	25,500	32,530	35,000	35,800	36,300	46,400
Phu Yen	14,060	13,150	18,400	15,524	21,000	20,800	22,650	24,442	24,500	27,500	28,100
Khanh Hoa	36,910	38,500	38,100	40,429	44,520	44,000	49,500	50,000	52,000	65,000	66,130
Ninh Thuan	12,840	12,970	14,320	19,000	19,500	22,000	27,000	25,200	26,400	27,500	29,500
Binh Thuan	77,160	78,000	92,000	94,000	95,000	97,000	110,000	100,620	103,200	112,550	131,000
Ba Ria -Vung Tau	61,200	70,000	76,468	84,793	91,860	100,000	95,000	102,400	103,800	115,000	140,180
HCM City	10,800	5,340	8,120	14,600	18,500	19,000	20,485	26,000	24,015	23,830	17,100
Tien Giang	24,590	25,125	23,550	36,000	39,650	38,000	40,000	57,960	57,900	56,000	62,980
Ben Tre	35,000	30,000	35,000	36,000	50,000	50,000	48,000	54,462	57,000	58,000	61,570
Tra Vinh	23,000	24,150	36,820	48,800	33,000	33,800	31,000	32,000	35,500	37,500	44,000
Vinh Long	14,200	14,200	3,000	2,500							
Can Tho	18,000	2,785	739	913	1,400	1,250	380				
Soc Trang		13,806	14,500	14,523	16,500	18,000	15,900	18,500	20,500	24,000	24,850
Minh Hai	75,000	76,000	94,200	101,500	104,000						
Bac Lieu						112,000	46,745	46,851	48,500	50,500	57,360
Ca Mau							93,000	92,700	111,000	123,000	125,000
Kien Giang	110,303	112,000	134,000	155,000	170,800	173,000	196,535	210,100	212,300	223,000	256,200
An Giang	2,000	1,500				1,500					
Long An	3,000	1,000		2,500	7,460	6,500	9,600	9,500	9,800	10,100	9,730
Total	**712,377**	**711,181**	**798,057**	**889,998**	**954,640**	**962,500**	**1,078,630**	**1,151,400**	**1,212,800**	**1,280,590**	**1,395,783**

Source: Fishery Statistics 2002, Fisheries Information Center. (FICen)

Trends in marine catches

Total marine catch increased from 419,470 tonnes in 1981 to 1,434,800 tonnes in 2002. During the same period, total engine power increased from 453,871 to 4,038,365hp, respectively. Similarly, total engine power increased 8.9 times, however, total marine catch only increased 3.4 times. This indicates that profits are perhaps diminishing.

1.1.2 Fishing effort by gear

In recent years, the number of fishing boats increased considerably from 29,117 in 1983 to 81,800 in 2002. The size of engines used by fishing boats has increased. Average engine power per boat increased from 16.3hp/boat in 1983 to 49.4 hp/boat in 2002.

Table 3 presents the number of boats operating in coastal and offshore fishing areas.

Table 3 Number of fishing boats by fishing grounds in Vietnamese waters.

Region	Total number (boats)	Total horse power (hp)	Fishing area			
			Coastal		Off shore	
Tonkin Gulf	20,268	409,578	18,977	94%	1,291	6%
Central	35,155	838,233	29,198	83%	5,957	17%
South East	11,508	810,440	9,619	84%	1,889	16%
South West	9,660	786,520	7,657	79%	2,003	21%
Total	**76,591**	**2,844,771**	**65,451**	**86%**	**11,140**	**14%**

Source: The Implementation of Work plan 1999 and Fishery Socio-Economic Development Plan 2000, Ministry of Fisheries (2000).

Around 86% of fishing boats in Viet Nam operate in coastal fishing grounds, with a major part of the marine catch derived from coastal fishing areas.

Catch per Unit of Effort by key gears and area

The Research Institute for Marine Fisheries has observed many fishing gears operated by different fishing boats. Based on these observations, an estimate of average catch per unit of effort of some fishing gears employed in coastal and offshore waters is presented in *Table 4.*

Table 4 Average catch per unit of effort of key fishing gears employed in coastal and offshore waters of Viet Nam.

Region	Pair trawl (kg/hp/h)		Single trawl (kg/hp/h)		Purse seine (kg/gear operation)	
	Coastal	Off shore	Coastal	Off shore	Coastal	Off shore
Tonkin Gulf	0.23-0.63	0.19-0.49	0.04-0.39	0.06-0.86	125.2	303-582
Central	0.24-0.34	0.41-0.58	0.3-0.41	0.19-0.45	170-500	428-2008
South East and South West	0.15-0.94	0.25-0.49	0.11-0.43	0.19-0.49	616-910	470-887

1.1.2.1 Trawl

Trawls are one of the most important fishing gears used in Viet Nam, as well as in many other countries. The catch produced by trawl fisheries constitutes 20 to 30% of the total world marine catch, 40% of the total Asian marine catch, and 43% of the total Viet Nam marine catch.

Key types of trawls used in Viet Nam:

Shrimp trawl

As high towing speed is not required while fishing, most fishing boats (<45hp) use a single trawl. Shrimp trawlers represent approximately 95% of the total trawlers operating in the Tonkin Gulf and 91% in the central waters of Viet Nam. Particularly, in the southeast and southwest, fishers use large single shrimp trawlers up to 350hp. With very fine stretched mesh at cod-end from 18 to 25mm, shrimp trawls capture not only shrimp, but also many juvenile fishes.

The proportion of trash fish in catches made by shrimp trawl boats of less than 90hp has been observed to be as high as 80.7%, whilst that for boats greater than 90hp is approximately 60% of the total catch. In this respect, fishing depth is an important factor. Small shrimp trawlers (<90hp) normally operate at depths of 10 to 20m, whilst only 4% of the total large shrimp trawlers (90 to 350hp) operate in waters 15 to 20m deep.

Resources in Viet Nam's coastal waters are declining, and fishing pressure is increasing. Shrimp trawl fishing is often pinpointed as the main reason for resource decline. For this reason, adequate studies into the effects of fishing on the dynamics of fish populations are required to provide a scientific basis for the adjustment of the number of shrimp trawls operating in coastal waters.

Fish trawl

High towing speed is required to operate this gear type effectively, so medium to large size vessels typically use this gear. Single trawlers are often not able to maintain a constantly high towing speed, causing low catches, so many fishers have changed to a pair trawling pattern.

Fish trawls commonly have a head rope length of 30 to 36m, an overall length of 40 to 70m, and a stretched mesh at codend from 18 to 30mm. Several types of Chinese trawls have recently been introduced in Viet Nam. These trawls are too big for Vietnamese fishing boats. The nets are 120 to 160m long, with a head rope length of 90 to 95m, and wing mesh sizes from 1,000 to 4,000mm. This type of net does not align with the towing speed of the local boats. Due to low towing speed, catches are low.

The results of investigations into towing speed indicate that Vietnamese fishing boats do not gain optimum velocities. Hence, there is a need for a fish trawl net that is suitable for Vietnamese boats. The identification of such a net would assist the development of Viet Nam's offshore fisheries.

Catches in main fishing grounds by trawl fisheries:

Single trawlers

Almost all single trawlers in Viet Nam are shrimp trawlers. In Tonkin Gulf, shrimp trawlers mostly have engine capacities less than 60hp, however, in the southeast and southwest, shrimp trawlers are quite big, some having engine capacities greater than 450hp. The annual catch of trawlers by horsepower group is presented in Table 5.

Table 5 Annual mean catch per one single trawler in Vietnamese waters. (tonnes)

Region	Horsepower group (hp)					
	36-60	61-90	91-135	136 -300	301 -450	>450
Tonkin Gulf	10-20	-	-	-	330 -466	-
Southeast-west	-	324	106 -129	135 -272	118 -617	550 - 685

Pair trawlers

All pair trawlers target fish resources. Several large trawlers (>300hp) operating in the Tonkin Gulf are employing large meshed nets with stretched mesh at wing ranging from 1,000 to 4,000mm. This type of gear is effective in making large catches of small, low value fish. The annual catch of the pair trawl fleet is presented in Table 6.

Table 6 Annual mean catch per one pair trawler in Vietnamese waters. (tonnes)

Region	Horse power group (hp)					
	36-60	61-90	91-135	136-300	301-450	>450
Tonkin Gulf	-	144	145-210	154	416-580	440-736
Southeast-west	-	196-231	194-298	179-400	367-661	396

1.1.2.2 Purse seine

Purse seine is another important fishing gear for Viet Nam, and is mostly used for offshore fishing. Catch derived from the purse seine fishery represents 20.6% of Viet Nam's total marine catch, whilst the number of purse seine boats (5,174 units) is only 7.6% of the total fishing fleet.

Common Purse seines

Use of purse seines with artificial light or aggregative devices for fish attraction
Purse seine fishers use artificial light to attract and gather fish. This is the most common purse seine fishing technique in Viet Nam today, with approximately 70 to 90% of Viet Nam's purse seine fleet using light or aggregative devices for fish attraction when fishing.

Purse seines used to catch small pelagic fish in Viet Nam are often 350 to 500m in length, with a stretched height from 70 to 120m. The bunt stretched mesh size used in these purse seines is usually 20-25mm. For Anchovy purse seines, these dimensions may be smaller, with net lengths from 300 to 500m, net heights from 45 to 55m, and bunt stretched mesh sizes at codend from 4 to 6mm, being common.

Ordinary purse seine
Due to the need to encircle schools of fish moving in front of the gear, ordinary purse seine nets used without light or aggregating devices need to be larger. These nets are usually 600 to 800m long, 100 to 160m deep, and have a bunt stretched mesh size at codend of 20-40mm. For faster swimming fish, purse seine length and depth is increased.

Almost all purse seine operations in Viet Nam involve the use of a single fishing boat.

Fishing effort of purse seine fleet
The main target species in the purse seine fishery are small pelagic fish, including tuna, mackerel, Indian mackerel, herrings, scads, and anchovies. One fishing trip of a purse seine boat often involves 7 to 20 days at sea. Catches depend largely on the abundance of resources in the fishing area.

Average catches of a purse seine boat using light for fish attraction range from 306.6 to 902.7kg/gear operation, whilst those of an ordinary purse seiner range from 351.5 to 465kg/gear operation. The average revenue of one purse seiner in Kien Giang and Vung Tau province ranges from 816,900 to 2,494,800 VND/operation.

In some central provinces, the catch composition of purse seine boats includes mainly anchovies. The annual mean catch of one purse seine boats is presented in Table 7.

Table 7 Annual mean catch per one purse seiner in Vietnamese waters. (tonnes)

Region	Horse power group (hp)					
	36-60	61-90	91-135	136-300	301-450	> 450
Tonkin Gulf	44	30-45	31-45	45-50	-	-
Central	52-168	104	-	-	-	-
Southeast-west	195	150-171	160-213	159-261	155-400	-

1.1.2.3 Line fisheries

Yellowfin tuna longline
This fishery has been developed recently in Phu Yen and Khanh Hoa provinces. Fishing boats involved in this fishery have engine capacities from 45 to 60hp. The length of the mainline used is approximately 18 to 25km. The total number of hooks ranges from 330 to 580. The length of branch lines are from 50 to 60m. Average catches from a 15 to 30 day fishing trip range from 1,200 to 4,300kg, and are mostly composed of bigeye and yellowfin tuna. The tuna for exporting, after removing internal organs and blood is commonly preserved in cool seawater at 0°C using ground ice and freesing equipment.

Pike conger longline
The most developed areas of this fishery are Ca Mau and Kien Giang provinces. Fishing boats involved in this fishery have engine capacities from 20 hp to 350hp, and commonly operate in waters from 25 to 35m deep. The main target species is pike conger, which often represents 90% of the total catch. The length of the mainline used is between 20 and 30km with 900 to 2,000 hooks. One 8-day fishing trip, using a mainline of 30km, will often result in catches between 2,000 and 5,000kg.

Shark longline
This fishery has developed strongly in the central provinces, including Binh Dinh, Binh Thuan, and Khanh Hoa. The fishing grounds are typically offshore. Fishing boats involved in this fishery have engine capacities from 60 to 90hp. The length of mainline used ranges from 24 to 32km, with 620 to 1,322 hooks. A fishing trip of 20 to 30 days often results in 3,900 to 4,200kg of catch.

Squid hand line
This is a simple and low-investment fishery with only one line and 2 to 3 hooks used. The target species is squid. This gear is often used by fishing boats with an engine capacity less than 23hp, and is sometimes used in combination with other gears.

Fish hand line
This gear is used to catch groupers and other fish. This fishery is minor, making a very small contribution to total production.

Fishing effort of line fisheries

The catch per unit effort (CPUE) of longline fishing is calculated as the average catch per 100 hooks per one operation, as well as the average revenue per 100 hooks per one operation.

Observations indicate that the average catch per 100 hooks of a tuna longline is 14.8 times higher than that of pike conger longline, 10.2 times higher than shark longline, and 5.6 times higher than mackerel longline.

The average catch of a squid hand line ranges from 4 to 6kg/person/day.

Table 8 Annual mean catch per one line boat in Vietnamese waters. (tonnes)

Region	Horse power group (hp)					
	36-60	61-90	91-135	136-300	301-450	>450
Tonkin Gulf	9-15	-	-	-	40	40
Center	3-23	19-34	29-40	-	-	-
Southeast-west	20-42	19-45	-	25-50	-	-

1.1.2.4 Gill net

Gill net fishing is a traditional fishing activity in Viet Nam, however, it is only conducted by small fishing boats. The common types of gill net used include:

Shrimp trammel net
This gear is normally used by boats with an engine capacity less than 25hp. Length of nets range from 500 to 2,000m, with heights from 1.5 to 3.0m, the stretched mesh of the inner layer ranges from 48 – 50mm. This gear is used in inshore waters and estuaries that are less than 20m deep.

Cuttlefish trammel net
This gear is normally used by boats with an engine capacity less than 25hp. The length and height of the net is the same as that of the shrimp trammel net. The stretched mesh of inner net is approximately 80mm. This gear is used in inshore waters with high salinity (not in estuaries).

Demersal fish trammel net
This gear is normally used by boats with an engine capacity from 15 to 45hp. The length of nets range from 2 to 5km, with heights from 4 to 6m. This gear is used in inshore waters from 15 to 35m deep.

1.1.2.5 Other fishing gears

Besides the main fishing gears described above, a number of other fishing gears are operated effectively in Vietnamese waters. These include lift nets, stow nets, push nets, and traps. The catches made by different gear types in certain areas of Viet Nam's EEZ are introduced in Table 9.

Table 9 Total catches in 14 coastal provinces by fishing gear type in 1997. (tonnes)

Seawaters	Total catch	Trawl	Purse seine	Gill net	Line	Lift net	Stationary net	Other gears
Gulf of Tonkin	73,703 100%	27,182 36.9%	4,880 6.6%	18,728 25.4%	4,773 6.5%	14,110 19.1%	1,240 1.7%	2,391 3.2%
Central area	173,218 100%	31,078 17.9%	41,614 24.0%	34,674 20.0%	23,793 13.7%	36,534 21.7%	841 0.5%	4,504 2.6%
Southern area	283,415 100%	169,958 60.0%	62,593 22.0%	18,729 6.6%	16,452 5.8%	- -	13,371 4.7%	2,322 0.8%
Total (14 provinces)	530,336 100%	228,218 43.0%	109,087 20.6%	72,131 13.6%	45,028 8.5%	50,644 9.5%	15,452 2.9%	9,217 1.7%

1.1.3 Economic value of catch

Trend in catch per unit of effort (CPUE)

There are a large and increasing number of small fishing boats operating in Viet Nam's coastal waters. The corresponding increases in fishing effort and total catch have led to the overexploitation of fisheries resources in these areas. Consequently, for each unit increase in fishing effort in Viet Nam's coastal waters, the income of fishers per unit of effort diminishes. In order to maintain financial returns on their investments in time and effort, fishers typically intensify their operations by increasing fishing duration, increasing number of gear operations, and reducing mesh size. This often further contributes to the problem of overexploitation, driving further increases in fishing effort. For example, the average catch per 1 horsepower declined significantly from 1985 to 2002 (Table 16). Specifically, the average catch per 1 horsepower was 1.11 tonnes/hp in 1985, although by 2002 this had fallen to 0.35 tonnes/hp, or 31.5% of the 1985 catch rate.

Trend in price and value of catch

As discussed above, approximately 82% of Viet Nam's total marine catch is derived from waters less than 50 m deep. The overexploitation of coastal fisheries resources has the following consequences:

- The proportion of high value fish species in catches is gradually reduced.
- The sizes of individual high value fish in catches become smaller over time.
- The proportion of trash fish (very low value fish) in catches tends to increase.

This drives fluctuations in the price per kg and value of catch.

Fish price per kg

The prices obtained for species of high commercial value, especially coral-associated species such as grouper, eel, and lobster, have recently increased significantly. The price of other commercial species, including yellowfin tuna, snapper, and mackerel, have also increased. However, price for these latter species is not stable due to fluctuations in market supply and demand.

Value per fishing trip

Due to ongoing reductions in catch rates, the quantity of high quality fish, size of fish, and income per fishing trip has declined.

Estimated value of the total catch

At present, Viet Nam's fisheries statistics only provide general information regarding total catch, total number of fishing boats, and total engine power. Information at the fishing gear or species level has not been collected due to an underdeveloped fisheries statistics system in Viet Nam.

In fact, the total annual catch of marine fish from Vietnamese waters was estimated very roughly. Although the total catch (*Table 1*) may not be precise, it provides an indication of the level of resource exploitation.

Estimates of the cost of fishing, based on data collected from different fleets (trawl, purse seine, gill net, and line fishing boats) and horsepower groups across a variety of regions (Tonkin Gulf, Centre, South East and West) indicate that the:

- Mean price per one tonne of catch is 4.214 million VND; and
- Mean cost per one hp is 1.843 million VND per year (1 US$ = 15,340 VND in 2002).

It is possible to estimate the total annual value and cost of fishing by multiplying these figures with those relating to total catch and total engine capacity. The data from 1981 to 2002 indicate that the catch rate and income per horse power decreases with increases in engine capacity.

The total costs of fishing increased 8.89 times from 836,484.3 VND in 1981 to 7,442,706.7 million VND in 2002. However, during this period, the total value only increased 3.42 times from 1,767,646.6 to 6,046,247.2 million VND. Profit per fishing boat or operator in Viet Nam's marine fisheries tends to decline as horsepower or the number of boats increases.

Highest profits were obtained during the period from 1986 to 1991, with total profits ranging from 1,462 to 1,558 billion VND. Since 1991, total profits have declined. This indicates that traditional waters, less than 50m deep, have been overexploited and that fishing in these areas results in poor economic returns. It is considered that the development of sustainable fisheries in Viet Nam requires a reduction in the size of the coastal fishing fleet, supported by an expansion of fishing effort in offshore areas.

1.1.4 Importance of the fisheries sector in terms of employment and dependence

1.1.4.1 Fishery labors

Viet Nam's fisheries are small-scale, multi-species, and multi-gear. The majority of investment in these fisheries is private. These small-scale fisheries contribute more than 87% of the total catch. Some 640,000 Vietnamese people are engaged in fishing, including approximately 60,000 people participating in offshore fishing activities.

Development of state-owned fishing enterprises has not been effective due to insufficient management and lack of investment. They gradually lose their leading role in application of new technologies as well as in catch contribution. In 2001, according to the Ministry of Fisheries, there were 452 fishing co-operatives (Table 10) comprising 15,650 labourers and 4,300 fishing groups comprising 21,000 fisheries labourers.

The educational level in every Vietnamese fishing community is low. It is estimated that: 68% of people in these communities only finish primary school; slightly more than 20% complete lower secondary school; about 10% finish secondary schools; and only 0.65% have graduated from vocational schools or universities.

The following socio economic conditions influence the quantity and quality of fishery labourers in Viet Nam:

- Coastal fisheries in all areas of Viet Nam face the threat of overexploitation. There is a need to introduce strict measures aimed at reducing fishing effort in coastal waters. However, many fishers cannot afford to purchase fishing boats suitable for offshore use due to lack of sufficient capital. Therefore, a continuously growing number of coastal and inshore fishers exacerbate existing conditions.
- Marine fishing is a customary and hereditary profession in Viet Nam. Fishers normally do not have any other sources of income. Compared to agriculture, incomes associated with fishing are typically higher. This situation attracts many labourers to this sector.
- Due to low levels of education, it is difficult for fishers to learn about advanced technology, especially offshore fishing techniques. Similarly, finding employment in other areas is often a major challenge for small-scale fishers.
- The decline in fisher incomes, associated with the degradation of coastal resources, has driven fishers to increase the efficacy of fishing effort. This has involved fishers:
  + reducing mesh size to catch fish of all shapes and sizes, including juvenile fish;
  + increasing the number of gear operations per trip, or extending the duration of fishing; and
  + using destructive fishing gears or methods, including explosives, chemicals, and other poisonous substances.
- In the reduction of overall fishing effort exerted in coastal waters, there is a need to create alternative employment opportunities for fishers.

There is a requirement for these socio economic considerations to be incorporated into Viet Nam's strategic policy and planning for fisheries in the future.

1.1.4.2 Fisheries infrastructure

At present, there are about 700 shipyards in Viet Nam with a capacity to build 4,000 new boats and repair 10,000 units in a year. Normally, hulls of fishing boats are made of wood. Some fishing enterprises and transportation units use steel. Those boats may be equipped with an engine capacity of 200 to 400hp.

At the end of 2002, the fisheries sector had 63 fishing ports, including 47 in coastal provinces and 16 on islands. The construction of these facilities relied on a range of different capital sources. Among them, 48 ports are in operation, providing a total jetty length of 6,700m. 15 ports are still under construction.

Although the Ministry of Fisheries has attempted to improve infrastructure, the logistical system for fisheries remains underdeveloped and does not have all the necessary services. Some services are not operated effectively. For instance, several access routes have not been dredged, hampering the navigation of fishing and transportation boats into and out of port facilities. Similarly, the number of shelters and landing places is not sufficient for Viet Nam's large fishing fleet, resulting in efficient offloading of catch. This often leads to the deterioration of catch quality.

There are 8 manufacturing enterprises producing net thread, packing bags and other fish related packaging. These facilities have an annual capacity to produce 200 tonnes of thread and 7,500 tonnes of packing materials. Among them, 2 are State-owned, 2 are joint-ventured with foreign countries, 3 have 100% foreign capital investment, and 1 is a private Vietnamese-owned factory.

In 2000, new fish market complexes were constructed in BacLieu, Kien Giang and Quang Ninh (CoTo Island).

There are 266 industrial processing enterprises in Viet Nam having more than 300 processing plants. Most of them use freezing technology (Do Van Nam, 2003).

In general, marine fisheries in Viet Nam are still small-scale. The management of the sector is difficult due to the complexity of the multi-species tropical fish fauna, too many small fishing boats and gears, too many small landing sites and beaches scattered along Viet Nam's coastline, open access to fisheries resources, and underdeveloped production techniques.

1.1.4.3 Marketing

At present, there are no fish auctions or large markets in Viet Nam. Intermediaries play key roles in the trading of fisheries products.

Intermediaries often buy fish on a wholesale basis from fishing boats, and then sell items to the skipper of the fishing boat that are required for the next fishing trip. These items include ice, fresh water, fishing gear, and food. Powerful intermediaries often enter into contracts with fishers that involve the intermediary lending the fishers money, usually 20 to 70 million VND/boat, to cover the costs of fishing, in return for monopoly rights to purchase the entire landings from a boat.

The landings are usually sorted into species and size classes prior to sale in the following key markets:

- **Export market**: High value products are selected and stored properly and carefully. Intermediaries sell them to export processing plants or export them directly to China and other countries.
- **Domestic market**: Products selected for domestic consumption are usually transported in frozen form to big cities for sale as fresh fish, or to processing plants for the production of dried products for domestic markets.
- **Fish sauce processing**: About 40 to 50% of the total landings, or trash fish, from trawl fishing, and low value products derived from other fisheries, including sardinella and anchovies, are used in the production of fish sauce. In 1998, approximately 160 million litres of fish sauce was produced in Viet Nam.

Apart from the powerful intermediaries associated with the larger landing sites, small-scale traders operate in most small landing places. These traders are typically female workers in fishing communities, or the wives of fishing boat owners and operators. They buy small quantities of landings for resale in local fresh food markets.

1.1.4.4 Processing and exporting of marine products

In 2000, the majority of exports of marine products were frozen (shrimp, fish, squid), representing 65% of the total export quantity. Frozen shrimp represented approximately 66% of these exports in terms of both value and quantity. Other important fish exports include dried cuttlefish, dried squid, and frozen fish fillets. Canned food for export is still limited in quantity. Other value added products make up 35% of the total export value.

Fisheries exports have grown in terms of quantity and value. The export quantity increased from 3,441 tonnes in 1980 to 64,366 tonnes in 1990. The export value increased from US$11.2 million in 1988 to US$550 million in 1995, and then to US$2,014 million USD in 2002. This 2002 export value is approximately 180 times higher than that observed in 1988. In 1990 to 2000, the national export turnover increased 584%, with an average yearly growth of 21.2%.

1.1.4.5 Socio-economy of marine capture fisheries

The fisheries of Viet Nam have recently experienced a rapid and continuous growth phase, becoming one of the key sectors of the national economy. In 2003, fisheries contributed to more than 4% of the national GDP. The yearly average increase in the contribution of fisheries to GDP has been estimated at 40%. In 1990, the GDP of fisheries was 1,281 billion VND, growing to 6,664 billion VND in 1995, and by 2003, it was approximately 25,675 billion VND. The average GDP/fisher is approximately US$160/year. However, compared with average national living standards, the welfare conditions of fishers are still low.

Fishing communities contain 2.5 to 3% of the total population of Viet Nam, of which 49% are male and 51% are female. The average number of persons per one fishing household is 6 to 7 persons.

Most fishers can only afford to buy small fishing boats and gear, resulting in most fishing effort being directed towards coastal fisheries resources.

In the fisheries sector, there exist different economic components: (1) state-owned fishing enterprises; (2) fishing cooperatives; (3) fishing groups; and (4) private fishers.

The number of fishing cooperatives reduced dramatically from 1985 to 1996. However, they did increase slightly during the late 1990s (Table 10).

Table 10 Changes in the number of fishing cooperatives in Viet Nam from 1985 to 2000.

Year	1985	1990	1995	1996	1997	2000
Number of fishing cooperatives	673	398	95	94	184	452

Source: A preliminary Analysis on Socio-economic Situation of Coastal Fishing Communities in Viet Nam, Nguyen Long, 2000.

Fishing groups consisting of several fishers, who are willingly to cooperate with each other in fishing and investment, have grown in popularity (Table 11).

Table 11 Changes in the number of fishing groups in Viet Nam from 1985 to 1997.

Year	1985	1990	1995	1996	1997
Number of fishing groups	2,205	2,884	3,773	3,886	5,542

Source: The Implementation of Work plan 1999 and Fishery Socio-Economic Development Plan 2000, Ministry of Fisheries (2000).

2. SPECIES OF REGIONAL, GLOBAL AND TRANSBOUNDARY SIGNIFICANCE

2.1 Ranking of importance of species

In Viet Nam, the data on total catch by species is not available. Generally, catches are sorted into separate commercial groups. The number of commercial groups depends on the type of the fishery. The most complicated catch compositions are associated with trawl fisheries. The commercial groups are defined by the species, size, quality, and market price. Some commercial groups consist of only one or two species, whereas other groups contain many species, for instance the trash fish group. Trawl fisheries may also contain both demersal and pelagic fishes.

2.1.1 In terms of landings

Table 12 presents Viet Nam's provinces with the highest total catches in 2001.

Table 12 The catch of ten most fishery important provinces in 2001.

Unit: 1000 tons

Province	Kien Giang	B/Ria-V/Tau	Binh Thuan	Ca Mau	Khanh Hoa	Tien Giang	Ben Tre	Binh Dinh	Tra Vinh	Quang Nam
Catch	256.2	140.18	131.0	125.0	66.13	62.98	61.57	46.4	44.0	39.5

2.1.2 In terms of local market value

According to an observation of the Research Institute for marine Fisheries (RIMF), the market price of some important species in terms of quantity and high value are presented in Table 13.

Table 13 Market price of some important marine fish species in Viet Nam (1000 VND).

Important species in terms of quantity			Important species in terms of high value	
Species	**Market price**		**Species**	**Market price**
Round scad	6.0-9.0		Spiny lobster	500.0-550.0
Sardinella	5.0-8.0		Marine eel	180.0-210.0
Indo – Pacific mackerel	5.0-7.0		Tiger shrimp	120.0-150.0
Frigate tuna	4.0-7.0		Mud crab	100.0-140.0
Yellowstripe scad	3.0-4.0		Silver pomfret	100.0-120.0
Ponyfish	1.0-2.0		Grouper	90.0-120.0
Trash fish	0.3-2.0		Abalone	90.0-110.0
Spanish mackerel	30.0-40.0		Cuttlefish	50.0-80.0
Seabream	30.0-50.0		Snapper	40.0-60.0
Yellowfin tuna	40.0-60.0		Seabass	40.0-50.0

(Exchange rate: 1 US$ = 15,340 VND in 2002).

2.1.3 In terms of status (endangered, threatened, rare etc., IUCN criteria)

Recently, declines in the abundance of some fish species have been observed in the waters of Viet Nam and the broader South East Asian region. A number of these species are classified as endangered or threatened. There are 37 marine fish species, 5 spiny lobster species, 27 mollusc species and 3 cephalopod species in Viet Nam waters that are considered as endangered, threatened, or rare in Viet Nam red book.

Table 14 Endangered, vulnerable, threatened, and rare species in Viet Nam's marine waters.

No	Type	Scientific name	Status
1	Fishes	*Amphioxus belcheri*	Vu
2	Fishes	*Stegostoma fasciatum*	Ra
3	Fishes	*Rhincodon typus*	Ra
4	Fishes	*Alopias pelagicus*	Dd
5	Fishes	*Cephaloscyllium umbratile*	Ra
6	Fishes	*Etmopterus lucifer*	Ra
7	Fishes	*Pristis cuspidatus*	Ra
8	Fishes	*Pristis microdon*	Ra
9	Fishes	*Rhina ancylostoma*	Th
10	Fishes	*Narcine tonkinensis*	Ra
11	Fishes	*Chimaera phantasma*	Dd
12	Fishes	*Elops saurus*	Ra
13	Fishes	*Megalops cyprinoides*	Ra
14	Fishes	*Albula vulpes*	Ra
15	Fishes	*Nematolosa nasus*	En
16	Fishes	*Anodontostoma chacunda*	En
17	Fishes	*Ateleopus japonicus*	Ra
18	Fishes	*Solenostomus paradoxus*	Ra
19	Fishes	*Trachyrhamphus serratus*	Ra
20	Fishes	*Syngnathus acus*	Ra
21	Fishes	*Solenognathus hardwickii*	Ra
22	Fishes	*Hippocampus histrix*	Vu
23	Fishes	*Hippocampus kuda*	Vu

Table 14 *cont.* Endangered, vulnerable, threatened, and rare species in Viet Nam's marine waters.

No	Type	Scientific name	Status
24	Fishes	*Hippocampus japonicus*	Dd
25	Fishes	*Hippocampus trimaculatus*	Vu
26	Fishes	*Hippocampus kellogi*	Vu
27	Fishes	*Velifer hypselopterus*	Ra
28	Fishes	*Zeus japonicus*	Ra
29	Fishes	*Zeus cypho*	Ra
30	Fishes	*Schindlerria praematura*	Ra
31	Fishes	*Bostrichthys sinensis*	Vu
32	Fishes	*Satyrichthys rieffeli*	Ra
33	Fishes	*Psilocephalus barbatus*	Ra
34	Fishes	*Oxymonocanthus longirostris*	Ra
35	Fishes	*Masturus lanceolatus*	Th
36	Fishes	*Mola mola*	Ra
37	Fishes	*Antennarius melas*	Ra
38	Spiny lobster	*Panulirus homatus*	Vu
39	Spiny lobster	*Panulirus longipes*	Vu
40	Spiny lobster	*Panulirus ornatus*	Vu
41	Spiny lobster	*Panulirus versicolor*	Vu
42	Spiny lobster	*Tachypreus tridentatus*	Th
43	Mollusc	*Haliotis asinina*	Vu
44	Mollusc	*Haliotis ovina*	Vu
45	Mollusc	*Trochus niloticus*	En
46	Mollusc	*Trochus pyramis*	En
47	Mollusc	*Turbo marmoratus*	En
48	Mollusc	*Chelycypraea testudinaria*	Th
49	Mollusc	*Cypraea argus*	Ra
50	Mollusc	*Cypraea histrio*	Ra
51	Mollusc	*Cypraea mappa*	Ra
52	Mollusc	*Cypraea spadicea*	Ra
53	Mollusc	*Cypraea turdus*	Ra
54	Mollusc	*Mauritia scurra*	Ra
55	Mollusc	*Blasicrura chinensis*	Ra
56	Mollusc	*Ovula costellata*	Ra
57	Mollusc	*Calpurnus lacteus*	Ra
58	Mollusc	*Calpurnus verrucosus*	Ra
59	Mollusc	*Lambis crocata*	Ra
60	Mollusc	*Strombus luhuanus*	Vu
61	Mollusc	*Cymatium lotorium*	Ra
62	Mollusc	*Charonia tritonis*	Vu
63	Mollusc	*Epitonium scalare*	Ra
64	Mollusc	*Mytilus viridis*	Vu
65	Mollusc	*Pinctada margarritifera*	Vu
66	Mollusc	*Tridacna gigas*	Ra
67	Mollusc	*Anomalocardia squamosa*	En
68	Mollusc	*Gafrarium tumidum*	En
69	Mollusc	*Nautilus pompilius*	En
70	Cephalopoda	*Loligo chinensis*	En
71	Cephalopoda	*Sepioteuthis lessoniana*	Vu
72	Cephalopoda	*Sepia pharaonis*	En

Remarks: En = endangered; Vu = vulnerable; Th = threatened; Ra = rare and Dd = data deficient.
Source: Country Report of Viet Nam for Transboundary Diagnostic Assessment, National Environment Agency, 1998.

In a report on the status of sea turtles in Viet Nam, Pham Thuoc et al. listed 5 endangered species in Viet Nam. They are Green turtle, Loggerhead turtle, Leatherback turtle, Hawksbill turtle and Olive Ridley turtle. The 2000 IUCN Red List of Threatened Animals classifies 4 of these species as endangered and 1, the Hawksbill turtle, as critically endangered at the global level. All five species is listed in Appendices I and II of the Convention on Migratory Species.

2.1.4 Food security

Since 1996, Viet Nam has transformed its general policy and strategy from a central planned economy to a market economy with socialism style. In line with this new direction, the Ministry of Fisheries, in its Master Plan (2000 to 2010), has set the following objectives for the socio economic development of this sector:

- Increase domestic consumption of fish and fishery products.
- Increase export earnings.
- Create substantial additional employment.
- Improve the sector's infrastructure, equipment, and technology base.
- Increase the sector's contribution to national income.

Table 15 Some major socio-economic development targets for Viet Nam's fisheries sector to 2010.

Item	Unit	Year		
		2001	2005	2010
1. Total fisheries production	**1,000 t**	**2,256.941**	**2,450**	**3,400**
Consists of:				
- Marine capture fisheries	1,000 t	1,367.393	1,300	1,400
- Aquaculture fisheries	1,000 t	879.548	1,150	2,000
2. Export value	**USD billion**	**1.76**	**3.0**	**4.5**

Source: Master plan for fishery Socio-Economic Development to 2010, Research Institute for Fishery Economics and Planning, 2002.

The main species contributing to total fisheries production and food security in Viet Nam are tuna, round scads, sardine, anchovy, mackerel, threadfin bream, lizardfish, trevally, grouper, snapper, squid, cuttlefish, black tiger prawn, catfish, tilapia, clam, blood cockle, and mud crab.

2.2 Biology and ecology of the priority species

Since 2000, the project of Assessment of the Living Marine Resources in Viet Nam has conducted a series of scientific surveys by trawlers in the gulf of Tonkin, Southeast – Southwest waters and by gill-netters and long liners in the Central waters of Viet Nam. The below analyses in this report used the data from these surveys.

2.2.1 Large pelagic fishes

Generally, the most important component of the large pelagic fish resource in Vietnamese waters is tuna, belonging to the *Scombridae* family. Other families including *Xiphiidae, Istiophoridae, and Coryphaenidae* are also found in these waters.

The most important species found in scientific surveys conducted 2000-2003 with gill nets in central and southeastern waters of Viet nam were skipjack tuna *(Katsuwonus pelamis),* Devil ray (*Mobula diabolus*), and yellowfin tuna *(Thunnus albacares).*

Skipjack tuna are mainly caught with gillnets of 100mm stretched mesh size. The length of this species observed in Viet Nam's waters from 2000 to 2003, ranged from 13 to 84 cm, with fish of lengths between 40 and 50 cm dominating catches. *Figure 1* shows the mean length of skipjack tuna caught in 8 surveys (based on 31327 individuals) with very small fluctuation over the time.

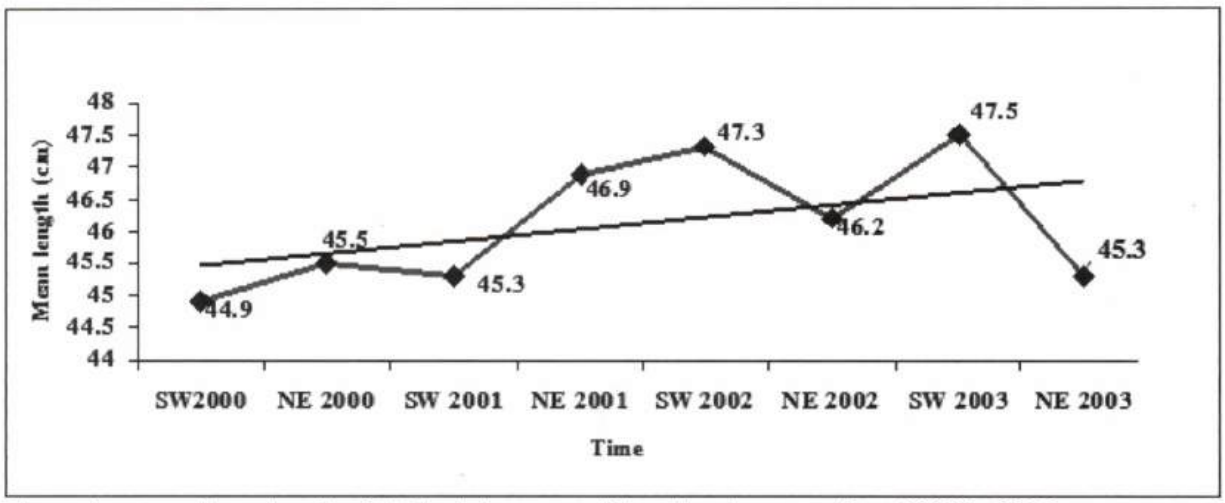

Figure 1 Mean length of skipjack tuna caught in gill net surveys from 2000 to 2003.

Yellowfin tuna (*Thunnus albacares*) is also a target species for gillnet and longline fisheries conducted in Vietnamese waters. Yellowfin tuna caught by longline were much bigger than that caught by gillnet in identical areas, ranging from 85 to 112cm.

2.2.2 Small pelagic fishes

The important small pelagic fishes caught in Vietnamese waters include scads (*Decapterus*), herrings (*Sardinella*), anchovy (*Stolephorus*), and Indian mackerel (*Rastrelliger brachysoma*). Other species belonging to genus and families of *Trichiurus, Sphyraena, Priacanthus, Selaroides, Selar, Polynemus, Formioniger* and *Leiognathidae* also contribute significantly to total catch volumes of this group.

In the coastal waters of the Gulf of Tonkin, small pelagic fishes are present at all times. Generally, they start to come closer to shore in the southern part of the gulf for spawning during March, and from May to June, they are abundant in all inshore waters.

The continental slope in the central region of Viet Nam is very narrow. Therefore, fishes tend to concentrate close to the shore or in small bays like Quy Nhon, Nha Trang, and Phan Rang.

There are four southeastern areas characterised by high abundances of small pelagic fish. The include: (1) coastal waters from Phan Thiet to Vung Tau; (2) the Mekong estuaries; (3) waters adjacent to Con Dao Island: and (4) Phu Quy Island waters. Fishes with deep-water characteristics have been found in the fourth area. In the Gulf of Thailand, small pelagic fishes are ubiquitous. The most important pelagic species in the catch of a series of trawl surveys from 2000 to 2003 were *Atule mate, Decapterus maruadsi,* and *Selaroides leptolepis.* The description of biology of fishes in the below part is originated from a bottom trawl survey in the Southeast and Southwest waters of Viet Nam in December 2000.

Atule mate

The lengths of *Atule mate* caught during trawl surveys conducted in the southeast and southwest areas in December 2000 ranged from 7 to 20cm. The mean length was 14.9cm. Total biomass of this species was estimated to be 2,747 tonnes (Q=1) with a CV of 58%. The gonads of 208 fishes (72.6%) were in the resting phase for both sexes (December 2000).

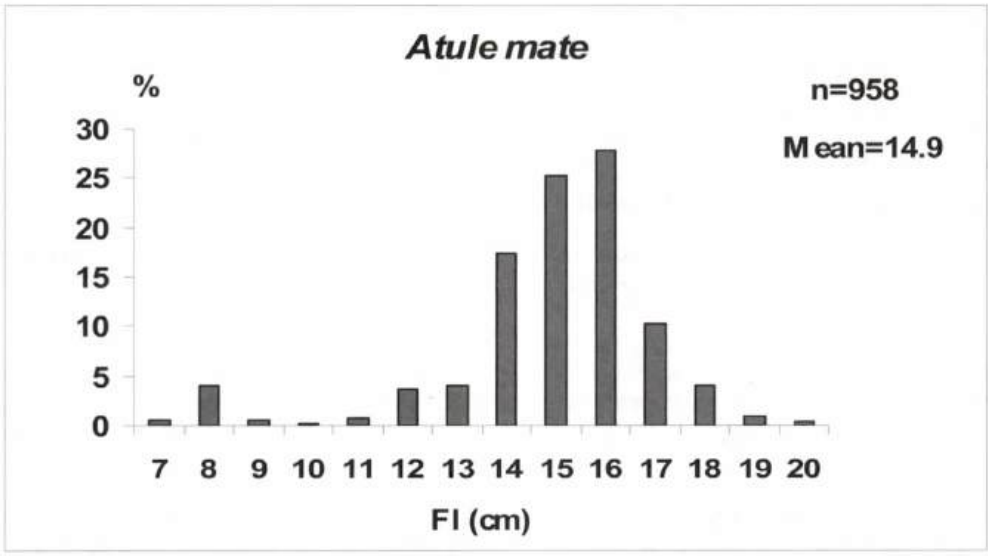

Figure 2 The length frequency distribution of Atule mate caught during trawl surveys conducted in southeastern and southwestern areas of Viet Nam during December 2000.

Selaroides leptolepis

The catch of this species contributed 3% of the total catch during the 2000 trawl survey. The total biomass was estimated to be 8,168 tonnes with a CV of 59%. The catch was mainly taken in depths from 20 to 100m. The highest biomass was observed in the 30 to 50m depth range (6,257 tonnes). The length frequency of 1,788 measured fishes ranged from 6 to 16cm, with a mean length of 11.9cm.

There were no juvenile fish observed in the exploited stock during this period, with 49.7% of studied gonads in the resting stage (II). Approximately 38% of fish gonads were at gonad stage (III) and 11.4% of the surveyed population were ripe stage, indicating that a part of the stock was going to spawn soon.

Decapterus maruadsi
This species contributed 1.25% to the total catch volume during the survey period. Total biomass was estimated to be 2,288 tonnes with a CV of 63%, with the main catches being taken in waters deeper than 30m. Lengths ranged from 13 to 22cm, with a mean length of 15.4cm. The 15cm length class dominated catches of this species. According to the analysis of gonads from 265 individuals, approximately 13.6% of the catch were juveniles. The main part of the stock was in resting stage (75.8%) for both sexes. A few female were ripe and at the spawning stage (2.3%). The gonads of the remaining fish were developing.

2.2.3 Demersal fish species

The demersal resources of Vietnamese waters can be divided into two groups: (1) coastal resources; and (2) deep sea resources. The first group, including *Lutianidae, Mullidae, Nemipteridae, Pomadasssyidae, Synodidae,* and *Priacanthidae*, are mainly targeted with bottom trawls. Most fishes in the second group are of low economic value, including *Myctophidae, Scorpaenidae, Chimaeridae and Lophiidae.*

In the surveys conducted in December 2002, in southeastern waters and the Gulf of Thailand, the dominant species were *Upeneus bensasi, Trachinochephalus myops, Saurida undosquamis, Saurida tumbil,* and *Priacanthus macracanthus.* The key biological information collected for these species during the survey is presented below.

Upeneus bensasi
This species contributed 7.21% to total catch. The biomass of this species was estimated to be 14,240 tonnes with a CV of 51%. The main catch was derived from waters deeper than 30m in southeastern waters and 50m in southwestern waters. Lengths ranged from 6 to 18cm, with a mean length of 10.4cm.

Analysis of gonads revealed that approximately 22% of the catch was juvenile. More females were developing or ripe (30.8%) as compared to males (2.4%).

Trachinocephalus myops
This species contributed 5.83% to total catch. The biomass of the species was estimated to be 10,761 tonnes with a CV of 40%. The main catch was derived from waters deeper than 30m. The lengths of 2,115 individual fishes ranged from 7 to 39cm, with a mean length of 16.2cm. The length frequency distribution peaked firstly at 12cm and secondly at 24cm.

Analysis of gonads revealed that approximately 9.9% of the catch was juvenile. Generally, a higher percentage of males were developing or ripe (37.0%) as compared to females (28.5%).

Saurida undosquamis
This species contributed 5.56% to total catch. The biomass of the species was estimated to be 10,575 tonnes with a CV of 40%. The main catch was derived from waters deeper than 30m. Lengths ranged from 6 to 49cm, with mean length of 16.8cm. Analysis of length frequency enabled to identification of at least two cohorts in the catch. The smaller sized cohort dominated the catch.

Analysis of gonads revealed that approximately 12.5% of the catch was juvenile. There were a higher proportion of males than females with gonads in the resting (II) and developing stages (III). Generally, 16% of both sexes were ripe. There was no fish in the spawning stage during the time of the survey.

Saurida tumbil
This species contributed 2.02% to total catch. Lengths ranged from 7 to 48cm, with a mean length of 17.9cm.

Analysis of gonads revealed that both sexes were mainly in the gonad resting stage (54.7%).There were about 26.7% in developing stage, and 9.3% in the ripe stage. Approximately 9.3% were juvenile. There were no fish in spawning condition, indicating that the survey period did not align with the spawning season for this species.

Priacanthus macracanthus
This species contributed 5.16% to the total catches during the survey. Lengths ranged from 5 to 30cm, with a mean length of 17.7cm. The length group from 17 to 19 cm dominated the catch.

The results of gonad analysis indicate that 3.3% were juvenile. Most of the catch was in the gonad resting stage (57.9%). Females appeared to reach active stage sooner than the male (11.2% for female and 4.6% for male). There were no fish in spawning stage (V) observed during the survey.

2.2.4 Commercially exploited invertebrates

Loligo chinensis
According to the trawl surveys conducted during 2000, this species contributed 2.84 % to total catches. The biomass was estimated at 5,642 tonnes with a CV of 31%. The length frequency distribution of 726 individuals is provided in *Figure 3*. Mantle lengths ranged from 6 to 33cm, with mean length of 13.2cm.

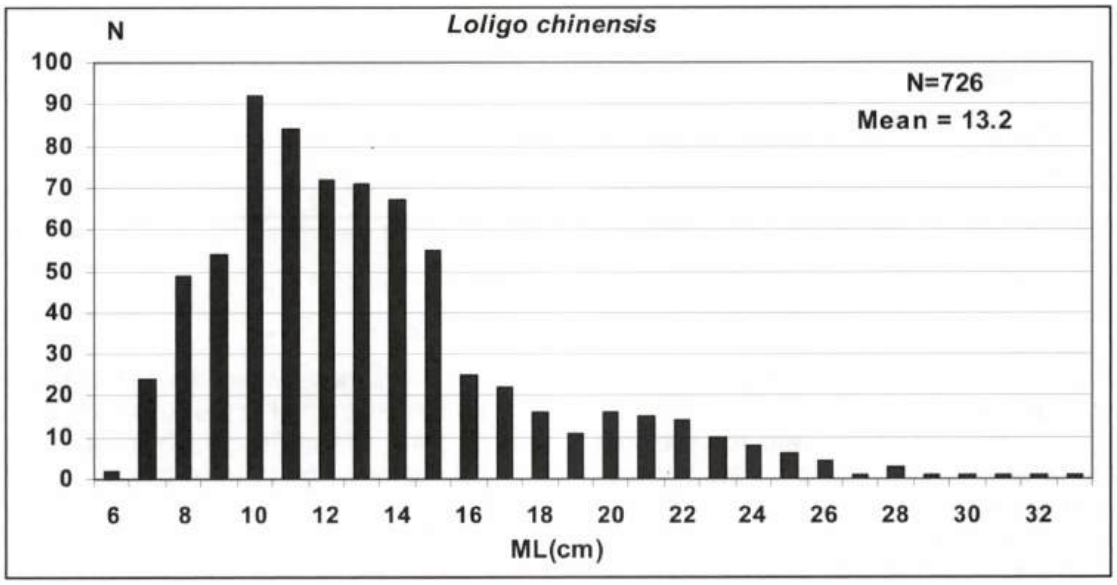

Figure 3 The Length frequency distribution of Loligo chinensis caught during trawl surveys conducted in southeastern and southwestern areas of Vietnamese water in December 2000.

Metapenaeus affinis
Length frequency data were collected monthly from the commercial trawl fishery (fleet <45 hp) in 1997. The length of female of *Metapenaeus affinis* ranged from 6 to 33cm, with a mean length of 13.2cm.

3. THREATS & CURRENT STATUS

3.1 Status of the fishery in terms of CPUE

As shown in *Table 16*, annual mean catch rate per horsepower has declined rapidly year by year. The reason for that could be overexploitation in the near shore waters, where most of fishing boats harvesting in.

Table 16 The number of fishing boats, total horsepower, landings, and catch rate in Viet Nam from 1981 to 2002.

Year	No of motorised fishing boats (units)	Total Horsepower (hp)	Landings (tonnes)	Catch rate (Tonnes/hp/Year)
1981	29,584	453,871	419,470	0.92
1982	29,429	469,976	475,597	1.01
1983	29,117	475,832	519,384	1.09
1984	29,549	484,114	530,650	1.10
1985	29,323	494,507	550,000	1.11
1986	31,680	537,503	582,077	1.08
1987	35,406	597,022	624,445	1.05
1988	35,774	609,317	622,364	1.02
1989	37,035	660,021	651,525	0.99
1990	41,266	727,585	672,130	0.92
1991	43,940	824,438	730,420	0.89
1992	54,612	986,420	737,150	0.75
1993	61,805	1,291,550	793,324	0.61
1994	67,254	1,443,950	878,474	0.61
1995	69,000	1,500,000	928,860	0.62
1996	69,953	1,543,163	962,500	0.62
1997	71,500	1,850,000	1,078,000	0.58
1998	71,779	2,427,856	1,130,660	0.47
1999	73,397	2,518,493	1,212,800	0.48
2000	75,928	3,185,558	1,280,591	0.40
2001	78,978	3,722,577	1,347,800	0.36
2002	81,800	4,038,365	1,434,800	0.35

Source: The Implementation of Work plan 2002 and Fishery Socio-Economic Development Plan 2003, Ministry of Fisheries (2003).

Pelagic resources

There was no comprehensive acoustic survey carried out in Vietnamese waters during the decade prior to late 2003. Recently, the Government of Viet Nam has provided support to the Research Institute for Marine Fisheries for a three-year acoustic project, which is still in its initial stage. The major gears used to exploit small pelagic resources are purse seine, drift gill net, and high opening bottom trawl. So far, the status of these resources has not been updated by scientific surveys. However, the project *Assessment of the Living Marine Resources in Viet Nam* (ALMRV) established an enumerator-sampling programme in 1996 aimed at collecting data from commercial fisheries along Viet Nam's coastline. *Table 17* shows the mean catch rate of the purse seine and drift net fleets by area from 2000 to 2002. According to these figures, the mean catch rate (kg/day) of many fleets seems to have significantly decreased over time. Catch rate has decreased more than half in some horsepower classes and fleets of drift gillnet boats. The catch rate of nearly all purse seine fleets has declined significantly. The most serious problem has occurred in the fleet of 90 to 140hp class purse seine boats in the north (from 1324.2kg in 2000 to 447.9kg in 2002) and in the central region (from 1128.6kg in 2000 to 362.1kg in 2002).

Table 17 Mean CPUE (kg/day) of purse seine and drift gill net fleets from 2000 to 2002.

Region	Landing year	Drift gillnet					Purse seine			
		20	20-45	46-89	90-140	>140	20-45	46-89	90-140	>140
North	2000	26.2	176.5	299.3			752.2	494.8	1324.2	1687.7
	2001	24.3	43.4	200.0			323.6	133.3	867.3	
	2002	28.7	61.7	116.5			302.0	295.2	447.9	
Center	2000	42.1	144.7		205.9		413.5	644.7	1128.6	
	2001	56.9	206.3		144.0		471.3	712.7	423.8	
	2002	41.8	207.3		95.7		205.4	344.4	362.1	
Southeast	2000	56.7	272.8	193.2	317.6	117.1		951.4	958.5	1134.8
	2001	45.4	108.6	264.9	313.4			667.5	738.1	867.3
	2002	52.1	141.3	332.6	343.7				507.3	737.9
Southwest	2000	18.3	95.5	232.8		249.3	868.1	815.9		1191.9
	2001	15.8	26.8			257.0				1358.2
	2002	25.0	50.9	191.0		224.8				

Source: Extraction from Vietfishbase, Enumerator Programme, Assessment of the Living Marine Resources in Viet Nam, 2003.

To update information regarding the relative abundance of large pelagic fishes, there have been two gillnet surveys conducted each year since 2000 in central and south-eastern waters of Viet Nam during the southwest and northeast monsoon seasons. In general, the mean catch per unit effort observed during the two seasons was quite stable at a low value of more than 31kg/km of net (Table 18).

Table 18 Mean catch rate (kg/km of net) of large pelagic fish in gill net surveys conducted from 2000 to 2002.

Year	Southwest monsoon season (SW)		Northeast monsoon season (NE)		Total	
	CPUE	CV (%)	CPUE	CV (%)	CPUE	CV (%)
2000	29.0	90	33.7	68	31.4	78
2001	41.8	93	30.9	134	36.7	109
2002	31.5	115	31.8	109	31.6	110

Source: Extraction from Vietfish Survey Database, Assessment of the Living Marine Resources in Viet Nam, 2003.

Demersal resources

According to Pham Thuoc (1993), during the decade after 1988, the density of demersal fish resources in south-eastern waters declined by 93.7% in waters shallower than 30m, and by 60.57% in waters deeper than 30m.

Figure 4 shows fluctuations in CPUE of the single trawl fleet (20 to 45hp) by area from 1996 to 2002. It is noted this figure generated from Vietfish database, Enumerator Programme, Assessment of the Living Marine Resources in Viet Nam includes only active boats.

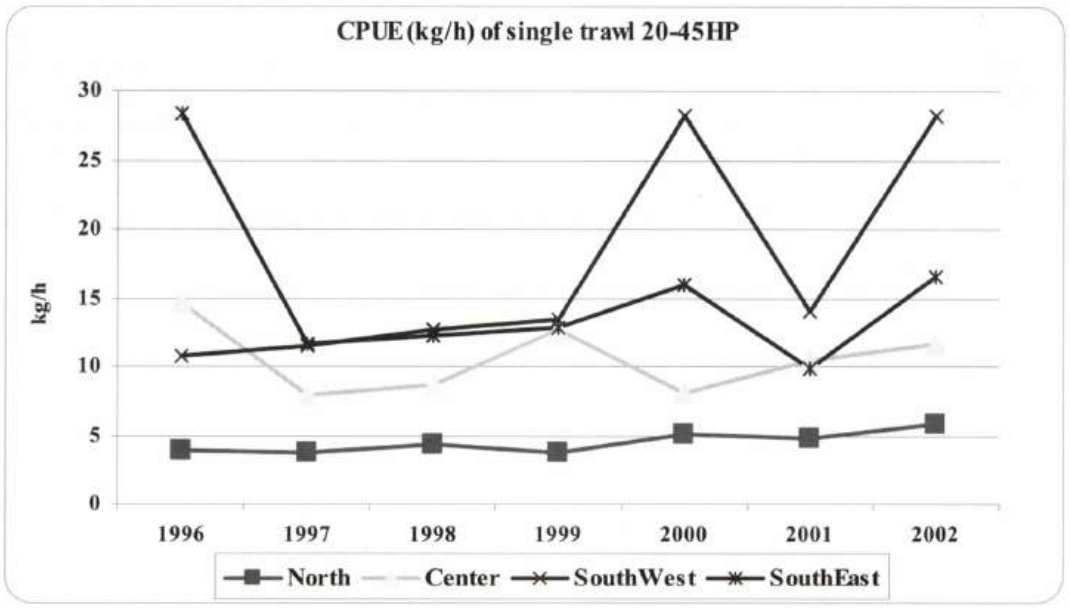

Figure 4 CPUE of the single trawl fleet (20 to 45hp) in northern (Gulf of Tonkin), central, southeastern, and southwestern (Gulf of Thailand) waters of Viet Nam.

In the period from 2000 to 2003, a number of scientific trawl surveys (using the same boat and same gear) were conducted in the Gulf of Tonkin, south-eastern and south-western (Gulf of Thailand) waters. Table 19 shows the mean catch rate by area and depth stratum observed during these surveys. The lowest catch rate (22.3kg/h) was derived from the Gulf of Tonkin in November 2001, with the highest from south-eastern waters in November 2003 (1670.9kg/h).

Table 19 Mean CPUE observed during the surveys from 2000 to 2003.

Depth stratum (m)	CPUE (kg/h)				
	Gulf of Tonkin				
	May-01	Nov-01			
20-30	57.6	22.3			
30-50	73.2	101.2			
50-100	113.3	95.6			
100-200	77.7	97.1			
CPUE (kg/h) in southeastern waters					
	May-00	**Nov-00**	**May-02**	**Nov-02**	**Nov-03**
20-30	62	25.4	39.4	47.5	81.1
30-50	77.9	60.7	52	49.1	144.1
50-100	65.9	87.4	53.4	72.6	211.2
100-200	187.5	107.5	65.2	141.8	221.7
> 200 m					1670.9
CPUE (kg/h) in the Gulf of Thailand					
	May-00	**Nov-00**	**May-02**	**Nov-02**	**Nov-03**
20-30	37.8	54.3	43.4	71.1	73.3
30-50	79.9	91.3	70.5	65.6	108.4
50-100	68.4	77.9	62.5	71	148.3

Source: Bottom survey technical reports, Assessment of the Living Marine Resources in Viet Nam, 2000-2003.

Shrimps

Shrimp trawling is an important fishing activity in the Gulf of Tonkin and the Gulf of Thailand. The most important fleet targeting shrimp resources in northern waters are single trawlers of the 20 to 89hp class, whilst in southeastern and southwestern waters the 20 to 45 and > 140hp classes are important. In the Gulf of Thailand, shrimp mostly occur in waters less than 30m deep. The recent use of large boats (> 90hp) to catch shrimp is believed to have caused severe degradation of the resource. In general, not only the catch rate of shrimp has declined, the compositions of catches have changed. The catch rates of high value shrimp, including white prawn and pink prawn, are low. The trend line indicates a clear decrease in the catch rate of pink prawn in both the Gulfs of Tonkin and Thailand (Figure 5). The catch rate of white prawn in these areas is not significant at all.

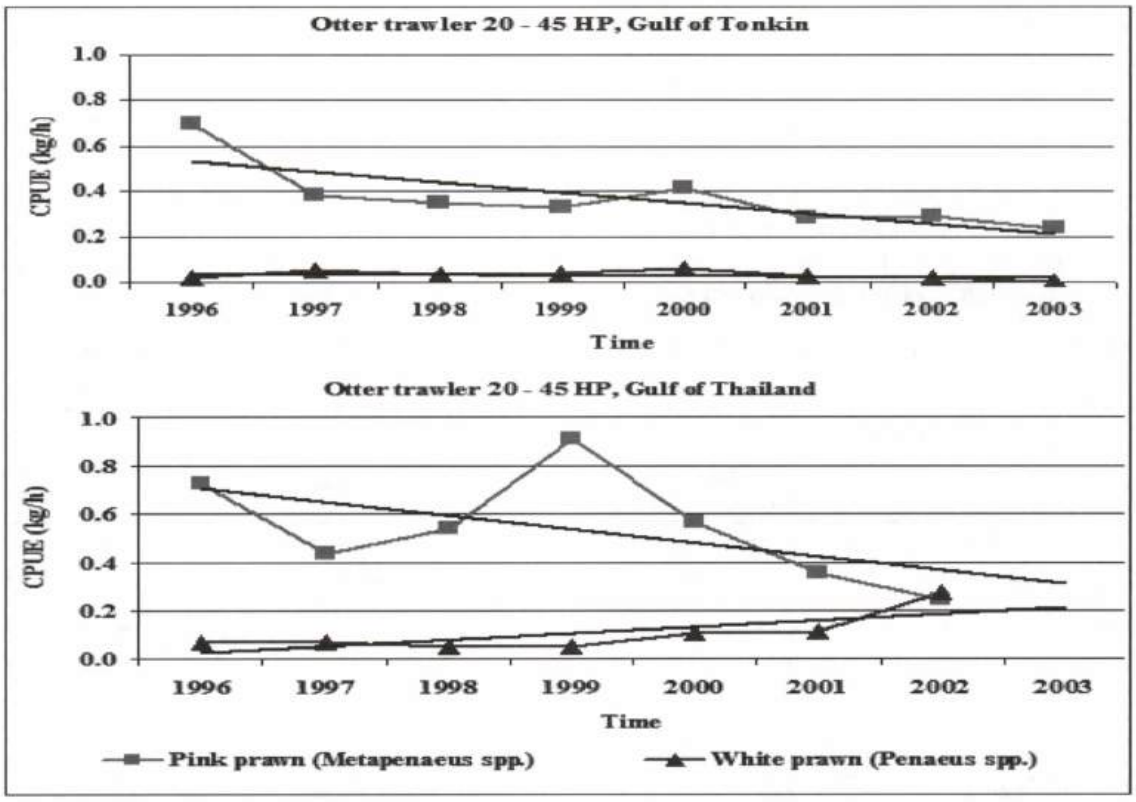

Figure 5 Mean CPUE of pink and white prawns in Vietnamese waters located within the Gulfs of Tonkin and Thailand from 1996 to 2003.

3.2 Status of the fish stocks based on historical review of landings and CPUE

With the rapid development of fisheries during recent decades, it is believed that marine resources in near shore waters are overexploited. The Government of Viet Nam has recently devoted much effort to the redirection of fishing effort from coastal waters towards offshore waters. A number of studies and surveys aimed at assessing the status of fisheries resources have been initiated in Viet Nam. Different international donors have supported these efforts, and the results will be used to guide the development of sustainable fisheries in Viet Nam.

3.2.1 Fish Resources

3.2.1.1 Species composition

In the continental shelf areas of the northern and central regions, 301 and 260 species have been identified, respectively. In the continental shelf areas of the southeast and southwest, 845 and 581 species have been identified, respectively.

There were 70 species belonging to 31 genus caught in gill nets during a survey conducted from October to November 2002, with the dominant families being *Carrangidae, Scombridae*, and *Gemplydae*. Table 20 highlights the five dominate species in the total catch in gill nets used during surveys from 2000 to 2002. *Katsuwonus pelamis* always ranked first in terms of contribution to total catch volume.

Table 20 Proportion (%) of the five dominant species in the total catch of gill net surveys conducted in Vietnamese waters from 2000 to 2003.

Name	2000		2001		2002	
	NE	SW	NE	SW	SW	NE
Katsuwonus pelamis	68.0	50.0	63.0	62.0	65.3	63.81
Mobula diabolus	5.5	6.9	8.5	15	4.6	4.8
Mobula japanica	1.,2	9	3.9		10.2	0.59
Thunnus albacares	3.2	6.4	4.6	1.7		3.04
Auxis thazard		6.7		2.7	3.3	1.68

Source: Bottom survey technical reports, Assessment of the Living Marine Resources in Viet Nam, 2000-2003.

Demersal fishes live near the seafloor and in communities comprised of a large number of other species. Normally, trawl catches also consist of some small pelagic fish. No fish species has been observed to dominate trawl catches across all areas and seasons. *Table 21* shows the mean CPUE and proportion of the top ten species caught in the trawl surveys conducted during both fishing seasons of 2000 and 2001.

In the Gulf of Tonkin, *Evynnis cardinalis* was the most abundant in both seasons. In the southeast, *Paramonacanthus nipponensis* was dominant during the southwest monsoon and *Upeneus bensasi* dominated during the northeast monsoon. In the Gulf of Thailand, *Loligo chinensis* and *Leiognathus spp.* were ranked first in the southwest and northeast seasons, respectively.

Table 21 Mean CPUE (kg/h) and proportion (%) of the total catch of top ten species by season and area in Viet Nam.

Gulf of Tonkin			Southeast waters		
Species name	% to total catch		Species name	% to total catch	
	SW 2001	NE 2001		SW 2000	NE 2000
Evynnis cardinalis	34.54	9.46	Paramonacanthus nipponensis	42.73	4.26
Loligo chinensis	8.16	3.70	Trachinocephalus myops	5.56	7.22
Acropoma japonicum	6.77	5.46	Upeneus bensasi	3.41	8.64
Trachurus japonicus	4.04	3.16	Loligo chinensis	3.24	2.71
Saurida tumbil	3.31	3.84	Pristotis jerdoni	2.88	1.66
Leiognathus spp.	2.63	5.04	Charybdis cruciata	2.52	1.44
Trichiurus lepturus	2.55	7.56	Priacanthus macracanthus	2.4	6.32
Charybdis cruciata	2.14	0.53	Saurida undosquamis	2.22	6.21
Decapterus maruadsi	1.70	2.22	Selaroides leptolepis	2.18	3.45
Lophiomus setigerus	1.38	0.99	Nemipterus bathybius	2.17	1.68
Gulf of Thailand					
Species name	% to total catch		Species name	% to total catch	
	SW 2000	NE 2000		SW 2000	NE 2000
Loligo chinensis	7.8	3.32	Sepia esculenta	3.25	3.53
Leiognathus spp.	6.61	17.25	Lagocephalus inermis	3.11	2.35
Trichiurus lepturus	3.92	4.5	Paramonacanthus nipponensis	2.62	0.89
Selar crumenophthalmus	3.64	0.32	Nemipterus tambuloides	2.59	0.34
Loligo duvauceli	3.36	3.1	Apogon spp.	2.32	1.2

SW: Southwest monsoon season; NE: Northeast monsoon season.
Source: Bottom survey technical reports, Assessment of the Living Marine Resources in Viet Nam, 2000-2003.

3.2.1.2 Fish distribution

The fisheries of Viet Nam clearly divide into two seasons: (1) the southwest monsoon (May-October); and (2) the northeast monsoon (November to April). In the southwest monsoon, fishes tend to move into shallow waters for spawning, and during the northeast monsoon, they move into deeper areas. Normally, catch rates during the southwest monsoon season are higher than during the northeast monsoon season. However, the quality of fish is usually better during the northeast winter season.

Figure 6 presents the CPUE distribution by fishing season as indicated from the trawl and gillnet surveys conducted in 2000 and 2001.

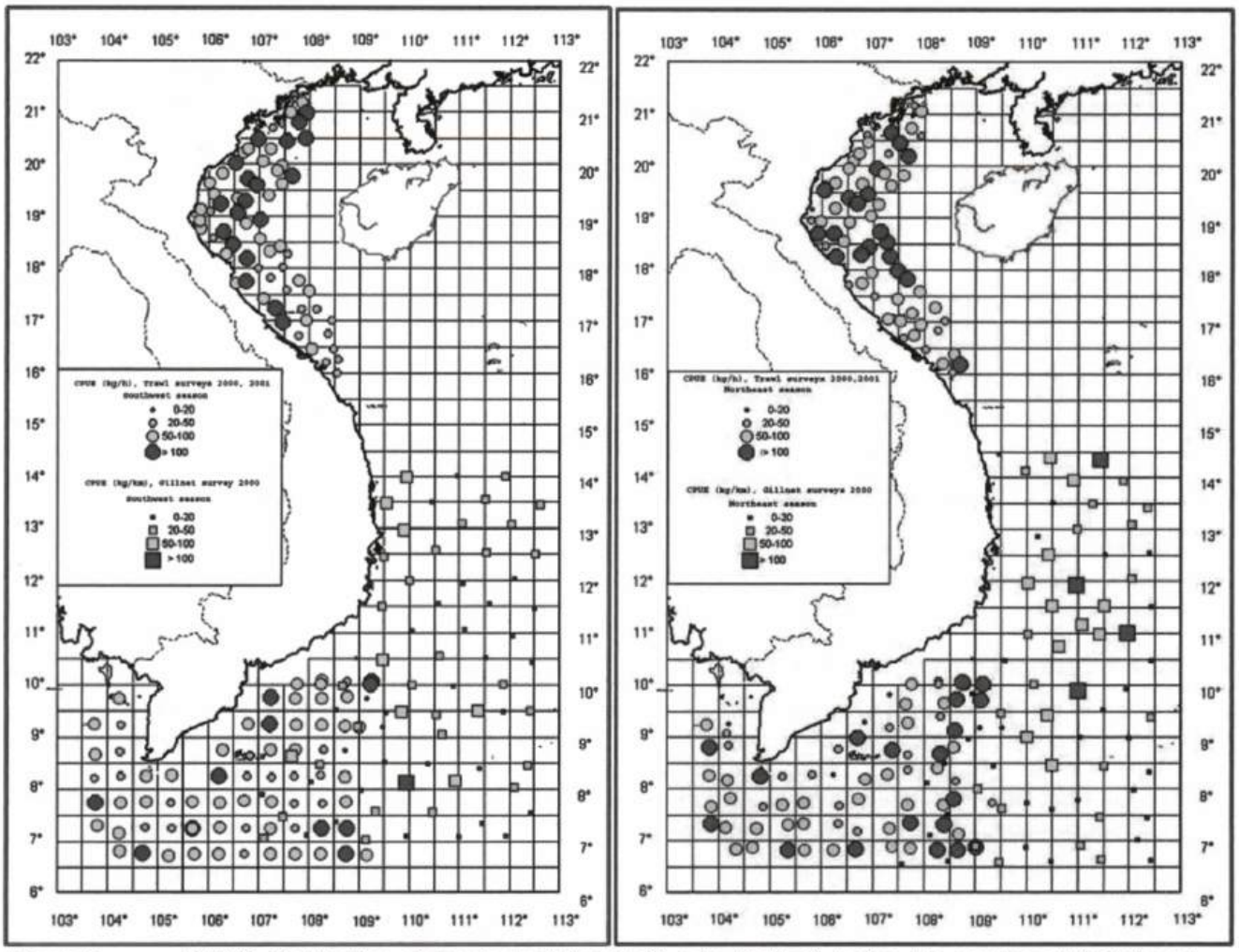

Figure 6 CPUE distribution of trawls (kg/h) and gill nets (kg/km) during the southwest (right) and northeast (left) seasons from the surveys conducted by ALMRV and the Offshore Fisheries Project in 2000 and 2001.

3.2.1.3 Standing stock and potential yield.

It is necessary to note that Viet Nam was unable to undertake any comprehensive studies into small pelagic resources for quite some time. Furthermore, there was no appropriate methodology for estimating the biomass of the large pelagic fish stock. To obtain some knowledge regarding the relative abundance of large pelagic fishes, gill nets and longlines have been used in scientific surveys.

According to Pham Thuoc (2000), the total standing stock of Viet Nam's marine fish was estimated at 3.3 to 3.5 million tonnes, resulting in 1.5 to 1.6 million tonnes of sustainable yield.

3.2.2 Shrimp resources

3.2.2.1 Species composition

There have been 225 shrimp species from 69 genera and 24 families found in Vietnamese waters. Out of those, the 6 most important families are *Penaeidae* (59 species); *Solenoceridae* (12 species); *Nephropidae* (3 species); *Aristeidae* (3 species); *Palinuridae* (9 species); and *Scyllaridae* (9 species).

From 2001, several surveys regarding shrimp resources were conducted in the Gulf of Tonkin, and the southeast and southwest (Gulf of Thailand) waters in Southwest monsoon (SW) and Notheast monsoon (NE) season. Table 22 shows the proportion of the most dominant families in the total catch of shrimp during these surveys.

Table 22 Proportion (%) of the dominant shrimp families in the total catch of shrimp.

		2001		2002		2003	
Area	**Family Name**	**SW**	**NE**	**SW**	**NE**	**SW**	**NE**
Gulf of Tonkin	Penaeidae	-	-	17.87	9.60	9.32	13.46
	Solenoceridae	-	-	0.82	1.54	0.39	-
	Squillidae	-	-	3.96	4.24	-	2.46
Total		-	-	22.64	15.38	9.70	15.92
Southeast waters	Penaeidae	-	-	14.02	13.12	-	-
	Solenoceridae	-	-	0.41		-	-
	Squillidae	-	-	3.32	3.76	-	-
Total		-	-	17.74	16.88	-	-
Gulf of Thailand	Penaeidae	10.39	22.76	25.31	20.54	-	-
	Solenoceridae	3.33	4.62	1.91		-	-
	Squillidae	4.12	3.66	5.28	3.71	-	-
Total		17.84	31.04	32.50	24.26	-	-

The family of *Penaeidae* was found in all surveyed areas in both seasons. However, a major part of the catch of this family was comprised of low value species. The contribution of high value shrimp of the *Penaeidae* family to total catch was not significant.

3.2.2.2 Distribution and harvesting season

The family of *Penaeidae* is ubiquitous in Gulf of Tonkin waters less than 30m deep. However, they are typically more abundant in the Diem Dien-Tra Ly and Lach Bang-Lach Quen estuaries, and waters of Cat Ba-Do Son, Bai Tu Long Bay, and those adjacent to the Mi andMieu Islands. The species of Thenus orientalis of the family of *Scyllaridae* is mostly found at depths less than 50m during both monsoon seasons, while the species of Ibacus ciliatus maily distributes at depth beyond 25m.

Species of the *Penaeidae* family are present throughout the year in coastal waters of the central region at depths less than 50m. However, they are typically less abundant than the species of the *Scyllaridae* family. *Ibacus ciliatus* are abundant in this area at depths greater than 50m during the dry season. The harvesting of shrimp in waters of the central region mostly occurs during the dry season.

The *Penaeidae* family and *Thenus orientalis* are relatively abundant in southeastern and southwestern waters throughout the year. Significant areas for shrimp in southern Viet Nam include the area from Cung Hau to An Dinh estuaries, Anh Dong-Nam Du waters (Kien Giang province), the northwest area of Hon Chuoi Island (Ca Mau province), and waters adjacant to Phu Quy Island.

In 1986, Pham Thuoc, in his PhD thesis mapped the key grounds of Penaeidae shrimp in Vietnamese waters (Figure 7).

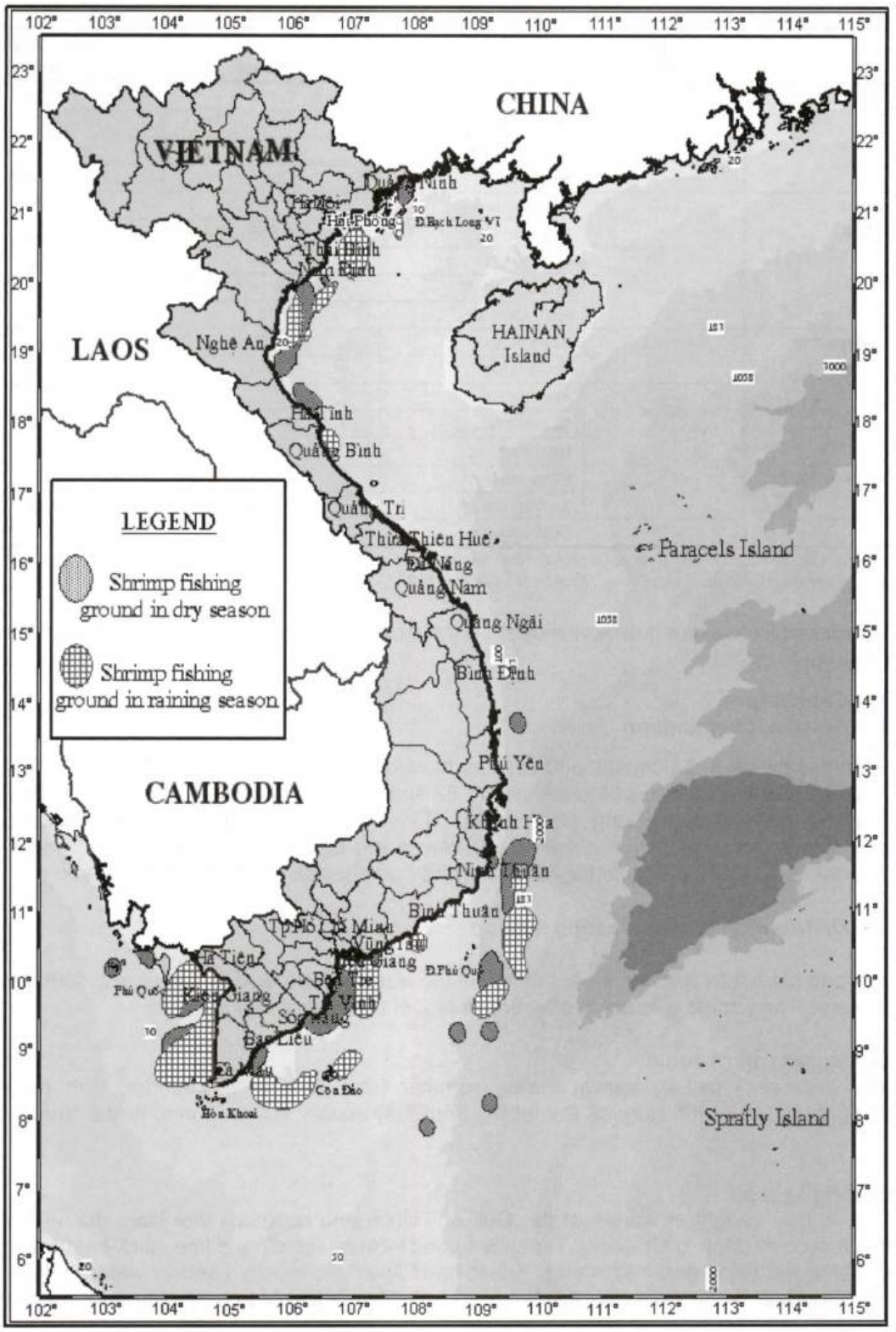

Figure 7 The key ground of Penaeidae shrimp in Vietnamese waters.

3.2.2.3 Shrimp stock and potential yield

Table 23 presents the biomass and potential yields of commercially important shrimp and lobsters in Vietnamese waters.

Table 23 Biomass and potential yields of selected shrimp and lobsters in Vietnamese waters.

Area	Depth (m)	Name	Biomass (tonnes)	Potential yield (tonnes)
Gulf of Tonkin	< 30	Penaeidae	1,408	704
		Scyllaridae	152	48
	> 30	Thenus orientalis	278	
		Scyllaridae	321	101-117
Central waters	<50	Penaeidae	1,200	600
		Scyllaridae	1,506	550
	> 50	Penaeidae	1,100	402
		Scyllaridae	14,793-16,175	5,399-5,904
		Nephropidae	319	116
Southeastern waters	< 30	Penaeidae	3,983	1,946
		Scyllaridae	4,344	1,586
	> 30	Penaeidae	1,012	369
		Scyllaridae	13,220-15,373	4,825-5,611
		Nephropidae	614	224
Southwestern waters (Gulf of Thailand)	< 30	Penaeidae	3,383	1,691
		Scyllaridae	5,461	1,993
	> 30	Scyllaridae	1,858-3,799	678-1,378

Source: The resources of shrimp, lobsters and cephalopod resources in Vietnamese waters: status and conservation methods, Pham Ngoc Dang, Nguyen Cong Con, 1995.

The families of Penaeidae and Scyllaridae are the most important in terms of distribution and bundance in Vietnamese waters.

3.2.3 Cephalopod

3.2.3.1 Species composition

In Vietnamese waters, 53 cephalopod species have been identified. Among them, one species belong to the class Nautiloidea, whilst the remaining 52 species belong to 12 genera from 6 families (Pham Ngoc Dang and Nguyen Cong Con, 1995). There are 12 species with high economic value: *Sepioteuthis lessoniana*; *Loligo chinensis*; *L. duvauceli*; *L. edulis*; *L. singhalensis*; *Sepia pharaonis*; *S. aculeate*; *S. lycidas*; *S. esculenta*; *Sthenoteuthis oualaniensis*; and *Octopus vulgaris*.

3.2.3.2. Distribution and harvesting season

Cephalopod resources are mainly distributed in the waters of the Gulf of Tonkin and southern Viet Nam. The oceanic flying squid is found in offshore waters of the central region.

Spawning season of squid

Squid (*Loliginidae*) usually spawn during summer from April to September, with peak spawning occurring during July and August. Cuttlefish (*Sepiidae*) usually spawn during winter from December to March.

Harvesting season

Squid is mainly caught in waters of the Gulf of Tonkin and southern Viet Nam during the southwest monsoon season (May to October). The gears used include squid hand line, stick-held falling net, purse seine, lifting net with light, and trawls. Squid hand lines are mostly used in waters adjacent to small islands and coral reefs. Cuttlefish are targeted from October to March, mainly with trammel nets. The key grounds are:

- Co To-Cat Ba, Long Chau-Bach Long Vi waters
- Hon Me, Hon Mat waters
- Qui Nhon coastal waters
- Phu Yen: from Dai Lanh to Cha La Island (Van Phong Bay).
- Khanh Hoa: from Nha Trang to Ca Na
- Phan Thiet: from off Mui Ne to Phu Quy Island
- Vung Tau: off Vung Tau, southeastern waters of Con Son Island
- Ca Mau: northwest and southeast of Hon Khoai Island
- Kien Giang: north and nouthwest of Phu Quoc

Flying Squid is harvested from May to November using squid hand lines.

3.2.3.3 Standing stock and potential yield

The standing stock of cephalopods in Vietnamese waters was estimated at 100,000 to 104,000 tonnes with a potential yield of 45,000 tonnes (Vu Huy Thu and Pham Thuoc, 2003). This figure does not include the flying squid resource.

Table 24 The biomass and potential yield of squid and cuttlefish in Vietnamese waters.

Water areas	Biomass (ton)	Potential yield (ton)
Tonkin Gulf	13,500-14,000	
Central waters	33,000-35,000	
Southeast and Southwest waters	54,400-55,000	
Total	**100,900-104,000**	**45,000**

Source: Guidelines on exploitation and protection of the marine resources of Viet Nam, Vu Huy Thu and Pham Thuoc, 2003.

3.3 Threats

3.3.1 Current threats

3.3.1.1 Environmental problems caused by fishing activities

The practice of releasing waste like garbage, human waste, and petrol sludge directly from fishing boats into the sea is quite common. In addition to this, oil leaking from boats also contributes to pollution at fishing ports and landing places.

A survey conducted at the fishing harbours of Cat Ba, Bach Long Vi, Do Son, and Diem Dien in northern Viet Nam indicated that oil pollution is a common problem. The lowest level of oil pollution was observed at Bach Long Vi fishing harbour (0.10mg/l), whilst the highest was at Cat Ba (0.28mg/l). However, oil concentrations in both places exceed Viet Nam's standard for coastal water quality (Quality standards of sea water of Viet Nam 5943, 1995). This situation has the potential to hinder the development of fisheries resources.

3.3.1.2 Environmental problems caused by aquaculture

Aquaculture has the potential to contribute to the degradation of wild fisheries resources and the environments upon which they depend.

Discharges of untreated wastewater and the remains of trash feed fish from aquaculture facilities into Viet Nam's coastal waters can potentially cause disease in populations of wild marine fish species.

Mangroves play very important roles in fisheries. At the most basic level, the primary production of mangroves supports numerous forms of wildlife and avifauna, including estuarine and coastal fisheries. Around 90% of marine species depends on mangroves for at least one part of their lifecycle. However, mangrove and other littoral areas continue to be destroyed in Viet Nam for the development of facilities associated with the aquaculture of shrimps, clams, ark-shells, and crabs (Table 25).

Table 25 The area of mangroves converted for the aquaculture of ark-shell, clam and crab in the Mekong Delta of Viet Nam from 1995 to 2000 (ha).

Cultured species	1995	1996	1997	1998	1999	2000
Blood ark-shell	1,494	1,319	1,626	2,250	3,718	4,919
Clam	3,425	1,905	3,155	5,105	6,053	7,734
Crab	1,270	239	1,243	513	420	307
Total	**6,189**	**3,513**	**6,124**	**7,868**	**10,191**	**12,960**

Table 26 highlights the area of mangroves in some southern provinces that have been cleared for the development of shrimp aquaculture facilities.

Table 26 The area of mangrove forests used for shrimp culture in selected provinces of southern Viet Nam.

No.	Province	Area (ha)		
		1998	1999	2000
1	Ca Mau	37,143	41,000	45,000
2	Ben Tre	3,250	3,650	4,213
3	Soc Trang	1,560	1,980	2,072
4	Kien Giang	598	650	850

The continuing degradation of mangroves will not only reduce terrestrial and aquatic production and wildlife habitats, but will also seriously affect the environmental stability of coastal forests. These forests have been effective buffers between the sea and inland agricultural areas and villages.

Presently, the restoration of mangrove forest ecosystems is a primary concern of the Government of Viet Nam. A mangrove rehabilitation programme has been launched in many coastal provinces. Recently, Bac Lieu province has planted 1,100 to 1,200ha of new mangrove forests each year. Its neighbouring province of Ca Mau has carried out 7 mangrove restoration projects. Ben Tre province plans to increase mangrove forest area in that province to 10,416ha after the year 2000, including 2,273ha combined with aquaculture. In northern Viet Nam, thousands of hectares of mangroves have recently been planted in Hai Phong, Thai Binh, and Nam Dinh provinces.

3.3.1.3 Environmental problems caused by fisheries logistics supplies and processing plants

The majority of logistical suppliers and fish processing facilities are located along the coast or adjacent to estuaries. Among them, only a few facilities treat wastewater prior to its release into coastal waters. Small-scale processing facilities, which do not usually treat waste, are one of the main causes of pollution in the water bodies into which they release wastes.

> The amount of solid wastes is equivalent to 35 to 40% of raw materials. Liquid wastes are estimated at 1.5 to 2 billion m^3/year, including the water used for washing raw materials, and wastewaters pressed from fishmeal.

3.3.1.4 Destructive fishing

According to incomplete statistics from 1998 to 2000, Viet Nam's inter-sectoral surveillance force uncovered 149 cases involving the illegal transportation and trading of explosives; 843 cases of explosives use; 19,658 cases involving the use of electric pulses; and 106 cases involving the use of poisons in fishing. Exploitation of corals for sale to tourists or cement factories is a large problem in central Viet Nam.

To overcome this problem, the Government of Viet Nam has introduced strong management measures, including: the issuing of legal regulations stipulating desired fishing behaviours; establishing inspection committees for the control of destructive fishing in important provinces; and surveillance and monitoring activities. The Government also devotes a lot of effort to an awareness and education programme, which involves training, TV messages, newsletters, posters, and magazines.

3.3.1.5 Over-fishing

It is generally believed that there are indications of over-fishing in the coastal waters of Viet Nam, as approximately 80% of Viet Nam's total catch is derived from these waters. The catch rates and size of fishes have declined over recent years. The composition of catches have also changed, with large declines in the representation of high value species such as silver pomfret, grouper, snapper, and prawn in landings.

3.3.2 Potential threats

3.3.2.1 Projected market demand

The export value from fishery products of Viet Nam has rapidly increased. Especially, when Viet Nam becomes an official member of the World Trade Organisation, there will be more markets opening to

Viet Nam. It is also expected that domestic demand for fish products will increase in line with general increases in per capita income in Viet Nam. Similarly, the government has recently established favourable policies to assist fishers and fish-farmers, including soft loans and low taxes, fisheries infrastructure improvement projects, and technology development. This setting may lead to the unsustainable development of fisheries in the case of ineffective fisheries management. Some species, including anchovy, lobster, and prawn, are fully or overexploited. High demand situations will give such species little chance to recover.

3.3.2.2 Increased coastal population

Coastal Viet Nam is 1.3 times more populated than the average for the whole country. Similarly, annual population growth in coastal provinces is higher than other areas, creating a need for finding more employment opportunities, such as those associated with fisheries.

4. HABITATS AND AREAS OF IMPORTANCE IN THE MAINTENANCE OF EXPLOITED FISH STOCKS

4.1 Physical, chemical, and biological characteristics of the spawning, nursery, feeding, and fishing grounds

Based on geography, bathymetry, hydrodynamics, and climatic conditions, Vietnamese waters can be divided into 4 areas:

Gulf of Tonkin

Water circulation
In summer (the southwest monsoon season), currents flow up along the coastline to the north of the Gulf, exiting through the west coast of Hai Nan Island, creating a closed clockwise circulation. This system forms an up-welling area of 60 nautical miles long along the west of the gulf from Ha Tinh to Quang Binh. The current speed is low at approximately 10 to 15 cm/s. In winter (the northeast monsoon season), this current reverses its direction. The currents in the whole area reach an average speed of 10 to 15cm/s.

Temperature
The water temperature in the Gulf of Tonkin fluctuates widely throughout the year from 16 to 23°C in winter and 28 to 31°C in summer.

Salinity
The salinity ranges from 27.0‰ to 32.0‰ and from 32.0‰ to 33.5‰ in summer and winter, respectively.

Plankton
In general, the average zooplankton biomass in the Gulf of Tonkin is higher than that in central and southeastern waters with an average biomass ranging from 80 to 120mg/m^3.

Central waters

Water circulation
The hydrological regime in this area is controlled by a distinct offshore hydrological regime. In summer, from the latitude of 16°N to 18°N, inflow water partly goes into the Gulf of Tonkin, partly flows parallel to the shore to the south. Upon reaching 10°N to 11°N, the direction of the current changes to and northwest to southeast direction. Further from the shore, the current flows parallel to the line if latitude until reaching the longitude of 111°E, where the current flows in a south to north direction, or in an opposite direction to the coastal current.

The mean speed of currents in summer in this region is usually between 30 and 40cm/s, occasionally peaking at 75cm/s.

The formation of currents in winter is similar to that in summer, however, its average speed increases to 70cm/s, with a maximum of 150cm/s.

Temperature
During summer, water temperature ranges from 27 to 30°C, and during winter, it ranges from 25°C to 28°C.

Salinity
Marine water salinity in the central region is very stable, with little difference between summer and winter. Salinity tends to fluctuate from 31.5‰ to 34.5‰ throughout the year.

Plankton
Zooplankton biomass in waters of the central region is relatively low, with an average concentration ranging from 20 to 40mg/m^3.

Southeast seawaters

Water circulation
The coastal waters of the southeastern region are shallow and the seafloor is flat. In summer, the coastal hydrological regime is dominated by water from coastal rivers and streams. Coastal currents, which are largely influence by river water, flow in a northwest to southeast direction. The speed of the current is quite low, ranging from 10 to 15cm/s.

During winter the current in eastern waters of this region appears to be a continuation of the current dominating the central region, flowing in a north to south direction, with a mean speed ranging from 20 to 30cm/s. In the western area, currents flow in a northeast to southwest direction. Around Con Son Island, there is a small orthodromic whirlpool, and a large antidromic whirlpool appears in the area of Cu Lao Thu Island. The current speed in the coastal area ranges from 15 to 20cm/s.

Temperature
Water temperature fluctuates from 29°C to 30°C in summer, and 25 °C to 27°C in winter.

Salinity
In this region, salinity is stable, except in estuarine areas, where salinity decreases by 2 to 3% during the rainy season.

Salinity ranges from 29.0% to 33.0‰ and 33.75‰ to 34.0% in the rainy season and dry season, respectively.

Plankton
According to an extensive time series survey, average biomass of zooplankton in this area is similar to the central region. The average zooplankton biomass in the coastal estuary of fishing grounds 9 and 13 ranges from 40 to 80mg/m^3, whilst that in the estuary of fishing grounds 11 and 12 ranges from 20 to 40mg/m^3.

Gulf of Thailand

Water circulation
In summer, the northwest to southeast current flows partly into the southeast area and partly into the Gulf of Thailand near the Ca Mau Cape.

Temperature
Water temperature is stable throughout the year. It ranges from 29 to 30°C in the rainy season and from 26 to 28°C in dry season.

Salinity
In the rainy season, mean salinity values at surface and bottom layers are observed at 27.0% to 27.4% respectively. During the dry season, mean salinity are 32.0 and 33.5% for the said layers.

Plankton
The highest zooplankton biomass has been observed in fishing ground 15 in the Gulf of Thailand. Here, zooplankton biomass ranges from 120 to 160mg/m^3. Fishing ground 14 (*Figure 8*) has an average zooplankton biomass ranging from 80 to 120mg/m^3.

4.1.1 Spawning and nursery grounds of fish, shrimp

Studies of fish eggs and larvae are used to identify fish spawning and nursery grounds. Before 1985, this was a key area of investigation in many surveys conducted in Viet Nam's northern and southeastern waters. From the mid 1980s through to the 1990s, this area received little attention until the Southeast Asian Fisheries Development Center (SEAFDEC) conducted some analyses on eggs and larvae in 1999. The Vietnamese Research Institute for Marine Fisheries also completed a number of surveys in 2002 and 2003. However, these efforts have mainly focused on the Gulf of Tonkin, and waters of the central and southeastern regions. A paucity of information exists for the Gulf of Thailand. Typical of tropical fish fauna, marine fishes in Viet Nam spawn throughout the year round and in all waters. We will now consider fish spawning and nursery grounds based on studies on eggs and larvae in specific areas of Viet Nam.

Gulf of Tonkin

Although eggs and larvae scatter over the Gulf of Tonkin, there are five areas where spawning is concentrated: (1) from Co To to Ha Mai Island; (2) around Bach Long Vi Island; (3) coastal waters from Cat Ba Island to the Ba Lat estuary; (4) from Ninh Co to Lach Ghep estuaries; and (5) coastal waters from Dien Chau Gulf to the Cua Viet estuary.

More fishes tend to spawn from March to September. However, peak spawning occurs from April to June.

In a survey conducted from August to September 2003 (Do Van Nguyen 2004), the highest density of fish eggs and larvae was found in the area from Cat Ba to Long Chau Islands, with 6,000 to 9,000 eggs/1,000m^3. In the southern part of the Gulf, densities ranged from 9,000 to 22,900eggs/m^3. The highest larval densities, observed in the southern Gulf area, ranged from 3,000 to 12,000 larvae/ 1000m^3. The analysis of eggs indicated that the dominant families were *Engraulidae* (17.08%), *Synodontidae* (5.48%), and *Clupeidae* (2.01%). The dominant families in term of larvae were *Scombridae* (16.56%), *Clupeidae* (14.29%), and *Leiognathidae* (12.15%). In the survey conducted from October to November 2003 (Do Van Nguyen 2004), the areas with highest concentrations of eggs and larvae were Cat Ba and Bach Long Vi Islands, as well as the southern part of the Gulf (more than 1000 eggs or larvae/1,000m^3). A counting of egg and larvae by Do Van Nguyen indicated that the family of *Engraulidae* ranked first (50.14 and 59.04%, respectively). Other dominant families were *Synodontidae*, *Synoglossidae*, *Gobiidae* and *Leiognathidae*.

Central waters

In waters of the central region, there is no typical spawning ground. Eggs tend to be scattered along the coastline or adjacent to river estuaries, whilst the distribution of fish larvae extends a little further offshore. In this area, it seems more fishes spawn from April to September, with peak spawning activity occurring from May to July.

According to a survey conducted from April to May 2003, the dominant families were *Excoetidae* (19.11% of total eggs and 35.70% of total larvae), *Scombridae* (13.75% and 24.40% eggs and larvae, respectively) (Do Van Nguyen 2003). The eggs and larvae were scattered throughout the area. However, densities were highest (more than 500 eggs or larvae/1000m^3) in waters adjacent to Danang, the Paracels archipelagos, as well as more southern waters. The composition of eggs and larvae observed in the survey from October to November 2003 differed slightly (Do Van Nguyen 2003). According to the number of total eggs, the family of *Clupeidae* ranked first (41.62%) and *Scombridae* (8.67%) second. The larvae of *Myctophidae* (35.08%) and *Scombridae* (7.52%) were dominant.

Southeastern waters

According to historical data (Do Van Nguyen 1981 and 1999), there are three main spawning grounds: (1) around Cu Lao Thu Island; (2) around Con Son Island; and (3) coastal waters from Phan Thiet province to Ca Mau Cape. In general, the spawning season in this area is longer than that observed for the Gulf of Tonkin, and can be divided into two groups:

- Migratory fishes, such as tuna and flying fish, tend to spawn more from April-September in the coastal waters between Quang Ngai to Khanh Hoa provinces.
- Commercially important inshore fish species spawn from February to March until October-November. They may spawn 3 to 4 times during this season.

The data available from recent SEAFDEC surveys (Do Van Nguyen, 1999), conducted from 30 April – 29 May 1999, indicate that the area with the highest concentration of fish eggs (>1,000 eggs/1,000m ^{3}) is that from Phu Quy Island to the Mekong revers estuaries. The concentration of larvae was highest in waters extending from the Mekong estuaries to Con Son Island. According to egg counts, the dominant families were *Engraulidae, Synodontidae, Cynoglossidae*, and *Clupeidae*. Families of *Engraulidae, Leiognathidae, Gobiidae, Carangidae, Mullidae, Scombridae*, and *Nemipteridae* dominated according to larvae quantities.

4.1.2 Fishing grounds

According to the study, *"Characteristics of Viet Nam Fisheries Resources, Biomass, and Potential Yield" (Pham Thuoc, 1981 to 1985),* there are 15 main fishing grounds in Vietnamese waters. Most of these are located in coastal waters, close to islands, and in waters less than 200m deep. There are only 3 offshore fishing grounds. These are located in central and southeastern waters. Based on location, the fishing grounds can be grouped into four areas:

Gulf of Tonkin: Fishing ground numbers 1 to 3.

Fishing Ground Number 1:
This fishing ground includes the area adjacent to Bach Long Vi Island, with a maximum depth of 50m. The main fishing season is from June to August. The dominant species caught in this area include round scad (*Decapterus maruadsi*), lizardfish (*Saurida tumbil*), threadfin bream (*Nemipterus spp.*), bensasi goatfish (*Upeneus bensasi*), and spined red bream (*Argyrops swainson*).

Fishing Ground Number 2:
This fishing ground is located in the centre of the Gulf of Tonkin, with a depth of 50m. The main species caught in this area include spined red bream (*Argyrops swainson*), round scad (*Decapterus maruadsi*), bensasi goatfish (*Upeneus bensasi*), yellow goatfish (*Upeneus sulphureus*), and threadfin bream (*Nemipterus spp.*).

Fishing Ground Number 3:
This fishing ground is located in the southern part of the Gulf of Tonkin near Hon Me-Hon Mat Islands, where water is approximately 20m deep. The major species caught include goatfish (*Upeneus spp.*), lizardfish (*Saurida tumbil*), threadfin bream (*Nemipterus spp.*), and malabar jack (*Caranx malabaricus*).

***Central waters*:** 5 fishing grounds, including 3 coastal and 2 offshore areas.

Fishing Ground Number 4:
The depth of Hon Gio (Thuan An) fishing ground ranges from 45 to 70m. The main fishing season is from April to July. The main species caught in this area include threadfin bream (*Nemipterus spp.*), goatfish (*Upeneus spp.*), lizardfish (*Saurida tumbil*), coastal trevally (*Carangoides caeruleopinnatus*), and gray emperor (*Gymnocranius griseus*).

Fishing Ground Number 5:
This fishing ground is located in waters to the northeast of Cu Lao Cham Island, with depths ranging from 100 to 300m. The bottom substrate is sandy mud. The area of this fishing ground is approximately 1,306 square nautical miles (4,476km^2). The main species caught include lizardfish (*Saurida tumbil*), yellow tail scad *(Atule mate*), and goatfish (*Upeneus spp.*).

Fishing Ground Number 6:
This fishing ground is located northwest of Da Nang province. It runs in a southeast to northwest direction, with water depths ranging from 50 to 200m. The main species caught in this area include spined red bream (*Argyrops swainson*), croaker *(Argyrosomus argentatus*), yellow tail scad (*Atule mate*), lizardfish (*Saurida tumbil*), and threadfin bream (*Nemipterus spp.*).

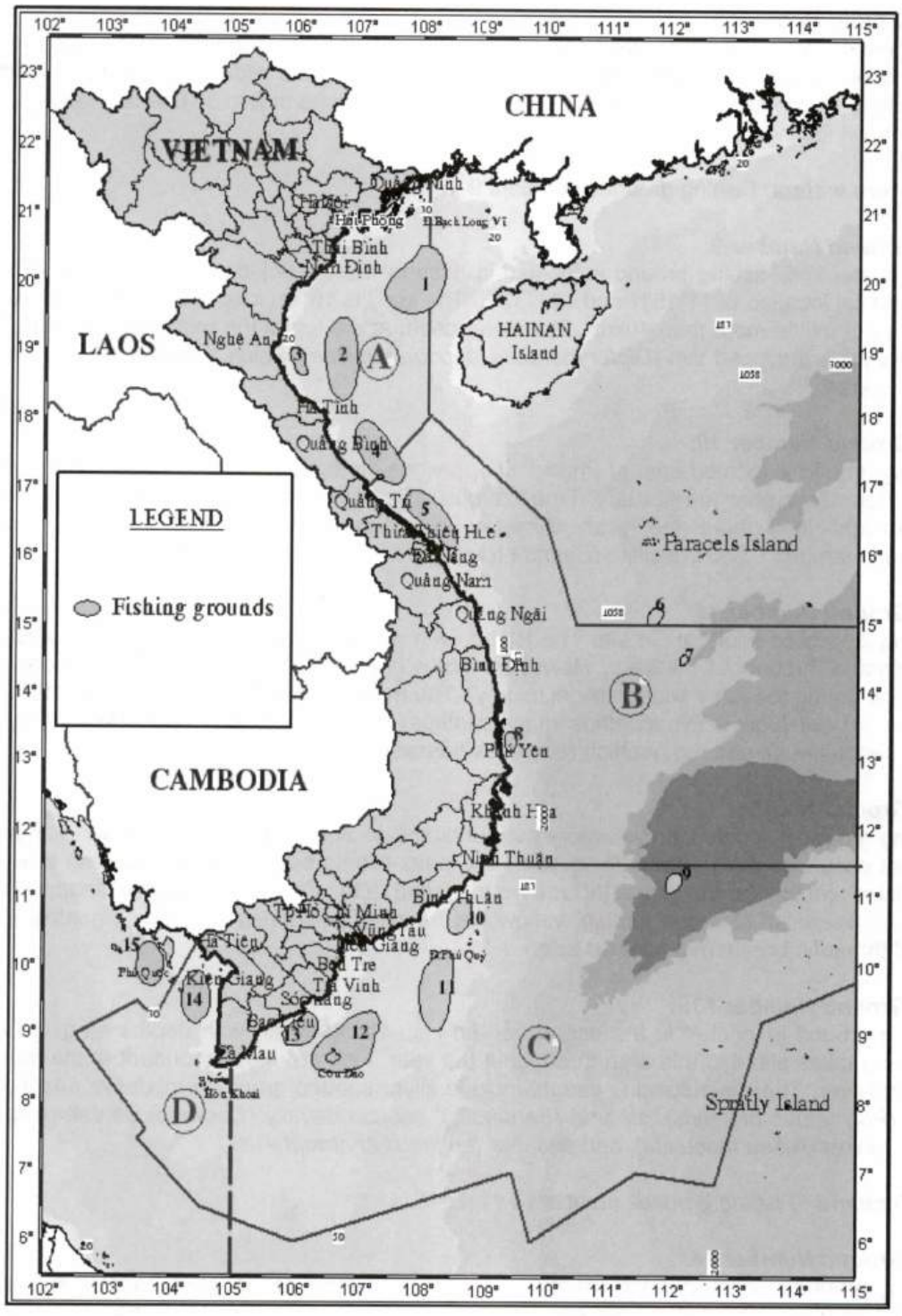

Figure 8 The main fishing grounds (as highlighted in green) in Vietnamese waters.

Source: Fish resources of Viet Nam seas: biological charateristics, biomass assessment and exploitation potentials, Pham Thuoc, Schechin 1986 (PhD thesis).

Fishing Ground Number 7:

This underwater knoll "125" fishing ground is located in offshore waters adjacent to Da Nang province. The knoll surface is only more than 5km^2. It occurs at a depth of 215m, and the bottom consists of organic sediments. The main species caught in this area include redlipped fish (*Dipterygonotus leucogrammicus*) and small head hairtail *(Trichiurus muticus)*.

Fishing Ground Number 8:
The "Margest-seamount" underwater knoll stretches in a southeast to northwest direction in offshore waters adjacent to Qui Nhon province. It is 5.7km long and 1.1kms wide (total area is 6.37km^2). The water depth at the top of the mountain is 290 to 350m, with a slope of 2 to 3. This is a very good fishing ground for trawl fishing.

Southeastern waters: Fishing grounds numbers 9 to 13.

Fishing Ground Number 9:
This underwater knoll fishing ground is located in offshore waters adjacent to Phan Rang-Phan Thiet. Its geographical location is 11°15'N and 111°32'E. The knoll is 16 km long and 2.4km wide, with a total surface area of a little more than 40km^2. The water depth at the top of the mountain is 280m. The main species caught is redlipped fish (*Dipterygonotus leucogrammicus*), which accounts for 62% of the total catch in this area.

Fishing Ground Number 10:
This fishing ground is located east of Phan Thiet province. Its bottom is muddy-sand. The peak-fishing season is from December to February. True lizardfish *(Saurida undosquamis)* is the main species and can be caught throughout the year. Similarly, red bigeye (*Priacanthus tayenus*), round scad (*Decapterus maruadsi*), and lizardfish (*Saurida tumbil*) are abundant in this area.

Fishing Ground Number.11:
This fishing is located south of Cu Lao Thu Island, with water depths ranging from 50 to 200m. This is area is fishable throughout the year. However, winter is considered the peak-fishing season. Catch rates decline during the rainy season (April to July). The main species caught include lizardfish (*Saurida undosquamis*), red bigeye (*Priacanthus macracanthus*), greater lizardfish (*Saurida tumbil*), snapper (*Lutjanus sanguineus*), and red goatfish (*Upeneus bensasi*).

Fishing Ground Number 12:
This fishing ground is located in the waters surrounding Con Son Island, with a fine sand and clamshell bottom that occurs at depths from 25 to 40m. The peak-fishing season is from autumn to winter. The main species caught in the area include round scad (*Decapterus maruadsi*), snapper (*Lutjanus sanguineus*), lizardfish (*Saurida tumbil*), yellowtripe trevally (*Selaroides leptolepis*), goatfish (*Upeneus spp.*), and threadfin bream (*Nemipterus spp.*).

Fishing Ground Number 13:
The fishing ground is located in the estuary of the Hau Giang River, with depths ranging from 10 to 22m. Fishing takes place in this area throughout the year. Fish are most abundant at the mouth of the Hau Giang River. The main species caught include silver-spotted grunt *(Pomadasys hasta)*, common threadfin *(Polynemus plebejus)*, sardine *(Sardinella)*, coastal trevally (*Carangoides caeruleopinnatus*), blotched croaker *(Nibea maculata)*, and snapper *(Lutjanus erythropterus)*.

Gulf of Thailand : *Fishing grounds numbers 14 and 15.*

Fishing Ground Number 14:
This fishing ground is located in the southwestern coastal waters of Viet Nam. Waters in this area are only 10 to 15m deep. High catch rates are observed in this area throughout the year. The main species caught is ponyfish (*Leiognathus*), which accounts for 70% of total catch. Other species include yellowtripe trevally (*Selaroides leptolepis*), snapper (*Lutjanus sanguineus*), grunter (Theraponidae), and threadfin bream (*Nemipterus*).

Fishing Ground Number 15:
This fishing ground is located in waters southwest of Phu Quoc Island. Waters in this area are only 10 to 15m deep. High catch rates are observed in this area throughout the year. The main species caught include pony fish (*Leiognathus*) (25 to 30%), yellowtripe trevally (Sel*aroides leptolepis*), snapper (*Lutjanus sanguineus*), grunter (*Theraponidae*), and anchovy *(Stolephorus spp)*.

4.2 Unknown issues such as stocks with undefined spawning grounds

Very few studies regarding spawning, nursery, and feeding grounds have been conducted in Vietnamese waters, especially those located in the Gulf of Thailand. Therefore, spatial and temporal variations in fish distribution and abundance, particularly in offshore areas and regarding pelagic fishes, cannot be compared against any baseline information. In order to strengthen knowledge regarding the status of resources, there is a need for the initiation of a comprehensive fisheries research programme.

4.3 Threats, current and potential

At present, there are a number of threats to spawning, nursery, feeding, and fishing grounds. These are mainly associated with the rapid development of Viet Nam's coasts, including the establishment of a number of new industrial zones, over population, deforestation, oil spills, and use of destructive fishing gears.

4.3.1 Coastal development

The Government of Viet Nam's renovation policy, applied during the last 20 years, has resulted in a large number of new factories, industrial zones, ports, aquaculture facilities, and tourism zones along Viet Nam's coast. In general, waste treatment in most facilities is poor, leading to reductions in the health of the ecosystems into which the wastes are released. Furthermore, the uncontrolled utilisation of mangrove for the establishment of aquaculture facilities for has reduced the overall availability of this valuable spawning and nursery habitat.

4.3.2 Pollution

The release of untreated water and waste into the sea is a growing problem, with negative impacts on coastal ecosystems. The pollutants may come from industrial activities, agriculture, ports, and tourism areas. They may include ammonia, oxygen-demanding contaminants, heavy metals, bacteria, viruses, and toxic chemicals.

4.3.3 Oil spills

Oil spills in Vietnamese waters may occur because of activities associated with oil exploitation, transportation, or leaking from ships and fishing vessels. The concentration of oil in waters adjacent to large ports usually exceeds Viet Nam's standard (0.05-1mg/litre).

The combined discharges or leaks of oil from a large number of fishing boats can seriously pollute fishing harbours or landing places. It is believed that this source contributes around 61.5 to 86.5% of the total oil discharged into Viet Nam's coastal waters. A study carried out in a number of estuaries located in the Gulf of Tonkin shows oil concentrations fluctuating from 0.18 to 2.01mg/l. In large ports, including Hai Phong and Hon Gai, oil concentrations exceeded 1.0 mg/l. Generally, in highly polluted areas, oil concentrations can exceed Viet Nam's allowable limit (Quality standards of sea water of Viet Nam 5943-1995) by 333 to 670%. In the middle of Tonkin Gulf in August 1998, the concentration of oil was 0.108mg/l (about 36% of the limit).

Table 27 highlights the concentrations of oil recorded for southeastern waters from 1992 to 1995.

Table 27 Oil concentrations recorded in Viet Nam's southeastern coastal waters from 1992 to 1995.

Observation time	Concentration (mg/l)			% of the national limit	National limit
	Minimum	Maximum	Average		
12/1992	0.025	0.320	0.178	59.3	0.30
12/1993 to 1/1994	0.397	0.660	0.175	158.3	
5/1994	0.060	0.120	0.087	29.0	
12/1994	0.030	0.218	0.105	35.0	
3-4/1995	0.007	0.064	0.029	9.6	

The coefficient of oil pollution represents the relationship between recorded oil concentrations and the national limit (0.3mg/l). The coefficient of oil pollution in the coastal estuaries of northern Viet Nam is provided in Table 28.

Table 28 The average coefficient of oil pollution in the coastal estuaries of northern Viet Nam.

Areas	Coefficient of oil pollution						
	1995	1996	1997	1998	1999	2000	2001
Cua Luc	0.9	211	1.6	2.0	2.5	2.7	2.7
Bach Dang	1.1	1.8	1.2	1.0	1.6	1.7	2.2
Ba Lat	0.9	2.4	1.3	1.7	2.5	1.7	2.0
Sam Son	0.5	2.0	1.3	2.6	1.7	2.0	2.0
The whole area	0.8	2.1	1.4	1.8	2.1	2.0	2.2

The figures presented in Table 28 indicate that oil pollution in these areas has increased over time. In 1995, oil pollution in the whole area was low. However, from 1996 to 2001, the coefficient of oil pollution generally increased, fluctuating between 1.2 and 2.7.

4.3.4 Destructive exploitation

It appears that the further fisheries resources are degraded in Viet Nam, there are more fishers employing illegal fishing methods. The most destructive fishing method in Viet Nam is dynamite fishing, which leads to severe degradation of critical fisheries habitats, including coral reefs. The use of intensive light and excessively small mesh sizes in fishing nets are also thought to be unsustainable fishing practices in Viet Nam.

The extraction of coral from reefs for selling to tourists, or for cement production, has seriously damaged fish habitats, especially in Khanh Hoa and Ninh Thuan provinces.

4.4 Ranking of habitats

4.4.1 Association with species of importance to food security

Fish is an important component in the diet of Vietnamese people. As a result, the consumption rate of fish in Viet Nam is high and increasing. The goal of the Vietnamese fisheries sector is to increase its annual total production to 3.4 million metric tonnes by 2010, including 1.4 million tonnes of marine fish and 2.0 million tonnes of fish from aquaculture (Master Plan for Fishery Socio-Economic Development to 2010, Research Institute of Fishery Economic and Planning, 2002). Catches from southern Vietnamese waters make the greatest contribution to fisheries production in Viet Nam.

4.4.2 Association with high value species

The most important habitats for small pelagic fishes, including scads, herrings, and Indian mackerel, are those of southern Vietnamese waters. Waters of the central region are most important for large pelagic fish, including tuna, swordfish, sailfish, and dolphin fish. The coral reefs in the Gulf of Tonkin (adjacent to Bach Long Vi Island), the central region (adjacent to Con Co, Paracels, and Spartly Islands), and the southeast (adjacent to Cu Lao Thu Island), are critical habitats for demersal fishes, including grouper and snappers. Lobsters mainly occur in waters of the central region from Quy Nhon to Khanh Hoa provinces.

4.4.3 Association with endangered, rare and threatened species

The most important habitats associated with endangered, rare, and threatened species are river mouths, coral reefs, sea grass, and seaweed habitats. In the Gulf of Tonkin, these habitats are located in the Cat Ba, Ha Long, Bach Long Vi and Co To areas, and are inhabited by many endangered species, including *Clupanodon thrissa, Haliotis diversicolor*, and other reef fishes. In the central region, there are areas of seagrass important for turtles, dugong, sharks, and dolphins in waters extending from Hue to Binh Thuan provinces.

Lobsters mainly live in reefs present in the waters adjacent to Phu Yen, Khanh Hoa, and Binh Thuan areas. In the southern regions, the waters of the Mekong estuaries and the Phu Quoc Islands are considered the most important for endangered, rare, and threatened species, including dugong, milk fish, and sea horse.

Table 29 presents the distribution of endangered turtles in Viet Nam's marine waters. The critical area in the Gulf of Tonkin is Cat Ba Island, whereas in the Gulf of Thailand, Phu Quoc and Tho Chu Islands are important.

Table 29 The distribution of five endangered, rare, and threatened sea turtles in Viet Nam's water.

Area	No of species	Scientific name	English name
Gulf of Tonkin	4	*Chelonia mydas* *Caretta caretta* *Dermochelys coriacea* *Eretmochelys imbricata*	Green turtle Loggerhead turtle Leatherbackturtle Hawksbill turtle
Central area (including Paracels islands and Spratly islands)	4	*Caretta caretta* *Chelonia mydas* *Eretmochelys imbricata* *Lepidochelys olivacea*	Loggerhead turtle Green turtle Hawksbill turtle Olive Ridley turtle
Southeast area	4	*Caretta caretta* *Chelonia mydas* *Eretmochelys imbricata* *Lepidochelys olivacea*	Loggerhead turtle Green turtle Hawksbill turtles Olive Ridley turtle
Southwest area	3	*Caretta caretta* *Chelonia mydas* *Eretmochelys imbricata*	Loggerhead Green turtle Hawksbill turtle

Source: Status and Protection of Sea Turtles Resources of Viet Nam, Pham Thuoc et al., 2001.

The 2000 IUCN Red List of Threatened Animals classifies 4 of these species as endangered and 1, the Hawksbill turtle, as critically endangered at the global level.

5. CURRENT MANAGEMENT REGIMES

5.1 Legal instruments

There are many legal instruments for the management of Viet Nam's fisheries. They include a large number of regulations (stipulating the objectives, functions, and organisation of the fisheries sector), norms and standards (standards used in the fisheries sector; safety control of fishing boats; quality control of fishery products; and aquaculture management), duties of fisheries stakeholders (taxation regulations), behaviours on resource users.

The most important document for the protection of fisheries resources and their habitats is "The Ordinance on Fisheries Resources Protection and Development", issued by the National Assembly on 25 April 1989. In this ordinance, all activities leading to destruction of resources and their habitats are prohibited. The government is responsible for the identification of closures or temporary-closures in areas such as spawning and nursery grounds. The registration of all mechanised fishing boats is required. The trading of endangered, rare, and threatened species is prohibited.

In support of this range of fisheries rules and regulations, the Department of Fishery Resources Conservation was established in 1991 within the Ministry of Fisheries. Provincial divisions were established in all coastal provinces. The main tasks of the Provincial Division of Fishery Resources Conservation are the licensing of vessels and the monitoring of fishing activities in provincial waters.

To provide a more formal basis for the development of responsible fisheries and their management, the National Assembly of Viet Nam introduced new fisheries legislation on 26 November 2003. This legislation will be enacted on 1 July 2004.

5.2 Institutional arrangements (research, monitoring, control & enforcement)

The highest government agency responsible for the administration, development, and management of Viet Nam's fisheries is the Ministry of Fisheries (MOFI). MOFI consists of the following departments:

- Department of Fisheries Management
- Department of Fisheries Resources Conservation
- Department of Planning & Investment
- Department of Personnel & Labour
- Department of Science & Technology
- Department of Legislation
- Department of Finance & Accounting
- Department of International Cooperation
- Administrative Office
- Inspection

Concerning capture fisheries at the central level, the Department of Fisheries Management is responsible for establishing policies for fisheries development and the renovation of non-state-owned fisheries enterprises. The Department of Fisheries Resources Conservation, through its nationwide network of Provincial Fishery Resources Conservation Divisions, takes care of resource protection and enhancement, quarantine, as well as vessel registration and licensing.

In all coastal provinces, there is a Provincial Fisheries Department. In the inland provinces, the Department for Agriculture and Rural Development is responsible for fisheries. This department assists the local authority (People's Committee) in the administration and development of fisheries. Normally, the department has subordinate networks at the district and community level in important areas for fisheries.

The Research Institute for Marine Fisheries, established in 1961, is responsible for assessing fisheries resources and fleet performance. The Institute collects and analyses information and data derived from surveys and studies conducted in Vietnamese waters. The Institute's research outputs provide MOFI with a scientific base for the institution of management and development policies. The Research Institute of Fisheries Economics and Planning mainly deals with development of master plans.

Fisheries rules and regulations are enforced through monitoring and surveillance activities conducted by the fisheries inspection staff of the Fishery Resources Conservation Divisions, and coast guards, the navy and marine police.

5.3 Overview of patterns of resources ownership and traditional utilisation

Living marine resources in Viet Nam are common property and managed by government. Access to resources is open to all individuals and organisations that qualify for a fishing licence. According to government regulations, all boats larger than 0.5 tonnes require a licence prior to fishing. The licences for coastal waters (6 miles from the shore for the Gulf of Tonkin and southern waters; and 3 miles from the shore for waters of the central region) are valid for 12 months. Licences for near shore waters are valid for 24 months. Near shore waters are defined from the outer boundary of the coastal water area boundary to the depth strata of 30m in the Gulf of Tonkin and southern waters, and to the depth strata of 50m for waters of the central region. Licences for fishing in offshore area are valid for 36 months. Fishing boats with an engine capacity greater than 90hp are not permitted to fish in coastal and near shore waters. Some gears like trawl push net, beach seine, and gears using artificial light to attract fish (except squid hand line) are banned in the coastal waters.

Fisheries in Viet Nam are mainly small scale. Most boats operate in water less than 50m deep. A large numbers of boats from the central region fish in the Gulf of Tonkin or southern waters for extensive periods. Being aware of high fishing pressure in coastal areas the government has recently encouraged fishers to redirect fishing effort towards offshore waters and resources, with soft loans and tax reduction incentives. As a result, there have been many new large fishing entering Viet Nam's offshore fisheries. However, a number of these larger boats have been observed fishing in coastal and nearshore areas. In fact, with few patrol boats and staff, the enforcement forces ineffectively control fishing activities in Viet Nam's EEZ. The open access nature of Viet Nam's fisheries severely hinders resource and habitat conservation efforts.

In order to improve the management of fishery resources, there are some proposals to divide Vietnamese waters into different management zones. These proposals suggest that the management of coastal and nearshore waters should be transferred to the local authorities. Co management may be another alternative for these areas.

5.4 Capacity, human & institutional (include location of research and MCS institutions)

To ensure proper management and development of fisheries, there is an administrative network from the national to grass-root levels in Viet Nam. This network is made up of representatives of MOFI, the provincial departments, the district office, and the community in important fisheries areas. The enforcement units of all Provincial Fishery Resources Conservation Divisions are equipped with patrol boats for surveillance. At important fishing harbours and river mouths, there are fisheries inspection stations. To supply scientific information to MOFI, there is the Research Institute for Marine Fisheries (RIMF) and Institute of Fisheries Economics and Planning.

The Research Institute for Marine Fisheries (RIMF)
RIMF is part of the Ministry of Fisheries. At present, the RIMF headquarters are in Haiphong province, with a Marine Biodiversity Research Station on Cat Ba Island in the Gulf of Tonkin. The Government of Viet Nam has recently given approval for RIMF to establish a research centre in the southeastern province of Vung Tau. A centre for resource conservation and fisheries development is also planned for the province of Kien Giang (Gulf of Thailand).

RIMF has the main following tasks: 1) to survey and research living marine resources (distribution, migration, biology, stock assessment, potential yield estimates and resource conservation methods, etc.); 2) to study the marine environment and relationships between environment and fisheries development, including methods for monitoring the marine environment; 3) to study biodiversity and the establishment of marine protected areas (MPA); 4) to study, trial, develop and apply new technologies for exploiting fish; 5) to develop post - harvest technologies; 6) to transfer technologies in the fields of fishing, post - harvest technologies to all economic counterparts; 7) to provide postgraduate training on specific subjects and other training on marine fisheries science and technology; and 8) to provide consultation services.

Institute of Fisheries Economics and Planning in Hanoi
This institute conducts research on the economics and management of fisheries. Planning the restructuring of production and the establishment of regional and master plans are some of its key activities.

Centre for Fisheries Science-Technology and Economics Information (FICen) in MOFI
This centre is responsible for gathering and supplying information to the fishery management process.

Other research institutions and agencies
Some other institutions and agencies involved in fisheries research are:

- The Centre for Natural Resources and Environment Study (CRES) under the National University of Viet Nam (NU).
- The Sub-institute for Forestry Sciences in South Viet Nam.
- The Research Institute of Oceanography, Nha Trang.
- The Branch Institute of Oceanography, Hai Phong.
- The Branch Institute of Ecology of Biological Resources, Ho Chi Minh City.

Extension Services
The top organisation of fisheries extension services is the National Extension Center, located in the Ministry of Fisheries. Extension centres have been established in 24 of the 28 coastal provinces, and in 26 inland provinces, with the purpose of transferring knowledge to fishers and fish farmers to enhance their activities. However, these organisations are currently focused mainly on aquaculture.

5.5 Review of stakeholders

Fishers
The most important stakeholders in capture fisheries are the fishers. The fishery sector is considered an important source of employment due to the large amount of primary and secondary jobs created in fisheries. According to the national strategy for the fisheries sector, fisheries should create around 4 million jobs in 2010.

State-owned fishing enterprises
Generally, the state-owned enterprises own large fishing boats. Traditionally, these enterprises have played a leading role in fisheries. However, since the introduction of the market economy, these enterprises have lost their competitiveness. Many of them have now discontinued their activities.

Fishing cooperatives
After 1985, most of fishing cooperatives were disbanded due to poor effectiveness. In 1997, some new cooperatives were re-established for obtaining loans from financial institutions. Fishing cooperatives play a useful role in fisheries management, as the government can efficiently introduce its policies or management measures to fishers through this system.

Fishing groups
Due to the large amounts of capital required to purchase fishing boats and gear, fishers tend to create fishing groups. People in fishing groups can receive support from others in a very flexible way. Since 1985, the number of groups has rapidly increased.

Private business
The private business approach to capture fisheries is the most popular in Viet Nam. Many fishers own private fishing boats, requiring less than 5 crew. Others may own more than one boat or larger boats requiring more than 5 employees. Some people make capital investments in large boats, with a capacity to operate at sea for extended periods. These people may have several large boats operating as part of a larger fleet.

6. RECOMMENDATIONS

Due to the important contribution of fisheries to the national economy and social stability, the Government of Viet Nam has committed to develop fisheries in a sustainable way. Therefore, many measures have been adopted to maintain the resources and their habitats. As key players in Viet Nam's fisheries systems, fishers cannot be excluded from any fishery management system. This sector can only be successful by managing fisheries in light of fisheries resource and ecosystem interdependencies, as well as the socio economic welfare of fishers and their communities.

The management of fisheries resources is heavily dependent on information. Fisheries management measures should be based on information that is sound, robust and provided in a timely fashion.

In light of the status of fisheries resources and their habitats, as well as the performance of fisheries, the following recommendations aimed at improving Viet Nam's fisheries situation are provided:

1. Strengthen the assessment of fisheries resources status via the establishment of a regular resource-monitoring programme. This programme should collect necessary biological data and provide regular assessments. A fixed station survey programme may be appropriate.
2. Strengthen the national fishery statistics system to facilitate the use of indicators in monitoring trends in commercial fisheries. This approach was agreed by the ASEAN countries in a series of technical consultations for the implementation of the Code of Conducts for Responsible Fisheries. The use of indicators can enable the rapid identification of the effects of fishing on fisheries resources and their ecosystems. For example, a decrease in catch rate, or change in catch composition, may provide an indication of broader unsustainable trends in the fishery.
3. Replant mangroves in coastal areas for the creation of spawning and nursery grounds for aquatic resources.
4. Establish Marine Protected Areas (MPAs). MPAs can be an effective tool in resource enhancement. At present, there are two pilot projects of Hon Mun in Khanh Hoa and Cu Lao Cham in Quang Nam provinces. The Ministry of Fisheries, with support from various international donors, is working on the establishment of 15 MPAs in Vietnamese waters. It is intended that these areas will assist in the recovery of overexploited resources.
5. Improve the use of responsible fishing gears and practices. Although, the government has issued regulations, clearly prohibiting destructive fishing gears and methods, this problem has become more serious in recent years. Therefore, the enforcement force should be provided with sufficient means to conduct effective surveillance and monitoring activities.
6. Reduce fishing pressure in nearshore waters. Alternative income sources should be created for those fishers required to leave fisheries.

7. Help fishers increase the value of their catches through the adoption of effective post-harvest handling and processing.
8. Raise awareness of fishers regarding fisheries laws and regulations.

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