FISHERY COUNTRY PROFILE	Food and Agriculture Organization of the United Nations	FID/CP/SUR
PROFIL DE LA PÊCHE PAR PAYS	Organisation des Nations Unies pour l'alimentation et l'agriculture	February 2008
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THE REPUBLIC OF SURINAME

3. Fishery sector structure

3.1 Overall fishery sector

Fishing vessels operating in Suriname waters are multi-species and multi-gear, with trawlers, snapper boats, open or decked wooden vessels and canoes. A few fishing units are operated without a boat. Fleets can be defined as combinations of boat and gear.

Trawl net operators include shrimp trawlers and different types of finfish trawlers. Large stern trawlers using high opening trawls were introduced in 1993. Part of their catch consists of finfish species that had been little exploited by other fleets (small sandy-bottom demersal fish). The potential yield of this resource is not yet fully known. The other part includes species that were exploited by earlier fleets (soft-bottom demersal fish). This fleet catches both demersal and pelagic species. There are differences in trip length: an average trip is two weeks. Licences are given to these boats to operate outside the 15 fathom line over the entire EEZ. In 2002, three stern trawlers started to exploit small pelagics, which led to by-catch of large coastal pelagics and some demersal species. These vessels are still in operation.

Outrigger trawlers exploiting finfish are converted shrimp trawlers, and are generally owned by nationals. As this fleet is exploiting species that are found in shallow waters, there is conflict with the artisanal coastal fleets. The minimum depth is set at 10 m, and the stretched mesh size at the cod-end should be not smaller than 8 cm. The converted shrimp trawlers operate in shallow waters between 10 and 20 m depth, catching mainly demersal species. Outrigger trawlers, exploiting shrimp, are almost totally foreign owned and operated.

Outrigger trawlers exploiting seabob have developed since 1996, and a precautionary approach is recommended until the potential of the resource has been estimated, and the impact of this new fishing activity on other resources and other fleets has been investigated. Constraints on the vessel and gear should be similar to those imposed on outrigger trawlers targeting penaeid shrimp and finfish (450 hp maximum; 4.5 minimum cod-end mesh size; TED). The fishing zone is set beyond 10 m depth.

Outrigger trawlers exploiting deepwater shrimp target scarlet shrimp. The potential yield of this resource is not yet known, and hence a precautionary approach is recommended. The number of vessels should be limited to 3 boats until details are known of the yield. These vessels should not be allowed to operate in less than 90 m depth (450 hp maximum; 4.5 minimum cod-end mesh size; TED)

The snapper fishery is owned and operated by foreign fishermen. As the snapper fishing grounds are distributed between 50 and 80 m depth, depth limits could also be established for this fishery, in order to reduce risks of conflict with other fisheries. A minimal depth of 40 m is proposed. The snapper boats are catching *Lutjanus purpureus*, *L. synagris, Rhomboplites aurorubens*, other snappers, mackerels (*Scomberomorus* spp.) and small-sized Serranidae. They make use of vertical hook-and-lines, because traps are forbidden.

Tuna trawlers operated in May 2001. Two North American vessels caught tuna in and out of the EEZ of Suriname. These vessels stopped operation for reasons unknown to the government.

The artisanal fleet is divided into coastal and inland fleets.

The coastal drifting gillnet ("*drijfnet*") fishery, is carried out by two types of boats using a similar fishing gear: the so called "Guyana boats" (with or without deck). It estimated that the MSY of the target resource, large demersal finfish, has been reached, and already exceeded in recent years. It is therefore necessary to restrict access, both by limiting the number of licences and by curbing illegal fishing. All the decked gillnet boats use 20 cm-mesh stretched polyethylene nets. Open Guyana-type boats also use polyethylene nets of 12 to 17 cm stretched mesh, while gillnets operating in estuaries use different sizes of nylon nets. Constraints are also proposed on the fishing gear: a minimal mesh size could be set at 20 cm (the same as the current size) for the decked boats and at 16 cm for the open type of boat. The nets should not be longer than 5 km and 4 km, respectively, for the decked and the open types.

In the river mouth, fishing is done by canoe-type boats using Chinese seines, of which there are three types: one is mainly for catching finfish. They are classed as large (FJ, for fish), medium (FK) and small (FN) for seabob, white belly shrimp and juvenile fish caught together. The Chinese seines use polyethylene nets of various sizes.

Fixed gillnets used in the lagoons are made of a number nylon nets of 20 m length. The nets are attached to poles both top and bottom. The mesh size ranges from 3 cm to 4.5 cm.

River seine boats use gillnets with mesh size ranging from 5 to 6 cm. The net is set in a circle using one boat.

Aquaculture in Suriname currently comprises only two commercial farms, rearing *Penaeus vanamei*. Lots of feasibility studies had been conducted in various parts of the country. In the western part of the country (Nickerie), infrastructure is being built for rearing *Penaeus monodon*.

3.2 Marine subsector

The industrial fishery comprises shrimp trawling fleets, finfish trawling fleets, red snapper and mackerel hand-liners and large-pelagic long-liners. Coastal fishing includes drifting gillnetters, pin seiners and bottom long-liners.

3.2.1 Landing sites

The majority of the landing sites are in the capital, which is obvious, since all processing plants are located there.

All landing places are in the four estuaries of the country: from east to west they are the Marowijne estuary, the Suriname-Commewijne estuary, the Coppename-Saramacca estuary and the Corantijne-Nickerie estuary. With the exception of the Marowijne district, which is not included in the present system for security reasons, the districts cited in the table of landing places corresponds to one of the estuaries. Commewijne and Paramaribo (including Wanica) districts are respectively on the right and the left bank of the Suriname river, while Saramacca and the Nickerie districts carry the name of the corresponding rivers.

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Table 2. List of landing sites for marine fishery.

Landing site	Type: primary or secondary	Strategy[(1)]	Stratum	District
006. Visserij Centrum Commewijne	P	C	03. Commewijne left bank	COMMEWIJNE
010. Central Market Paribo	P/S	C+	06. Central Market Par'bo	PARAMARIBO
011. Platte Brug	P			
012. Boomskreek/ Nene Steiger	P	C	07. Paramaribo North	PARAMARIBO
013. Bisoen steiger	P	C		
014. Blauwgrond	P	C		
015. Clevia Sluis	P	C		
016. Bethesda	P	C	08. Paramaribo South	PARAMARIBO
017. CEVIHAS	P	A		
017. TASA	P	A		
018. Jaha fish	P	A		
019. Holsu	P	A		
018. Niekoop Steiger	P	C		
019. Kamal Kanaal	P	C		
020. Jasodra	P	C		
036. SAIL	P	A	Paramaribo	PROCESSORS
037. SUJAFI	P	A		
038. SIS	P	A		
021. Boskamp	P	S	09. Boskamp	SARAMACCA
022. Huwelijkszorg	P	S	10. Saramacca river	
024. Calcutta	P	S		
028. Totness Kanalen	P	S	11. Coronie canals	CORONIE
029. John	P	S		
030. Burnside 2	P	S		
031. Burnside 1	P	S		
033. Central Market Nickerie	P/S	C+	13. Central Market Nickerie	NICKERIE
034. Zeedijk	P	C+	14. Zeedijk Nickerie	

NOTES: (1) S = effort and landing per unit effort (lpue) collected certain days (entire day); A = effort and lpue data supplied by plant or administration; C = effort by complete census, lpue sampled; C+ = effort and lpue by complete census.

3.2.2. Fishing production means

Many different types of fishing vessels operate in Surinamese marine, brackish and inland waters. According to their characteristics, the type of fishing gear used and the fishing grounds they exploit, they can be grouped into a number of relatively homogeneous categories, which can be called fleets. Table 3 gives a list of the fleets, divided into industrial and small-scale current in Suriname.

Table 3. Classification of fishing fleets operating in Suriname.

Fleet category	Type of vessel	Type of gear	No. of licences (2005)
Industrial fleet	Outrigger trawlers	Shrimp trawl	67
		Finfish trawl	15
		Seabob trawl	30
	Stern trawlers	High-opening trawl	5
	Snapper boats	Hook-and-line	57
	Shark and Tuna	Long-line	9
Artisanal fleet	Guyana boats	Drifting gillnet	390
		Njawarie (banknet)	15
		Longline (bottom)	2
	Korjaal (canoes)	Large fuiknet (Chinese seine)	53
		Medium fuiknet (Chinese seine)	116
		Small fuiknet (Chinese seine)	192
		Drifting gillnet	100
		Longline (bottom)	21
		Kieuwnet (fixed gillnet)	63
		Haritete (river seine)	8
	Small canoes or beach-based	Drag net	2
		Spannet (fixed gillnet)	5
		Cast net	--

4. Main resources

All fleets harvest many species, but in most cases one or more particular species are the target, while others species are by-catch (either discarded or taken ashore).

The impact of each type of fishery on each resource can be seen more clearly through analysis of landing data over a number of years. A distinction can be made at this stage between selective and non-selective gear types. Drifting gillnets used in the coastal zone have large mesh sizes (6 to 8 inches (15–20 cm) stretched), and belong to the most selective fishing gears, targeting a few large demersal fish species. The same can be said of vertical hook-and-lines, which only catch, besides the target species (red snapper and groupers), a few species of sharks and large pelagic fish. The large Chinese seines (fuiknet) can also be counted among the more selective gears, as the fish is caught selectively, piece by piece, by the fisherman.

In contrast, trawls of all types retain a large range of different species and sizes, including a number that are of no economic value, and juveniles. The pin seine (njawarie) is probably the only other fishing gear with selectivity as low as that of the trawls.

4.1 Main commercial species

Although entries were provided for most species in the former data collection system, it is not possible to record accurate information separately on a large number of species. A selection of the main commercial species and groups of species has therefore been worked out, in such a way that all the data fall into one of the categories. Table 4 gives a list of the species and categories, and their grouping for practical purposes.

Table 4. Species and categories recorded by the Fisheries Department.

Common or local name	Scientific name	Family
	Marine fishes	
Koemakoema Kodokoe Jarabaka Koepila Pani Barbaman Other catfishes	*Arius couma* *A. Grandicassis/quadriscutis* *Arius parkeri* *Arius proops* *Arius passany* *Bagre bagre*/*B. marinus* Ariidae	Ariidae
Rays	All species	Batoidea
Zeezalm	*Caranx hippos*	Carangidae
Snoek	*Centropomus* spp.	Centropomidae
Dagoefisie	*Elops saurus*	Elopidae
Paoema	*Lobotes surinamensis*	Lobotidae
Red snapper Lane snapper Vermillion snapper Snapper (unidentified)	*Lutjanus purpureus* *Lutjanus synagris* *Rhomboplites aurorubens* Lutjanidae	Lutjanidae
Trapoen	*Megalops atlanticus*	Megalopidae
Aarder	*Mugil* spp.	Mugilidae
Batjawvis	*Rachycentron canadus*	Rachycentridae
Bang bang Blakatere Kandratiki Dagoetifi Krokus Botrofisie Wit wittie Other croakers	*Cynoscion acoupa* *Cynoscion steidachneri* *Cynoscion virescens* *Macrodon ancylodon* *Micropogon furnieri* *Nebris microps* Sciaenidae juveniles Sciaenidae unidentified	Sciaenidae
Makreel	*Scomberomorus* spp.	Scombridae
Graumurg	*Promicrops itajara*	Serranidae
Sharks	All species	Sharkoids
Marine finfish (unidentified) Tri (miscellaneous small pelagics)		
	Freshwater species	
Platta hede kwi kwi Soke kwi kwi Catrina kwi kwi Kwi kwi	*Callichthys callicthys* *Hoplosternum littorale* *Holposternum thoracatum* Callichtydae unidentified	Callichthydae
Warapa Anjoemara Pataka	*Erythrinus erithrinus* *Hoplias macrophthalmus* *Hoplias malabaricus*	Characinidae
Krobia Tilapia	*Aequidens* spp. *Oreochromis mossambica*	Cichlidae
Koebie	*Plagioscion surinamensis*	Sciaenidae
Freshwater finfish unidentified		
	Marine shrimps	
Hopper shrimp Pink shrimp White shrimp Brown shrimp	*Penaeus brasiliensis* *Penaeus notialis* *Penaeus schmitti* *Penaeus subtilis*	Penaeidae
	Brackishwater shrimps	
Seabob	*Xyphopenaeus kroyeri*	Penaeidae
Witi bere	*Naemotopalaemon schmitti*	Palaemonidae
Shrimp (unidentified)		
Crabs		
Crabs (unidentified)		

5. Management applied to main fisheries

Marine fisheries have been regulated in Suriname since 1980 by Decreet C-47 and subsequent revisions. A Fisheries Law has been drafted and was submitted to Parliament in the 1998, but has yet to be approved. The proposed new legislation makes provision for the elaboration, by the Fisheries Department, of a Fisheries Management Plan. The Plan is to discuss management issues in detail and propose regulations on such matters as the classification of vessels and gear, the delimitation of fishing grounds, the implementation of closed seasons and areas, fishing rights, etc. After discussion by the main groups involved in the fishery sector, regulations should be implemented through Ministerial Bills, issued by the Minister of Agriculture, Livestock and Fisheries.

Fisheries evolve continuously, and the pressure on specific resources is likely to change, generally towards more intensive exploitation, making new regulations necessary. At the same time, there are still many gaps in our knowledge of the resources and their utilization. Regulations that can be proposed today are based on the best current knowledge and derived from a precautionary approach. As future investigations provide more detailed information on stocks, the socio-economic characteristics of groups involved in their exploitation, etc., it will become possible to adapt and improve management.

Enforcement capacity is subject to change as well. Regulations that would be pointless today because their observance cannot be controlled might be considered at a later stage. However, even carefully prepared regulations may prove, once implemented, less efficient than expected, or they may have unforeseen and unwanted side effects. The collection of data to monitor the effects of regulations must be built in to any management strategy, and such assessments will play an important role in fine-tuning regulations.

Thus legislation needs to be flexible, able to adapt quickly to a changing situation. In this new approach, the Fisheries Law itself provides only a general legal framework, and leaves most details for less permanent application decrees, such as Ministerial Bills, derived from the Fisheries Management Plan for Suriname (the first one was prepared in 1993). It is intended to be updated and complemented every year, starting from 1999, and to gradually become a comprehensive summary of the current situation of the fisheries as well as an efficient instrument in the hands of government.

For management purposes, it is convenient to group species and categories of exploited marine organisms into assemblages with similar characteristics of fishing grounds, ecology and exploitation strategy. Categories proposed in Table 5 can be seen as management units. This classification should be refined as more detailed information becomes available. The most important species within each management unit should then be considered individually.

Table 5. Classification of fishery resources into management units.

MANAGEMENT UNIT		MAIN SPECIES	OTHER SPECIES
01	Large demersal fish	*Cynoscion acoupa, C. steindachneri, Arius parkeri, A. proops*	*Megalops atlanticus, Epinephelus itajara, Lobotes surinamensis*
02	Small soft-bottom demersal fish	*Macrodon ancylodon, Cynoscion virescens, Nebris microps, Micropogon furnieri*	*Larimus breviceps, Arius* spp.*, Bagre* spp.
03	Small sandy-bottom demersal fish	*Lutjanus synagris*	*Haemulon* spp.*, Calamus* spp.
04	Red snapper & deep sea fish	*Lutjanus purpureus*	*Rhomboplites aurorubens,* Serranidae
05	Rays & sharks		
06	Large pelagic fish	Scombridae	Sphyraenidae*, Caranx hippos*
07	Small pelagic fish	Engraulidae, Clupeidae	Carangidae
08	Brackish water fish	Mugilidae, Centropomidae, *Tilapia mossambica*	*Arius passany, Arius couma, Elops saurus*
09	River fish	*Plagioscion surinamensis*	
10	Fresh water fish	Callichthydae, Erithrinidae	*Aequidens* spp.
11	Estuarine shrimp	*Xyphopenaeus kroyeri*	*Nematopalaemon schmitti*
12	Penaeid shrimp	*Penaeus subtilis, P. brasiliensis*	*Penaeus schmitti, P. notialis*
13	Deep sea shrimp	*Solenacera* spp.*, Scarlet shrimp*	

14	Crabs	*Ucides cordatus*	Other crabs
15	Cephalopods		
16	Sea turtles	*Chelonia mydas, Dermochelys coriacea*	*Lepidochelys olivacea, Eretmochelys imbricata*

5.1 Types of regulations available

In view of the very limited enforcement capacities in Suriname, regulations that are relatively easy to control should be preferred. Types of measures that could be applicable in Suriname include the control of fishing effort, the protection of categories of marine organisms, financial regulations and monitoring of fishing operations.

5.2 Control of fishing effort

Since licensing is compulsory for all fishing units, fishing effort can be limited by restricting the number of fishing licences. This is feasible for the part of the fleet delivering the catch in Suriname. Control at sea is, of course, required to prevent illegal fishing. A maximum number of licences is therefore proposed for the types of fisheries exploiting stocks that are believed to be reaching or exceeding the Maximum Sustainable Yield (MSY). This is the case for Penaeid shrimp, the large demersal fish and the red snapper. For the fisheries exploiting resources where the potential is not known, it is proposed to adopt a precautionary approach and to grant a limited number of licences. The seabob fleet and the stern trawler fleet are two examples.

Fishing effort can also be regulated through constraints on the vessel, for example by limiting the power of trawlers, or through constraints on the fishing gear (number and/or length of nets, for example).

5.3 Constraints on the characteristics of the catch

The incidence of given categories of marine organisms in the catch can be limited either by adjusting characteristics of the fishing gear, or by closing areas where these organisms are abundant. Small species or small individuals of larger species can be (partly) spared, for example, by imposing minimum mesh sizes on certain gear. Closing areas to certain gear throughout the year or in given seasons can also be efficient. The distribution of the resources then obviously needs to be taken into account. As depth is often an important factor, depth limits can be a useful way of protecting given categories of organisms. Closed seasons can help preserve vulnerable phases of the life cycle, like juveniles or breeding stock.

5.4 Financial measures

Fishing rights have always been levied from fishing activities. Besides the role they can play in limiting the number of vessels, fishing rights are a way for the government to secure part of the revenues of the fishing activities. These can be used, for example, for enforcement of fishery policies, for surveillance, for research, etc. It is proposed to calculate the fishing rights in accordance with the estimated average output of a fishing unit of each type. It could be set at 1% of the annual gross earnings for the fisheries carried out by national fishermen, and 5% for the fisheries carried out by foreign fleets.

5.5 Monitoring

Because fisheries can alter the state of the resources more or less quickly, monitoring (statistical and biological) is always necessary, and cooperation on this matter should be put as a standard condition for the right to fish. Possible monitoring systems include the reporting of catch and effort by the fishers, the registering of landings by enumerators, the recording of data by observers on board, logbooks, etc.

5.6 Vessel Monitoring System

All fishery types are regulated by fishing operation in zones. Complaints has been made that fish trawlers do not operate in their designated zones, causing conflict among the different fishery types. Therefore, the Fisheries Department was expected to start in January 2007 with a VMS to control all activities by the trawl fleets. It was intended to use the ARGOS system.

6. Fisher communities

All fisher communities built up around small-scale fisheries and today remain the same. Some communities are expanding and others are contracting, because some fishers only live in the communities during the fishing season.

Marine fishers are coastal and industrial fishers and boat owners. All are based in the capital and nearby areas. They are not based in fishing communities *per se*.

7. Inland subsector

The inland fishing fleets operate in estuaries, rivers, lagoons and other open waters on the mainland.

Aspects to be developed resemble marine fisheries, with probably more emphasis on fishing techniques, fishery areas and distribution of communities.

7.1 Catch profile

Table 6. Estimated catch by fisheries (tonne)

	2004	2005
Fish		
Scianids	1138	1010
Arriids	649.4	779.3
Freshwater	187	273.0
Others	232.4	226.5
Processed	75.0	74.6
Shrimp		
Xyphopenaeus kroyeri	552.7	556.2
Nematopalaemon schmitti	271	263
Other	18.3	19.9

7.2 Landing sites

The majority of the landing sites are in the capital as all processing plants are located there.

The fishing units do not necessarily landing always at the same place. In addition, the present registration system does not allow for a classification of the fishing vessels in accordance with the place where they usually land.

Table 7. List of landing sites and strata included in the F.I.S.

Landing site	Type: primary or secondary	Strategy[1]	Stratum	District
001. Braamspunt Strand	P	S	01. Pomona	COMMEWIJNE
002. Braamspunt Oever	P	S		
003. Pomona	P	S		
004. Rust en Werk	P	S	02. Commewijne right bank	
005. Nieuw Amsterdam (bakasrosie)	P	S	03. Commewijne left bank	
006. Visserij Centrum Commewijne	P	C		
007. Matapica	P	S	04. Matapica	
008. Margrita	P	S	05. Commewijne lagoon	
009. Kronenburg	P	S		
010. Central Market Par'bo	P/S	C+	06. Central Market Par'bo	PARAMARIBO
011 Blauwgrond	P	C	07. Paramaribo North	
012 Clevia Sluis	P	C		
013Boskamp	P	S	09. Boskamp	SARAMACCA

022. Huwelijkszorg 023 Stoepeveer 024. Calcutta 025. La Providence	P P P P	S S S S		
032. Afdamming	P	S	12. Afdamming	CORONIE
033. Central Market Nickerie	P/S	C+	13. Central Market Nickerie	NICKERIE
034. Zeedijk	P	C+	14. Zeedijk Nickerie	

NOTES: (1) S = effort and landing per unit effort (lpue) collected certain days (entire day); A = effort and lpue data supplied by plant or administration; C = effort by complete census, lpue sampled; C+ = effort and lpue by complete census.

8. Fishing production means

For a classification of artisanal fleets operating in Suriname, see Table 3.

In the river mouth, fishing is done by canoe-type boats. Three types of Chinese seines are used, namely small, medium and large. Large Chinese seines are mainly used to catch fish only.

The Chinese seines use polyethylene net of different sizes. The small seines are 13 m long, 3 m wide and 5 m deep. The net is made of various mesh sizes (1 inch, 0.75", 0.5" and 0.25", starting from opening to cod end). The length and width of the net parts depend on the wish of the fisherman. The medium-size Chinese seine net is 25 m long, 7 m wide and 4 m in depth at the opening. The meshes are from 2.5 inches, through 1.5" and 1.0" to 0.75" at the cod end. The net is constructed as the fisherman wishes. The large Chinese seine nets are constructed in a different way.

Fixed gillnets use in the lagoons are made of a number nylon nets of 20 m length. The nets are attached to poles at both top and bottom, and use mesh sizes from 1.25 inches to 1.75 inches. The fixed gillnet fleet operates in two major brackish lagoon areas, located in the districts Commewijne and Nickerie.

River seine boats use gillnets with mesh size ranging from 2 to 2.5 inches. The net is set in a circle using one boat. River seine and other inland fishing systems are operated mainly on the Suriname river, but also on the Saramacca river.

9. Main resources

Table 8. Inland fishing

Driftnet	*Cynoscion* spp., *Arius* spp., shark, *Elops saurus, Centropomus* spp.
Chinese seines	*Xyphopenaeus kroyeri, Nematopalaemon schmitti, Macodon ancylodon, Nebris microps, Cynoscion* spp., *Arius* spp.
Lagoon gillnet	Muglidae, *Megalops atlanticus, Tilapia mossambica,* Arridae
River seines	*Plagioscion surinamensis*
Other	*Ucides cordatus,* Callichthydae, Erithrinidae, *Aequidens* spp.

10. Management applied to main fisheries

10.1 Control of fishing effort

Since licensing is compulsory for all fishing units, fishing effort can be limited by restricting the number of fishing licences. This is feasible for the part of the fleet delivering the catch in Suriname. Control at sea is required to prevent illegal fishing. A maximum number of licences are therefore proposed for the types of fisheries exploiting stocks believed to be reaching or exceeding the MSY. This is the case of the Penaeid shrimp, the large demersal fish and the red snapper. For the fisheries exploiting resources where the potential is not known, it is proposed to adopt a precautionary approach and to grant a limited number of licenses. The seabob fleet and the stern trawler fleet are two examples. Since 2004, there has been a limit of 15 bottom trawlers, and seabob trawlers were reduced in 2006 from 30 to 27 boats.

In 2006, fishing effort was regulated through constraints on the vessel by limiting the power of trawlers.

10.2 Constraints on the characteristics of the catch

The incidence of given categories of marine organisms in the catch can be limited either by adjusting characteristics of the fishing gear, or by closing areas where these organisms are abundant. Small species or small individuals of larger species can be (partly) spared, for example, by imposing minimum mesh sizes on certain gears. Closing areas to certain gears, throughout the year or in given seasons, can also be efficient. The distribution of the resources then obviously needs to be taken into account. As depth is often an important factor, depth limits can be a useful way of protecting given categories of organisms. Closed seasons can help preserve vulnerable phases of the life cycle.

10.3 Financial measures

Fishing rights have always been levied from fishing activities. Besides the role they can play in limiting the number of vessels, fishing rights are a way for the government to secure part of the revenues of the fishing activities. These can be used, for example, for enforcement of fishery policies, for surveillance, for research, etc. It is proposed to calculate the fishing rights in accordance with the estimated average output of a fishing unit of each type. It could be set at 1% of the annual gross earnings for the fisheries carried out by national fishermen, and 5% for the fisheries by foreign fleets.

10.4 Monitoring

Because fisheries can alter the state of the resources more-or-less quickly, monitoring (statistical and biological) is always necessary, and cooperation on this matter should be put as a standard condition for the right to fish. Possible monitoring systems include the reporting of catch and effort by the fishermen, registering of landings by enumerators, the recording of data by observers on board, logbooks, etc.

10.5 Vessel Monitoring System (VMS)

In 2007, VMS was to become mandatory for all trawlers, whether shrimp or fish, using the Argos system, as a condition for licence renewal

11. Recreational subsector

For this section there is little information. Annual licences are issued for recreational fishing, but there are no other obligations. The nets are generally smaller than normal fishing nets, regardless of the fishing type.

12. Aquaculture subsector

12.1 Characteristics, structure and resources of the sector

In the 1990s some companies started with culture of the white leg shrimp (*L. vannamei*) and the Red Hybrid Tilapia. These have had some success because the shrimp farms were still operational in 2004. In 2004, 288 t were produced, with a market value of US$ 1.16 million. This equates to an average yield in the main production systems of about 2 t/ha.

12.2 Human Resources

The number of people involved in industrial aquaculture activities were 59 (51 male and 8 female, all full-time) and 40 involved in small-scale aquaculture (35 male and 5 female, all part-time). Table 9 shows the general education level and aquaculture skills of these people.

Table 9. Education and skills in industrial and small-scale aquaculture.

	Industrial		Small-scale		
	Male	**Female**	**Male**	**Female**	**Total**
Education level					
High	5	2	0	0	7
Medium	7	3	35	5	50
Low	39	3	0	0	42

None	0	0	0	0	0
Aquaculture skills					
High	4	1	0	0	5
Medium	15	1	0	0	16
Low	32	6	35	5	78

12.3 Farming systems

The main geographical area of industrial aquaculture is the district Commewijne, located in the coastal area of Suriname. The main areas of small-scale aquaculture are the districts Nickerie, Saramacca and Paramaribo.

Table 10. Industrial aquaculture parameters.

Parameter	Value
Total size of farming area available	925 ha
Total size of farming area in use	90.2 ha
Type of farming	Intensive and semi-intensive
Type of water used for culture	Brackish and fresh
Origin of water	River basin or swamp
Type of feed used	30–35% protein
Origin of feed	USA
Type of fertilizer used	TSP and urea
Type of liming agent used	Agriculture lime
Origin of electricity	Diesel generator / power plant
Production facilities used	Earthen ponds or concrete tanks
Quantity of shrimp produced per unit area	2 t/ha

Table 11. Small-scale aquaculture.

Total size of available farming area	unknown
Total size of farming area	10 ha
Type of farming	extensive
Type of water used for culture	Brackish and fresh
Origin of water	River basin and swamp
Type of feed used	None or farm-made
Origin of feed	Local (Suriname)
Origin of fry	Local (Suriname)
Type of fertilizer used (occasionally)	TSP and Urea
Type of liming agent used (occasionally)	Agricultural lime
Origin of electricity	Diesel generator or power plant
Production facilities used	Earthen ponds

12.4 Species cultured

The species contributing to most of the industrial aquaculture production value is *Litopenaeus vannamei.* In the 1990s some companies started with the culture of *L. vannamei*. The shrimp larvae have always been imported and introduced into controlled environments, where they have been fed with commercial feed and allowed to grow to market size. The species was first imported and introduced from the Sea Hatch hatchery in Aruba. Since then, different strains have been imported from the USA, Dominican Republic and Colombia. Since annual production has not yet increased to a level justifying a local hatchery, the larvae are still imported.

The species contributing to most of the small-scale aquaculture production value are *kwie-kwie* (*Hoplosternum littorale*) and Mozambique [black] tilapia (*Oreochromis mossambicus*). These species are endemic to Suriname and can be found in water bodies (fresh and brackish) throughout the country. The fingerlings of these species are caught in the wild and introduced into controlled environments, primarily located in the backyards of local farmers.

The industry makes no use of genetically improved or modified species.

12.5 Practices and culture systems

The main farming systems used in industrial aquaculture activities in Suriname are earthen ponds (semi-intensive culture) and concrete tanks (intensive culture). Earthen ponds are used because of the semi-intensive nature of the operations on farms. The daily water exchange rate is about 5–10% and aeration is only used when necessary. The stocking density varies from 15 to 25/m^2. The animals feed on small invertebrates, plankton and commercial feed. Fertilizers are applied to the ponds to promote the production of small invertebrates and plankton.

Concrete tanks are used for intensive operations. The daily water exchange rate is 100% and aeration is used continuously. The stocking density is more than 100/m^2. The animals feed only on commercial feed so there is no use of fertilizers.

The main farming systems used in small-scale aquaculture activities are earthen ponds (extensive culture) and integrated farming. The operations of the farmer have an extensive nature. There is no daily water exchange and aeration. The stocking density is low (1–2/m^2) and the animals feed on plankton and small invertebrates. Some fertilizer is added to the ponds to promote growth of plankton and small invertebrates.

Integrated rice-fish and vegetables-fish farming is being introduced for small-scale farmers to improve food security and generate more income. The earnings from the integrated fish farming can provide the farmers with their daily needs. The fish farming is not the sole activity but integrated into daily activities.

12.6 Production

Industrial production was 310 t in 2003 and 288 t in 2004. No data is available for small-scale aquaculture production. The average farm-gate price was US$ 4.03/kg.

12.7 Market

Fish harvested from the small-scale operations are sold as fresh products at the local markets in different parts of the country.

The main exported aquaculture species is *L. vannamei,* exported as quick frozen products to Europe and the USA.

The shrimp farmers have agreed Good Agriculture Practice, and sell their products to local processing plants, which are HACCP certified, where heads are removed and the shrimp tails are quick frozen, packed and distributed. The distribution can be local (as 1 kg units frozen) or international (inner packing 2 kg or 1 kg, and outer packing master carton 20 kg or 6□2 kg).

12.8 Contribution to the economy

Commercial aquaculture contributes to the economy by creating local jobs and exporting income from cultivated shrimp going to the world market. Small-scale aquaculture operations contribute to national food security and protein supply by supplying the nation with animal protein resources. Aquaculture, especially small-scale aquaculture, is seen to have a good impact on the livelihood of poor rural households by generating income, increasing fish consumption and improving family nutrition.

Integrated rice-fish farming provides small-scale farmers with a better income and supports food security. The implementation of aquaculture in rice operations requires an environment free of chemical substances, which promotes food safety at national and international level.

12.9 The governing regulations

At present there is Draft Aquaculture Legislation in Suriname waiting for approval by Parliament (since 2004). The sector also complies with the Fisheries Legislation pertaining to licensing, food safety, HACCP, environment issues, harvest and post-harvest handling. There are also some practical guidelines that are being followed by the private companies pertaining to Good Agriculture Practice (use of resources, ownership, product safety, import of inputs and export).

13. Post-harvest use

13.1 Fish utilization

Fish processing industry in Suriname can be divided into artisanal and industrial processing plants.

The artisanal processing plants are mainly family undertakings that process fish on a small scale, in combination with fish catching activities that are also organized within the family. As little as possible is invested and labour is mainly that of immediate or extended family members or relatives, sometimes in combination with other economic activities.

These artisanal processing plants are not always registered at the Chamber of Commerce. However, an authorization of the District Commissioner is required. They used to be the most important producers of traditional fish products, but now they have to compete with industrial enterprises. Table 12 show some of the traditional fish products.

Table 12. Some the traditional fish products (Ethnic seafood).

Product	Description	Destination
Trie	Juvenile fishes (mainly Scianidae) whole, are salted for 2–3 days and laid in the sun to dried.	Mainly local
Smoked fish	The fish is gutted, remains whole and sometimes cut (split in the back) and then smoked on a *barbakot* (open fire) or in an oven.	Local and export
Salted fish	The fish is gutted and cut (split, single or double fillets). The fish is rubbed with salt and laid on a tray. The fish can either be left in the brine or the salted fish is put on a tray with a small opening to allow the brine to drain. This may be for a few hours or a days, followed by sun drying.	Local and export
Tingie fisie	The fish is not always gutted, and when gutted the intestines are removed from the gills. Then salted and the process continues as for salted fish.	Mainly local
Dried shrimp	The shrimp is boiled in brine and laid in the sun to dry. After the drying process, the shell is removed and the shrimp is cleaned.	Local and export
Trasie (shrimp paste)	This is a fermented product made of shrimp.	Mainly local

13.2 The industrial processing of fish

The industrial processing plants are those that, according to Surinamese standards, apply the production means of labour, investment and technology on a relatively large scale to convert raw materials to end products or semi-manufactured products. They process the fish into various products, mainly for export (Table 13).

Table 13. Industrial processing plant products

Type	Product	processed
Fish	whole (gutted)	fresh on ice
	whole (gutted)	salted
	whole (gutted)	frozen
	steak	smoked
	cuts = blocks	frozen
	without head and tail	frozen
	fillet	frozen
	fillet	smoked
	fillet	fresh on ice
	fillet	salted
	fillet (skinless)	frozen
	split in the back	smoked
	split in the back	frozen
	gilled and gutted	frozen
	whole (headless)	fresh on ice
	heads	frozen
Shrimp	headless shrimp	frozen
	head-on shrimp	frozen

There is no plant that processed fish meal; however, some of the waste from the industrial processing plants is use as animal feed. Those persons cooked the waste before feeding the animals (mostly pigs).

13.3 Fish markets

Table 14. Export of fishery products by country of destination, 2005 (kg)

Country	Shrimps				Fish (all products)
	Marine	Seabob (from trawlers)	Aquaculture	Whitebelly	
Antigua					42 774.50
Aruba					20 700.00
Bahamas		20.00			
Barbados	8 330.00				102 540.00
Belgium	6 900.00	912 716.01			
Canada					25 573.00
Curacao	1 630.00	20.00	888.00		888.00
UK		10.00			98 683.00
France	233 220.00	223 476.18	25 704.00		
French Guyana					50.00
Guadeloupe					5 070.00
Guyana		1 422.00			20 360.00
Hong Kong SAR					14 639.30
Italy	7 893.00				
Jamaica	6 360.00				4 783 249.29

Japan	760 438.00	16 767.52			
Korea	10.00	8 200.00			
Martinique					80 965.00
Mexico					20 250.00
Netherlands	78 353.60	46 789.31	81 763.20	17 971.70	1 539 030.34
Santo Domingo					45 115.00
Singapore					4 156.50
Spain	37 269.00				75.00
St. Lucia					16 264.00
Trinidad	2 011.20	20.00			136 513.00
Turkey	12.00				38.00
USA*	56 640.00	2 755 819.31			249 054.35
USA**					4 697 682.72
Total quantity	1 199 066.80	3 965 260.33	108 355.20	17 971.70	11 903 671.00
Total customs value (US$)	14 335 334.75	6 623 143.06	225 161.40	21 730.05	9 274 029.23

NOTES: USA* is the quantity registered at the fisheries department from the health certificates. USA** is the quantity given by the custom minus health certificates.

14. Fishery sector performance

14.1 Economic role of fisheries in the national economy

The role of the fisheries sector in the economy of the country is seen as:

- assuring reasonable animal protein supply (fish production) for the local population;
- providing jobs (primary and secondary sectors);
- assisting the balance of payment through export of fish and shrimp products;
- contributing to national GDP; and
- contributing to the national budget through fees and income taxes.

14.2 Demand

There is a demand for Surinamese fish and shrimp in the region and also beyond. Due to high exploitation costs, this demand could not always be met.

The demand for shrimp and a few fish species is high, but production is decreasing, for several reasons:

- high exploitation costs due fuel prices, and also the use of very old vessels;
- inadequate management of the resources; and
- stock is declining throughout the region.

The local populations are not big consumers of fish products. They prefer what they known, so the introduction of new species is a very long process. For this reason, species are discarded at sea, despite their being considered good fish elsewhere in the region.

14.3 Supply

Table 15. Landings and exports of fish and shrimp in 2004 and 2005 (in tonne).

	2004			2005		
	Landings	**Exports**	**%**	**Landing**	**Export**	**%**
Total fish	18 647	11 256.8	80	17 395	11 903 6	83
Prawns	1 530	1 454.5	95	1 335	1 199	89.8
Seabob	24 304	3 040.8	29	20 609	3 965 3	44.3

Cultured shrimp	288	171.3	83.2	202	108 6	75.3

NOTE: For seabob, the landings are liveweight, but the export weight is peeled (without head and without shell).

14.4 Trade

Data on operational costs have been collected a few times, but not regularly. The information can be extracted from the annual reports of the bigger enterprises (such as the processing companies).

Table 16 Amounts exported and average prices by major species

	2004		2005	
	Netto (tonne)	**Value (US$)**	**Netto (tonne)**	**Value (US$)**
Total fish	11 256.8	13 671 241.09	11 903.6	9 274 024.23
Prawns	1 454.5	17 195 273.80	1 199.1	14 335 334.75
Seabob	3 040.8	4 262 206.56	3 965.3	6 623 143.06
Cultured shrimp	171.3	533 042.70	108.6	225 161.40

NOTE: Seabob is peeled weight, other shrimp are tails.
SOURCE: Fisheries Department and Immigration Office.

14.5 Food security

In Suriname, sport fishing is traditional a game and a hobby. This is mainly for freshwater fish species. People can go fishing for free or for a small fee. Those that live in the countryside are able to go fishing any time, because there is usually a channel with fish in the neighbourhood.

Nowadays sport fishing also take place in the river with fishing nets similar to those of commercial fishers, but they are restricted to a maximum length. They also use boats with outboard engines. These sport fishers, however, are licensed by the Fisheries Department.

Small-scale fishery contribute a lot to food security, providing cheap fish and fish products. People living in and around fishing villages are also able to buy this animal protein at very reasonable prices.

However, for the majority of the low income population and poor people living in the capital and nearby areas, food security still remain a problem.

14.6 Employment

Fisheries Department estimates for employment in the primary and secondary fishery sectors are shown in Table 17.

Table 17. Estimated employment in fisheries.

	Primary sector	**Secondary sector**
Fishermen	4 420	
Boat-owners	190	
Company directors	30	
Company staff	80	
Joint proprietors	Not known	
Processing plant workers		1 400
Fish vendors		1 000
Truck drivers		
Middle men (selling)	10	
Aquaculture farms	59	

14.7 Rural development

Small-scale fishing is commercially an income and employment source for those in rural areas. In 2005, of the 550 licences issued, only 30 were to fishermen living in the capital, indicating the important role of fishery in the rural context. The government, being aware of this, is making efforts to

improve living standards through regular medical services, schools and other government services in the village or nearby. With donor assistance, fishing centres have been built in some districts.

15 Fishery sector development

15.1 Constraints

The fishery sector faces many constraints, including:

- management problems, such as conflicts among fishermen competing for the same species but using different gear;
- economic problems, particularly increased energy prices affecting the processing sector, high fuel prices but low catches, poor bank loan facilities, and poor social and legal services for foreign employers;
- technical problems, as use of TEDs result in catch losses, entanglement of different gear on fishing ground (leading to losses of nets), and inadequate landing facilities;
- ecological problems, such as side effects of large trawls with chains and heavy doors on the sea floor;
- legal problems, in part because control and surveillance are not conducted on a regular basis; and
- problems in the aquaculture sector, as exports to EU countries was forced to stop due to lack of an Aquaculture Act and laboratory facilities

15.2 Development prospects and strategies

The Ministry of Agriculture, Animal Husbandry and Fisheries has developed an Agricultural Sector Plan, one that includes all projects to be conducted in the period 2006 – 2010. It includes the following fishery-related projects:

- a Fish Inspection Institute, due to become operational in 2007. All arrangement had been made, although some equipment was still needed;
- enactment on the Fisheries Act to replace Decree C-14 for Marine Fisheries. A draft act ready since 1995 has been delayed for various reasons;
- an Aquaculture Act. This is new, with a draft from 2004. Changes are being made to enable this act to pass the Assembly;
- a National Residue Plan for fisheries products, requiring a laboratory facility for the aquaculture sector;
- a Fish Disease Monitoring Plan, also important in the aquaculture sector; and
- Integrated Rice-Fish culture in the district of Nickerie.

15.3 Research

- The Fisheries Department
- The University of Suriname
- CELOS (Institution for Agriculture Research in general)
- CRFM (CARICOM Regional Fisheries Mechanism)
- WECAFC (*ad hoc* Working Group on Shrimp and Groundfish)

15.4 Education

At the University, in the Faculty of Natural Science, there are streams that include Environmental science; Aquaculture and Fisheries; and Animal science.

IOL – the Institute for Advanced Teacher College – covers Biology and Chemistry.

The Fisheries Department in collaboration with the Ministry of Education provided training courses for Quality Managers in 1998, 1999 and 2002. There was a Fish Inspectors training course in 2003.

15.5 Foreign aid

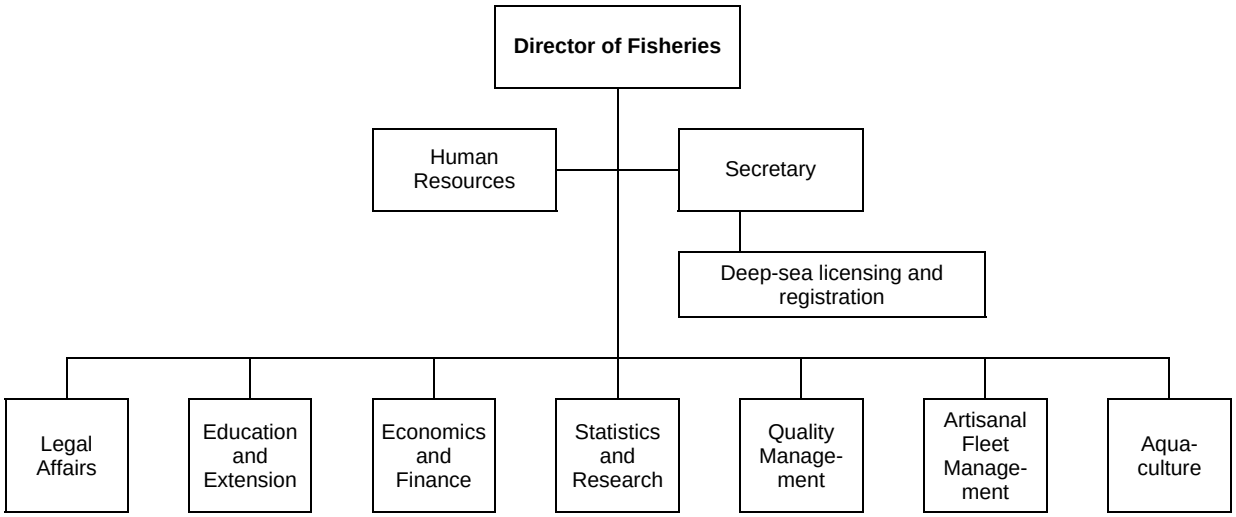
- Small-scale fisheries centre in Paramaribo, donated by JICA (Japan International Cooperation Agency) This will be a landing site for artisanal fishing boats that satisfy the standards provided for in the Fish Inspection Act at Cevihas, targeting 172 boats that have been forced to use insanitary and inefficient

landing sites. This aims to enhance maintenance, and thus increase yield and quality of marine products supplied by artisanal fishermen.

- Caribbean Large Marine Ecosystem. Pilot project on Shrimp and Groundfish for the Guiana – Brazil shelf, starting in Q1 2008 and running to Q4 2010, funded by UNESCO.
  The main outputs of this Project will be:
  - Stakeholder analysis
  - Report which includes evaluation of the policy cycles and linkages, with recommendations
  - Proposal for regional forum for decision making
  - Agreement and consensus on the policy cycles and linkages recommendations (regional, national and local)
  - Agreement on the appropriate regional decision making forum

16. Fishery sector institutions

Organigram of the Fisheries Department



17. General legal framework

The current Fisheries Laws in Suriname are:

- The Fish Stock Protection Act: effective 1961 and last revised in 1981. This Act contains the procedure for fishing licences in the inland waterways of Suriname.
- The Sea Fisheries Act: effective 1980 and last revised in 1981. This Act contains the procedures for fishing in the Territorial Waters and the Exclusive Economic Zone.
- The Fish Inspection Act: effective 2000. This Act contains the guidelines for exporting fish and fish products to the European Union, Canada and the United States of America.
- The Fish Inspection Decree: effective 2002. This Decree is to implement some of the articles of the Fish Inspection Act.

Due to various circumstances, the Act regarding Aquaculture is still a draft. With the exception of the Fish Inspection Act and the Fish Inspection Decree, the other Acts need to be revised. The Aquaculture and the Fisheries Act (a junction of the Fish Stock Protection Act and the Sea Fisheries Act) were scheduled to be effective by 2007.

Some of the reasons for the Fisheries Act are:

1. Parts of the Sea fisheries Act is not in accordance with international agreements, such as the United Nations Convention on the Law of the Sea (LOSC).
2. The fact that the inland fisheries can not always be clearly delimited from the inshore fisheries. The new Fisheries Act will provide articles that apply to the fishing activities in Surinamese waters and the protection of the marine environment.

The Fisheries Act intends sustainable exploitation of the fish stock in Surinamese waters.