

In any further communication on this subject, please quote  
No. *W 8239/1121/29*  
and address—not to any person by name, but to  
The Under-Secretary of State, Foreign Office, London, S.W. 1.

*Sent by Dept  
26 8 36  
444  
Dutch Encl*

THE Under-Secretary of State for Foreign Affairs presents his  
compliments to *the Under-Secretary of State  
for the Colonies* and, by direction of the Secretary of State,  
transmits herewith copies of the under-mentioned paper.

Foreign Office,  
*25<sup>th</sup> August, 1936.*

RECEIVED  
26 AUG 1936  
C. O. REC'D

Reference to previous correspondence:

*40*  
C.O. letter N<sup>o</sup> 60013/36 of 10 Aug.

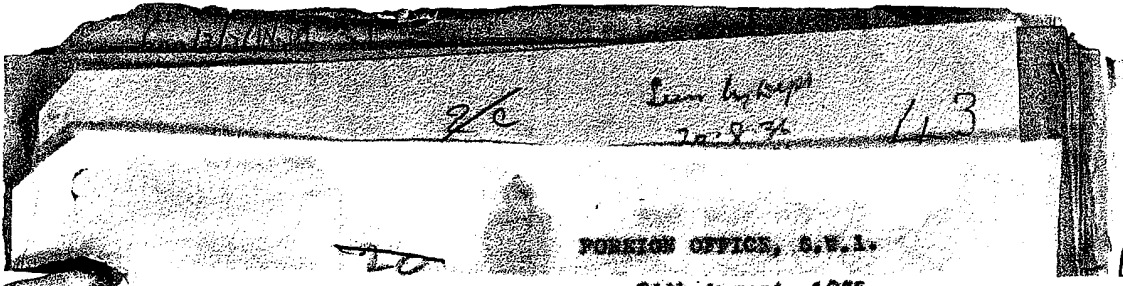
Description of Enclosure.

Name and Date.	Subject.
<p><i>copy sent to B. S. (45) (54) 20</i> Netherlands Minister 24 August.</p>	<p>Boundary between Surinam &amp; British Guiana.</p>

Similar letter sent to *W.O.*

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 Ref: *CO111730/2*  
 202616



FOREIGN OFFICE, S.W.I.

24th August, 1956.

No. V 8239/1121/59.

Sir,

I have the honour to refer to my note V 6195/1121/59 of the 25th July last regarding the draft treaty in connexion with the boundary between Surinam and British Guiana, and to state that a telegram has been received from the Governor of British Guiana reporting that a satisfactory agreement has been signed between the Netherlands Commissioner and the Chief British Commissioner regarding the Kutari River, and that the boundary mark at the mouth of the Courantyne has also been fixed.

2. The direction has also been marked seawards of the boundary on the bearing of  $10^{\circ}$  instead of  $28^{\circ}$  which intersects the navigation channel. The  $10^{\circ}$  line is parallel to the channel and leaves it entirely in Netherlands territory, thus avoiding divided control of buoys etc.

3. I should accordingly be glad to be informed if the Netherlands Government agree to an amendment of Article 5 of the draft treaty so as to provide that the direction of the boundary seawards will depart on a bearing of  $10^{\circ}$  instead of  $28^{\circ}$  as originally proposed.

I have the honour to be,  
with the highest consideration,  
Sir,  
Your obedient servant,  
(For the Secretary of State)

Jonkheer E. de Marees van Swinderen, G.C.V.O.,

etc., etc., etc.

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The following map is attached as Annex 22.

Map of British Guiana, published by  
British Directorate of Overseas Surveys (1959)



17<sup>th</sup> August 1959.

HW 0496/57.

Dear Miss Collinge,

British Guiana - Surinam Boundary.

79

I am sorry to have been so long examining the Netherlands chart you kindly sent me with your letter HW 1031/7 of June 3, 1959. The chart is returned herewith together with a tracing which can be superimposed on it showing some other lines which are explained below.

- My remarks on the chart are as follows:-
- (a) The chart only embraces the southern extremity of the proposed boundary across the continental shelf.
  - (b) The line shown in orange colouring and marked "Lijn van de Volgens Nederlands Baken" conforms to that suggested in the draft Treaty.
  - (c) The red line marked "Verlengde Dalgweg" appears to be constructed mid-way between the high-water marks of Surinam and British Guiana except near the northern limit of the chart where it would appear to be drawn mid-way between the "fictitious" low-water line of British Guiana (see (e) below) and the low-water line of Turtle Bank.
  - (d) The blue line marked "Median Line" is the median line between the blue "fictitious" low-water line of British Guiana (see (a) below) and the green base line marked "Sluitlijn" (see (f) and (g) below).
  - (e) It is not known on what information the blue dotted "fictitious" low-water line of British Guiana has been based by the Dutch. An examination of the British chart adjoining the area and also the small scale Netherlands chart would seem to indicate, however, that the low-water line is very much closer to the high-water line there, perhaps as shown by the green dotted line on the accompanying tracing. All charting of the locality near the coastline north of 6°N latitude is extremely poor and little reliance should be placed on the charts there.
  - (f) The question of the "Sluitlijn" or base line closing the river entrance as drawn by the Dutch raises two very debatable points. These are (i) should a base line be drawn at all? and (ii) if it is permissible, where should it be drawn? With regard to (i) the view of the Colonial Office is that there is "some room for argument" as to whether such a line would be justified (Scarlett's letter HW 222/57 of February 11, 1959). This was agreed by the Foreign Office (Gillick's letter HW 1031/6 of May 22, 1959).
  - (g) The Colonial Office argue against any closing line here by likening the river mouth to a bay the coasts of which do not belong.....

Miss J.J.d'A Collinge,  
The Foreign Office,  
London S.W.1.





8.

(g) The Dutch have marked a base line to close the internal waters of the river. This is 10 miles long although (if such a line be allowed (see (f), (iii) above) it could perhaps have a maximum length of 24 miles. A further criticism of the line as drawn is that it terminates on the British Guiana low-water line well northward of the limit of the territorial sea of British Guiana based on the bearing 010° from the buried markers. Thus this line encloses as Dutch internal waters some of the British Guiana territorial sea. If there is to be such a closing line at all, its western end should be at the intersection of the British Guiana low-water line and the bearing of 010° from the buried markers. Such lines have been drawn on the tracing in a brown broken line to the "fictitious" green low-water line (see 2 (e) above) and in yellow broken line to the "fictitious" blue low-water line.

- (h) On the tracing additional median lines are shown as
- (a) in alternate green dots and brown dashes that between the "fictitious" green low-water line and the brown broken line and
  - (b) in alternate blue dots and yellow dashes that between the "fictitious" blue low-water line and the yellow broken line.

If no base line be allowed near the river mouth, other median lines could be drawn between the "fictitious" low-water lines of British Guiana and the low-water lines of Surinam taking into account such of the drying banks (Droogvallingen) as fall within the breadth of the territorial sea as measured from Surinam (e.g. 3 miles, 6 miles etc.)

- (i) It is noted that this Netherlands chart only covers the southern ends of the median lines mentioned above, further northwards they all run together along one line. All these southern ends (with the exception of the extremity of that drawn by the Dutch through the territorial sea of British Guiana) lie on the Surinam side of the bearing 010° from the buried markers with its suggested continuation further seaward to the "rationalised" median line. If the bearing of 010° from the buried markers be retained as the division of the territorial sea, we are still left with a "barrening factor".

5. The problem in international law set out in paragraph 2(f), above on the general question of a closing line across a river the banks of which do not belong to a single State, will no doubt be brought to the attention of your Legal Advisers. I shall be grateful to learn in due course their opinion on this matter.

4. This is being copied, without the chart or tracing to Scarlett at the Colonial Office.

Yours sincerely,

(R.H. Kennedy)

17 August 1959.

HW0496/57.

Dear Miss Collings,

British Guiana - Surinam Boundary.

I am sorry to have been so long examining the Netherlands chart you kindly sent me with your letter WN 1031/7 of June 3, 1959. The chart is returned herewith together with a tracing which can be superimposed on it showing some other lines which are explained below

2. My remarks on the chart are as follows:-

- (a) The chart only embraces the southern extremity of the proposed boundary across the continental shelf.
- (b) The line shown in orange colouring and marked "Limit License (Volgens Nederlands Baken)" conforms to that suggested in the draft Treaty.
- (c) The red line marked "Verlengde Dalwag" appears to be constructed mid-way between the high-water marke of Surinam and British Guiana except near the northern limit of the chart where it would appear to be drawn mid-way between the "fictitious" low-water line of British Guiana (see (e) below) and the low-water line of Turtle Bank.
- (d) The blue line marked "Median Line" is the median line between the blue "fictitious" low-water line of British Guinea (see (e) below) and the green base line marked "Sluitlijn" (see (f) and (g) below).
- (e) It is not known on what information the blue dotted "fictitious" low-water line of British Guiana has been based by the Dutch. An examination of the British chart adjoining the area and also the small scale Netherlands chart would seem to indicate, however, that the low-water line is very much closer to the high-water line there, perhaps as shown by the green dotted line on the accompanying tracing. All charting of the locality near the coastline north of 6°N latitude is extremely poor and little reliance should be placed on the charts there.
- (f) The question of the "Sluitlijn" or base line closing the river entrance as drawn by the Dutch raises two very debatable points. Those are (i) should a base line be drawn at all? and (ii) if it is permissible, where should it be drawn? With regard to (i) the view of the Colonial Office is that there is "some room for argument" as to whether such a line would be justified (Scarlett's letter WIS 220/44/01 of February 11, 1959). This was agreed by the Foreign Office (Killick's letter WN 1081/5 of May 22, 1959). The Colonial Office argue against any closing line here by likening the river mouth to a bay the coasts of which do not

belong.....

Miss J.J.d'A Collings,  
The Foreign Office  
London S.W.1.

belong to a single State and quote Article 7(i) of the 1958 Geneva Convention on the Territorial Sea and Contiguous Zone. Considerable but unavailing efforts were made in the Committee stage at Geneva to expand the present Article 13 of the Convention to cover contingencies such as this case, but the stumbling block proved to be an authoritative definition of an “estuary”. The feeling was that river mouths and estuaries should in general be treated as “bays” except where the river cuts directly through the coast. There seems little doubt that the waters of all rivers proper, whether the banks are owned by one State or more, should be internal, for it is manifestly inconceivable that the territorial sea could extend to a river’s source. The question therefore is, at what point do the waters change their juridical character? This is a matter affecting not only the States or State owning the river, but it has also an international aspect.

(i) In the case of a river where both banks and the coasts at the mouth are owned by a single State, it seems logical that it should be treated as a “bay” under Article 7 of the 1958 Geneva Convention and a closing line or base line be drawn in accordance with that Article, taking into account all the area of the river and its tributaries when applying the criterion in paragraph 2. The waters on the landward side of the closing line would then be internal.

(ii) Where the banks at the river mouth or the coasts in its immediate vicinity are owned by two or more States it would seem reasonable that the area should not be treated as a “bay”, thus conforming with the sense of the first paragraph of Article 7 of the Convention. The argument against the treatment as a “bay” is that there would seem no reason why one State should benefit in any way from the geographical formation of one of its neighbours. Thus the waters at the mouth remain wholly territorial. The normal base line for the territorial sea is the low-water line of the coast; it then follows that the territorial waters extend into the river to the limit of the low-water line, that is up to the point where the high and low water marks are the same or “as far as the tide do flow”. The limit of internal waters then becomes a straight line joining the points on each bank as far inland as high tide reaches. Such a line may be some miles up the river proper. The division of waters seaward of the closing line would then follow the median line between the low-water marks of the rivers banks and thence seaward between those of the coasts unless by agreement otherwise.

(iii) In the case of a river, the banks of which belong to two or more States and it is agreed between them that the waters of the river shall belong to one State only, it is considered that the closing line for internal waters should be as in (ii) above for this limit has international significance. No other base or closing line appears justified for such a line must join two points on the low-water lines of its banks. In this case, although the low-water line of one bank and all the waters belong to one State, the opposite low-water line belongs to the other. It must be conceded, however, that the waters change their character from territorial to internal when the territorial “sea” becomes the river i.e. at the limiting point reached by the tide. It then follows that agreement must be reached as to the line of division of the territorial sea, to extend from the point on the low-water line of the one State above which all the waters belong to the other. Such a line should either meet the median line between the low-water lines of both States or continue seaward as an agreed line to the seaward limit of the territorial sea and/or beyond to the edge of continental shelf.

(g) The Dutch.....



- (g) The Dutch have marked a base line to close the internal waters of the river. This is 10 miles long although (if such a line be allowed (see (f), (iii) above) it could perhaps have a maximum length of 24 miles.

A further criticism of the line as drawn is that it terminates on the British Guiana low-water line well northward of the limit of the territorial sea of British Guiana based on the bearing  $010^{\circ}$  from the buried markers. Thus this line encloses as Dutch internal waters some of the British Guiana territorial sea. If there is to be such a closing line at all, its western end should be at the intersection of the British Guiana low-water line and the bearing of  $010^{\circ}$  from the buried markers. Such lines have been drawn on the tracing in a brown broken line to the "fictitious" green low-water line (see 2 (e) above) and in yellow broken line to the "fictitious" blue low-water line.

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If no base line be allowed near the river mouth, other median lines could be drawn between the "fictitious low-water lines of British Guiana and the low-water lines of Surinam taking into account such of the drying banks (Droogvallingen) as fall within the breadth of the territorial sea as measured from Surinam (e.g. 3 miles, 6 miles etc.)

- (i) It is noted that this Netherlands chart only covers the southern ends of the median lines mentioned above, further northwards they all run together along one line. All these southern ends (with the exception of the extremity of that drawn by the Dutch through the territorial sea of British Guiana) lie on the Surinam side of the bearing  $010^{\circ}$  from the buried markers with its suggested continuation further seaward to the "rationalised" median line. If the bearing of  $010^{\circ}$  from the buried markers be retained as the division of the territorial sea, we are still left with a "bargaining factor".

3. The problem in international law set out in paragraph 2(f), above on the general question of a closing line across a river the banks of which do not belong to a single State, will no doubt be brought to the attention of your Legal Advisers. I shall be grateful to learn in due course their opinion on this matter.
4. This is being copied, without the chart or tracing to Scarlett at the Colonial Office.

Yours sincerely,

(R.H. Kennedy)

1966	<b>A</b>	(Security Grading—to be Up-graded where Appropriate)
	AMERICAN DEPARTMENT	<del>CONFIDENTIAL</del>
	GENERAL	<b>A</b> 1081/23
FROM F.O. Minnie (Mr. Martin)	SUBJECT: Details of past correspondence between H.M.G. and the Netherlands Govt. regarding the Kutagi & New Rivers. Suggests that Lord Walston informs Dr. Jans when he falls on 120 April that we regard the big junction point as already determined. Have we a strong case for administrative protection.	
No.	Enclosed Copy of:	References and Relevant Papers:
Date 12 April		
Received 21 April		
(Outward Action)	SEE MINUTES WITHIN	
	<div style="border: 1px solid black; width: 100%; height: 100%; transform: rotate(45deg);"></div>	
(Printing Instructions)		
(Referred to Legal Adviser)		
(Action completed)	(Main Indexed)	
<i>MM 29/6/66</i>	<i>DM 10/48</i>	

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A 1081/23

Reference Confidential  
Chitarr

The Netherlands Foreign Minister is coming to London on 20 April for talks with Lord Walston on the Surinam-British Guiana frontier. It seems likely that he will press for the resumption of negotiations on a frontier treaty. Recent attempts to get these talks going again (they were terminated by the outbreak of war in 1939) have failed because neither side could agree to talks on the basis of the other's position regarding the New River. We have maintained that the frontier should follow the Kutari, since this is the upper Corentyne, while the Netherlands have maintained since the war that the New River is really the continuation of the Corentyne, and should constitute the frontier:-



2. In the period 1931 to 1936, there was a certain amount of correspondence between the two governments on this question. It was agreed that the Kutari should form the frontier, and a Mixed Frontier Commission was appointed to fix the trijunction point between British Guiana, Surinam and Brazil. The instructions ~~relative~~ to the Commission were agreed between the Governments. The tri-junction point was determined in accordance with these instructions in 1936, and a joint report was signed by all three commissioners. The papers flagged A to J are all relevant.

3. Could you please advise us as soon as possible to what extent these events constitute an Agreement between the governments, to which we could hold the Netherlands under international law. Can Lord Walston tell Dr. Luns next week that we regard the tri-junction point as already determined? If we cannot, how strong would our case be if the question came before any kind of arbitration or mediation?

*S.W. Martin*  
S. W. Martin  
American Dept.  
12 April

Assistant legal adviser (Mr. Watts)

*In Mr. Watt's absence, I discussed with Mr. Barthe-  
For. In the absence of a formal agreement, it would  
be difficult to argue that the Netherlands Govt  
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were bound by their diplomatic correspondence  
and the tri-junction point under international  
law.

ASL  
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Asst. Legal Adviser.  
Mr. Watts

I agree that it is difficult on the basis of this  
information to say that the Dutch are committed to this  
particular tri-junction point. But the way in which the  
Mixed Frontier Commission was set up might well have  
involved an agreement, and this might well have been in  
terms which stated or implied that the Kaitani was agreed  
to be the frontier in relation to which a tri-junction  
point should be established.

Watts

I think this is so. While we no longer have  
direct responsibility for this issue, we have a  
moral obligation to keep the Guyanese with their  
problems. Could you please have a look at the  
papers A-4 in the attached folder, (Anglo-Dutch  
correspondence 1929-35) and also the paper at  
page 14 (Despatch from the British Commissioner  
in Georgetown).

Ashe  
7/6

Mr. Watts

I am afraid that I have only had time for  
/a

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Minutes

a quick look at these papers. I do not find them altogether reassuring. First, it seems to me that the statement which we have often quoted to the effect that the Dutch have accepted the Cutari River as the frontier is really only a statement that they would be willing to accept it as the frontier in the context of negotiating a treaty (which in the event was never concluded). Second, the Commission which fixed the tri-junction point was similarly part of the negotiations for that treaty, in the context of which its significance lies.

I think we can continue to argue in general terms that Dutch acceptance of the Cutari as the frontier is evident in the discussions in the 1930s, but I think it would be unwise to lay stress on particular occurrences as demonstrating that acceptance since our position may not be wholly watertight.

*[Signature]*

Thank you. This is rather what I feared. I agree that we should be careful about quoting instances from the 1930s; on the other hand we cannot say in our utterances that the Dutch have not accepted the Cutari.

/wlc

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Minutes

We have argued that they have  
ever since 1900 that they have.

Selmastrin  
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*[Signature]*

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1966

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AMERICAN DEPARTMENT

GENERAL

A 1081/37

FROM  
Mr. Jenkins (Col. office)

SUBJECT: Minute by Mr Ramphal of Br. Guiana after a discussion with Mr. Martin (Fo.) and Mr. Jenkins (Col. office) about the boundary dispute with Surinam. Unlikely that a meeting with the Netherlands Govt. could be arranged before August.

No

Date

Received

10 May.

Encloses Copy of:

Minute dated 6 May.

References and Relevant Papers:

(Outward Action)

MINUTES

The Attorney-General of British Guiana, Mr. S.S. Ramphal, who is to be Minister of External Affairs, dictated a minute, a copy of which appears on this jacket, at a meeting in the Colonial Office with Mr. Jenkins and myself. My present minute concerns only the question raised in Mr. Ramphal's third paragraph, namely the assistance which Foreign Office officials might give to Guyanese officials after independence over the frontier question with Surinam. Since this meeting, the British Guiana Government have confirmed their request for help. In suggesting that there should be talks at official level with the Surinam Government in the Caribbean area after 15 June, they have proposed that it would be helpful if Guyanese officials could hold discussions with Foreign Office officials familiar with the frontier question, and hope that it would be possible to arrange a visit by these officials either to Guyana or to the place of meeting with the Surinamese. Presumably, the U.K. officials might also be expected to sit in on meetings or at least to be available for consultation if required.

Flag A

2. The position on the frontier settlement is that negotiations for a frontier treaty between the United Kingdom and the Netherlands began in 1930. Over the next nine years, agreement of all matters of principle was worked out, but the intervention of the war prevented the signature of the treaty. Attempts to renew these discussions since the war have been fruitless, partly because of political difficulties inside British Guiana, and partly because the Surinam Government have brought up and are pressing with increasing consistency a claim to a part of British Guiana. Consequently the agreed basis for a treaty reached in 1939 now no longer exists. Nevertheless, there is a considerable amount of material on our files for the period 1930-39 on the frontier question, some of which has recently been copied to Mr. Ramphal. Subject to the views of the legal advisers, it seems that Guyana's case for refuting the Surinam claim and retaining her present frontier rests very largely on the evidence from these files showing that the Netherlands Government already recognized the present frontiers in the period 1930-39 and moreover acting on them. Since 1945, the Foreign Office files on this question contain an enormous volume of paper, chiefly in the form of minutes, on the Surinam claim to the New River Triangle, as well as on every other aspect of the problem. These minutes relate

/mainly

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(Referred to Legal Adviser)

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mainly to the revised British draft treaty put to the Netherlands Government in 1961.

3. The specific matters on which we can expect the British Guiana Government to seek our advice are therefore as follows:

- (a) The New River Triangle and diplomatic correspondence in the period 1930 to 1939; attempts to conclude a settlement by treaty in that period; the legal validity of this material in establishing British Guiana's title. (American Department and legal advisers).
- (b) British Guiana's rights on the River Corentyne. The British Guianese apparently have no rights under international law, since the frontier follows the British Guianese bank of the river rather than the middle. Their rights would therefore have to be established by the treaty. There are minutes on papers in 1961-63. (Legal advisers and General Department).
- (c) Division of the territorial seas, contiguous zone and continental shelf.
  - (i) The political issue i.e. whether the boundary should be determined on the principle of equidistance or by a line based by agreement between the parties on historic title or other special circumstances. (General Department, legal advisers and American Department).
  - (ii) The technical details arising in relation to (i), and in particular when a ~~discussion of decision on~~ (i) has been reached; the correlation of hydrographical information on the mouth of the Corentyne River, the adoption of charts from U.K. and/or Netherlands sources, responsibilities for navigational aids (Ministry of Defence (Navy), Naval Hydrographer).

4. In my own view we are under a definite moral responsibility, first to Guyana, to assist her over all these matters, and secondly to the Netherlands, to exercise our good offices in bringing about a satisfactory settlement. Moreover, the Guyanese may well wish for our legal opinions on how a settlement should be achieved e.g. the relative advantages of negotiation, arbitration, mediation etc. In offering advice, we should clearly have to be careful since the consequences of it, if unfavourable to Guyana, might result in blame being attached to us.

5. In practical terms, we have to consider the implications of this responsibility to help Guyana in relation to

- (a) the talks at official level in the Caribbean area after 15 June (if these are accepted by Surinam);
- (b) a Ministerial meeting, which might well be in Europe, after August.

I doubt whether we could justify the expense of sending out officials from the interested departments referred to above. Moreover, a great deal could be done by the preparation of briefs from existing material. However, it does seem that we should be prepared to send officials if the Guyanese asked for them, and if we later hear that the Netherlands may also be represented. *A meeting in Europe would be very difficult.*

*S.W. Martin*  
(S.W. Martin)  
20 May, 1966

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*to the Caribbean*

Minutes

I do not think we should send officials to these tables if the Guyanese ask for them and the Netherlands are going to be represented. Relations between the U.K. and Guyana after independence will not be the same as those between Holland and Surinam. A precedent might also be created for the Venezuela / Guyana dispute. The first step, it seems to me, is for one or two Guyanese officials to begin at once to steep themselves in such papers on this subject as we are prepared to make available to them

*[Handwritten signature]*

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Minutes

I agree that we are under a strong moral obligation to help the Guyanese over this. The question is how. It seems to me that we should begin by offering them the use of our archives here; Mr. Lamphal might be persuaded to send one of his staff over here for this purpose. If necessary, we could also follow this up by sending someone out to Georgetown to offer the Guyanese Board quiet advice on how to handle the Dutch at the talks. But I think we must keep away from both meetings.

le  
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The meeting with officials took place in London. I spent a morning with the Solicitor General of Guyana & Sir Bernard Luckhoo and gave them advice on all points about the points on which they wished to be informed.

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BULLETIN OF THE AMERICAN ASSOCIATION OF PETROLEUM GEOLOGISTS  
VOL. 45, NO. 7 (JULY, 1961), PP. 1045-1089, 19 FIGS., 18 TABLES

PETROLEUM DEVELOPMENTS IN SOUTH AMERICA  
AND CARIBBEAN AREA IN 1960<sup>1</sup>

E. W. CLARK ET AL.<sup>2</sup>  
New York, N. Y.

ABSTRACT

Exploration activities continued at a high level in Argentina and Brazil, but declined practically to a standstill in Venezuela.

South American production of crude averaged almost 3,500,000 b/d in 1960, and was 5% higher than in 1959; most of the increase came from Venezuela, Argentina, and Brazil.

The Government of Venezuela set up an agency to operate as a national oil company, thus increasing to eight the number of governments in the Western Hemisphere participating directly in petroleum exploration and production operations by this means.

INTRODUCTION

In general, the exploration and production operations of the oil industry in South America continued to grow in 1960, although the emphasis varied from one country to another, mainly in response to politically generated influences. For the continent as a whole, crude-oil production averaged 3,474,100 b/d during 1960, an increase of 175,500 b/d or 5%, as compared with 1959. It is a fair assumption that proved reserves increased proportionally.

If the demand for petroleum products in South America had been satisfied entirely from indigenous crude, there would have been an exportable surplus of about 2,500,000 b/d of crude in 1960. As it was, however, significant quantities of Middle Eastern and Russian oils were imported into some South American countries having crude deficiencies, thus increasing the quantity of South American crude seeking markets in North America and Western Europe.

The following table shows the annual crude oil production of individual countries in the last three years, and also their cumulative production to the beginning of 1961.

<sup>1</sup> Manuscript received, April 28, 1961.

<sup>2</sup> Shell Oil Company.

PRODUCTION OF CRUDE OIL

	<i>(Thousands of Barrels)</i>			
	1958	1959	1960	Cumulative
Venezuela	951,000	1,011,000	1,041,672	13,873,000
Argentina	35,709	44,578	63,846	800,602
Colombia	46,582	53,332	55,666	944,516
Trinidad	37,355	40,919	42,357	720,276
Brazil	18,923	24,506	35,563	99,505
Peru	18,732	17,733	19,255	578,477
Chile	5,568	6,423	7,231	35,031
Bolivia	3,436	3,170	3,572	28,408
Ecuador	3,187	2,823	2,799	80,652
Total	1,120,492	1,204,484	1,271,961	17,160,467

The daily average production and the change from 1959 to 1960 were as shown below.

ACKNOWLEDGMENTS

Grateful acknowledgment is made to the following, who contributed the reviews of petroleum developments in the countries mentioned.

ARGENTINA	Juan J. Zunino, Yacimientos Petroliferos Fiscales, Buenos Aires
BOLIVIA	L. E. Schlatter, Cia. Petrolera Boliviana Shell, La Paz
BRAZIL	F. W. Lange, Petroleo Brasileiro S. A., Rio de Janeiro
BRITISH GUIANA	Y. Bonillas, California Exploration Company, San Francisco, California
CHILE	Empresa Nacional del Petroleo, Santiago
COLOMBIA	Olian Shockley, Colombia Cities Service Petroleum Corporation, Bogota

*(Thousands of Barrels Daily)*

	1958	1959	1960	Increase or (Decrease) (1959-60)	
				Bbls.	Per Cent
Venezuela	2,606.0	2,771.0	2,846.1	75.1	2.7
Argentina	97.8	122.1	174.5	52.4	43.0
Colombia	127.6	146.1	152.1	6.0	4.1
Trinidad	102.3	110.7	115.7	5.0	4.5
Brazil	51.8	67.1	97.2	30.1	44.9
Peru	51.3	48.6	52.6	4.0	8.2
Chile	15.3	17.6	19.7	2.1	11.9
Bolivia	9.4	8.7	9.8	1.1	12.2
Ecuador	8.7	7.7	7.4	(0.3)	(3.9)
Total	3,070.2	3,299.6	3,475.1	175.5	5.3%

1080

E. W. CLARK

of gun perforation, both in recompletions and in the original completion of wells.

Tennessee del Ecuador terminated its second year of operation in western Ecuador after having completed 5 wildcat ventures as dry holes, 2 being located north of Guayaquil; 3 development wells were completed as marginal producers. Two to three field parties have been active in surface exploration, completing 26 party-months.

In the coastal areas of western Ecuador, 4,764 sq. km. were covered by aerial photography; 7 stations on concession boundaries were surveyed and monumented, completing the marking of concessions totalling 1,288,577 hectares in western Ecuador.

California Ecuador Petroleum Company completed two offshore tests during the year. Golfo No. 1 was abandoned at 4,107 ft. with significant shows in the Azucar sandstone, and Santa Clara No. 1 was abandoned and plugged at a depth of 4,987 ft. This company ceased active operations in Ecuador in July and has now been reduced to a small organization in Quito.

a reconnaissance gravity survey covering the on-shore coastal area. No further field operations were conducted during the term of the license.

GUATEMALA AND BRITISH HONDURAS (Figs. 16,17)

By H. H. WILSON, Petroleum Investments (Overseas) Guatemala

GUATEMALA

During 1960 the tempo of exploration in the Petén carbonate province of northern Guatemala slowed down considerably.

One drilling string of tools was kept permanently in this area by Ohio who completed Chinajá No. 1 as a dry hole and then drilled a second dry hole at San Román No. 1. Atlantic introduced a rotary rig for one month with which it deepened the cable-tool hole at San Francisco; this well was also abandoned as a dry hole.

One portable Rayflex seismic crew completed 5½ party-months of detailing for Delhi-Taylor

COMPLETION SUMMARY, ECUADOR, 1960

	Oil	Gas	Dry	Total	% Success.
Exploratory wells	—	—	8 <sup>a</sup>	8	Nil
Semi-exploratory wells	2	—	1	3 <sup>b</sup>	66.6
Development wells	63	—	1	64 <sup>c</sup>	98.4

<sup>a</sup> 5 wells, 3,800 ft.-6,000 ft.  
1 well to 753 ft.  
2 offshore wells; 4,107 ft. and 4,987 ft.

<sup>b</sup> 3 wells, 3,800 ft.-5,500 ft.

<sup>c</sup> 4 wells 5,000-6,000 ft.  
16 wells 4,000-5,000 ft.  
9 wells 3,000-4,000 ft.  
35 wells 1,200-2,100 ft.

PRODUCTION IN ECUADOR IN BARRELS

	1959	1960	Cumulative to Dec. 31, 1960
Anglo-Ecuadorian Oilfields, Ltd.	2,256,177	2,346,410	64,279,197
Tennessee del Ecuador, S. A.	330,735	250,231	10,260,305
Carolina Oil Company	150,969	125,261	3,041,436
Petropolis Oil Company	40,374	37,066	1,510,770
Concepcion Ecuadorian Oilfields	44,947	39,952	1,560,395
	<u>2,823,202</u>	<u>2,798,920</u>	<u>80,652,103</u>

BRITISH GUIANA

By Y. BONILLAS, California Exploration Company, California

In April, 1960, the California Oil Company (British Guiana) Limited relinquished its concession rights on approximately 16,000 sq. mi. of coastal and offshore British Guiana. This concession was first acquired in April, 1958, and during the latter part of that year exploratory field operations were commenced. These included a marine reflection and refraction seismic survey conducted on the offshore part of the license and

who had taken over Texas' acreage in northwestern Petén.

Most concessionaires confined their exploration to geological structure mapping, reconnaissance geology, and regional basin evaluation, which accounted for a total of 52 geological party-months.

The concession situation was modified considerably during 1960 by relinquishments, pooling agreements, and changes of ownership. The most important changes are listed.

1. The Atlantic, Sohio, Tidewater Group, Hawthorne Investments and Belco Petroleum relinquished all their acreage in Guatemala.

The American Association of Petroleum Geologists Bulletin  
V. 59, No. 10 (October 1975). P. 1756-1813. 22 Figs., 70 Tables

## Petroleum Developments in South America, Central America, and Caribbean Area in 1974<sup>1</sup>

L. E. HATFIELD,<sup>2</sup> B. A. TATOR,<sup>2</sup> and C. H. NEFF<sup>2</sup>

Miami, Florida 33143

**Abstract** The 1974 review presents information on petroleum developments in 30 countries and areas. Petroleum was produced in 11 countries with total production of 1,551,745,000 bbl (4,251,353 b/d) an 8.9% decrease from the 1973 production level. Venezuela accounted for the major part of the volume decline by reducing production 389,773 b/d from 1973 levels to 2,976,249 b/d. However, Venezuela still accounted for 70% of the total production of the area. Ecuador's production decreased by 15.2% to 177,029 b/d because of governmental restriction coupled with pipeline breaks. Production decreased less precipitously in Argentina, Colombia, Bolivia, and Chile. Trinidad and Tobago reported the largest volume increase (12.3%) followed by Brazil (4.2%) and Peru (9.2%); in each, offshore activities were responsible for these production increases and perhaps the most noteworthy development of the year was the increase in offshore activity.

Total wells drilled were 1,730, an increase of 92 or 5.6% over the 1973 level with Brazil and Peru reporting increases of 46 and 63 wells respectively. The number of exploratory wells completed (405) represents an increase of 21 or 5.5% over 1973 completions with Peru reporting 43, an increase of 38.7% above the 1973 level. Brazil reported 17 rigs operating in the offshore. Successful exploratory completions (128) increased by 4%. Peru and Venezuela recorded the highest success ratios (51 and 66% respectively) of the 13 countries in which exploratory wells were drilled. Exploration drilling results offshore Caribbean and Pacific Nicaragua (3 wells), Gulf of Panama (2 wells), and Guyana (2 wells) continued to be disappointing. A new-field discovery in Guatemala (Rubelsanto 1) has the potential to be Central America's first commercial production.

Geologic and geophysical party-months of field work (1,150.2) registered a 12.5% increase over 1973 which reflected a 125.4-party-month (+16.1%) seismic and a 28.5-party-month (+74.2%) gravity increase; however, surface geology decreased by 20.7 party-months (-10.8%). Peru reported the highest total (271 party-months) of seismic activity, an increase of 14%, but Bolivia with 92.9 party-months registered a 228% increase. Argentina and Brazil maintained their 1973 level of seismic activity with 268 and 117 party-months respectively.

Four new contract operations were signed with YPF making a total of 11 operational companies or groups exploring in Bolivia at year-end.

### INTRODUCTION

Petroleum production in 1974 from 11 countries in the review area was 1,551,745,000 bbl, a decrease of 8.9% from the previous year (Tables 1, 2). Even though production in Venezuela decreased 11.6% from 1973, that country continued as the dominant producer—70% of the total—as oil was produced at a rate of 2,476,249 b/d. Production increased in Trinidad (12.2%), Peru (9.2%), and Brazil (4.2%), and in each country the increase was a result of the successful devel-

opments offshore. Production from the offshore area of Trinidad was one of the highlights of 1974.

The total wells drilled were 1,730, up about 5% from 1973 in both exploration and development categories (Table 3). Argentina (606 wells), Venezuela (416), Trinidad (200), Brazil (176), and Peru (152) were the leaders in drilling.

In exploration drilling the continued intensive work on the continental shelf of Brazil by Petrobras was a notable accomplishment. Unfortunately offshore exploratory drilling in Guyana, Nicaragua, and Panama had negative results. In the Oriente of Peru exploration drilling is following the vigorous seismic work of the past 3 years and a similar pattern probably will be followed in Bolivia.

Oil exploration or related activity is reported for 30 countries or areas in Latin America and the Caribbean; 18 had field-party effort. Total party-months of geologic/geophysical exploration was 1,150 m, up 12% from 1973 (details in Table 4). Argentina with 364.5 party-months continued as the leader, followed by Peru, Bolivia, and Brazil with total party-months of 305, 161, and 117 respectively. Peru was the leader in seismic work—271 party-months—and total seismic effort accounted for 903.8 party-months or 72.5% of the total party-months of exploration.

Guatemala gave indications of becoming the first country in Central America to establish commercial production as the Shenandoah group's Rubelsanto 1 produced oil at rates up to 2,250 b/d from the Cretaceous. This, coupled with the much publicized results from recent drilling in adjacent areas of Mexico, has resulted in a revival of interest in the Peten region of Guatemala.

In Colombia the concession system was abolished and henceforth all exploration and development will be carried out by association contracts with the state company Ecopetrol. In much of the area covered by this review, the present tendency is toward that type of arrangement.

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<sup>1</sup>Manuscript received and accepted, June 9, 1975.

<sup>2</sup>Weeks-Tator Consulting Geologists, Inc.

## Developments in South America and Caribbean Area

1767

had been recovered in drillstem tests of 4 separate zones within the Cretaceous Coban Formation. The highest flow rate was 2,250 b/d on a 3/8-in. choke, and the combined potential of all zones was about 3,000 b/d. The tests were conducted over a gross formation depth interval between 4,112 and 5,253 ft. Additional drilling below the interval indicated the presence of other prospective zones, not yet fully evaluated.

The reservoirs are largely dolomite beds within a predominantly anhydrite sequence near the lower part of the Coban Formation. Owing to mechanical difficulties, the well was completed at a depth of 5,328 ft, leaving an undetermined thickness of the prospective lower Coban strata unevaluated. Although the dolomite reservoirs tend to be thin, favorable reservoir characteristics and the apparent multiplicity of pays, ultimately may prove Rubelsanto 1 to be the first viable discovery in Central America outside of Mexico.

In the course of the year, offset wells Rubelsanto 2 and 3 (Table 46) were spudded 3 km west and east, respectively, of the discovery. At year-end, both wells were involved in fishing jobs, Rubelsanto 2 at a depth of 5,558 ft and Rubelsanto 3 at 2,400 ft.

The Shenandoah Group also tested and abandoned 2 shallow wells (63-6 and 63-7) in May which had been drilled previously on the flanks of the Tortugas salt dome.

The Zamora/Centram combine continued preparation for the drilling of Manglar 1 in the Gulf of Honduras (Fig. 11). The proposed well, the first of a 2-well program, is scheduled to spud in early 1975 at a location 12 mi off Guatemala in 153 ft of water.

The group controls an approximate 790,000-acre tract in the coastal area of east-central Guatemala. Zamora, a wholly owned subsidiary of Westcoast Petroleum of Calgary, is operator for the combine, the other joint title holder being Cia. Centram, a subsidiary of International Nickel Co. of Canada Ltd.

Exploration activity by the group during 1974 was confined to a 90-mi offshore-seismic survey.

The much publicized press coverage in September concerning speculation as to the potentially large reserves attributable to Pemex's Reforma area Cretaceous discoveries in southern Mexico, combined with the added encouragement from the Rubelsanto discovery in Guatemala, succeeded in focusing industry attention on the carbonate prospects of this part of the southern Gulf coast sedimentary province. As all Mexican oil activities are state controlled, Guatemala's bordering Peten region became the logical target of exploration, being open to foreign participation,

and within a similar structural-depositional framework.

By November 1974, in anticipation of the long pending passage of service contract legislation, 42 different applications had been filed in the Peten region. The applications were made without respect to fixed or defined geographic areas, and as a consequence most were overlapping. The government provisionally restructured the contract areas in November to include 14 blocks, each averaging slightly less than 400,000 ha. (about 1 million acres). By March 1975, 12 different companies, including equal numbers of independents and majors, had applied variously for 9 of the blocks under the new format.

For more than 3 years the government has been working toward the establishment of a model service contract to provide a mechanism to allow foreign interests to explore in the country under terms which are more modern than provided by the old Petroleum Code. These matters were advanced further in 1974 by the Congressional passage of Decree-Law 62-75 in June which governs production sharing, and the approval in October of the same year of the Regulations (Government Resolution 21-74) to the new Petroleum Decree-Law. The final instrument to implement the new legislation, the model contract itself, had not been published by year-end, although most authorities believed that it would be ready by early to mid-year 1975.

Decree-Law 62-74, effectively the new Petroleum Law, guarantees a minimum 50% share of production to the state on a no-risk basis. In addition, it establishes that in lieu of income tax, a payment equivalent to 40% of the market value of the contractor's crude will be made.

In addition, terms are reported to include a maximum 3-year exploration period with a possible 3-year extension, and a minimum investment during the former period of \$5 million, 2 million to be spent on the drilling of at least 2 wildcats, and 3 million on seismic. As was indicated above, the newly defined contract area would amount to no more than 400,000 ha. (about 1 million acres).

## FRENCH GUIANA

The Elf-Aquitaine/Shell/Eurafrep group holds the only exploration rights and these are in the offshore area. There was no field-exploration activity in 1974, however, exploratory drilling is planned for 1975.

## GUYANA (Fig. 12)

After a lapse of almost 3 years, exploratory drilling was resumed in Guyana. The first drilling in 1974 was by Guyana Shell, who in September

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abandoned Mahaika 1 (Fig. 12) at a depth of 7,000 ft; water depth was 180 ft and the location was approximately 105 km offshore northeast of Georgetown at geographic coordinates 7°27'36"N lat. and 57°09'16"W long. Shell then drilled Berbice 2 (7°48'56"N and 57°15'35"W) to TD 11,049 ft in 400 ft of water at a location about 6 km south of Berbice 1 (TD 12,500 ft) which was drilled in 1971. Berbice 2 was abandoned in November. Near the end of December a third wildcat, Abary 1, was spudded by Shell at geographic coordinates 7°19'14"N lat. and 56°42'46"W long.

In November Deminex started drilling Essequibo 1 in its offshore block approximately 140 km north-northeast of Georgetown; it was drilling at a depth near 5,000 ft at year-end. In conformity with the petroleum legislation, Deminex converted its Oil Exploration License to Oil Prospecting Licenses before starting to drill.

#### HAITI (Fig. 9)

By MICHEL GODEL, Petroconsultants S.A., Geneva, Switzerland

In early 1974 Weeks Natural Resources acquired an option on Wendell Phillips exploration permit covering 86,350 sq km of on- and offshore Haiti. By conducting seismic work Weeks Natural Resources could earn a 40% interest with the remaining 60% earned by Bonanza International Petroleum and Haven Oil. Wendell Phillips would have retained an overriding royalty.

Weeks did reconnaissance marine-seismic work off Haiti in February and in December 1974, shooting a total of 300 line-mi. Weeks did not exercise its option after an additional seismic program shot in February 1975.

#### HONDURAS (Fig. 13)

By C. J. MILLER, International Ventures, Shell Oil Co., Houston, Texas

There was no drilling activity in Honduras during 1974.

Marine-seismic operations (770 line km) were conducted by Shell Exploration Honduras Ltd. (SIPM) in the Caribbean Sea north of the mainland.

Louisiana Land and Exploration relinquished its concessions during the year. Concession status at the end of 1974 shows Weeks (awarded 1973), Union, Signal, Occidental, and Shell (SIPM) as remaining holders of concessions in offshore Honduras.

A geologic map of Honduras was issued by the government in 1974 (scale 1:500,000).

#### JAMAICA (Fig. 14)

By RAYMOND M. WRIGHT, Mines and Geology Division, Kingston 6

Exploration activity reached a low level in 1974. The only concession was held by Weaver International Jamaica Corp. and associates and there was no drilling activity. Its onshore holdings totaled 4,241.86 sq mi. Southern Jamaica, the Pedro Banks, and other offshore banks and cays on the southeast were open to concession.

Detailed surface mapping was conducted by the Weaver group on the Flower Hill and Blowfire Hill structures along the north coast as part of its ongoing exploration program.

Although no new geophysical surveys were initiated, the Jamaican government has been involved with the reevaluation of geophysical data in the Pedro Bank area. Possible structural traps in the Pedro Bank area were identified in a study completed in September, using the Signal-Occidental seismic data from the period 1967-1969. In the last quarter of the year the government took steps to acquire copies of the magnetic tapes of seismic data from Burmah and Occidental to enhance some of the output in critical lines by reprocessing.

During 1974 the government developed policy for encouraging exploration, and greater activity is expected by the second half of 1975.

#### LESSER ANTILLES (Figs. 15-16; Table 47)

By MICHEL GODEL, Petroconsultants S.A., Geneva, Switzerland

No exploration activity was reported during 1974 in the Lesser Antilles, but several changes have been reported in the concession situation. In the Leeward Islands, Atlantic and Oceanic released all of its offshore tracts which covered a total area of 24,270 sq km. In the same area Weeks Natural Resources was granted a seismic permit on the Saba Bank under Netherlands Antilles jurisdiction (see Netherlands Antilles for full details).

In the Windward Islands, General Crude Oil and Minerals S.A. is the sole concessionaire. During the year 1974, General Crude relinquished 875 sq km (216,116 acres) of the original 2,245-sq-km (554,880 acres) concession area, which included all of the Island of St. Vincent and the offshore waters of the Grenadines on the south. The area retained, 1,370 sq km, is entirely offshore. A seismic program in addition to the one previously carried out in 1973 is scheduled for the offshore



## Petroleum Developments in South America, Central America, and Caribbean Area in 1975<sup>1</sup>

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**Abstract** The review for 1975 presents information on petroleum developments in 30 countries and areas. Hydrocarbons were produced in 11 countries with total reported production of 1,308,847,000 bbl of oil and 1,056,076 MMcf of gas. Oil production decreased 15.7% from the 1974 level with Venezuela accounting for most of the volume decline by reducing production to 2,346,700 b/d. Since 1958 this was the first year that Venezuelan production dropped below one billion bbl. Ecuador's production declined by 9.1% to 160,911 b/d because of continued governmental restriction, a major pipeline break, and full storage terminals. Other countries also reported production declines with the exception of Trinidad and Barbados.

Total wells drilled (1,557) decreased by 173 or 10% from the 1974 level with the sharpest decline in Venezuela (132) and Argentina (54). Brazil and Peru reported increases of 52 and 9 wells, respectively. Brazil reported 19 offshore and 23 onshore rigs and Argentina had 63 operating rigs. The number of exploratory wells completed (321) represents a 20.7% decrease from 1974 completions. However, Brazil, Peru, and Chile maintained their 1974 level of exploratory drilling. Successful exploratory completions decreased by 30.5%. Of the countries with major drilling programs Trinidad, Venezuela, Chile, and Argentina recorded the highest exploratory-well success ratios (64, 49, 30, and 28% respectively).

Exploration-drilling results offshore Caribbean-Belize (1 well); Guatemala (1 well); Honduras (1 well); Nicaragua (2 wells); Costa Rica (1 well); and offshore Guiana basin, Guyana (3 wells); Surinam (1 well); and French Guiana (1 well) continued to be disappointing. However, Brazil reported 7 offshore and 2 onshore new-field discoveries; Peru and Colombia reported 2 and 3 new-field discoveries, respectively. Successful outposts were reported in Guatemala with Rubelsanto 2 and 3.

Geologic and geophysical party-months of field work (1,030) registered a 10.4% decrease from 1974 reflecting 137.4 party-months (-19.9%) of surface geology, 835.0 party-months (-7.6%) of seismic, 41.8 party-months (-32.5%) of gravity, and 6.6 party-months (65%) of magnetometer surveys. "Other" exploration party-month activity (principally topographic and SLAR) registered a 70.2-party-month increase. Argentina and Brazil maintained their 1974 level of seismic activity with 264 and 116 party-months respectively. Bolivia increased surface geologic and seismic activity to 64 and 142 party-months.

Brazil during 1975 decided to adapt a service-contract basis for allowing foreign companies to bid for 1 onshore and 9 offshore blocks. Chile also invited operation-contract bids for 7 areas, 3 offshore and 4 onshore.

The end of the "concession era" occurred on December 31, 1975, in Venezuela. All areas under concession or service contract were nationalized by decree. The state will form 14 state-owned companies including CVP from concessions and assets of the 20 former concessionaires.

### INTRODUCTION

Exploration activities and production in the review area declined in 1975. This decrease is particularly disturbing in view of the continued energy crisis.

Petroleum production decreased 15.7% to 1,308,847,000 bbl in the 11 producing countries. Venezuela's long-range conservation program and other factors reduced production by 21%, and for the first time in 17 years, to less than a billion bbl (Table 1). Only 2 countries reported increased petroleum production, Trinidad and Tobago (+15.9%), and Barbados (+107%). The offshore area was the source of Trinidad's production increase.

Total wells drilled (1,557) represent a 10% decrease from 1974 (Table 3). Argentina (552), Venezuela (284), Brazil (228), Trinidad (189), and Peru (161) were the leaders in drilling. Brazil's continued intensive exploration drilling on the continental shelf resulted in 7 new-field discoveries. Otherwise, offshore exploratory drilling in French Guiana (1), Surinam (1), Guyana (3), Costa Rica (1), Nicaragua (2), Honduras (1), Guatemala (1), Belize (1), and Peru (2) had negative results. Onshore, Brazil, Colombia, and Peru reported 2, 3, and 2 new-field discoveries, respectively.

Hydrocarbon exploration or related activity is reported for 30 countries or areas in Latin America and the Caribbean; 21 had field-party effort. Party-months of geologic-geophysical exploration (1,030.3) declined by 10.4% not including 64.7 party-months of topographic effort reported by Argentina and Colombia. Peru reported the greatest party-month decline (-65.6%), and Argentina (393.7), Bolivia (229), Brazil (116), Chile (52), and Venezuela (64) maintained or increased party-month activity over the 1974 level. In seismic work Argentina was the leader with 263.9 party-months followed by Bolivia, Brazil, and Peru with 142, 116, and 105 respectively. In Peru

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<sup>2</sup> Weeks-Tator Consulting Geologists, Inc.

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chancial difficulties at a depth of 3,844 ft (1,172 m). After extensive testing, the well was abandoned on December 2. Redrill, Rubelsanto-4A, was spudded about 500 ft (150 m) south, and at year end was drilling at a depth of 5,013 ft (1,528 m) toward a projected TD of 11,500 ft (3,505 m).

Two rigs, a land-based Loffland rig and a Helirig operated by Parker, were utilized in the course of drilling operations at Rubelsanto during 1975.

Fairly extensive road systems either had been initiated or were in planning stages during 1975, which are to provide access for projected wildcat drilling in the southern and western reaches of the concession area during 1976.

On March 8, the Zamora/Centram combine spudded Manglar-1 at a location (Table 54) in the Gulf of Honduras, in 153 ft (47 m) of water. The well was abandoned in April at a depth of 6,348 ft (1,935 m) with no reported encouragement. At total depth, the well was in Tertiary age rocks. Cia. Zamora, a wholly owned subsidiary of West Coast Petroleum of Calgary, was operator for the drilling operation. The *Western Delta* jack-up was used. This rig then was moved to a nearby location, Amatique-1, but because of sea-bottom conditions, the *Western Delta* could not be positioned, and the rig subsequently was released.

In mid-November an additional offshore test, Manabique-1, was spudded on the consortium's holdings in the gulf region, and at year end this test was reported to be drilling at a depth of 3,903 ft (1,190 m). Cia. Centram, a subsidiary of International Nickel Co. of Canada Ltd., is operator of the Manabique well.

The Centram/Zamora combine reported no exploratory work, other than drilling, during 1975.

In mid-year 1975, title to the former Weissenberg holdings was transferred to the Shenandoah group in undivided interests as follows: Shenandoah Oil Corp. (operator) 25%; Saga Petroleum AS & Co. 25%; and Basic Resources International S.A. 50%. The group has conducted exploratory drilling on the 374,499-ha. concession area for the last several years, essentially as a petroleum contractor to Weissenberg. In the course of the transfer, contract conditions were renegotiated, to include a 51%/49% production-sharing arrangement. The group still operates under the provisions of the "old" Petroleum Code (Decree 345, 1955) and its Regulations (Decree 445, 1955). No additional contracts will be allowed under this legislation.

Dècree Law 62-74, the petroleum law governing production sharing, which was published in June 1974, was replaced in December 1975 by Decree 96-75. This was done to overcome certain inconsistencies and limitations in the former leg-

islation which were considered inconvenient for the interest of the government. Principal highlights of Decree 96-75 are as follows:

1. The government will receive at least 55% of the hydrocarbons produced, and its share will increase in relation to the volume produced.

2. The share to the government will include taxes paid by the contractor on income.

3. The duration of the contract for petroleum operations shall not exceed 25 years, and the area assigned to each contractor shall not exceed 200,000 ha.

4. Fifty percent of the contract acreage must be relinquished by the end of the fifth year.

5. Hydrocarbons considered to be the remuneration of the contractor are subject to an undefined export tax.

6. A one-million-Quetzal (\$1 million) signature bonus will be required.

The contract areas corresponding to the new law have not yet been defined, nor have regulations or model service contracts been established to implement this legislation. Thus, at the conclusion of nearly 4 years of work toward establishing service contracts, year end 1975 saw the government still frustrated in its attempt to provide foreign companies now interested in exploring in the country with the completed mechanism for doing so. At the end of 1975 a mixture of more than 30 independents and majors was on record as having filed on various of the fourteen, 200,000-ha. blocks which earlier were defined in conjunction with the Decree Law 62-75 legislation (see Fig. 13).

#### FRENCH GUIANA (Fig. 14)

One new-field wildcat, Sinnamary-1 operated by Elf/ERAP, offshore at long. 53°22'47"W, lat. 6°22'49"N, was abandoned May 21, 1975, at TD 2,104 m in basement rock.

No other exploration activity was reported.

#### GUYANA (Fig. 15; Table 55)

Offshore exploratory drilling continued to be disappointing in 1975, with 3 new-field wildcats abandoned. Total wildcat footage drilled was 25,227 (7,689 m). Shell drilled 2 tests, Abary-1 and Mahaica-2, and Deminex drilled Essequibo-1.

OXOCO and COMORO relinquished their concessions without drilling.

#### HAITI (Fig. 11)

By Petroconsultants S.A., Geneva, Switzerland

Under terms of an option to earn an interest in the Wendell Phillips permit, Weeks Natural Resources carried out a 2-week seismic survey in

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mum basis required withdrew when a government commission was preparing to negotiate.

The government has been reported to be preparing a second call for bids, but no further information on this matter is available.

The Government of El Salvador will receive technical assistance from ARPEL (Asistencia Reciproca Petrolera -Estatad Latinoamericana) and from Colombian ECOPEL for an evaluation of the country's offshore potential.

#### SURINAM (Fig. 14)

Elf-SURINAM drilled 1 new-field wildcat, N. Corone-1, offshore at long. 55°24'01" W, lat. 7° 19'16" N, which was abandoned November 12, 1975, in Lower Cretaceous sedimentary rocks at TD 5,406 m.

Elf-Shell-Euratrep reduced their holdings in January 1975 by 12,890 sq km retaining 57,490 sq km.

#### TRINIDAD AND TOBAGO (Fig. 22; Tables 63-69)

By Ministry of Petroleum and Mines, Port of Spain

##### Crude Oil Production

Crude oil production in 1975 continued to rise, in spite of set-backs caused by industrial unrest during March and April. Offshore production strengthened by Amoco's prolific East Coast fields continued to dominate the oil producing scene, and accounted for almost 60% of all oil produced in the country.

An average of 215,400 BOPD was produced during the year, the first time in Trinidad's oil-producing history that the 200,000-BOPD level consistently was maintained. Production for the year was 78,620,938 bbl, which was an increase of 15% over last year's figures. It is significant that the daily production per producing well averaged 78 bbl in 1975 as compared to 57 bbl 2 years ago.

As was expected, Amoco Trinidad Oil Co. continued to be the country's leading producer and averaged 124,675 b/d for the year, which was an increase of 54% on its output of last year.

Amoco was the only company in the country to increase its production during the year. The average marine well in Trinidad produced 492 BOPD, whereas the average Amoco well—whose producers are all marine—produced 2,011 BOPD. These figures illustrate the major contribution of the Amoco fields.

Trinidad Northern Areas Ltd. daily production fell by 4,100 bbl to 47,930 bbl. This is the first time since 1966 that TNA's production has fallen below 50,000 BOPD. Production by this marine producing company was affected by industrial unrest early in the year and a fire which put a

production platform out of action, and even at year end production did not reach the level attained in the first 2 months of the year. It is expected that with increased drilling activity in 1976 production again should top the 50,000-BOPD mark.

As Table 68 shows, the land producers fared no better in 1975 than they did in the previous year for all declined in production. The crippling effect of industrial action, which it is estimated accounted for a loss in excess of 2,000,000 bbl of crude over 2 months, counteracted to some extent the large increase in production in the East Coast marine fields.

The steady decline in the production of Trinidad-Tesoro Petroleum Co. Ltd. which began in mid-1974 continued throughout 1975, and was aggravated by industrial unrest, and a fire at the company's Trintes platform off Point Galeota. The company produced oil at an average daily rate of 17,808 bbl, which was 18% less than its producing rate during the previous year.

Although Texaco Trinidad Inc. continued their development drilling and secondary recovery program its production fell by an alarming 26% from the 1974 figures, and the company produced oil at an average rate of 18,535 b/d. This great drop in production was despite the fact that the company's production was boosted by 650 b/d from Tricentrol Ltd. whose assets were acquired by Texaco on January 1, 1975.

##### Drilling

The performance of the drilling sector of the industry also was affected adversely by industrial unrest in the country during March and April. Cumulative footage drilled in 1975 fell short of the previous year's figure by 8%. Of the 839,649 ft (255,913 m) drilled in 1975, 81% was achieved as a result of the drilling of development wells (Table 65). During the year the number of rigs operating was slightly more than in 1974, however, as 145.5 rig-months were achieved compared with 142.5 in the previous year. Table 64 gives a summary of wells completed in 1975.

The tempo of offshore drilling activity was stepped up in 1975 when 477,195 ft (145,442 m), that is, 57% of total footage, was drilled for the year. This figure was 53% more than the offshore footage drilled in 1974. An average of 9 rigs operated in offshore areas during 1975 as compared with 7 during the previous year.

*Development*—Development drilling was reduced in the early part of the year and, as a result, 155 successful development wells were completed in 1975 as compared with 186 during the year before. Development footage drilled in 1975 was

# Oil and Gas Developments in South America, Central America, Caribbean Area, and Mexico in 1988<sup>1</sup>

W. DAVID WIMAN<sup>2</sup>

## ABSTRACT

Exploration activity in South America, Central America, the Caribbean area, and Mexico in 1988 showed an increase from the low levels reported in 1987. Increases in seismic acquisition occurred in Brazil, Chile, Colombia, Costa Rica, Ecuador, Honduras, Mexico, and Trinidad. Exploratory drilling increased in most major producing countries and, in contrast to 1987, so did development drilling activity. Ecuador had the largest increases in production of both oil and gas, resulting from operating the Trans-Ecuadorian pipeline for 12 months in 1988 compared to 7 months in 1987, when 2 major earthquakes destroyed the line. Suriname increased its oil production by 55%, and Argentina had a 16% increase in gas production. Noteworthy discoveries were made in Argentina (Estancia Vieja X-1, La Reina X-1, and La Maggie X-1), Bolivia (Sirari X-2 and Vibora X-1), Brazil (1-PRS-4 and 1-RJS-409), Chile (Skua XE-4 and Kimiri Aike Sur-2), Colombia (Quilili-1, Quillacinga-1, Pompeya-1, Chaparrito-1, Palmarito-1, Tierrablanca-1, Guarilaque-1, Santiago Este-1, Jiba-1, Guahibos-1, Guarimena-1, Quimbaya-1, and Balcon-1), Ecuador (Mono-1, Frontera-1, Cantagallo-1, Daime-1, Ginta-1, and Indillana-1), Mexico (Chipilin-1), Peru (Jibaro-IX), and Venezuela (Pato Este, El Carito, Carito Norte-1, Tejero-IX, Furrial Norte-1, Cueta-3728, Cueta-3729, and Cueta-3732).

The highlights of 1988 were in Argentina (Estancia Vieja X-1 and La Reina X-1), Bolivia (Vibora X-1), Colombia's Llanos basin (Chaparrito-1, Palmarito-1, Jiba-1, Pompeya-1, Tierra Blanca-1, and Guahibos-1), and Upper Magdalena basin (Quimbaya-1 and Toldado-2), Ecuador (Frontera-1, Cantagallo-1, Daime-1, and Indillana-1), and Venezuela's Monagas state (El Carito, Carito Norte-1, Tejero-IX, and Furrial Norte-1).

## INTRODUCTION

Petroleum development in 20 countries are reported for 1988. Drilling activity for 15 countries is summarized in Table 1. Oil and gas production is listed in Tables 2, 7, and 12. Argentina, Bolivia, Ecuador, Guatemala, and Suriname reported increased oil production; Argentina, Barbados, Bolivia, Brazil, Ecuador, and Trinidad-Tobago showed increased gas production. Tables 3-12 list significant tests and exploration activities for which data are available.

### ARGENTINA (Figure 1; Tables 5-7)

By Edward E. Miller, Triton Argentina Inc., Buenos Aires

Since the implementation in mid 1985 of Argentina's new exploration policy (commonly called the Houston Plan), 24 contract areas totaling 150,545 km<sup>2</sup> have been awarded to private industry. Twelve contract areas were accepted by YPF (the national oil company) and approved by the Argentine government during 1988. The 12 blocks signed in 1988 were offered in the third round of the Houston Plan along with 18 blocks in October 1987. Offers were submitted on 24 blocks of which 11 were pending at year end.

In 1988, 102 exploration wells were drilled in Argentina with a meterage of 218,153 m. These figures are slightly higher than 1987 levels; however, when compared to Argentina's 1984 all-time high of 126 wells and 360,049 m, they are considerably lower.

New oil and gas fields were discovered by YPF, Occidental, Bidas, Cadipsa, and Total. The most significant discoveries were made in the Neuquen, Noroeste, and Austral (Magallanes) basins.

Occidental's Estancia Vieja X-1 well in the Rio Negro Norte block of the Neuquen basin tested a combined flow rate of 501 m<sup>3</sup>/day (3,151 b/d) of oil predominantly from the Punta Rosada and Catriel Formations. The discovery was significant in that it established the Punta Rosada as a new productive interval and additionally established production on the extreme eastern limit of the Neuquen basin previously believed nonproductive.

YPF had two significant discoveries in 1988: the La Reina X-1 well in the Noroeste basin tested 368 m<sup>3</sup>/day (2,315 b/d) of oil from the Palmar Largo Formation (Cretaceous weathered volcanics), and the Estancia La Maggie X-1 in the Austral basin tested 187.2 m<sup>3</sup>/day (1,177 b/d) of oil, indicating that the Springhill Formation continues to be the significant oil and gas reservoir in the basin.

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**South America, Central America, Caribbean Area, and Mexico / W. David Wiman**

**MEXICO**

Data from Petroconsultants S.A., Geneva, Switzerland

No private rights exist in Mexico. All exploration and development activity is conducted by Pemex, the state oil company.

Exploration activity, including geologic, gravity, magnetic, geochemical, and VSP surveys, decreased 25% to 1,132 party-months in 1988.

Exploratory drilling was up 22% in 1988 with 33 wells drilled; however, meterage decreased 28% to 131,000 m.

Significant discoveries were Chipilin-1, in the Mesozoic area of Chiapas-Tabasco, which produced 4,510 BOPD from the upper Jurassic, and Reynosa-1145, in the Frontera Norte district, which tested 2,155 MCFGD.

Development drilling was up 46% with 111 wells completed in 1988. Meterage was up 9% to 333,305 m in 1988.

Oil production averaged 2,506,642 BOPD, down 1.3% from 1987; gas output was 3,478.3 MMCFGD, down 0.6%; natural gas liquids were up 8% to 364,000 b/d; and condensate production was 76,299 b/d, up 0.7% from 1987.

Proven reserves decreased 2% to 67.6 billion bbl of oil equivalent. Reserves are broken down as follows: oil, 46,191 million bbl; condensate, 6,821 million bbl; and natural gas liquids, 14,588 million bbl. Gas reserves were reported to be 73.4 tcf, with 85% being associated gas.

**PANAMA**

Data from Petroconsultants S.A., Geneva, Switzerland

Four license blocks (1 onshore and 3 offshore) totaling 10,968 km<sup>2</sup> were in force at year end.

In 1988, approximately 900 line-km of marine seismic data were recorded, adding to the 1400 line-km recorded in late 1987 in the Gulf of Panama. No drilling occurred in 1988.

**PARAGUAY**

Data from Petroconsultants S.A., Geneva, Switzerland

Nine contracts totaling 221,601 km<sup>2</sup> were held by 7 companies at year end compared to 10 contracts covering 211,929 km<sup>2</sup> (revised) in 1987.

Exploration activity was down from 1987, with 2 groups recording 1,015 line-km of seismic data along with gravity recording. This compares to the 2,750 line-km of seismic data acquired in 1987. The Nazareth-1 wildcat was abandoned in January by Occidental in the Pirity subbasin.

**PERU**

Data from Petroconsultants S.A., Geneva, Switzerland

At year end, 187,616 km<sup>2</sup> were held by PetroPeru and Petromar (both state oil companies), and Occidental. Shell relinquished its blocks in the Madre de Dios basin

and in the Ucayali basin, where it discovered the giant San Martin and Cashiriari gas and condensate fields.

Exploration activity decreased in 1988 with the acquisition of 981 line-km of seismic data and 376.5 line-km of gravity.

Exploratory drilling was also down with 7 wells spudded drilling 21,062 m, down 42% from 1987. Occidental's outpost, Jibaro-IX, tested 1,008 b/d of heavy crude from the Vivian Formation and was completed. Occidental also spudded its first wildcat in the Ucayali basin: La Copa-1. Development drilling also decreased 21% to 110 wells drilling 186,425 m (down 28% from 1987).

Production decreased 14% in 1988 to 143,114 BOPD. Peru's total production for 1988 was 52,379,830 bbl of oil and 49.9 mmcf of gas.

**SURINAME**

Data from Petroconsultants S.A., Geneva, Switzerland

A 12,000-km<sup>2</sup> offshore exploration option was held by International Petroleum Exploration, which had until April 30, 1989, to form a group and negotiate a production-sharing contract with Stratsolie (the state oil company). Stratsolie has an 80-km<sup>2</sup> production lease onshore, where it continued developing and extending the Tambaredjo heavy oil field.

No exploration activity was reported during 1988.

Exploration drilling was up 22% with 11 wells drilled in 1988. Development drilling was up 77% to 46 wells drilled resulting in 27 oil completions.

Production from Tambaredjo field averaged 3,390 BOPD, up 56% from 1987.

**TRINIDAD AND TOBAGO**

Data from Petroconsultants S.A., Geneva, Switzerland

Total area under concessions in 1988 was 13,657 km<sup>2</sup>, up 8.7% from 1987.

Exploration activity resumed in 1988 after a lull in 1987, with 3,820 line-km of marine seismic and 83 line-km of land seismic acquired.

Exploratory drilling remained at a similar level to 1987 with 6 wells completed resulting in 3 oil discoveries. Trintoc and Trintopec (both state oil companies) were active onshore, and Amoco and TNA were active offshore. Exploration meterage was 12,193 m, up 8% from 1987. Development drilling was down 1% to 136 wells completed; however, meterage was up 9% to 193,900 m.

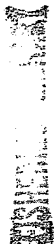
Production was up 4% to 55,180,000 bbl from the 1987 revised figure of 53,255,000 bbl. Amoco contributed 46.5%, TNA 25.4%, Trintopec 14.4%, Trintoc 13.2%, and Premier 0.5%. Natural gas production averaged 763.07 MMCFGD, up 2.9% from 1987.

**VENEZUELA**

Data from Petroconsultants S.A., Geneva, Switzerland

No foreign rightholders exist in Venezuela. The state oil company, Petroleos de Venezuela S.A. (PDVSA), controls 3 operating companies: Corpoven, Lagoven,





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WESTERN CENTRAL ATLANTIC FISHERY COMMISSION

National reports and selected papers presented at the Third Workshop on the  
BIOLOGICAL AND ECONOMIC MODELLING  
OF THE SHRIMP RESOURCES OF THE GUYANA-BRAZIL SHELF

Paramaribo, Suriname, 22-25 June 1992

Food and Agriculture Organization of the United Nations  
Rome 1995

**PREPARATION OF THIS DOCUMENT**

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The preparation of the report work was accomplished under the guidance and supervision of Mr. Pierre Charlier (BADC / Fisheries Department of Suriname) and of FAO/WECAFC.

The bibliographies appended to the technical papers have not been checked for accuracy, but have been edited to follow the FAO Fisheries Department format.

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Fisheries Department of Suriname. Western Central Atlantic Fishery Commission. National report and selected papers presented at the Third Workshop on the Biological and Economic Modelling of the Shrimp Resources of the Guyana-Brazil Shelf. Paramaribo, Suriname. 22-25 June 1992. *FAO Fisheries Report*. No. 526 Supplement, Rome, FAO. 1995. 200p.

**ABSTRACT**

This publication assembles the national reports and technical papers presented at the Third Workshop on the Biological and Economic Modelling of the Shrimp Resources of the Guyana-Brazil Shelf, Paramaribo, Suriname, 22-25 June 1992.

The papers are included in the language in which they were presented.

Nine papers are included dealing with the shrimp fishery of the region; six national reports, and three papers on escape panels, the artisanal shrimp fishery of the northern coast of Venezuela, and a review of the shrimp fisheries and resources of the Guyana-Brazil continental shelf.

- (i) Gradually reduce the prawn fleet to 100 vessels;
- (ii) License trawlers in keeping with their fishing activity (prawns, seabob/finfish, fin fish);
- (iii) Implement an annual closed season from November of one year to January of the other;
- (iv) Protect the nursery areas by restricting fishing vessels from operating 18 fathoms and shorewards.

In addition to management initiatives directed at the industrial/trawl fishery to conserve the shrimp resources, attention was also directed at the use of the chinese seines which destroy large quantities of juvenile fish and crustaceans.

Of the four initiatives to manage the shrimp resources only (i) and (ii) have been accepted by the policy makers. As such prawns catching trawlers are now below the 100 limit. Trawlers are now classified in terms of prawns, seabob/fin fish and fin fish with the seabob/fin fish level being set at 34 vessels. However, vessels do not always adhere to their classifications due to the seasonality of shrimping/fishing activities and the fact that they all use basically the same type of vessel and trawl gear.

In the case of the application of a closed season it was felt that enough information was not available to justify the period selected. Also, the enforcement of such mechanism was felt to be beyond the existing capacity of the Coast Guard.

In the case of restricting the area of operation of the trawlers to protect the nursery grounds, this is still being debated with the industry. There is a situation where trawlers that have been taken out of catching prawns and are now catching seabob and/or fin fish which required them to fish closer in shore.

In the case of the chinese seine, the initiative to regulate their use may become a socio-economic issue as large numbers of artisanal fishermen all along the coast use the chinese seine. One idea may be to keep this operation at present level by means of more rigid licensing requirements and diversion of credit opportunities to other gear types.

## NATIONAL REPORT OF SURINAME

by  
P. Charlier<sup>1</sup>, L. Samson-Pawironadi<sup>1</sup> and Y. Babb-Echteld<sup>1</sup>

### I. PRESENT SITUATION OF THE SHRIMP INDUSTRY

#### I.A. FISHING ACTIVITIES

##### 1. The fishing grounds

Suriname has proclaimed a 200-miles Exclusive Economic Zone (EEZ) in 1978. Shrimp is exploited over the entire zone in the depth range from about 20 to 90 meters. The fishermen recognize the following main fishing grounds (see figure 1):

- the "Western grounds", between 40 and 90 meters in the western part of the EEZ;
- the "Middle grounds", between 25 and 40 meters off the central part of Suriname;
- the "Puw patch", between 30 and 80 meters in the eastern part of the EEZ.

Depth is very important for the distribution of shrimp, and a distinction is usually made between "deep fishing grounds" (more than 50 meters depth) and "shallow fishing grounds" (less than 50 meters depth). The EEZ is divided in six longitudinal zones, each corresponding to 30' longitude, as shown in figure 1. The areas by depth and longitudinal zone have been estimated, based on the marine charts.

Table 1: Area of fishing grounds by depth and longitudinal zones (km<sup>2</sup>).

LONGITUDE (°)	I	II	III	IV	V	VI	TOTAL
DEPTH ZONE (m)	56.30-57.00	56.00-56.30	55.40-56.00	55.00-55.30	54.30-55.00	54.00-54.30	
10-20	494	487	355	626	610	943	3,515
20-30	2,264	2,125	1,761	1,190	749	2,186	10,275
30-40	2,349	2,372	1,452	1,236	1,159	1,754	10,322
40-50	494	881	1,360	1,553	1,337	2,240	7,865
50-60	695	888	641	904	966	943	5,037
60-70	286	394	448	487	633	1,190	3,438
70-80	433	533	402	417	533	711	3,029
80-90		564	657	572	309	199	4,698
90-100	85	216	195	247	425	502	1,668

<sup>1</sup> Fisheries Department, Ministry of Agriculture, Livestock and Fisheries.

Bottom is muddy in the shallower parts and sandy in the deeper grounds. Area by type of bottom has not been estimated.

According to fishermen, the deeper grounds are exploited at night, shallower grounds are generally fished by day. Fishing in shallow waters is more intensive in the second half of the year, with a maximum in July-August, and there is more fishing in deep water in the first half, with a maximum in February-March.

2. The fleet

The shrimp trawler fleet was owned, in 1991, by 23 fishing companies, listed in the following table. The fleet can be divided into:

- a Japanese fleet: 2 companies operating under Japanese flag;
- a Korean fleet: hoist a number of different flags;
- a Surinamese fleet: the SUGAM. Most boats belonging to this company are either rented, operated and/or manned by Korean companies, so that the strategy of this fleet is comparable to the Korean fleet.

Table 2. List of fishing companies and average characteristics of the vessels in 1991.

Landline at SAIL	# BOATS	AVERAGE HP	AVERAGE LENGTH (m)	FLAG	# NETS
Dong Ince	8	425	20.88	Korea	4
Marine Enterprises	7	425	20.79	"	4
Scoyang	7	365	20.42	"	4
Woojin	6	385	20.59	"	4
Young Jin	5	365	20.65	"	4
Bogo Fisheries	2	425	20.36	"	4
Jin Min	3	385	20.03	Vanuatu	4
Atlantic Star	1	365	19.63	"	4
Atlanta Shrimp Company	1	365	19.65	"	4
Kaya Fisheries	3	375	20.55	Korea	4
Mons Fisheries	4	395	20.25	"	4
Sung Ha Fisheries	5	365	19.63	Panama	4
Se Won	3	425	20.42	Korea	4
Se Woo	4	375	20.42	"	4
Sugam	17	418	19.21	Suriname	4 & 2
Sils Trading	11	425	20.88	Korea	4
Landline at SUJAEI					
Hakodate Kohai	16	383	19.79	Japan	4
Nishin Maru	18	474	21.95	Japan	4
Dong Jo	2	365	20.65	Korea	4
June enterprise	6	425	19.92	Vanuatu	4
Dong Nam	2	425	20.87	Korea	4
Estemar	1	425	19.95	Honduras	4
Woolli	6	276	20.07	Honduras & Japan	4
Other landline offices					
Caribbean Seafoods	1	1,250	34.98	Curaçao	
Sedhoe	1	430	21.90	Spain	
Wobolt	1	330	21.88	Suriname	
Jahafish	1	425	22.86	U.S.A.	

All companies use the same type of boat, the traditional double-rigged "Florida" or "Gulf of Mexico" trawler type. Differences exist in the gear (number of nets), the engine power, the age of the fleets. A study of their respective fishing power has not been carried out yet.

The number of trawlers with a fishing license, over the last 5 years, is shown in table 3, for each company.

Table 3. Number of registered trawlers (shrimp, fin-fish) by year.

	1987	1988	1989	1990	1991
<b>Shrimp trawlers landline at SAIL</b>					
Scoyang	8	8	7	7	7
Sea Fisheries	10	10	7	-	-
Woo Jin	7	7	7	7	7
Atlanta Shrimp Company	1	1	1	1	1
Atlantic Star	1	1	1	1	1
Shandong Fisheries	3	3	3	-	-
Jin Min	3	3	3	3	3
Marine Enterprises	10	7	7	7	7
Jinam	9	7	7	5	-
Sils Trading	20	20	20	10	11
Sugam	14	13	-	14	14
Wobolt	2	2	2	2	2
Young Jin	-	5	5	5	5
Koosic	-	3	3	-	-
Alons Fisheries	-	2	2	4	4
Kaya Fisheries	-	-	3	3	3
Dong Hee	-	-	-	8	8
Se Woo	-	-	-	7	4
Bogo Fisheries	-	-	-	3	2
Sung Ha Fisheries	-	-	-	4	1
Se Won	-	-	-	-	5
Total	88	92	78	87	87
<b>Shrimp trawlers landline at SUJAEI</b>					
Nishin Gyogyo	23	23	20	20	18
Hakodate Kohai	13	13	13	15	16
Dong Jo	5	5	5	3	3
June	6	6	6	6	6
Dong Nam	2	2	2	2	2
Estemar	-	-	4	4	1
Woolli	-	-	-	3	6
Total	49	49	53	53	53
<b>Fin-fish trawlers</b>					
Sugam	1	1	1	2	5
ASW	-	-	1	-	-
Wobolt	-	-	1	1	1
STVI	-	-	-	1	-
Sulfico	-	-	1	1	-
Total	1	2	4	5	6

3. The fishing strategies

The strategies of the two main components of the fleet (Japanese and Korean) are fundamentally different. The Japanese companies specialize in the exploitation of the deeper grounds, targeting the species *Penaeus brasiliensis*. Fishing is almost exclusively done at night. During a particular season, around July-August, these vessels fish day and night, switching between shallower and

deeper grounds. The Korean fleet, as well as the trawlers operating under the Suriname flag, exploit more the shallower fishing grounds. There is a great deal of overlapping between the fishing grounds exploited by both fleets, however.

Trawlers of both fleets carry out long trips of 50 to 100 days. The average was 68 days at sea per trip for the Korean vessels (SAIL, 1991), and somewhat lower for the Japanese vessels. The Japanese vessels make two hauls of 5½ hours in a night. According to Korean fishermen, hauls are shorter during the day (4 hours).

#### 4. The discards

Fishermen claim that they are not discarding any shrimp. There are indications, however, that small shrimp is discarded when it forms a large part of the catch. This is a consequence of a policy of the processing industry (SAIL) not to accept landings with more than a given percentage of small shrimp. It is believed that discarded penaeid shrimp, are mainly small *Penaeus subtilis*. Sea-bob is systematically discarded.

It is believed that the largest part of the fish by-catch is generally discarded, except for the larger specimens of a few species. Towards the end of the trip, the boats interested in fin-fish make a few hauls especially for fish. The bulk of the fin-fish landed by shrimp trawlers seems to be in fact caught during the last few days of the trip (and is no real by-catch).

#### 5. Artisanal fishery

There is no artisanal fishery targeting *Penaeus* species. Small-scale fishermen use funnel nets, or "fyke-nets" (locally called "fuknet") in the tidal zones and in estuaries to catch smaller shrimp species (sea-bob and white-belly). In certain seasons their catch includes small amounts of juvenile *Penaeus subtilis*.

Besides this incidental catch, *P. subtilis* is occasionally caught by hand-seines in brackish-water lagoons between May and July, in certain years.

### II.B. PROCESSING ACTIVITIES

#### 1. Industrial shrimp processing

Almost the totality of the shrimp caught by trawlers is processed at the two main plants:

S.A.I.L. (Suriname American Industries Limited) has been founded in 1957 with US capital. It was bought up by the Suriname State in 1985.

SUJAFI (Suriname Japanese Fisheries) was created in 1973, and is in hands of Japanese (49%) and Surinamese (51%) private capital.

Their respective share of the shrimp volumes is approximately 60% for SAIL and 40% for SUJAFI. The SAIL is diversifying her operations since 1986 and is currently processing some 1,000 tons a year of fin-fish. Sea-bob is not used by the industry.

Table 4: Production by processing plant in 1991.

SAIL		
Shrimp (head-off weight)	1,691,050 kgs	
Fin-fish	1,092,894 kgs	
SUJAFI		
Shrimp (head-off weight)	512,792 kgs	
Korean fleet	624,393 kgs	
Japanese fleet		

Each fishing company is under contract with one of the processing companies and delivers exclusively there. Currently 7 companies, of which 2 Japanese and 5 Korean deliver to SUJAFI, and 16 companies, of which 15 Korean (different flags) and 1 Surinamese are bound by contract to SAIL. The total number of vessels landing at SAIL is 87 and 52 for SUJAFI.

The two processing companies operate in a different way. SAIL buys all the shrimp landed, processes it and markets it for her own account. SUJAFI only sells her services (processing and storage of the head off shrimp, storage only for the head on shrimp). The Japanese fishing companies export under their own brands.

The shrimp delivered at SAIL have been headed on board. The processing on-shore includes thawing, grading (grading machine) into counts/pound commercial categories, and freezing in two kg boxes (in a block of ice). The commercial size categories are shown in table 18. The shrimp, graded by size, is also classified into several quality categories.

Species are generally not sorted. When the catch includes an important proportion of *Penaeus schmitti* is landed, however, this species is packed and marketed separately.

SAIL has been processing a part of her production head-on (for the European Market) in the years 1989 to 1990. The proportion always remained modest (around 50 tons whole weight, annually).

At SUJAFI a distinction needs to be made between the Korean vessels, which deliver the entire production head-off, and the Japanese vessels, which process the major part of the catch on board. Processing of head-off shrimp (totality of the Korean landings and part of the production by Japanese vessels) on shore is similar to this of SAIL, except that small shrimp is classified into different secondary categories (see table 18). Processing on board Japanese vessels includes the grading of shrimp (head-on) manually, and freezing in boxes of 2 kgs (in a block of ice). The product is delivered at Sujaifi packed and ready for export. It is stored at Sujaifi till the next shipment. The proportion head-on/head-off in the production of the Japanese fleet varies around 70%/30%.

## 2. Processing of the artisanal shrimp catch

The artisanal shrimp production (sea-bob, white-belly) is marketed locally, in fresh or dried condition. No part of it is sold to the processing factories. Juvenile *Penaeus subtilis* caught in the lagoons is sold fresh, and is salted and dried when catch is abundant.

## II.C. MARKETING ACTIVITIES

Both processing companies sell a part of the production locally (table 5). The local sales by SAIL includes mainly lower quality products (classified as "picked out"). Volumes remain relatively modest: 200 to 400 tons a year for SAIL, less than 100 tons for SUJAFI.

Table 5: Local shrimp and fin-fish sales by the shrimp processing companies.

	1987	1988	1989	1990	1991
<b>SAIL</b>					
shrimp amounts (tons)	304	397	138	261	349
shrimp value (1000 SF)	8,594	7,465	5,593	16,207	15,860
fish amounts (tons)	-	-	-	930	931
fish value (1,000 SF)	-	-	-	3,239	4,029
<b>SUJAFI</b>					
shrimp amounts (tons)	36	70	82	80	130
shrimp value (1,000 SF)	1,348	2,932	4,628	4,305	7,730

The bulk of the shrimp production is exported. Table 6 shows the volumes exported, from each of the processing plants, in the last years. The export values are calculated from price information by category of size and quality, provided by SAIL.

Table 6: Shrimp exports.

	1987	1988	1989	1990	1991
<b>SAIL</b>					
Amounts (tons, head-off weight)	2,098	1,664	1,294	1,446	1,200
Value (1,000 US\$)	27,905	21,696	20,585	20,196	17,604
<b>SUJAFI</b>					
Amounts of : Shrimp head-off (tons)	700	483	231	373	397
Shrimp head-on (tons, head-off weight)	338	308	262	557	418

The main destination is Japan. The exports towards the European have been increasing in the last years, but remain largely below the Japanese share. Only small amounts are marketed on the Caribbean market (see figure 2).

Table 7: Shrimp exports by destination in 1991.

	COUNTRY OF DESTINATION	QUANTITY (Cbd)	VALUE (US \$)
<b>SAIL</b>	Curacao	4,000	47,803
	Japan	1,029,896	14,765,789
	France	257,420	2,795,289
	<b>Total</b>	<b>1,291,316</b>	<b>17,606,881</b>
<b>SUJAFI</b>	Japan	100%	

## II. RESULTS OF THE EXPLOITATION

### II.A. EFFORT

The data available on effort include the number of boats licensed, the number of trips (deliveries) and the number of days at sea. The number of days at sea is currently obtained only for the vessels landing at SAIL. More accurate effort units, like the number of hauls or of trawling hours could be extracted from the logbooks. This is not done currently, mostly by lack of manpower.

Standardization of the effort data has not been carried out yet.

Table 8: Annual effort by fleet.

YEAR	SAIL	NUMBER OF DELIVERIES		TOTAL	NUMBER OF DAYS AT SEA	SAIL
		SUJAFI				
		Korean	Japanese			
1977	610	145	248	894	22,245	
1978	506	53	231	795	23,646	
1979	577	57	230	724	20,673	
1980	397	128	209	971	23,415	
1981	581	125	265	1,063	26,227	
1982	584	226	253	1,063	27,273	
1983	474	281	199	954	24,813	
1984	485	291	182	958	21,797	
1985	384	122	208	714	18,179	
1986	388	49	215	652		
1987	410	81	178	669		
1988	425	113	167	705		
1989	420	103	223	746		
1990	381	104	227	712		
1991	268	110	233	611		

Tables 9 and 10 show the average pattern of effort from January to December. The level of effort does not vary much from month to month. There is a slight peak in April-May (usually the best yields), and a minimum in September-October (maintenance work is generally carried out in that season of lower yields). There is also an apparent higher level of effort in January than in December, due to closure of the processing plants during the end of the year.



Table 9: Average pattern of the distribution of effort (# deliveries) over the year.

MONTH	AVERAGE 1987-1991											
	SAIL	SUJAFI		TOTAL	SAIL	SUJAFI		TOTAL	SAIL	SUJAFI		TOTAL
		Korean	Japanese			Korean	Japanese			Korean	Japanese	
January	37.6	7.2	20.8	65.6	33	9	24	66	35	4	8	28
February	28.4	8.0	17.4	53.8	16	4	8	28	16	4	8	28
March	30.4	8.6	18.6	57.6	19	12	23	54	12	23	35	54
April	32.8	8.6	18.6	60.0	23	11	19	53	11	19	27	53
May	36.2	10.4	16.0	62.6	27	18	27	72	18	27	45	72
June	32.6	9.2	16.0	57.8	23	9	13	45	9	13	22	45
July	33.6	7.8	16.8	58.2	23	12	22	59	12	22	42	59
August	29.0	9.0	17.2	55.2	23	6	20	49	6	20	26	49
September	29.6	7.8	14.2	51.6	18	5	19	42	5	19	24	42
October	32.8	9.4	13.4	55.6	24	8	10	42	8	10	22	42
November	28.0	8.6	20.2	56.8	22	5	30	57	5	30	37	57
December	29.8	7.6	16.4	53.8	15	11	18	44	11	18	29	44

The geographical distribution of effort, by zone and depth, and the seasonal trends (variations in the fishing grounds exploited), have not been investigated. This type of information should be obtained from the logbook system. Although logbooks are requested from all trawlers, these could not be analyzed yet, by lack of manpower.

Table 10: Average pattern of the distribution of effort (# days at sea, SAIL) over the year.

MONTH	1987-1991		1991	
	SAIL	SUJAFI	SAIL	SUJAFI
January	2,531	1,783	2,208	989
February	1,935	1,457	1,530	1,457
March	2,130	1,872	1,614	1,614
April	2,283	1,879	1,659	1,659
May	2,001	1,729	1,370	1,370
June	2,001	1,758	1,165	1,165
July	2,001	1,657	1,584	1,584
August	1,758	1,750	1,080	1,080
September	2,042	1,657		
October	1,657	1,750		
November	1,750	1,080		
December	1,750	1,080		

## I.I.B. CATCH / LANDINGS

Table 11 and figure 3 present the landings of each fleet for the years 1973-1991. All figures are expressed in head-off equivalents (tail weight).

The yearly production shows important variations, with series of good years alternating with series of less favourable ones. The last "maximum" year has been 1987. The landings afterwards reached a minimum in 1989. An increasing trend was observed again in 1990 and 1991.

Table 11: Total landings by year and by fleet (in kgs of tails).

YEAR	HEAD OFF LANDINGS				TOTAL (head-off + head-on)
	SAIL	SUJAFI		Total	
		Korean	Japanese		
1973	1,581,211				1,591,000
1974	1,425,290				2,022,000
1975	2,166,278				3,167,000
1976	2,771,022				3,781,618
1977	2,750,876	383,942	570,106	3,613,588	168,030
1978	1,915,595	150,676	496,350	2,562,521	280,273
1979	2,424,671	149,340	385,976	2,959,987	3,965,297
1980	1,792,898	546,667	403,160	2,742,725	2,751,043
1981	2,340,816	698,830	514,904	3,554,550	3,070,840
1982	1,645,442	991,264	306,948	2,943,654	3,846,733
1983	1,615,907	1,159,222	151,294	2,926,423	3,627,746
1984	1,475,790	874,262	72,558	2,462,610	3,493,258
1985	2,196,969	391,912	79,706	2,668,587	2,947,700
1986	2,447,690	238,172	313,976	2,999,840	2,432,518
1987	1,893,650	423,198	256,550	2,573,398	3,488,986
1988	1,398,167	313,274	80,930	1,792,371	2,754,883
1989	1,671,362	397,990	67,128	2,136,480	2,173,614
1990	1,691,050	512,792	198,798	2,402,640	2,566,222
1991					2,828,225

The monthly pattern is shown in table 12, based on the averages of the monthly landings during the period 1987-1991. Table 13 gives the monthly landings in the last year.

Table 12: Average pattern of the monthly landings over the year (1987-1991).

MONTH	SAIL	SUJAFI (head-off)		SUJAFI (head-on)	TOTAL
		Korean	Japanese		
		January	205,226		
February	144,897	36,674	17,500	32,954	235,045
March	159,785	35,701	15,602	34,652	245,540
April	162,984	38,210	11,794	37,988	250,926
May	159,819	34,580	9,947	24,902	227,189
June	130,992	28,602	8,920	29,911	197,895
July	138,191	26,186	10,791	29,546	204,713
August	118,674	33,000	9,198	34,534	195,406
September	138,146	28,825	8,554	27,159	201,192
October	171,965	43,235	9,050	27,159	251,407
November	145,662	41,793	14,188	38,334	239,976
December	146,690	32,995	11,196	17,424	208,305

Table 13: Monthly landings in 1991.

MONTH	SAIL	SUJAFI (head-off)		SUJAFI (head-on)	TOTAL
		Korean	Japanese		
		January	188,608		
February	76,878	23,344	7,862	34,488	143,522
March	141,844	57,886	11,940	34,488	240,158
April	157,894	56,880	15,456	34,958	269,198
May	180,703	65,332	18,698	41,125	305,898
June	130,394	19,690	8,708	22,820	181,552
July	122,567	39,158	19,038	42,651	223,414
August	112,549	24,714	16,436	41,590	196,070
September	109,579	23,144	17,832	41,590	307,810
October	193,577	66,356	8,346	39,571	307,810
November	172,552	45,960	33,140	27,903	277,555
December	104,105	57,124	28,438	8,282	197,949

### I.I.C. CATCH PER UNIT OF EFFORT

The best cpue data available for the entire fleet is the landing per delivery. The landing per day at sea is only available for the vessels landing at SAIL.

**Table 14:** Annual catch per unit of effort, per fleet.

YEAR	LANDING (kg tails) PER DELIVERY						LANDING (kg tails) PER DAY AT SEA (SAIL)
	SAIL			SUJAFI			
	SAIL	Korean	Japanese	TOTAL	Korean	Japanese	
1977							
1978	3,142	2,648	3,429	2,960	3,077	3,077	725
1979	4,792	2,843	2,860	2,846	4,071	4,071	641
1980	4,635	2,690	3,494	4,241	3,982	3,982	716
1981	4,029	4,271	3,272	3,272	3,225	3,225	93.8
1982	2,818	4,386	3,127	3,127	3,465	3,465	69.8
1983	3,405	4,127	2,664	2,664	2,078	2,078	58.7
1984	3,126	3,004	2,018	2,018	3,407	3,407	76.7
1985	3,854	3,212	2,696	2,696	5,080	5,080	93.0
1986	5,662	5,970	4,078	4,078	5,215	5,215	81.3
1987	5,970	5,828	3,198	3,198	3,908	3,908	84.2
1988	4,479	3,745	2,563	2,563	2,914	2,914	87.9
1989	3,329	3,041	2,073	2,073	3,664	3,664	84.8
1990	4,587	3,243	2,456	2,456	4,629	4,629	93.0
1991	6,310	4,662	2,880	2,880			

Table 14 gives the average value of each of these cpue units for each component of the trawler fleet between 1977 and 1991. Figure 4 demonstrates that the average landing per day at sea of the vessels landing at SAIL follow the same trend as the average landing per trip (for the whole fleet). The cpue's of all components of the fleet (Korean/SAIL, Korean/SUJAFI, Japanese) also display similar evolution.

In table 15 the average monthly cpue values have been calculated over the last five years. The monthly cpue's for 1991 are also shown (table 16) for comparison. It can be seen that the yields per day as well as per trip tend to be higher from October to March and lower between April and September (figure 5). In 1991 however two maxima are observed, one in April and the second one in October-November.

**Table 15:** Average pattern of CPUE per month (1987-1991).

MONTH	LANDING PER DELIVERY (kg)						LANDING PER DAY AT SEA (SAIL)
	SAIL			SUJAFI			
	SAIL	Korean	Japanese	TOTAL	Korean	Japanese	
January	5,458	4,720	3,301	4,693	81.1	81.3	81.1
February	5,102	4,584	2,901	4,513	81.3	81.3	81.3
March	5,256	4,151	2,691	4,263	82.6	82.6	82.6
April	4,967	4,443	2,616	4,182	76.5	76.5	76.5
May	4,415	3,127	2,178	3,629	70.0	70.0	70.0
June	4,000	3,109	2,427	3,423	69.4	69.4	69.4
July	4,113	3,557	2,401	3,517	69.1	69.1	69.1
August	4,092	3,667	2,543	3,540	68.7	68.7	68.7
September	4,667	3,695	2,410	3,899	78.6	78.6	78.6
October	5,243	4,599	2,702	4,592	84.2	84.2	84.2
November	5,202	4,860	2,600	4,225	87.9	87.9	87.9
December	4,922	4,541	1,745	3,972	84.8	84.8	84.8

**Table 16:** CPUE per month in 1991.

MONTH	LANDING PER DELIVERY (kg)						LANDING PER DAY AT SEA (SAIL)
	SAIL			SUJAFI			
	SAIL	Korean	Japanese	TOTAL	Korean	Japanese	
January	5,715	3,895	2,889	4,439	85.4	85.4	85.4
February	4,805	5,896	5,412	5,126	81.9	81.9	81.9
March	7,465	4,824	2,018	4,558	97.4	97.4	97.4
April	6,867	5,172	2,546	4,966	103.2	103.2	103.2
May	6,693	3,641	2,208	4,248	96.5	96.5	96.5
June	5,669	2,181	2,425	4,034	80.8	80.8	80.8
July	4,903	3,265	2,804	3,787	73.9	73.9	73.9
August	4,885	4,119	2,950	4,001	82.0	82.0	82.0
September	6,088	4,629	3,127	4,575	94.1	94.1	94.1
October	8,064	8,294	4,792	7,329	109.9	109.9	109.9
November	7,843	8,792	2,085	4,869	111.0	111.0	111.0
December	6,840	5,193	2,640	4,499	99.1	99.1	99.1

The general pattern of the geographical distribution of cpue, by zone and depth, is poorly known, since the logbooks are not analyzed. In general terms, it is known that the yields are higher on the deeper grounds in the beginning of the year, where they decrease markedly towards June. The yields in shallower grounds are higher in the second half of the year, corresponding to the recruitment of juvenile *Penaeus subitits*.

Table 17 presents the global parameters of the fishery since 1973, and figure 6 demonstrates the evolution of total landing, total effort and average cpue per year.

**Table 17:** Annual landings, effort and cpue.

YEAR	TOTAL LANDINGS (tons of tails)	TOTAL EFFORT (number of deliveries)	CPUE	
			Landing per delivery	Landing per day at sea (SAIL)
1973	1,791,000			
1974	2,022,000			
1975	3,167,000			
1976	3,791,618			
1977	3,965,297			
1978	2,751,043	894	3,077	
1979	3,228,695	793	4,071	
1980	3,070,840	724	4,241	
1981	3,846,733	971	3,962	
1982	3,427,746	1,065	3,225	
1983	3,303,758	954	3,465	72.6
1984	2,797,610	958	2,879	64.1
1985	2,492,318	714	3,407	71.6
1986	3,311,976	692	5,080	93.8
1987	3,488,866	669	5,215	93.3
1988	2,754,883	705	3,908	69.8
1989	2,173,614	746	2,914	58.7
1990	2,566,222	712	3,604	76.7
1991	2,828,225	611	4,629	93.0

### I.I.D. ARTISANAL FISHERY

No data is collected on the catch, effort, or cpue of *Penaeus shrimp* by artisanal fishermen. It is known that juvenile *Penaeus subitits* is caught in the lagoons in certain years during the months May to July. Amounts, though not recorded, are estimated at maximum 50 tons.

### III. ASSESSMENT OF THE RESOURCES

A comprehensive assessment of the shrimp resource in Suriname has not been achieved until now, by lack of sufficient detailed data. Preliminary analyses have been carried out, using surplus production models and the Thompson and Bell model. The application of surplus production models, with global (all species together) catch and effort data, generally led to the conclusion that the catch would keep increasing as fishing effort was increased, without reaching an discernible maximum. The Maximum Sustainable Yield, and the corresponding level of effort, could therefore not be determined with accuracy. Charlier (1989) made use of the bio-economic model BEAM 1, developed by FAO (Willmann and Garcia, 1985) with updated global data on catch and effort, and the (limited) economic information available. According to this analysis, the Maximum Economic Yield would be reached with a fishing effort of between 75 and 100 trawlers of the current type, for a year with an average level of recruitment.

The Fisheries Department has started the collection of the detailed data necessary for the application of more accurate stock assessment methodologies. These data are based on the information supplied by the processing industry, supplemented by the results of samplings carried out on the landings, at the processing plants.

Table 18: Annual head-off landings per commercial category (tons).

YEAR	SAIL												TOTAL		
	01/0	10/15	16/20	21/25	26/30	31/40	41/50	51/60	61/70	71/85	P/O/L	P/O/M		P/O/S	CULLS
1987	39	224	258	300	385	361	364	224	85	2	59	67	25	56	2,468
1988	25	205	245	251	293	215	147	69	69	0	74	65	35	66	1,904
1989	15	199	271	241	223	145	82	39	11	0	81	56	14	22	1,398
1990	16	169	272	237	271	215	133	107	61	12	63	52	19	44	1,671
1991	8	137	176	196	317	283	209	149	52	1	52	51	27	39	1,691
SUJARI Korea															
1987	5	27	45	47	53	99	72	50	36	13	27	0	0	0	472
1988	6	37	56	45	46	61	45	56	37	21	23	0	0	0	423
1989	4	33	67	52	39	45	22	24	10	2	15	0	0	0	313
1990	3	16	58	39	34	33	23	23	23	2	13	0	0	0	327
1991	5	44	55	54	81	90	74	46	22	7	34	0	0	0	513
SUJARI Japanese (head-on not included)															
1987	5	30	55	54	58	37	3	0	0	0	13	0	0	0	257
1988	1	15	26	17	25	16	3	2	1	0	10	0	0	0	117
1989	0	6	13	10	14	18	6	1	0	0	11	0	0	0	80
1990	0	3	7	8	17	15	6	1	0	0	9	0	0	0	67
1991	1	20	44	34	61	23	2	1	0	0	12	0	0	0	199

#### 1. Distribution of the landings by size categories

The largest part of the landings is processed on shore and graded into the traditional categories (in # tails per pound). The information on the shrimp production in each of these categories is kindly provided by the industry. Table 18 shows the annual results, from 1987 to 1991, for each component of the fleet. The part of the Japanese landings which is processed on board (head-on) is not included in these figures, because the classification used is different.

#### 2. Species and sex composition

As the shrimp species are not separated by the industry, a sampling programme has been initiated in 1985 in order to determine species and sex composition of the landings. Samplings are conducted monthly (ten samples a month) in each commercial category, based on which the composition of each category is calculated. The results are then summed to obtain the global species and sex composition of the landings. Although both processing facilities are covered by the sampling programme, only the results at SAIL have been partly worked out yet.

The species composition (SAIL only) for the year 1987 is given in table 19, and shown in figure 7. The species *Penaeus subtilis* is the most important in the total landings, representing 67% of the total shrimp production. The second species is *P. brasiliensis*, with 31%. *P. schmitti* and *P. notialis* are present in small quantities (about 2%).

The species composition varies markedly with the commercial category, corresponding to differences in sizes of the different species. *P. brasiliensis* makes up most of the large shrimp (categories U-10 to 16/20) and is almost absent from the landings of the small categories. The categories 26/30 and smaller consist mainly of the brown shrimp *P. subtilis*. The 2 less important species (the pink and the white shrimps) are represented in the large categories.

Table 19: Species composition by commercial categories. Landings at SAIL (tons) 1987.

	<i>P. subtilis</i>		<i>P. brasiliensis</i>			<i>P. notialis</i>			<i>P. schmitti</i>		
	F	M	F	M		F	M		F	M	
U 10	2.1	—	34.4	—	—	—	—	—	—	—	—
10-15	22.5	1.3	175.2	4.4	—	2.1	—	—	0.4	—	—
16-20	76.0	3.1	118.0	43.7	—	22.7	—	—	0.1	—	—
21-25	162.8	7.2	55.6	69.0	—	15.4	—	—	2.2	—	—
26-30	225.4	41.1	41.4	72.0	—	0.9	—	—	3.7	—	—
31-40	207.1	102.7	12.3	37.9	—	—	—	—	0.6	—	—
41-50	203.5	130.4	7.7	22.0	—	—	—	—	—	—	—
51-60	114.6	102.4	2.7	4.6	—	—	—	—	—	—	—
61-70	41.4	43.1	0.1	0.4	—	—	—	—	—	—	—
>70	31.1	26.5	0.1	0.2	—	—	—	—	—	—	—
P/O/L	18.5	2.3	28.1	11.1	—	2.0	—	—	0.5	—	—
P/O/M	31.8	12.4	7.7	14.7	—	0.1	—	—	0.1	—	—
P/O/S	14.1	9.4	0.5	1.1	—	—	—	—	—	—	—
Total	1,150.7	481.9	476.8	281.1	—	44.4	—	—	11.6	—	—
%	47.0	19.7	19.5	11.5	—	1.8	—	—	0.5	—	—

#### 3. Length frequency distributions

Length and weight measurements are carried out twice a year. Length frequency distributions are determined for each species/sex in each category, and conversion tables between size categories and tail length are worked out. The number of tails of each length is calculated, and summed across the categories, to obtain the overall length composition of the landings of species/sex, per month.

The average distributions (in number of tails) calculated over the years 1985-1991 for the main components of the landings, *P. subitilis* (♀ and ♂) and *P. brasiliensis* (♀ and ♂) are shown in table 20.

**Table 20:** Length frequency distributions per year, in thousands of tails. (SAIL, average 1985-1991).

TAIL LENGTH (mm)	<i>Penaeus subitilis</i>		<i>Penaeus brasiliensis</i>	
	♀	♂	♀	♂
14-40	0	0	0	0
40-44	1	1	0	0
45-49	22	14	0	0
50-54	176	139	1	2
55-59	903	722	10	24
60-64	3,600	3,049	67	134
65-69	7,040	7,011	200	436
70-74	7,935	8,125	517	830
75-79	8,027	6,016	486	1,082
80-84	8,467	4,301	881	1,849
85-89	7,043	2,556	1,992	3,213
90-94	4,143	822	2,201	3,850
95-99	2,578	370	2,561	2,940
100-104	1,253	111	2,915	1,521
105-109	520	18	2,859	348
110-114	183	8	2,359	67
115-119	47	2	1,208	11
120-124	6	0	397	1
125-129	0	0	91	0
130-134	0	0	10	0
135-139	0	0	0	0

#### 4. Indexes of recruitment

In order to assess and monitor recruitment, several indexes can be selected, based on the amounts of small shrimp present in the landings. The following indexes are proposed:

- cpue (landings per delivery), all fleets together, of the categories 51/60, + 61/70 + ≥ 71 + culls + broken + P/O S.
- cpue (landings per day at sea), SAIL only, of the categories 51/60 + 61/70 + ≥ 71 + culls P/O S.

Table 21 gives the average value per year of these indexes of recruitment from 1983 to 1991 (see also figure 8). It can be appreciated that both indexes follow similar trends. A cyclic evolution is observed, a few years of high recruitment alternating with a few years of low values of the recruitment indexes. The figures presented here are affected by the recruitment of several species, even though the brown shrimp makes up most of the small sizes. It is also possible, however, to calculate recruitment indexes by species (and by sex), for the years covered by the samplings mentioned above.

**Table 21:** Annual recruitment indices.

YEAR	CPUE (51/60 and smaller)	
	per day at sea (GAIL)	per delivery (all fleets)
1983	9.86	479.4
1984	8.92	445.8
1985	7.32	320.8
1986	11.36	524.3
1987	14.95	794.7
1988	11.65	664.0
1989	3.60	200.2
1990	11.12	493.6
1991	14.72	619.4

The average seasonal pattern of recruitment has been calculated over the last five years, using the same indexes computed by month. Table 22 and figure 9 reveal that recruitment takes place year round. A marked difference is observed, however, between the first and the second halves of the year. The months September to December (maximum in October) represent the season of maximum recruitment. No second recruitment period is detected. When the same indexes are computed for a single year, however, a minor recruitment peak may be observed in the course of the first half of the year. In 1991 for example, there was apparently a slight recruitment season in March-May. It must be pointed out that, due to the length of the fishing trips, the real period of recruitment to the fishing grounds is some 60 days ahead of the maxima detected at the level of the processing plant, i.e. between July and September, with possibly a secondary (much lower) season in February-March.

**Table 22:** Seasonal recruitment pattern (cpue 51/60 and smaller).

MONTH	PER DAY AT SEA (GAIL)		PER DELIVERY (all fleets)	
	average 1987-1991	1991	average 1987-1991	1991
January	8.99	14.45	656.5	1,180.8
February	5.27	7.89	483.4	813.1
March	4.31	9.00	356.7	1,298.9
April	5.15	12.90	408.1	1,335.6
May	5.86	11.39	499.8	1,399.3
June	6.57	9.21	411.8	841.0
July	10.95	8.21	606.0	864.9
August	12.32	10.65	740.2	876.7
September	19.78	19.54	932.5	1,627.7
October	20.63	26.66	1,268.0	2,714.5
November	19.93	24.01	1,442.4	2,363.1
December	17.43	22.89	1,294.4	2,606.7

#### 5. Identification of nurseries

Two brackish-water areas have been identified as potentially important for the production of juveniles *P. subitilis*. They are situated between the right bank of the Nickerie river and the sea, and between the right bank of the Commewijne river and the sea shore. The contribution of these areas to the recruitment of *Penaeus* shrimp has not been quantified, but is not believed to explain the total recruitment. Mud banks may play an important role in the early stages of this species. Samplings of juveniles carried out in the lagoons behind the shoreline and in the creeks between the lagoons and the sea have revealed the presence of *P. subitilis* only.

#### 6. Population dynamics

No population parameters have been determined locally yet.

Biometric relationships are currently being established. Preliminary results based on recent measurements of shrimp landed head-on at Sujafi are presented in table 23.

Table 23: Preliminary biometric relations for *Penaeus brasiliensis* (measurements in 1991).

Y - X	FEMALE				MALE			
	a	b	r <sup>2</sup>	n	a	b	r <sup>2</sup>	n
Y = axb <sup>k</sup>								
TL - CL	2.06	0.96	0.91	6.41	0.67	0.63	0.63	0.63
AL - CL	1.74	0.52	0.91	3.52	0.43	0.51	0.51	0.51
TL - PL	6.62	2.21	0.85	14.33	0.29	0.61	0.61	0.61
AL - PL	4.23	1.26	0.79	8.62	0.18	0.05	0.05	0.05
TL - AL	0.34	1.65	0.93	6.27	0.99	0.49	0.49	0.49
PL - AL	1.61	0.63	0.79	1.64	0.049	0.05	0.05	0.05
AL - TL	0.57	0.56	0.93	1.54	0.49	0.49	0.49	0.49
TW - AW	1.07	1.61	0.94	1.90	1.42	0.93	0.93	0.93
AW - TW	2.55	0.58	0.94	0.15	0.66	0.66	0.66	0.66

T=total, A=abdominal, C=Cubital, P=cephalothorax, L=length (mm), W=weight (gr)

#### IV. ECONOMIC ASPECTS

Information on the economic aspects of the shrimp fisheries have never been collected in a routine way. Only in the last few years, have data on the value of shrimp exports been requested from the processing companies. The value of each shipment, broken down by size category, is now recorded together with the amounts exported by size category.

The totals for the year 1991, as well as the average prices by size category, are given in table 24 for each destination.

No data on costs are currently collected. This type of information can be extracted from the annual reports of the national enterprises (SAIL and SUGAM). The same information is not accessible for the foreign fishing and processing companies.

Table 24: Amounts exported and average prices for head-off shrimp in 1991 (SAIL).

	TOTAL AMOUNT (tn kg)			TOTAL VALUE (US \$)			PRICE (US \$ per kg)		
	JAPAN	FRANCE	CUBACAO	JAPAN	FRANCE	CUBACAO	JAPAN	FRANCE	CUBACAO
U-10	7,660	5,420	160	195,904	115,806	3,394	25.58	21.37	21.21
10-15	109,680	8,820	400	2,360,297	160,765	7,230	22.27	18.25	18.08
16-20	134,116	16,960	200	2,550,757	266,767	3,255	19.02	16.35	15.98
21-25	152,640	29,000	200	2,492,207	404,734		16.35	14.07	13.81
26-30	243,772	29,000		5,450,098	685,576		10.61	9.08	11.50
31-40	189,580	29,560	3,240	2,008,887	588,701	33,924	9.08	7.72	10.47
41-50	113,604	60,590		1,040,353	427,819		7.97	7.26	6.35
51-60	62,088	51,240		502,920	168,744		7.31	14.95	10.15
61-70	19,956	23,240		145,797	22,290				
71-85		740			11,063				
P/O/L		7,100			72,065				
P/OM									
TOTAL	1,029,896	286,660	4,000	14,756,220	2,924,352	47,803			

#### V. SECONDARY RESOURCES

Other demersal (trawlable) resources have been very marginally exploited until recently in Suriname. Small amounts of fish use to be landed at SAIL by the shrimp trawlers, sold to middlemen and retailed at the Central Market of Paramaribo. This fish is not seen as shrimp by-catch, as it is believed to be caught by special fishing operations, in special (shallow) areas, during the last days of the fishing trips, instead of being collected from the by-catch of the hauls made on the shrimp fishing grounds.

In the last years, however, a number trawlers have started exploiting specifically fin-fish (see table 3). No accurate information is available on their production, nor on the by-catch of the shrimp trawlers. Total recorded landings at SAIL amount to about 1,000 tons. The total fish catch by trawlers, including discards, is certainly several times higher.

A resource of deep-sea shrimp was identified by the Japanese investigation carried out by R/V Nisshin Maru 201 in 1980-83. The species are the scarlet shrimp (*Plestopenaeus edwardsianus*), found at a depth of 800-900 meters, the spider shrimp (*Nematocarcinus rotundus*), which density is maximum between 700 and 900 meters depth, and the megalops shrimp (*Penaeopsis megalops*), which is abundant in the depth range of 300 to 400 meters (JAMARC, 1984). Although the investigators concluded that the three species have a commercial potential, no application for a licence to exploit this resource has been received.

Sea-bob (*Xyphopenaeus kroyeri*) is discarded by the trawlers. There is, however, an exploitation of this species by small-scale fishermen. The gear used is called "fuitknet", or chinese seine, and is set in the estuaries. Annual production may be around 500 tons.

## VI. SURVEYS ON SHRIMP AND RELATED RESOURCES

Surveys of shrimp or other marine resources are not carried out by national institutions. Suriname participates, whenever possible, in surveys organised at regional level and financed, coordinated and/or carried out by external agencies. In the last ten years the following investigations on shrimp and related resources have been completed:

- R/V Nisshin Maru 201 has carried out surveys of deep sea shrimp resources for the Japan Marine Fishery Resource Centre (JAMARC), from 1979 to 1983. Besides deep sea operations aimed at the assessment of deep sea shrimp resources, the vessel conducted a series of cruises in the zone between 20 and 100 meters depth, and provided estimates of the biomass of penaeid shrimp and of the demersal fish available in this depth range.

- Shrimp-tagging operations were carried out in 1982, in the EEZ of Suriname and French Guiana, under the coordination of FAO. Participants included scientists from French Guyana and Brazil.

- The German International Development Agency GTZ conducted surveys, with R/V Bonito, in 1981 and 1982. This investigation focused on the demersal fin-fish resources in the depth range 10-50 meters of the Suriname EEZ, and did not produce information on the shrimp resources.

- R/V Fridtjof Nansen carried out acoustic and trawl surveys in 1988, covering the northern coast of South America, from Suriname to Colombia. The executing agency was NORAD (Norwegian International Development Agency). Although this investigation was primarily aimed the assessment of pelagic and demersal fin-fish resources, the bottom trawl operations yielded also some information on shrimp distribution and abundance.

There is a program of investigations planned for the near future. The purpose is to study the recruitment mechanisms, particularly of *P. subitilis*. In addition, information will be collected on the abundance and composition of by-catch, biological data will be recorded on the main fish species, and the incidence of turtle catch will be investigated. Surveys will be carried out in 1993 and 1994, in collaboration with the "Institut Français de Recherche pour l'Exploration de la Mer" (IFREMER), and will cover the depth range between 10 and 50 meters in Suriname and in French Guyana. Two surveys will be undertaken each year, at periods corresponding with the recruitment peaks of the brown shrimp. This study is financed by institutes of the EEC, France and Suriname.

## VII. MANAGEMENT

### VII.A. LEGISLATION

Fisheries in Suriname are currently regulated by the Decree on Marine Fishery (Decree C-14), operational since 1 January 1981. The legislation is being revised and a new fisheries law is expected to be promulgated in the course of 1993. For the time being, the provisions concerning the shrimp trawling fishery can be summarised as follows:

- **Registration.** Compulsory registration of the boats, which are classified into three categories, according to their nationality status.

- **Annual fees.** The annual fishing rights amount to 10,000 guilders for vessels belonging to a foreign company/owner which is not established in Suriname; to 7,500 guilders if the foreign company/owner is established in Suriname; and to 5,000 guilders for vessels belonging to a national owner. Since 1986 licence fees of foreign vessels are cashed in US\$.

- **Reporting.** Each vessel has to report his position daily to his base. In addition, a logbook has to be filled out and submitted to the Fisheries Department within three days after completion of each trip. A landing report has to be prepared and delivered to the Fisheries Department within supplied three days after delivering the catch.

- **Closed areas.** Shrimp trawling is forbidden in areas shallower than:

- 12 fathoms from January to June;
- 15 fathoms from July to December

- **Destination of the catch.** The entire catch has to be landed in Suriname. Transshipment at sea is prohibited.

### VII.B. LICENSING POLICY

There has been no attempt to limit the size of the fleet until 1986, when a maximum number of boats to be licensed was established (120 vessels) by the State Commission for the Fishery. This regulation was not enforced, however, and the situation remains one of open access, as applications for licences are never turned down.

### VII.C. ENFORCEMENT

Regulations on registration and licence fees are effectively enforced, even though payment of the fee does not occur at the beginning of the year in all cases. Enforcement of regulations at sea is very poor, as Suriname does not possess the means necessary to effectively control the fishery

zones. For the same reason, control of transshipment and poaching is not possible. The responsibility for enforcement of fishery regulations lies with the Ministry of Defence.

The fishing companies in their majority supply the requested information (logbooks and landing reports) with months of delay, which makes this information difficult to use in the practice. The statistical information used and regularly updated by the Fisheries Department is based on data obtained from the processing industry.

#### VIII. REFERENCES

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- Willmann, R. and S.M. Garcia, 1985. A bio-economic model for the analysis of sequential artisanal and industrial fisheries for tropical shrimp (with a case study of Suriname shrimp fisheries). FAO Fish. Tech. Pap. (270):49p.

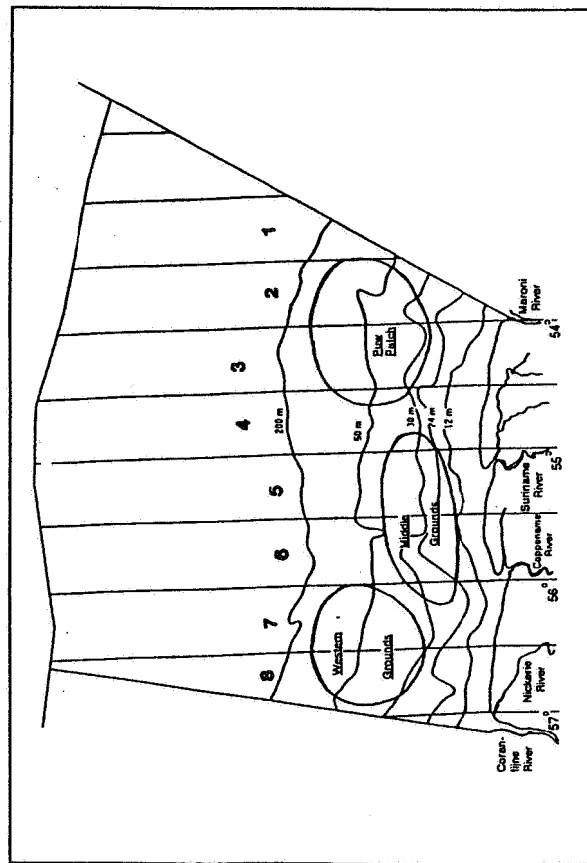


Figure 1: Statistical fishing zones for shrimp trawling.

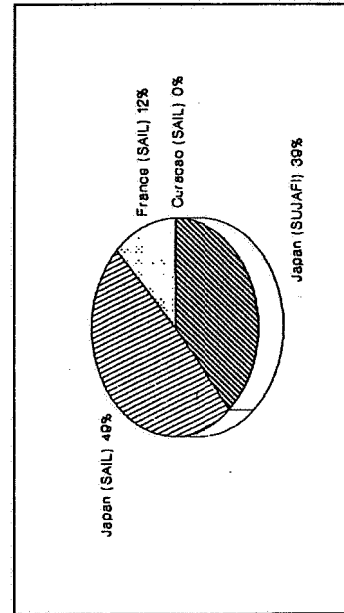


Figure 2: Destination of shrimp exports.



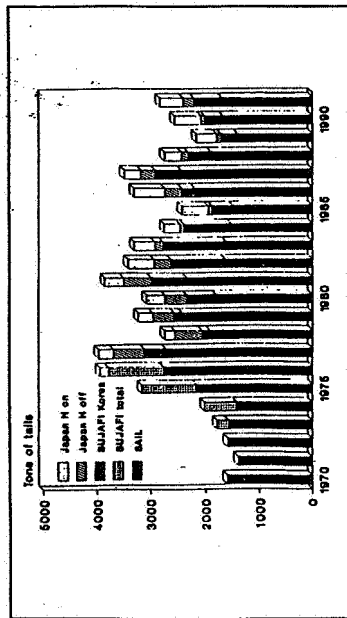


Figure 3: Shrimp production by processing plant and fleet.

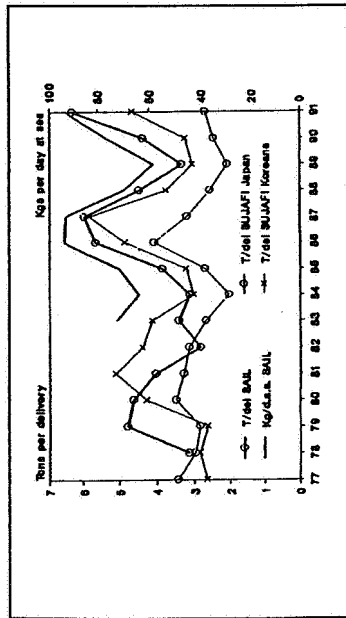


Figure 4: Annual CPUE per fleet.

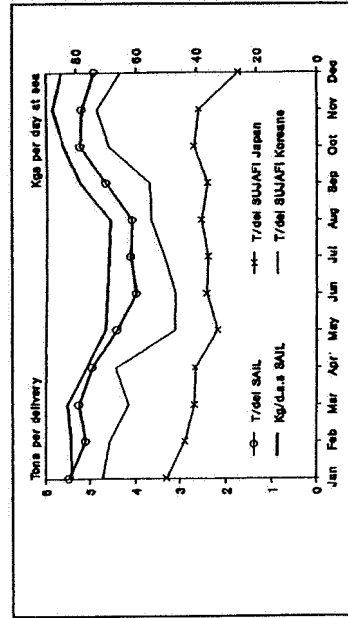


Figure 5: Average pattern of monthly CPUE (1987-1991).

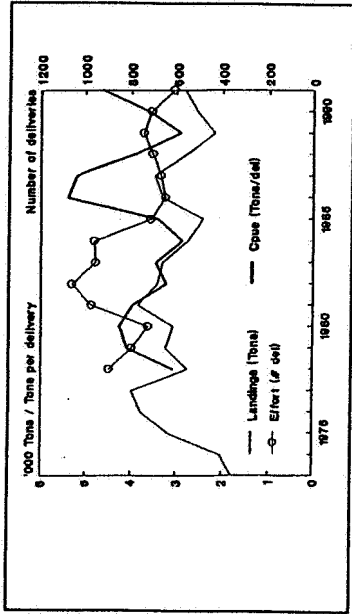


Figure 6: Annual landings, effort, CPUE (all fleets).

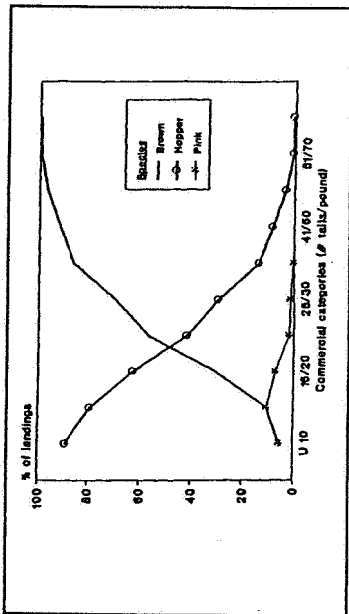


Figure 7: Species composition per commercial category (based on samplings at SAIL in 1987).

NATIONAL REPORT OF FRENCH GUIANA

*Evolution de la Pêcherie Crevetrière de Guyane Française de 1988 à 1991*

I. DESCRIPTION DE LA PÊCHERIE

A. ACTIVITÉS DE PÊCHE

A.1. Les zones de pêche

A.1.1. Délimitation des zones de pêche, limites, profondeurs et caractéristiques du fond

En Guyane française, Cayenne est l'unique port de débarquement de crevettes. La pêche traditionnelle repose sur l'exploitation des deux espèces du plateau continental: *Penaeus subtilis* et *Penaeus brasiliensis*.

*P. subtilis* est essentiellement exploitée sur des fonds de 20 à 40 mètres dans deux principaux secteurs:

- à l'ouest entre Sinnamary et Cayenne
- à l'est entre Cayenne et la limite des eaux brésiliennes, à l'embouchure de l'Oyapock.

*P. brasiliensis* est capturée de nuit principalement sur des fonds de 50 à 70 mètres dans la partie ouest du plateau continental entre la limite des eaux surinamiennes à l'embouchure du Maroni, et Sinnamary (Fig. 1).

Les surfaces bathymétriques de 10 à 80 mètres et la distribution saisonnière de l'effort de pêche sur le plateau continental en fonction de la profondeur sont regroupés dans les tableaux 1 et 2.

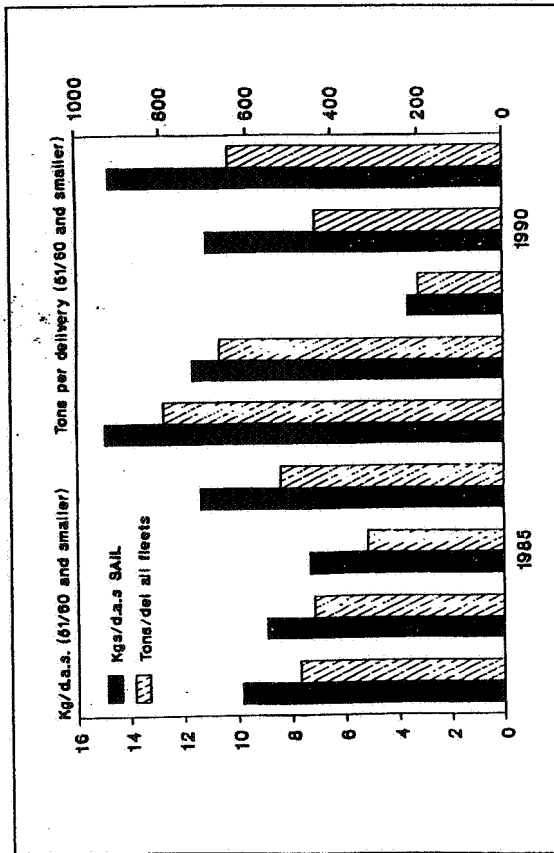


Figure 8: Annual recruitment indices.

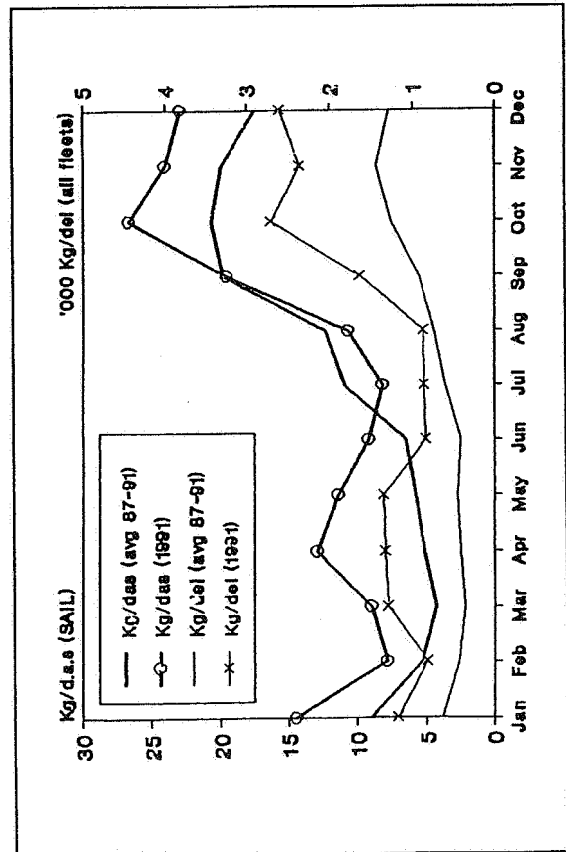


Figure 9: Average seasonal recruitment pattern (landing of shrimp) s 51/60.