REGIONAL SEAS

UNITED NATIONS ENVIRONMENT PROGRAMME

Oil pollution control in the East African region

UNEP Regional Seas Reports and Studies No. 10

Prepared in co-operation with

INTERNATIONAL MARITIME ORGANIZATION

Note: This document has been prepared jointly by the International Maritime Organization (IMO) and the United Nations Environment Programme (UNEP) under project FP/0503-77-03 as a contribution to the development of an action plan for the protection and development of the marine and coastal environment of the East African region. The assistance of the consultant, Captain J. G. J. Ferrari, in the preparation of this document is gratefully acknowledged. The designations employed and the presentation of the material in this document do not imply the expression of any opinion whatsoever on the part of IMO or of UNEP concerning the legal status of any State, Territory, city or area of its authorities, or concerning the delimitation of their frontiers or boundaries.

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PREFACE

The Regional Seas Programme was initiated by UNEP in 1974. Since then the Governing Council of UNEP has repeatedly endorsed a regional approach to the control of marine pollution and the management of marine and coastal resources and has requested the development of regional action plans.

The Regional Seas Programme at present includes ten regions 1/ and has over 120 coastal States participating in it. It is conceived as an action-oriented programme having concern not only for the consequences but also for the causes of environmental degradation and encompassing a comprehensive approach to combating environmental problems through the management of marine and coastal areas. Each regional action plan is formulated according to the needs of the region as perceived by the Governments concerned. It is designed to link assessment of the quality of the marine environment and the causes of its deterioration with activities for the management and development of the marine and coastal environment. The action plans promote the parallel development of regional legal agreements and of action-oriented programme activities.

Decision 8/13(C) of the eighth session of the Governing Council of UNEP called for the development of an action plan for the protection and development of the marine and coastal environment of the East African region. As a first activity in the region, UNEP organized in October and November 1981 a joint UNEP/UN/UNIDO/FAO/UNESCO/WHO/IMCO/IUCN exploratory mission which visited the eight States of the region 2/ in order to:

- assess each State's interest in participating in a future regional programme;
- consult with Governments with a view to identifying activities that may usefully be included as part of a comprehensive action plan;
- make a preliminary assessment of the environmental problems in the region, including the problems related to the environmentally sound management of marine and coastal natural resources and activities influencing the quality of the marine and coastal environment;
- collect available scientific data and information pertaining to the development and implementation of the action plan planned for the region; and
- identify national institutions that may participate in implementing an action plan once it is adopted.

1/ Mediterranean, Kuwait Action Plan Region, West and Central Africa, Wider Caribbean, East Asian Seas, South-East Pacific, South-West Pacific, Red Sea and Gulf of Aden, East Africa and South-West Atlantic.

The findings of the mission were used to prepare the following six sectorial reports:

- UN/UNESCO/UNEP: Marine and Coastal Area Development in the East African Region. UNEP Regional Seas Reports and Studies No. 6. UNEP 1982;

- UNIDO/UNEP: Industrial Sources of Marine and Coastal Pollution in the East African Region. UNEP Regional Seas Reports and Studies No. 7. UNEP 1982;

- FAO/UNEP: Marine Pollution in the East African Region. UNEP Regional Seas Reports and Studies No. 8. UNEP 1982;

- WHO/UNEP: Public Health Problems in the Coastal Zone of the East African Region. UNEP Regional Seas Reports and Studies No. 9. UNEP 1982;

- IMO/UNEP: Oil Pollution Control in the East African Region. UNEP Regional Seas Reports and Studies No. 10. UNEP 1982; and

- IUCN/UNEP: Conservation of Coastal and Marine Ecosystems and Living Resources of the East African Region. UNEP Regional Seas Reports and Studies No. 11. UNEP 1982.

The six sectorial reports prepared on the basis of the mission's findings were used by the UNEP secretariat in preparing a summary overview entitled:

- UNEP: Environmental Problems of the East African Region. UNEP Regional Seas Reports and Studies No. 12. UNEP 1982.

The overview and the six sectorial reports were used as the main working document and information documents for the UNEP Workshop on the Protection and Development of the East African Region (Mahé, Seychelles, 27 - 30 September 1982) attended by experts designated by the Governments of the East African region.

The Workshop:

- reviewed the environmental problems of the region;

- endorsed a draft action plan for the protection and development of the marine and coastal environment of the East African region;

- defined a priority programme of activities to be developed within the framework of the draft action plan; and

- recommended that the draft action plan, together with a draft regional convention for the protection and development of the marine and coastal environment of the East African region and protocols concerning (a) co-operation in combating pollution in cases of emergency, and (b) specially protected areas and endangered species, be submitted to a conference of plenipotentiaries of the Governments of the region with a view to their adoption (UNEP/WG.77/4). The conference is to be convened by UNEP in early 1984.

CONTENTS

INTRODUCTION

1. This publication reviews the major sources of oil pollution in the East African region, the status of oil pollution control and the levels of preparedness in the region to combat oil pollution.

2. The scope of the survey comprises a brief outline of the background environmental parameters, relevant to the fate and effect of oil pollution, a preliminary identification of the major factors which account for the current levels of oil pollution being experienced by the countries of the region and a critical assessment of the existing regulatory and technical oil pollution prevention and control capability.

3. Most of the information contained in this publication was obtained by the author during his visit to the countries of the region. Supplementary information has been obtained from IMO and IOC/UNESCO. This document should be read in conjunction with the section on oil pollution in the UNEP Regional Seas Reports and Studies No. 8 "Marine Pollution in the East African Region".

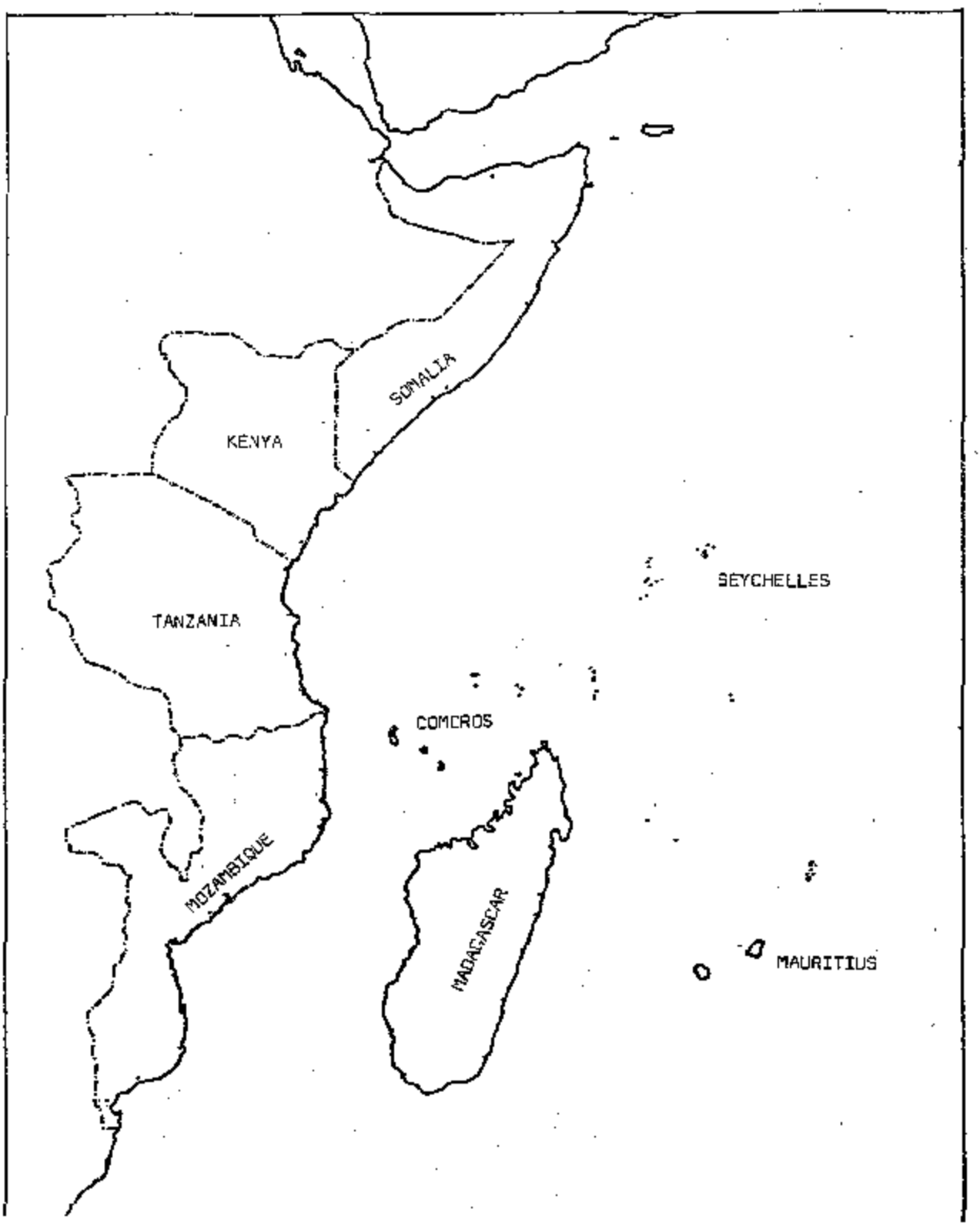
BACKGROUND ENVIRONMENTAL PARAMETERS

4. The East African region comprises the marine and coastal areas of the following States: Somalia, Kenya, Tanzania and Mozambique on the African mainland and the Indian Ocean Islands, Madagascar, Comoros, Mauritius and Seychelles. The area described is shown in figure 1.

5. The region consists of a large area of ocean between 2,000 metres to 3,000 metres deep in the Mozambique Channel and 3,000 metres to 5,000 metres to the east of Madagascar and in the northern area. Madagascar, the biggest Indian Ocean Island, covers a large area of the southern portion, whilst the 115 islands of Seychelles cover a wide area of the central region.

6. On the east coast of Africa, the continental shelf is for the most part narrow and poorly surveyed. The edge lies at comparatively shallow depths. In places there appears to be no shelf along straight stretches of coast. The average distance from the coast can be said to be around 10 to 15 miles. However, where there are indentations in the coast such as in Mozambique between latitudes 17°S and 21°S, the shelf widens to about 90 miles. Generally, the bottom is sandy with mud being dominant in the deeper water.

7. On the east and south-west coasts of Madagascar, the continental shelf is generally narrow, extending to an average of 25 miles. On the south and west coasts it widens to around 50 to 60 miles and on the extreme north-west coast to nearly 100 miles.


SOMALIA
KENYA
TANZANIA
SEYCHELLES
COMOROS
MOZAMBIQUE
MADAGASCAR
MAURITIUS

extensive continental shelf around the inner group of islands. Here again, the bottom is generally sandy. There are exceptions, however, such as in the Aldabra-Cosmoledo group of islands where there is no shelf at all and the coral reefs rise almost perpendicular from depths of up to 1,000 metres.

9. The African coastline is generally fringed with coral reefs from North Somalia to as far south as the Island of Inhaca in Maputo Bay. The coral is broken in places such as large river mouths and where the depth of water is too deep in the absence of a continental shelf. The islands of the Indian Ocean are all encircled by coral reefs with the exception of parts of Eastern Madagascar where deep water extends as far as the coast.

10. The currents in the area are shown in figures 2(a) - 2(e). It must be noted that only the average is shown. For greater details, refer to Admiralty Chart 5126.

11. On the East African Coast, the currents run parallel to the coast. Though these currents are mainly strong, they are concentrated into narrow flows of up to about 100 miles, beyond which the currents are often quite weak. To the north of 2°S, the Somali Current reverses in direction during the year following the monsoon winds of the area. Generally, this current flows NE during the SW monsoon at a strong rate of 4-5 knots, occasionally reaching 7 knots during the period June to September. It flows SW during the NE monsoon at a rate of 3-4 knots.

12. To the south of 2°S, there is very little variation in the northward-flowing East African Coast Current. It has no seasonal reversal of flow. This current extends to the region of Cap Delgado and is strongest in the SE monsoon - about 2 knots.

13. The Mozambique Current flows south along the coast of Mozambique from Cap Delgado southwards. This current is strongest - approximately 4 knots - in October to February. On this stretch of the coast, inshore counter-currents are common, especially in the vicinity of Banco de Sofala and Maputo Bay.

14. The South Equatorial Current flows westwards in the area 6°S to 20°S. Part of this current is diverted southwards as it approaches Madagascar. Between 6°S and 2°S the equatorial counter-currents flow eastwards.

15. North of latitude 2°S the Indian Monsoon Current flows westerly at approximately 1 knot from January to March. The flow of this current in the other months of the year is easterly at a rate of 1 knot.

16. The main currents involved are, therefore:

(a) the Indian Monsoon Drift;

(b) the Somali Current;

(c) the East African Current;

(d) the Mozambique Current;

(e) the South Equatorial Current;

(f) the Equatorial Counter Current.

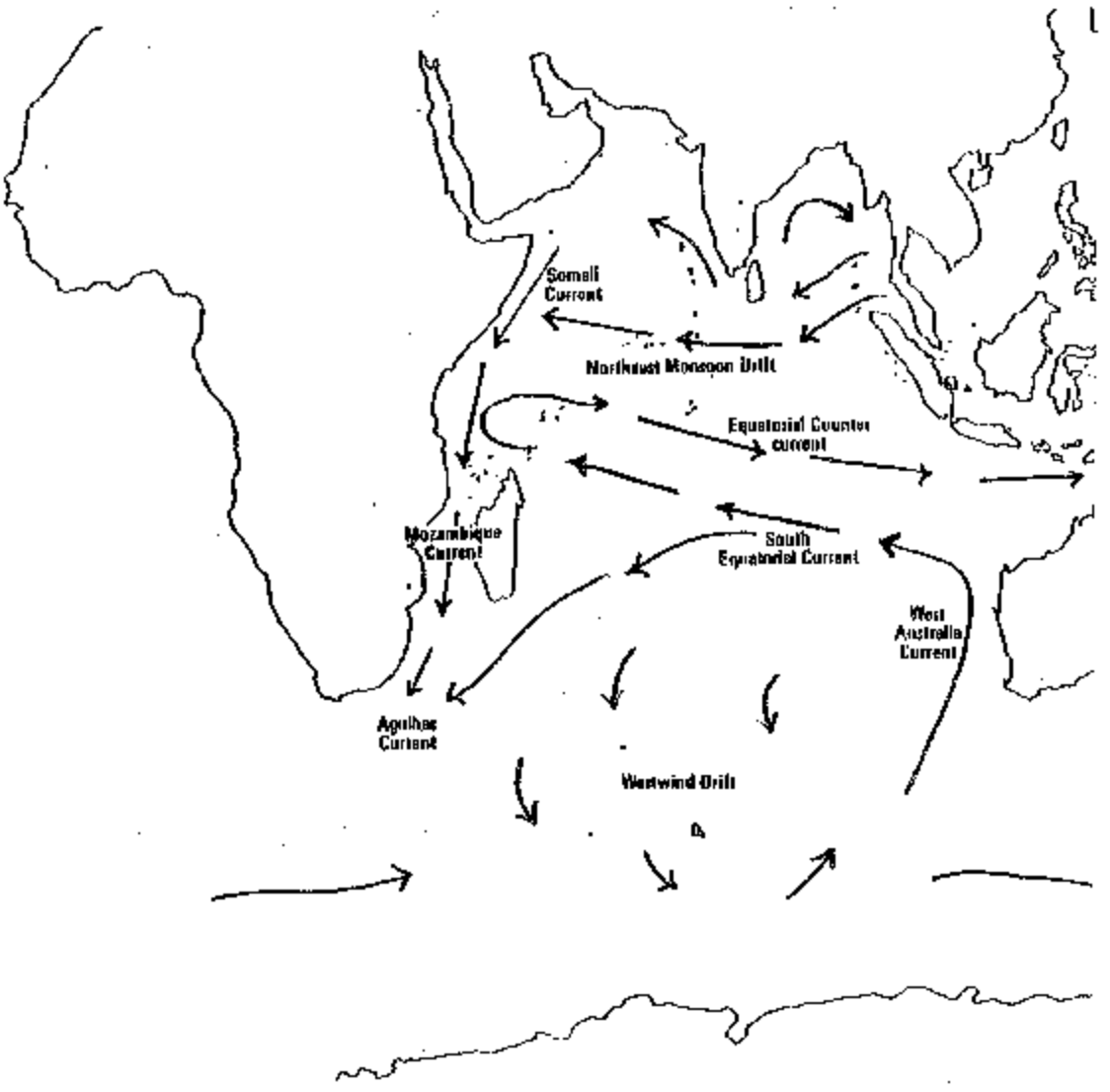
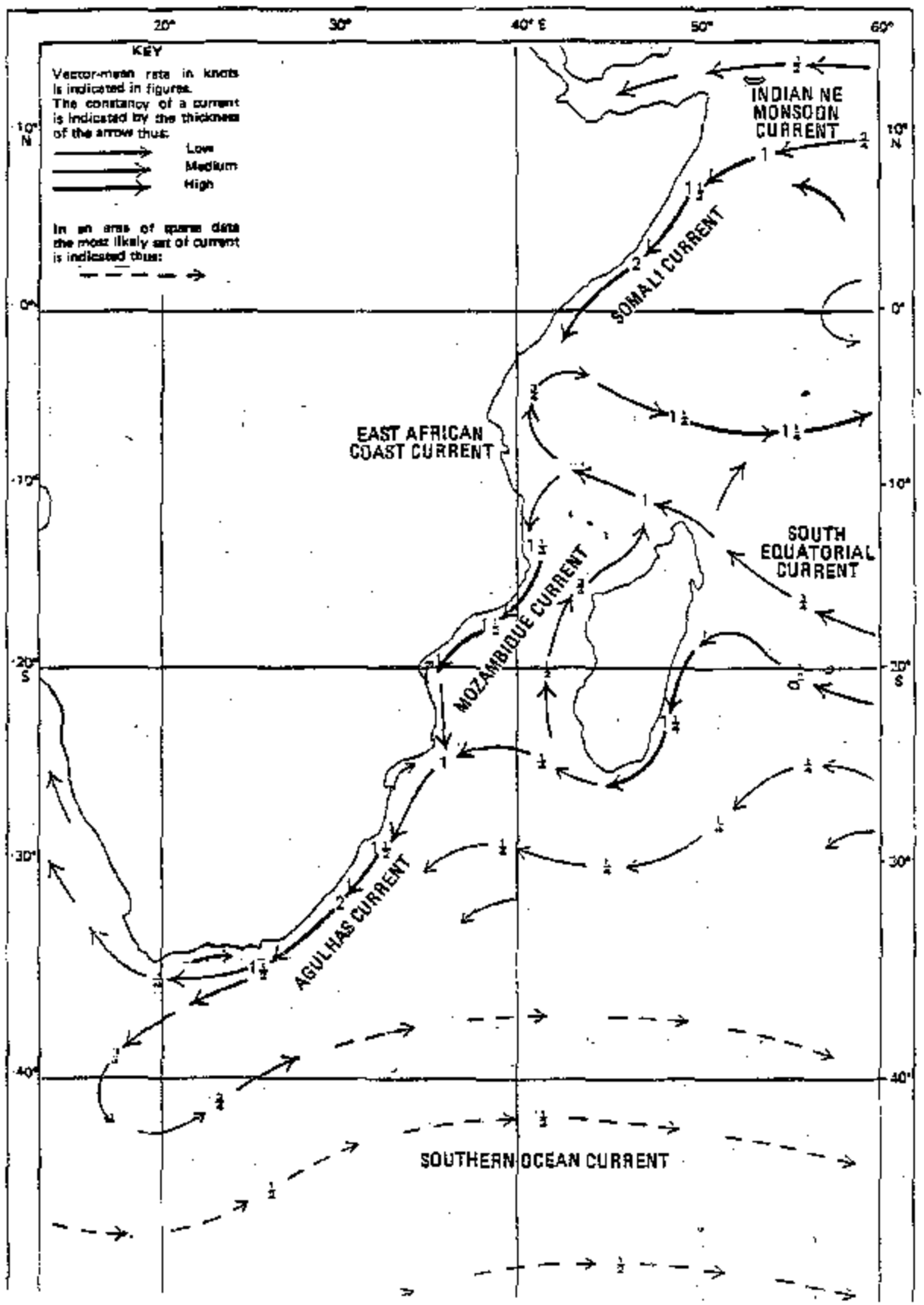


Figure 2(a) : January current pattern


KEY
Vector-mean rate in knots is indicated in figures.
The constancy of a current is indicated by the thickness of the arrow thus:
Low
Medium
High
In an area of sparse data the most likely set of current is indicated thus:
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20° S
30°
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INDIAN NE MONSOON CURRENT
SOMALI CURRENT
EAST AFRICAN COAST CURRENT
SOUTH EQUATORIAL CURRENT
MOZAMBIQUE CURRENT
AGULHAS CURRENT
SOUTHERN OCEAN CURRENT

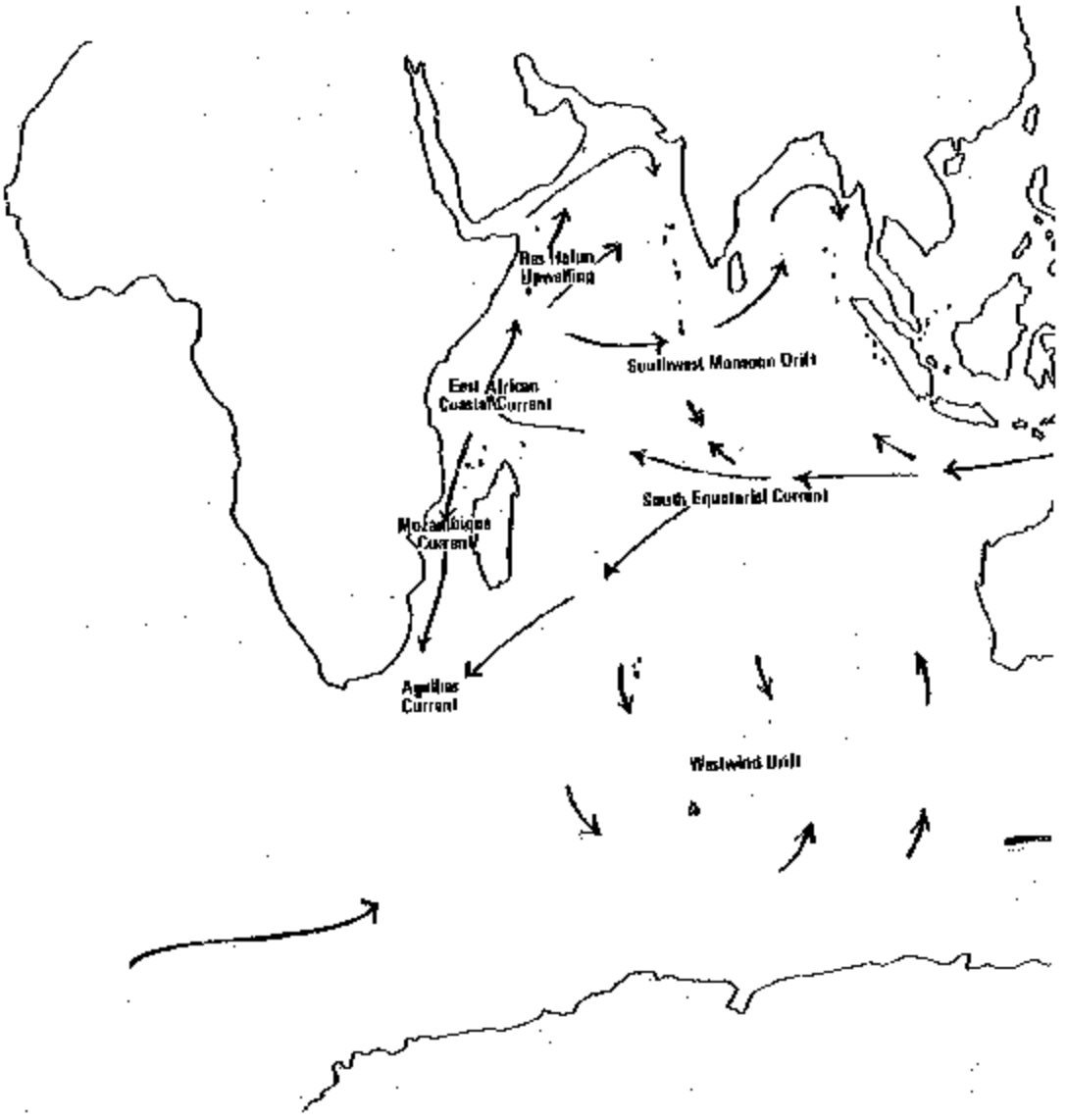
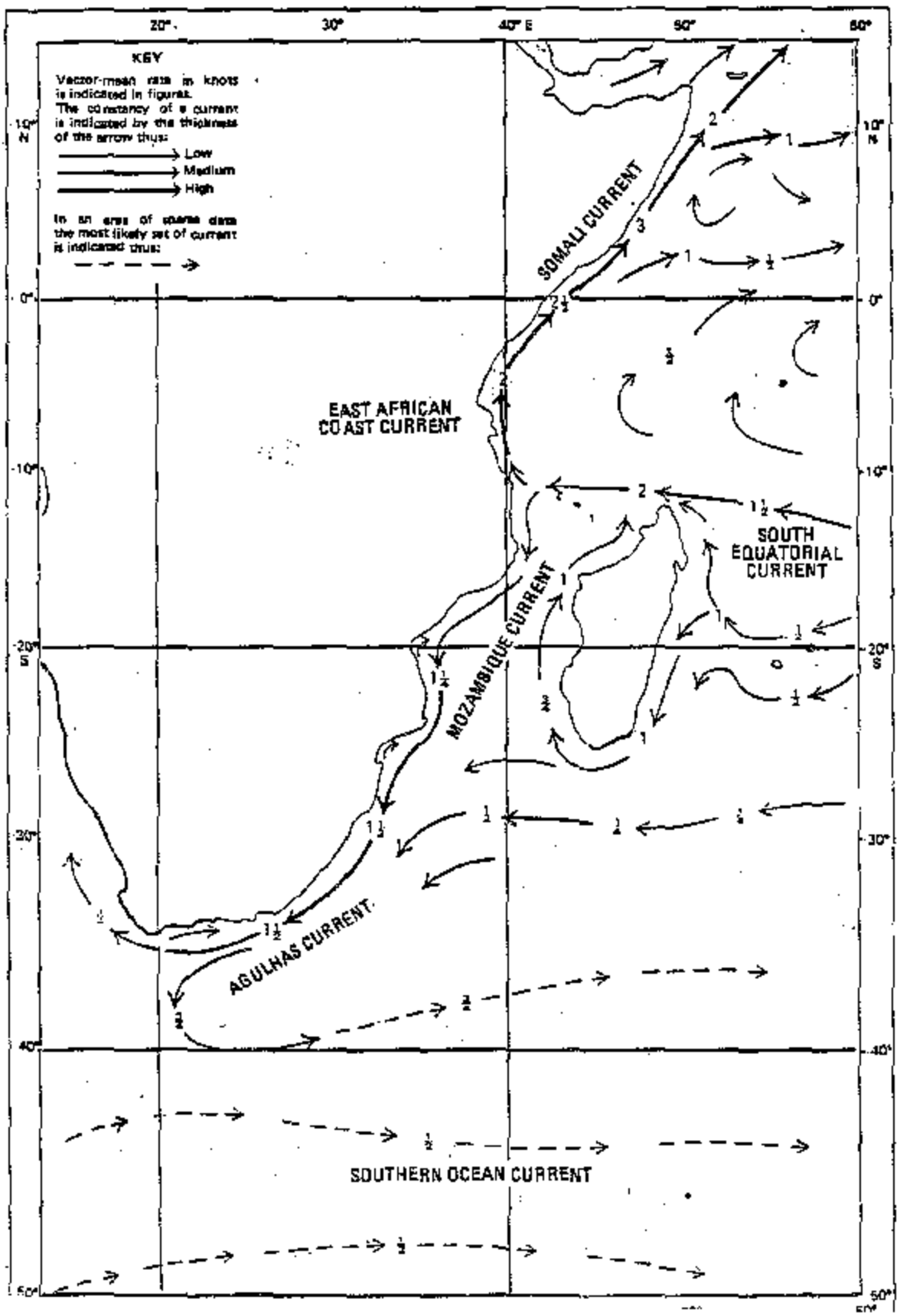


Figure 2(c) : July current pattern


KEY
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The constancy of a current is indicated by the thickness of the arrow thus:
Low
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In an area of sparse data the most likely set of current is indicated thus:
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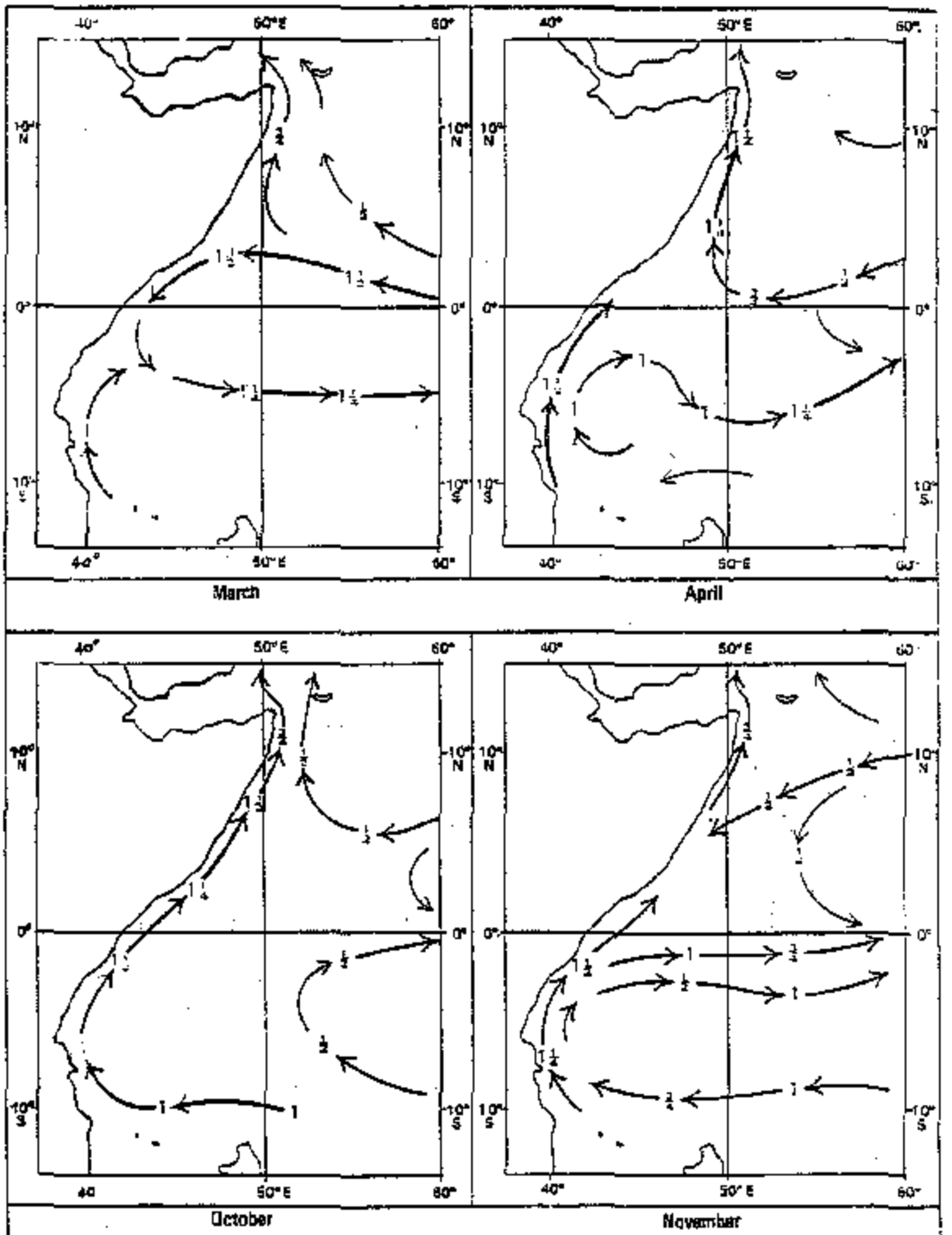
SOMALI CURRENT
EAST AFRICAN COAST CURRENT
SOUTH EQUATORIAL CURRENT
MOZAMBIQUE CURRENT
AGULHAS CURRENT
SOUTHERN OCEAN CURRENT


March
April
October
November
KEY
Vector-mean rate in knots is indicated in figures. The constancy of a current is indicated by the thickness of the arrow thus:
Low
Medium
High

17. The region is affected principally by the monsoon seasons; the SE and NW monsoons. On the Kenyan and Somalian coasts the direction of the prevailing winds is deflected SW and NE. The monsoon periods are generally from April to October for the SE monsoon and November to March for the NW monsoon (see figures 3(a) - 3(h)).

18. The southern area of the region is subject to occasional cyclones from December to April. This affects Mauritius, Madagascar, Comoros, Mozambique and at times the southern islands of the Seychelles group. The general tracks of cyclones are shown in figure 4.

19. The area of the Western Ocean includes well-known tourist areas such as Kenya, Tanzania, Mauritius and Seychelles. The tourism industry in these four countries accounts for a large part of the countries' gross national product and foreign exchange. This is of greatest importance in Seychelles.

OIL PRODUCTION, EXPLORATION AND REFINING

Production

20. There is at present no production of oil in the region. Most countries, however, expect to be producing, if only on a limited scale, during the next few years. In this respect great importance is given to exploration, especially in Kenya and Tanzania. It must be noted that commercial gas has been discovered on Songo Songo Island in Tanzania.

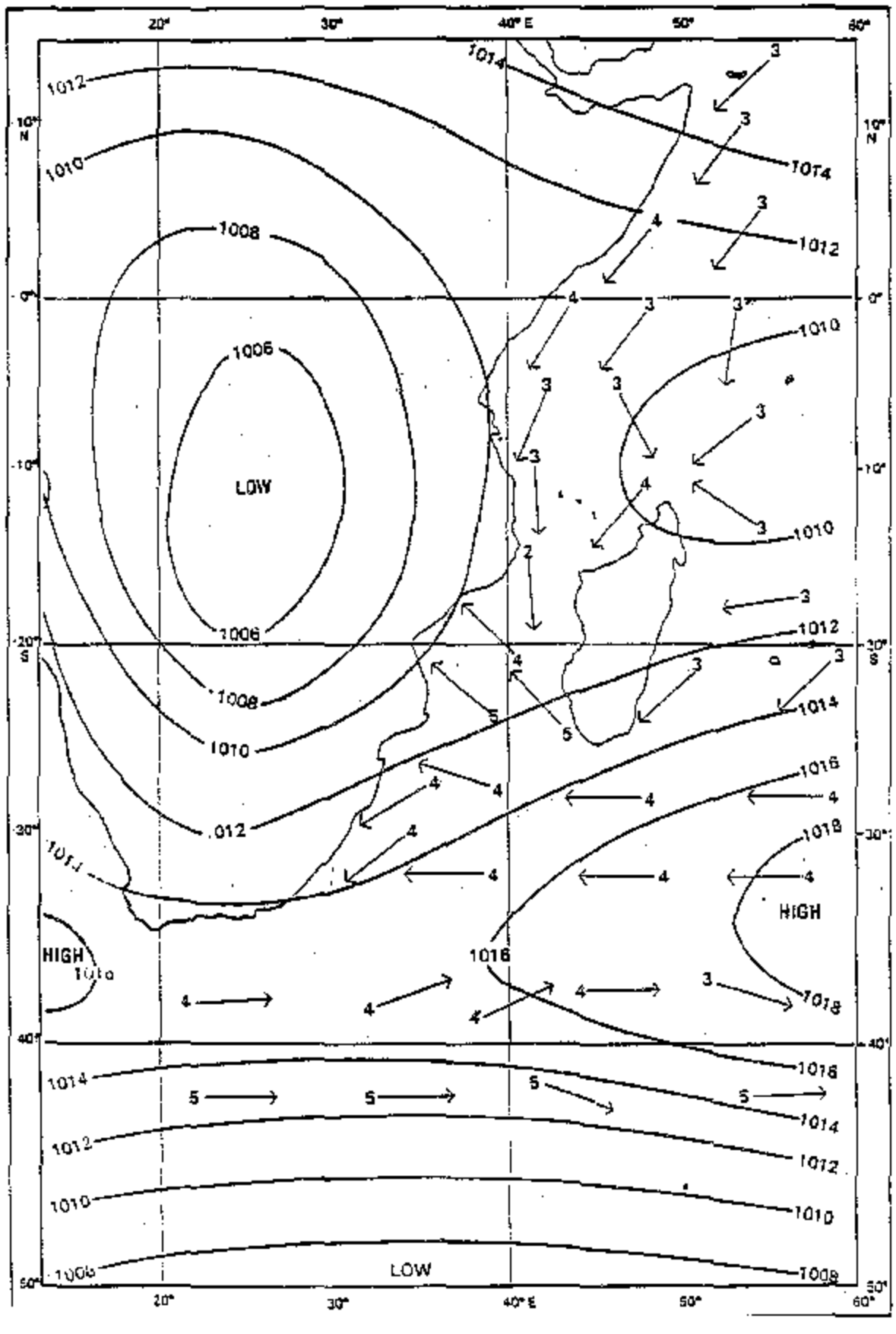
Exploration

21. Oil exploration is under way in all countries except Comoros. Somalia is drilling offshore on the north coast and the extreme southern area, and on land in the northern region. Kenya is drilling offshore in Ngwana Bay and plans to extend the drilling operations to cover most of the area along the coast both offshore and on land. Tanzania is now drilling near Mafia Island and on Songo Songo Island. Drilling is expected to start soon near Ras Kimbiji to be followed by other areas long the coast offshore and on land. Mozambique is carrying out seismic surveys along the coastal offshore belt. Mauritius has completed drilling operations on Saya de Malha and Chagos Banks. Madagascar is now drilling on the west coast offshore region. Seychelles has undertaken drilling operations on Owen Bank, 90 miles west of Mahé Island, and intends to carry out drilling operations on the Banks around Mahé.

22. As a major share of the foreign exchange of most countries in the region is spent on the importation of oil, great efforts are being made to reduce this burden by strict control and at the same time by giving priority to oil exploration projects.

Refining

23. There are five refineries in the region, and these are located in Mogadishu, Mombasa, Dar es Salaam, Matola and Toamasina (Tamatave) (see table I). Crude oil is imported mostly from ports in the Middle East by tankers of between 20,000 dwt tons to 100,000 dwt tons and piped ashore to the storage tanks. The refined products are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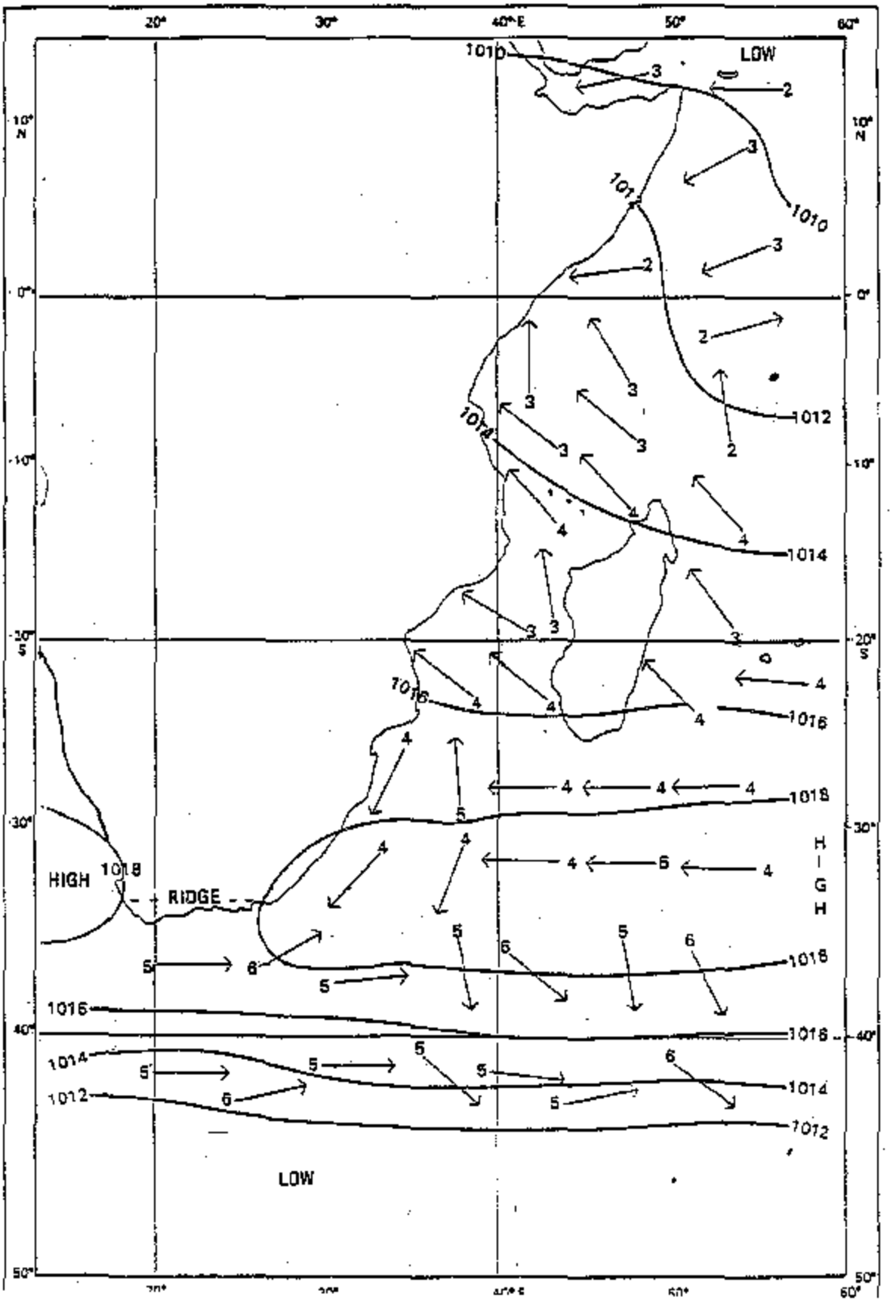
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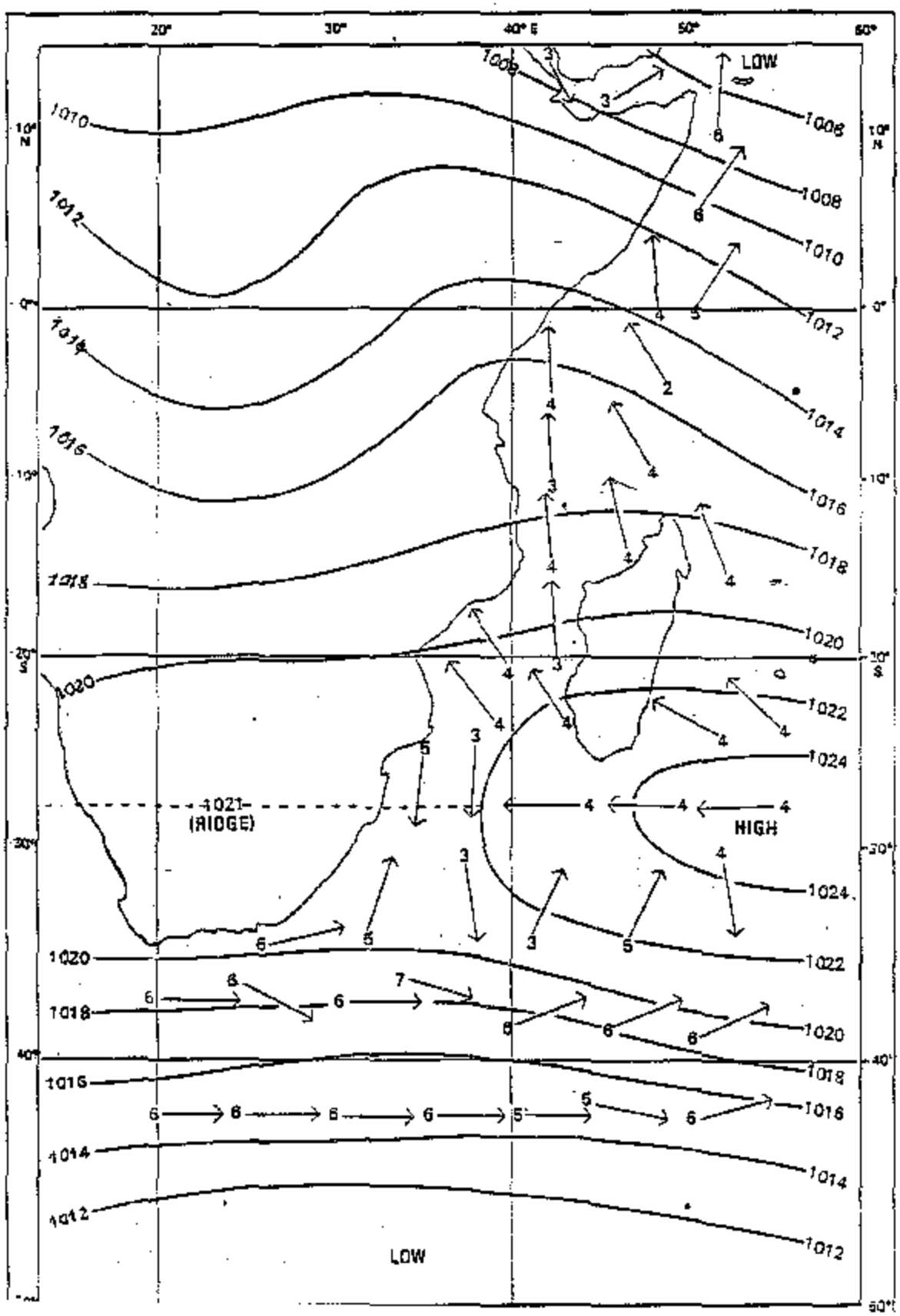
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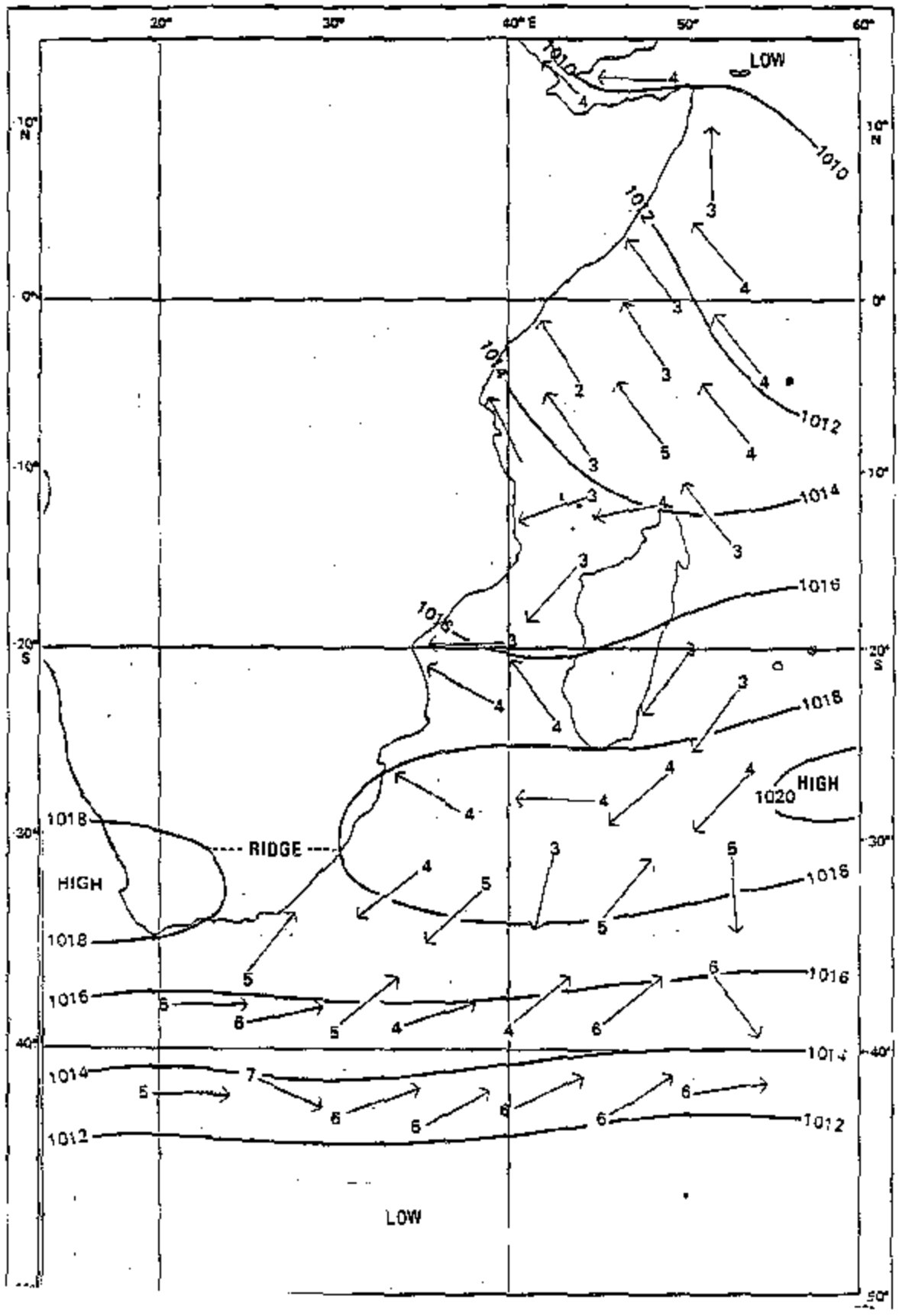
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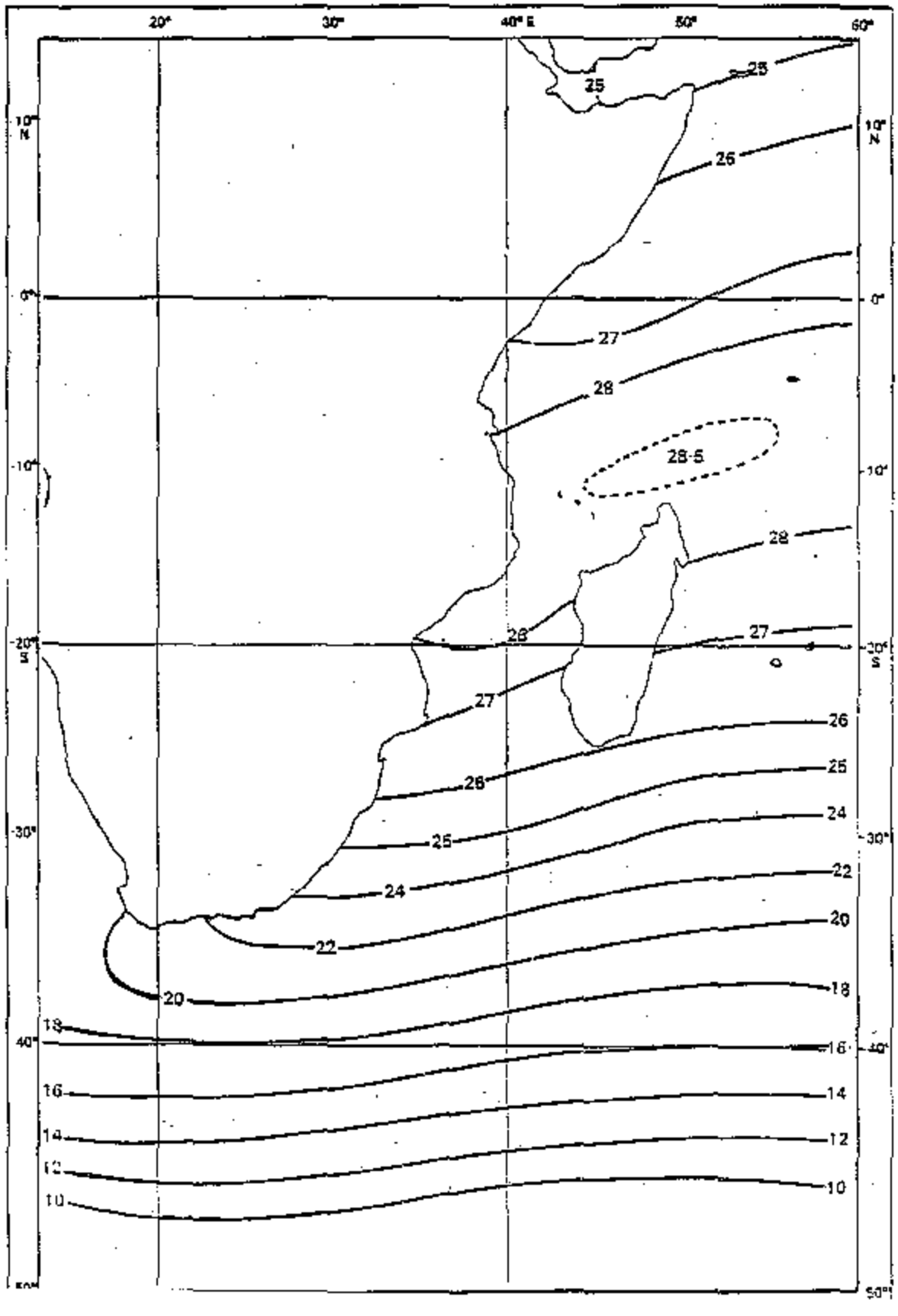
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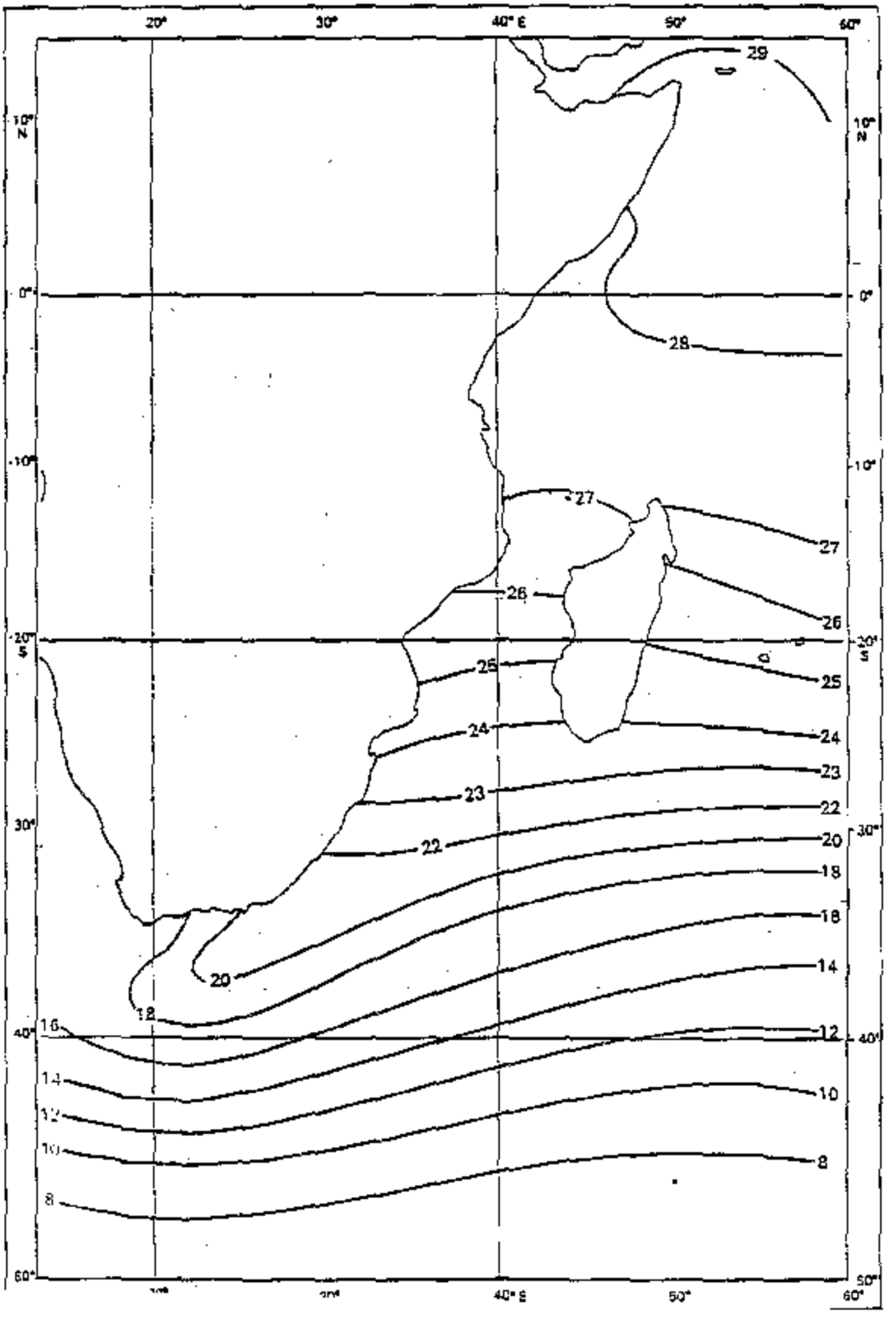
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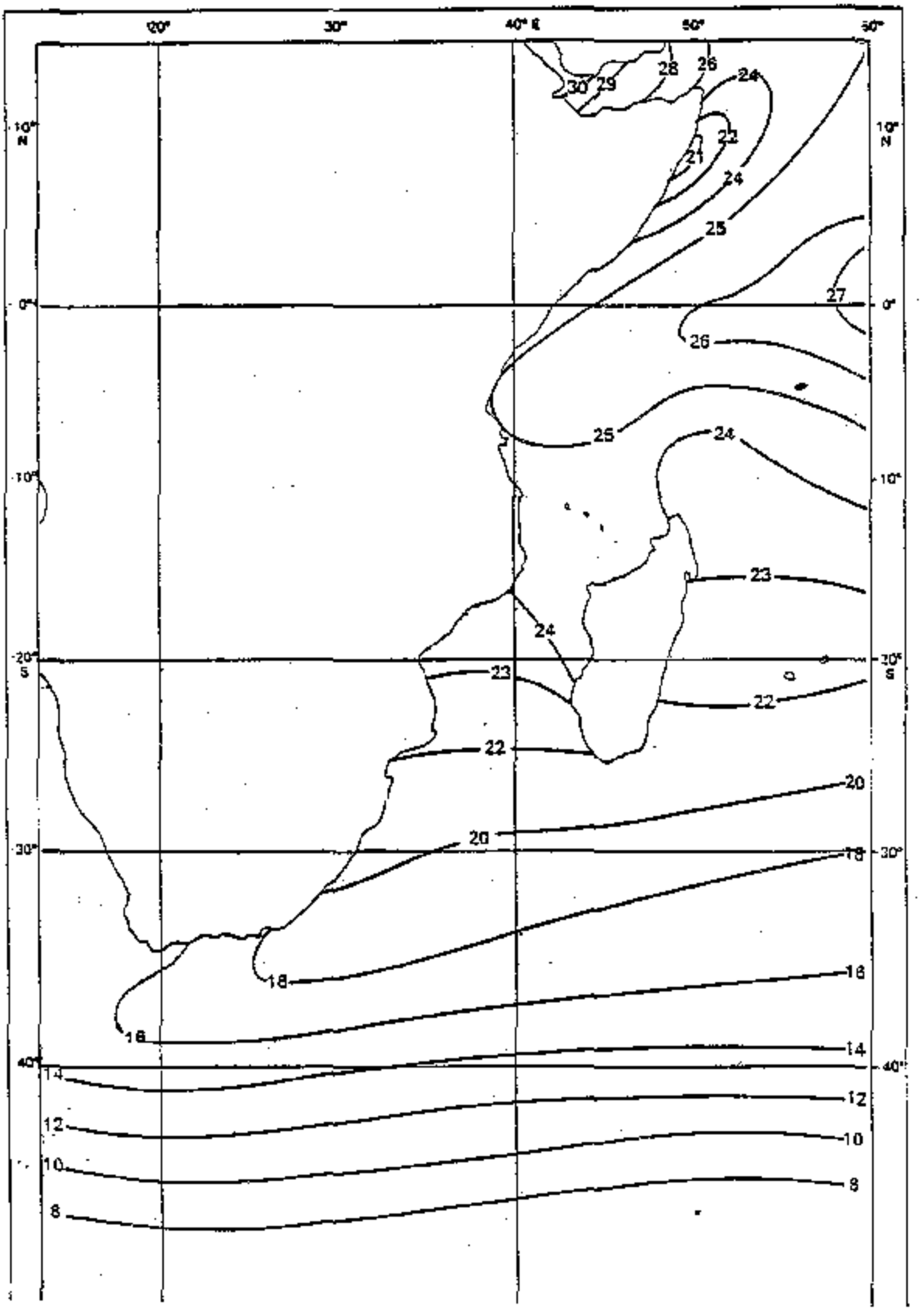
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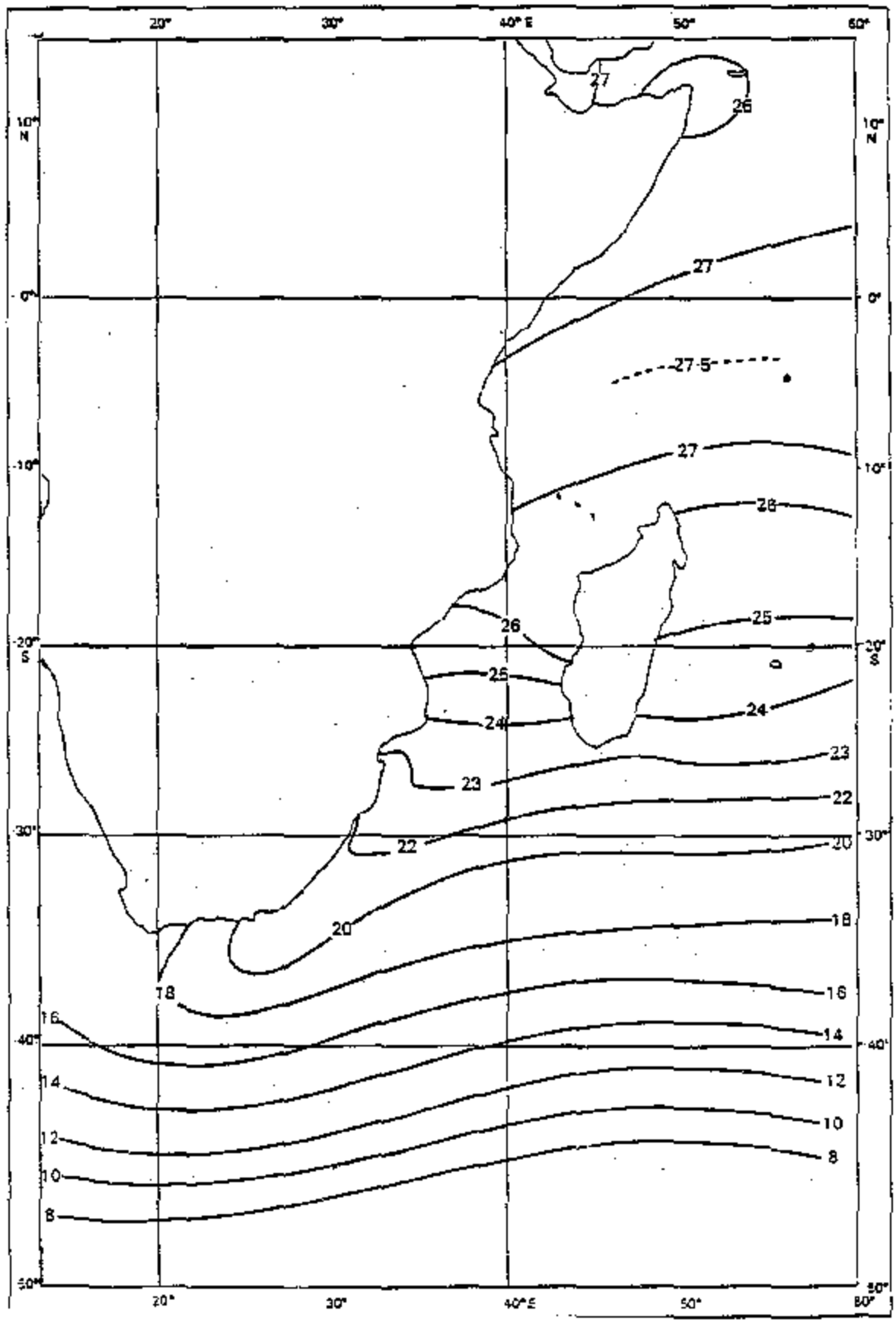
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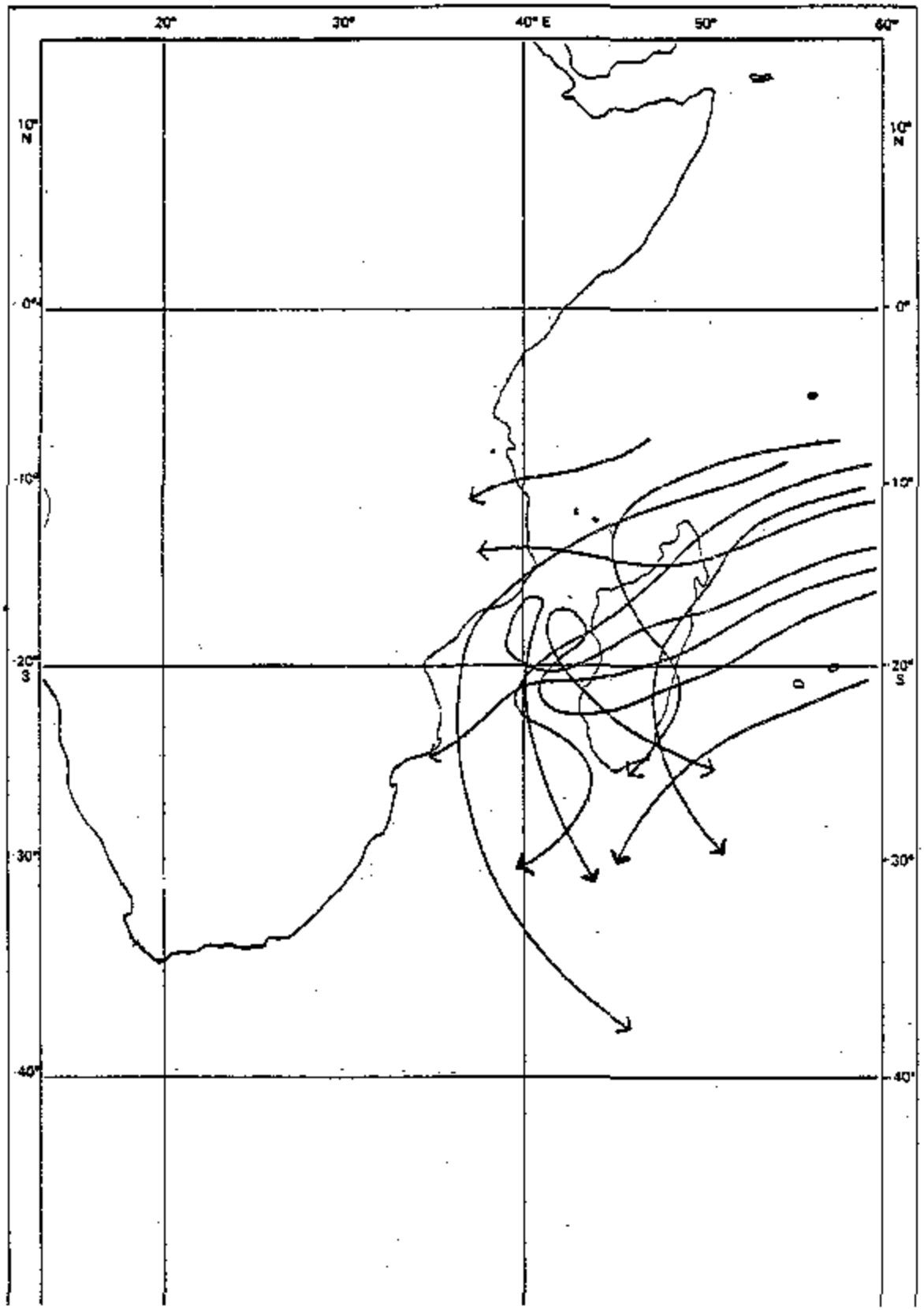
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Table 1 : Refineries - 1981

Location	Name of refinery	Yearly Amount	Size of Tanker	Discharge Arrangements
Mogadishu	Iraqsoma	0.3	30,000	Alongside
Mombasa	East African Oil Refinery	3.0	80,000	Alongside
Dar es Salaam	Tanzanian Italian Petroleum Refinery "T.I.P.E.R."	1.6	100,000	S.M. Buoy and under water pipeline
Matola		1.0*	50,000	Alongside
Tamatave	Solitany Malagasy Raffinerie de Toamasina "SOLIMA"	0.65	50,000	Under water pipe to berth

*Estimated

24. The "East African Oil Refinery" in Mombasa, Kenya's main port, handles an average of about 3 million tonnes of crude per year. This crude is refined mainly for the Kenya and Uganda markets. Coastal towns are supplied by coastal tankers of up to 1,200 tons whilst a pipeline supplies the requirement of the capital, Nairobi. Exports bound for Uganda are carried by rail and road tankers from Mombasa. Surplus fuel oil is re-exported mainly to the Far East.

25. The oil refinery in Matola, a port handling bulk cargoes (oil, cement, iron ore and coal), 20 km from Maputo, handles an estimated amount of 1 million tonnes of crude oil per year. The refinery supplies local requirements with the exception of some import of refined product at the Port of Beira. Coastal towns are supplied by tankers, barges and fuel tanks of cargo ships. The refinery is not at present operating to full capacity due to strict control on the importation of crude. The surplus fuel oil is re-exported.

26. The "Tanzanian Italian Petroleum Refinery", known as "T.I.P.E.R." is situated at Kigambony near Dar es Salaam. This refinery handles about 1,600,000 tonnes per year. Zambia's crude oil supply is also handled at this port. It is believed that this refinery is not operating to full capacity because of the stringent control on oil importation. Coastal tankers supply Zanzibar, Tanga and other towns with refined products.

27. The "Solitany Malagasy Raffinerie de Toamasina", known as "SOLIMA", is situated near the port of Tamatave (Toamasina). The refinery handles approximately 650,000 tonnes per year but has a capacity in excess of this amount. The maximum amount refined in one year has been 800,000 tonnes. The refinery is situated along the Pangalanes Canal. The refinery also supplies some products to Comoros and Reunion. Coastal tankers supply the main ports whilst Tananarive, the capital, is supplied by rail tankers.

28. The "IRAQSOMA" refinery, 14 km from Mogadishu, normally handles around 300,000 tonnes of crude per year. Although it has not operated for the past 14 months, it expects to resume operation in January 1982. The crude is imported from Iraq and the surplus fuel oil is re-exported to Iraq.

OIL POLLUTION FROM EXPLORATION AND REFINING

29. It is not possible to estimate the amount of pollution of the sea by oil as a result of the exploration going on and the effluent from the five refineries.

30. Exploration is limited to one floating drilling ship or rig in most cases, to simple rigs in others. Unless there is a blow-out, oil pollution will arise mainly from the use of oil on the rig or ship, or its accompanying supply vessels. No oil leakage or other accident has been reported.

31. Refineries use the American Petroleum Institute (A.P.I.) tank system to retrieve most of the oil in the waste system before emptying into the sea or canal as in Toamasina. Here, however, control is lacking in some places on the oil content of the waste water near the discharge points. The condition of the Pangalanes Canal at Toamasina suggests that a considerable amount of oil is being released into it. The surface of most harbours during ebb-tide supports the possibility of an appreciable quantity of oil reaching the sea. The East African Oil

32. In this refinery, effluent from areas of accidentally contaminated water (rain-water from tank farms, pipe tracks and oil-processing areas) and continuously contaminated water (rain-water from oil processing areas, tank drain water and deballasting water) is collected and brought to gravity type separators which are designed for the efficient separation of oil from waste water. The refinery is equipped with six gravity type separators. Oil removal by means of these separators is good and the treated water is almost oil free. Typical measurements of total dissolved hydrocarbon content of effluents issuing from the separators have given results of about 50 ppm. This is well within the specified limit of 100 ppm set by the Public Health Department of the Mombasa Municipal Council. The oil captured by the separator is pumped to storage for reprocessing.

33. In most other refineries, the oil content of the water was not checked frequently though it was believed to be less than the figure of 100 ppm. It should be noted, however, that 15 ppm is more typical of effluent limitation where such a regulation exists.

OIL POLLUTION FROM MARINE TRANSPORTATION

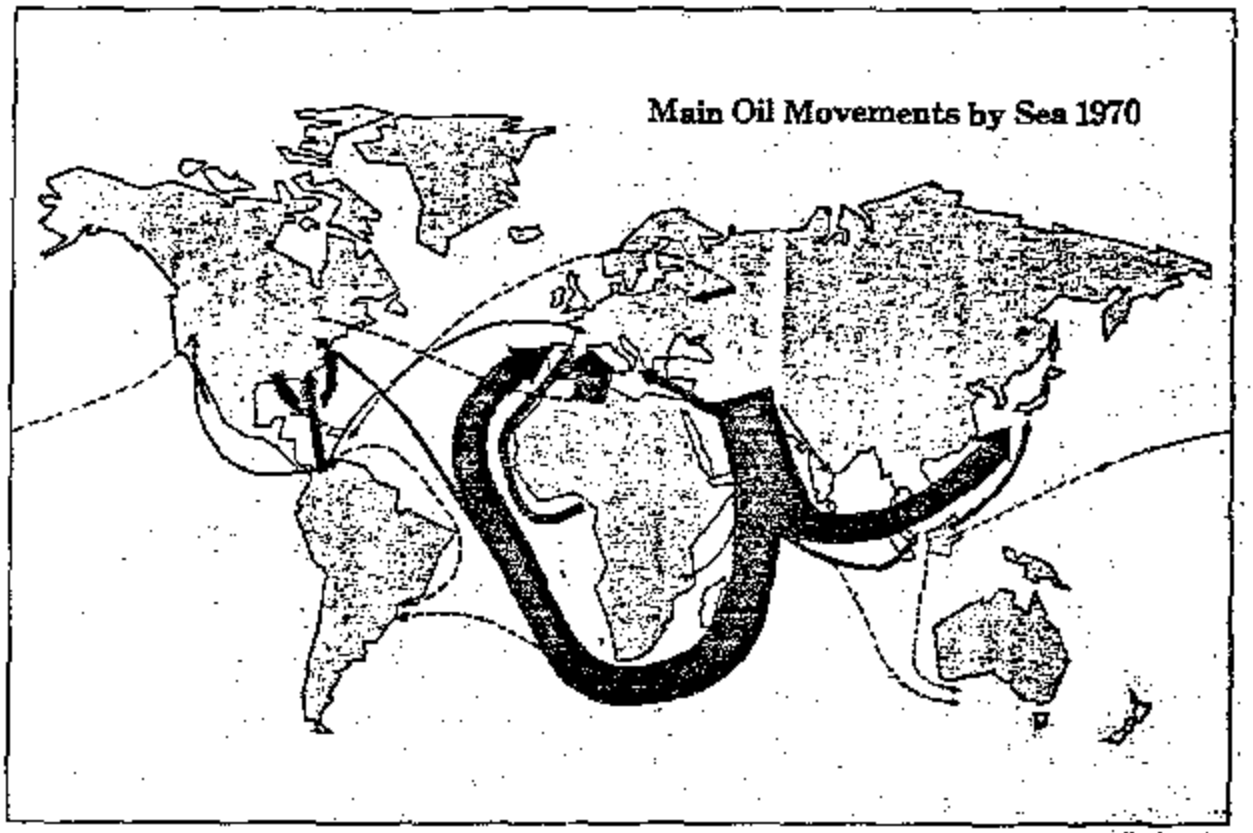
34. There are two principal crude oil transport patterns in the region. The first one is from the Middle East area and supplies the five refineries in Somalia, Kenya, Tanzania, Mozambique and Madagascar with a total of 6,550,000 tonnes of crude oil annually. The second pattern involves the supply of crude oil by very large crude carriers (VLCCs) to the European, North and South American markets, and by medium-size tankers to other refineries in Africa, Europe and America. This can be termed the transit route. Main oil movements by sea, 1970 - 1980, are shown in figure 5.

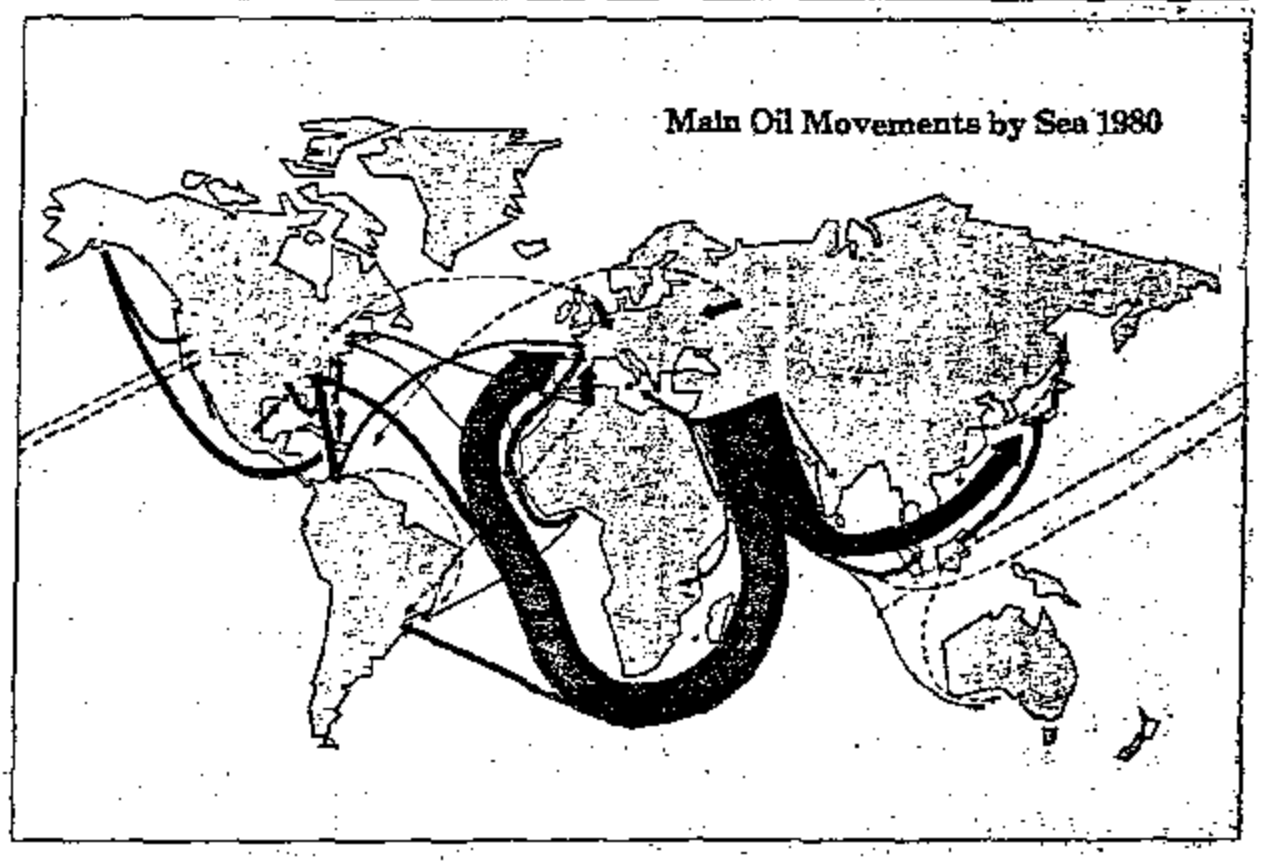
35. The first route is served by tankers of 20,000 tons dwt to 100,000 tons dwt. The crude oil is loaded at a port in the Middle East and the vessels proceed directly to the discharging port - Mogadishu, Mombasa, Dar es Salaam, Maputo or Toamasina. After discharge, the vessel normally returns to a Middle East port in ballast for the next cargo. It is possible that during tank cleaning operations on the return journey oil is pumped over the side in the region.

36. The transit route is served mostly by tankers of the VLCC class bound for European ports, and North and South American ports. Due to draft limitations in some ports, medium-size tankers are also used.

37. Approximately 550 million tonnes of oil per year are being transported from the Middle East ports to Western Europe and America - North and South. Taking into consideration approximately 22 million tonnes of crude imported by East and South Africa and assuming approximately 100 million tonnes moves via the Suez Canal, the total volume of oil passing through the region can be estimated to be approximately 475 million tonnes.

38. It is estimated that half of this oil is transported on VLCCs averaging about 200,000 tons and the other half on medium-sized vessels of average 60,000 tons. It can be estimated therefore that there are approximately 1,200 VLCC voyages per year and 4,000 medium-sized voyages per year through the region. This would mean an average of 3 VLCCs and 11 medium-sized tankers entering and leaving the region in either direction each day. By assuming that the average length of the voyage within [illegible] and the distance covered per day 360 miles, we arrive at


Main Oil Movements by Sea 1970


Main Oil Movements by Sea 1980

therefore, that at any one time there could be 24 VLCCs loaded and 24 VLCCs in ballast, 88 medium-sized tankers loaded and 88 in ballast in the region. This figure does not take into account the Middle East traffic to Suez and smaller coastal tankers. On any one day there are, therefore, approximately 224 tankers within the East African region.

39. Importation of crude oil in the region is as follows:

(a)	Mogadishu	-	yearly average 300,000 tonnes from Iraq
(b)	Mombasa	-	yearly average 3,000,000 tonnes from Middle East
(c)	Dar es Salaam	-	yearly average 1,600,000 tonnes from Middle East
(d)	Maputo	-	yearly average 1,000,000 tonnes (approximately)
(e)	Tamatave	-	yearly average 650,000 tonnes from Middle East
	Total	-	6,550,000 tonnes

No exportation of crude oil is carried out in the region.

40. Comoros, Mauritius and Seychelles import refined oil from refineries in the Middle East. Mauritius imports 250,000 tonnes and Seychelles 60,000 tonnes annually. The imports and exports of crude and fuel oil and refined products in the region are shown in table 2.

Tanker operations

41. During normal operations, oil tankers discharge into the sea a certain amount of oil contained in the ballast and tank washing water. OILPOL 54/69 stipulates that the instantaneous rate of discharge from the cargo tank area of oil tankers must not exceed 60 litres per mile and the total quantity of oil discharged during any one ballast voyage must not exceed 1/15,000 of the total cargo carrying capacity (hereafter referred to as "Tc"). MARPOL 73/78 sets out the same discharge criteria outside special areas, but the maximum quantity of oil permitted to be discharged for new oil tankers has been reduced from 1/15,000 to 1/30,000 Tc.

42. In order to comply with the requirements of OILPOL 54/69, which are in force, oil tankers should operate with the Load-on-Top (LOT) procedures. Through the use of LOT the tank cleaning residue (water and oil) is pumped into a holding tank. Here the mixture is allowed to settle and the water is drawn off the bottom so that only oil and a small amount of water remain in the tank. These consolidated slops are then transferred to a reception facility on shore or combined with the next cargo; hence the term "Load-on-Top". In the 1973 NAS study, it was assumed that 80 per cent of the tanker fleet was operating with LOT . At present all crude oil tankers engaged on long haul voyages (voyages exceeding 72 hours or 1,200 nautical miles) should operate with LOT, whereas tankers engaged on short haul voyages may not be able to do so. It is estimated by the International Association of Independent Tanker Owners (INTERTANKO) that long haul voyages (voyages exceeding 72 hours or 1,200 nautical miles) and short haul voyages constitute 85 per cent and 15

Table 2 : Tanker ports of the region; imports and exports

Country	Port	Import (foreign)	Import (local by sea)	Export (foreign)	Export (loc. by sea)	Export (to land-locked countries)
Somalia	Mogadishu	C	-	SFO	RP	-
	Berbera	-	RP	-	-	-
Kenya	Mombasa	C	-	SFO	RP	RP/PR to Uganda
Tanzania	Dar es Salaam	C	-	SFO	RP	C/P to Zambia
	Zenzibar	-	RP	-	-	-
	Tanga	-	RP	-	-	-
	Lindi	-	RP	-	-	-
	Mtwara	-	RP	-	-	-
Mozambique	Maputo (Matola)	C	-	SFO	RP	
	Beira	RP	RP	-	-	C/P to Zimbabwe from 1982
	Quelimane	-	RP	-	-	-
	Inhambane	-	RP	-	-	-
	Pebana	-	RP	-	-	-
	Angoche	-	RP	-	-	-
	Nacala	-	RP	-	-	-
	Pemba	-	RP	-	-	-
	Mocimba do Praia	-	RP	-	-	-
Madagascar	Toamasina	C	-	SFO	RP	-
	Antseranana	-	RP	-	-	-
	Nosy-Bé	-	RP	-	-	-
	Mahejanga	-	RP	-	-	-
	Morondeva	-	RP	-	-	-
	Toliara	-	RP	-	-	-
Mauritius	Port Louis	RP	-	-	-	-
Comoros	Moroni	RP	-	-	-	-
	Moheli	-	-	-	-	-
	Anjouan	RP	RP	-	-	-
Seychelles	Port Victoria	RP	-	-	-	-

Note: C - Crude Oil
RP - Refined Products
SFO - Surplus Fuel Oil

43. In this context the term LOT used is intended to encompass "retention on board" procedures which involve decanting of dirty ballast water, tank washings, transfer of oily residues to slop tanks and discharge of decanted water into the sea. The oil in slop tanks may or may not be carried as cargo for the subsequent voyage, but this is irrelevant to the assessment of operational discharges.

44. Annual crude imports for East and South Africa are estimated at approximately 22 million tonnes, with countries in the East African region accounting for approximately 7 mt. It is not possible to determine the sources of the 15 mt of oil imported by South Africa; however for the purpose of this calculation one could assume that at least 85 per cent (i.e. approximately 13 mt) is moved from the Middle East for a total of 20 mt moving to East and South Africa.

45. Assuming that 50 per cent of the crude oil tankers on this route meet the OILPOL 54/69 discharge criteria of 1/15,000 of the total carrying capacity and 25 per cent would discharge 1/7,500 (i.e. twice the OILPOL 54/69 criteria), in view of the nature of the trade it could be conjectured that 25 per cent of the vessels employed might not conscientiously practise retention-on-board techniques specified in the Load-on-Top procedure and would discharge oil equal to 0.4 per cent of Tc. Annual discharge of crude oil into the sea resulting from the normal operation of crude oil tankers on this route is estimated as follows:

$$20 \text{ mt} \times 0.50(10 \text{ mt}) \times \frac{1}{15{,}000} = 666 \text{ tonnes}$$

$$20 \text{ mt} \times 0.25\ (5 \text{ mt}) \times \frac{1}{7{,}500} = 666 \text{ tonnes}$$

$$20 \text{ mt} \times 0.25\ (5 \text{ mt}) \times 0.004 = 20{,}000 \text{ tonnes}$$

$$\text{Sub-total} = 21{,}300 \text{ tonnes (rounded)}$$

46. Approximately 550 mt of oil per year is transported from the Middle East ports to Western Europe, and North and South America of which it can be assumed that an increasing share moves through the enlarged Suez Canal (approximately 100 mt). It is assumed that in view of the nature of the trade and the length of the voyage, vessels using this route are likely to be fairly "clean ships" and, secondly, are more likely in the case of "dirty ships" to clean tanks and discharge contaminated ballast prior to arriving in the region (e.g. off West Africa). Certainly, bad weather conditions in the Atlantic may encourage cleaning in the Western Indian Ocean; however, ships that are likely to clean tanks and discharge contaminated ballast in violation of international rules would want to do so as soon as possible after leaving discharge ports so as to be clean and available for, e.g., spot market operations. Therefore, 50 per cent of the crude oil tankers on this route are assumed to meet the OILPOL 54/69 discharge criteria of 1/7,500 Tc). It is estimated that vessels on this long haul route spend approximately a quarter of the voyage time traversing the region.

47. In the light of the foregoing consideration, the annual discharge of crude oil into the sea resulting from the normal operation of crude oil tankers on this route is estimated as follows:

450 mt X 0.5 (225 mt) X $\frac{1}{15,000}$ = 15,000 X $\frac{1}{4}$ = 3,750 tonnes

450 mt X 0.5 (225 mt) X $\frac{1}{7,500}$ = 30,000 X $\frac{1}{4}$ = 7,500 tonnes

Sub-total = 11,250 tonnes

GRAND TOTAL = 32,500 tonnes

48. In addition to the discharge of dirty ballast and tank washing water, all vessels generate bilge and fuel oil waste. With respect to bilge, it has been estimated that the average quantity of bilge oil generated in an average tanker is 10 gallons per day. The majority of tankers may retain such bilge oil in slop tanks, as cargo oil is discharged to shore reception facilities. Assuming that 10 per cent of the total bilge oil generated in engine-rooms of tankers may be discharged into the sea, and that there are, as stated, approximately 244 tankers in the region on any given day, the annual discharge of bilge oil from tankers in the region is estimated as follows:

10 gallons/200 X 244 X 365 X 0.1 = 445 tonnes

Other vessels

49. General cargo and other non-tanker vessels also contribute to the input of petroleum hydrocarbons into the sea by, for example, the discharge of oily bilge from engine-rooms, fuel oil sludge and oily ballast from fuel tanks. Within the scope of this study it is not possible to estimate the number of dry cargo and other non-tanker vessels transiting the region. However, to illustrate the problem one can take the 19 to 20 million tonnes of East African dry cargo seaborne trade and, assuming that 5,000 vessels would be required to transport these goods spending approximately 16 days in the region, one could say that at any one time there are approximately 220 ships in the region. It has been estimated that the average quantity of slop oil generated in non-tankers per day is three gallons. The quantity of this bilge oil discharged into the sea would depend on whether or not vessels are fitted with oil/water separators and on the availability and use of shore reception facilities. It has been estimated that half of the world's non-tanker fleet are fitted with separators. Therefore, assuming that ships with separators would discharge into the sea 10 per cent of bilge oil and ships without separators two-thirds of bilge oil, the quantity of oil from bilge discharge into the sea per year from vessels serving the East African trade route is estimated as follows:

3 gal/200 X 220 X 365 X 0.5 (with separators) X 0.1 = 60 tonnes

3 gal/200 X 220 X 365 X 0.5 (without separators) X $\frac{2}{3}$ = 402 tonnes

Total 462 tonnes

50. For safety reasons, fishing vessels very often have to carry large quantities of water ballast in their fuel tanks and may be prone to discharge contaminated ballast in addition to normal discharge of oily bilge. There has been evidence that fishing vessels discharge oily bilge and other waste in or near the port areas of Mombasa, Dar es Salaam, Maputo, Toamasina, Antseranana, Port Louis and Port Victoria.

Related operations

51. During discharge in the tanker ports minor accidents are known to happen. All major ports in the region experience accidental discharges, though seldom, during unloading operations. These are normally caused by fractured pipelines, leaking joints, flow-back in hoses, etc.

In Mombasa, for example, recorded spills have been:

(a) 1975 - 2 tonnes of crude into the harbour area at a tanker terminal;

(b) four incidents at the refinery, which was contained by the bundwall, caused by a rupture in one tank, the overflowing of one tank, and two cases of leaking valves;

(c) one spill of about 200 gallons when a valve was left partly open during a discharge operation;

(d) one spill of about 100 gallons of refined oil at one loading berth due to oil in the hose when disconnecting. For spills recorded in Maputo, see table 3.

52. A more serious accident occurred in Mombasa when the BRITISH CAVALIER grounded on the reefs in the approaches to the harbour. An estimated amount of 100 tonnes of crude oil leaked overboard and found its way into the old harbour area. In Seychelles, the R.F.A. ENNERDALE sank in 1970 carrying approximately 60,000 tonnes of oil. Though blown apart to release the oil, five years later oil was still seeping out of the wreck.

53. Other ports of the region have had similar accidental spills during loading and discharging operations. On 9 January 1981, a major spill occurred during discharge operations on the single mooring buoy system off Dar es Salam harbour. Figures quoted indicated that an amount of between 50 to 100 tonnes of crude oil was lost. It is to be noted that this oil destroyed a large area of mangroves to the north-west of the harbour entrance.

54. It can, therefore, be generally accepted that pollution in harbours and their approaches is caused by the following:

(a) tanker accidental spills during loading and discharging operations;

(b) accidental spills at refinery storage tanks and tank farms;

(c) spills during bunkering operations;

(d) deliberate discharge of oily bilges into harbour limits and near approaches;

(e) grounding, collisions or other accidents.

Table 3 : Oil spills - Maputo Bay

Ship/Flag	Tonnage gross	Year built	Date of incident	Oil spilled Type	Quantity	Particulars	Investigat
Edinburgh/ Paneme	8146	1966	26-12-78	Burnt oil		Pumped overboard	Fined 55,(
			13- 1-79	Fuel oil	5 tons	Leaks during bunkering	Vessel wa
Regis Trade/ Greece	9026	1970	17- 1-79	Burnt oil		Pumped overboard	Fined 30,(
Chuabe/ Panama	479	1969	28 & 29-6-79	Fuel oil		Damage to pipes caused by careless ness of crew	Fined 30,(CFM warne
Matchedje/ Mozambique	6183	1972	1-11-80	Fuel oil		Escape during supply	Fined 5,0
Amazea V/ Japan	394	1975	8-11-80				Fined 10,
Ryoyoshi M./ Japan	254	1969	21-12-80			Pumped overboard	Fined 10,
Maine/ Mozambique	635	1979	12- 9-81	Fuel oil		Pumped overboard during supply	Fined 10,

Visual observation of oil

55. On a local flight from Grande Comore to Anjouan on 29 October 1981, a total of ten oil slicks were visible from the air, three major trails extending from horizon to horizon in a NE-SW direction, and seven of smaller dimensions. These oil slicks are seen on practically every flight between the islands of Comoros. The main tanker route passes between the Islands of Comoros. These tankers are seen every day discharging oil-contaminated ballast. This oil covers large areas of the ocean between and around the Islands. Tankers are observed every day, some within a mile of the shore and some further off, all pumping oily water over the side. This oil reaches the reefs and the beaches in great quantity and still in liquid form. The geographical distribution of oil slicks on the Indian Ocean as indicated by the percentage of positive reports is shown in figures 6(a) to 6(c).

56. Along the coast of Somalia the oil pollution is mainly in the form of tarballs deposited on the beaches. These are seen frequently and in large amounts. Oil deposits are also experienced in the rest of the region but no record has been kept of these.

57. An oil pollution survey of the Kenya beaches was carried out by the East African Oil Refinery (EAOR) for the year 1973. It was found that, in general, oil pollution inside the harbour, arising from either oil refinery/oil company operations or from other sources such as cargo vessels pumping bilges, has not been severe and has given no great cause for concern. However, pollution of the beaches has on several occasions given rise to considerable anxiety, in particular on account of its impact on the tourism industry.

58. The survey showed that in the majority of cases the oil on the beaches arrived as solid, black, tar-like lumps. On only one occasion in 1973 was liquid oil reportedly seen 15 km from the shore. The "tar balls" ranged from golf ball size or smaller up to almost football size on occasions. The heavy pollution reported for August of that year was characterized by the presence of some very large flattened lumps of soft tar, weighing up to 5 kg. Generally, the lumps were much smaller, about 2 to 10 cm in diameter. These were found on the high water mark.

59. Nineteen cases of pollution were reported in 1973. Six occurred during the NE monsoon from November to March, and thirteen took place during the SE monsoon season from April to October. The pollution was reported as "heavy" during the SE monsoon and as "slight" during the NE monsoon. The survey, though not as thorough as the EAOR would have liked, confirmed previous impressions that pollution on the Kenyan (and possibly Tanzanian) coast is worse during the SE monsoon. The oil pollution was evenly distributed to the north and to the south of Mombasa. However, bays such as Malindi, partly sheltered from the south-east, escape the frequent and heavy pollution experienced during this monsoon.

60. Air surveys revealed little, as the main pollutant - the tar balls - are not visible from the air.

61. It was concluded that the oil found on the beaches originated from the large spillages of crude or fuel oil, which had been in the sea long enough for the lighter fractions present to evaporate and the heavy residue to become emulsified with the sea-water under the effect of wave action. Tar balls are formed in this way and the whole process is estimated to take several weeks.

62. Owing to the onshore component of the prevailing winds and to the permanent 2

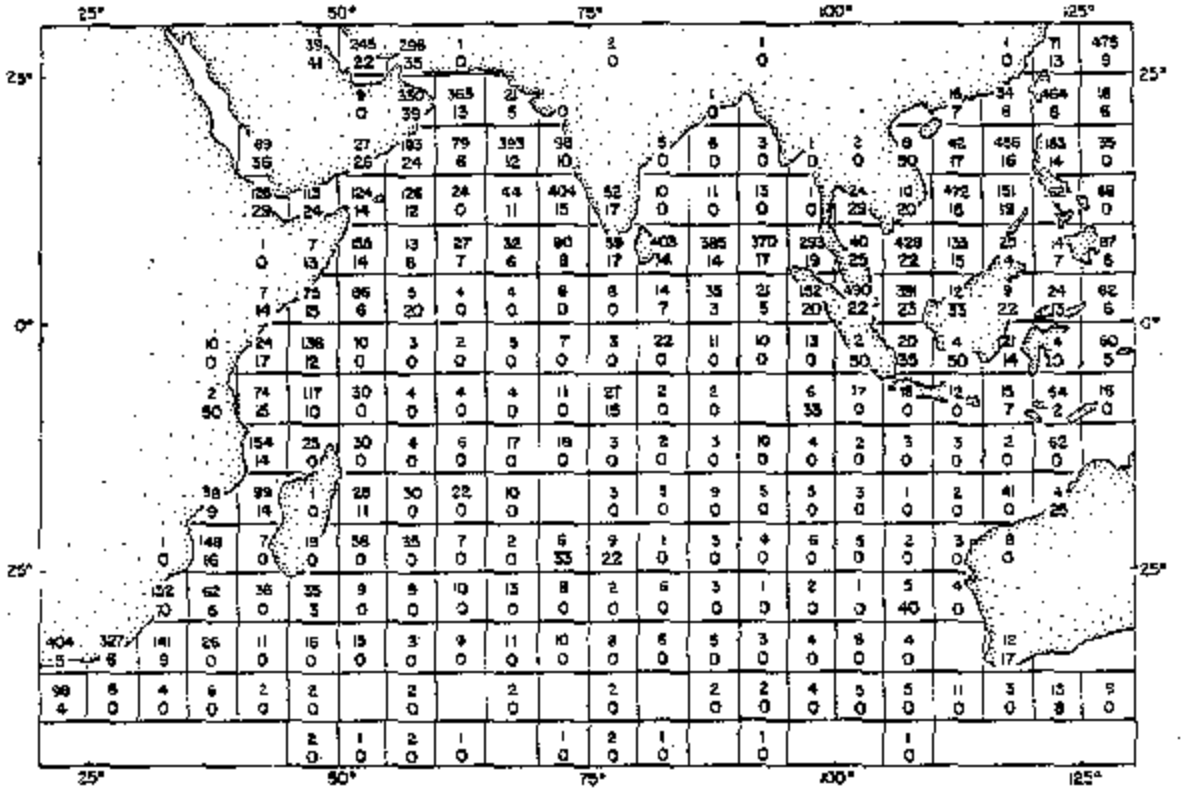
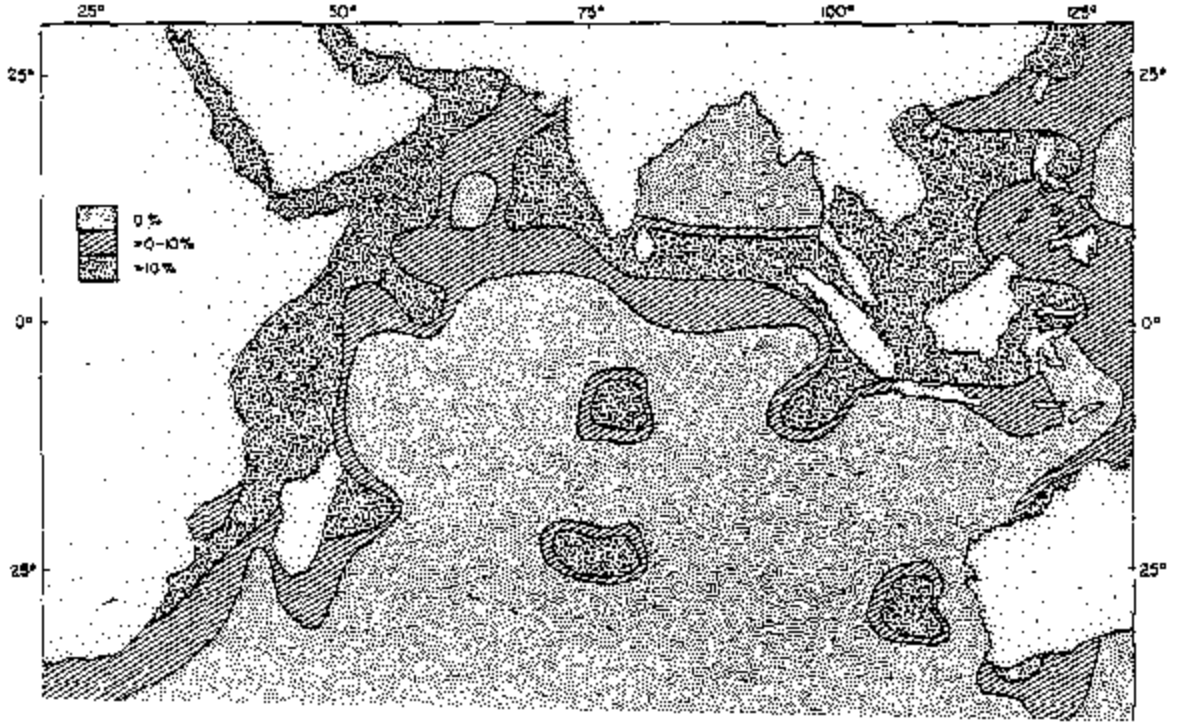


Figure 6(a) : Total number of reports of visual observations of oil slicks for 5° x 5° squares of latitude and longitude of the Indian Ocean and the percentage that indicated the presence of oil (upper value, total number of observations; lower value, percentage of positive reports)



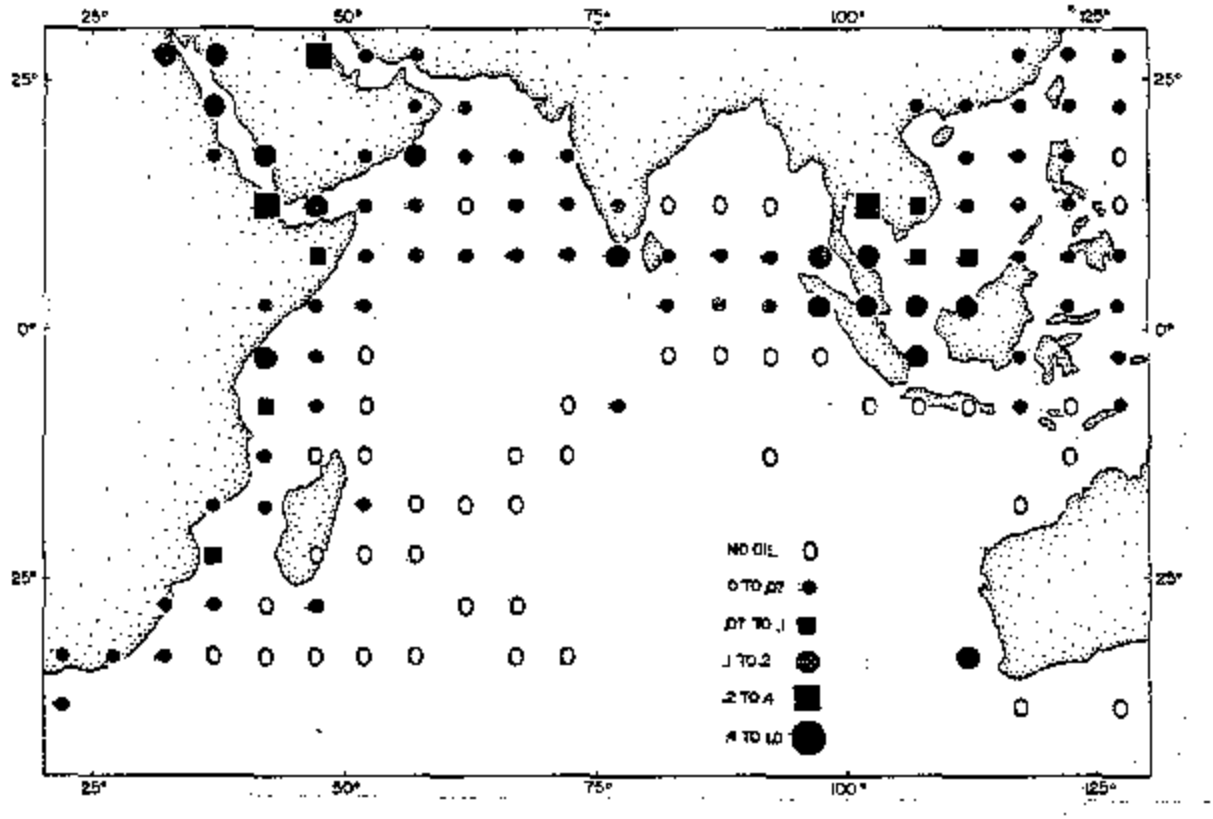


Figure 6(c) : Average number of sightings of oil slicks per 100 nautical miles of ships' tracks in the Indian Ocean

in liquid form. The solid nature of the pollution indicates other sources of spill. This principle applies to all countries in the region.

63. About 500 to 700 miles offshore lies one of the busiest tanker routes in the world along which laden crude carriers of all sizes up to half a million tons travel from the Middle East loading ports southwards around the African continent to deliver their cargoes in Europe and America. These vessels subsequently return in ballast to reload and it is likely that most of the pollution on the coasts of the region is caused by these tankers.

64. The South Equatorial Counter Current aided by the NW monsoon carries some of this pollution eastwards across 300 miles to 500 miles of ocean to the west coasts of the islands of Seychelles, including the Amirante group. Here also tar balls and, more frequently, thin flakes of solid tar are found on the beaches during the period November to March. In Comoros, where the tankers pass very near to the islands, the oil reaches the beach in liquid form almost every day of the year.

65. Oil pollution of the coasts of Kenya and Tanzania may be due to the northward-flowing currents bringing the residue of tank washings to the shoreline of these countries. The eastward-flowing Counter Current brings the same product to Seychelles and the Somali Current is responsible for the pollution off the coast of that country. The Mozambique Current with the frequent coastal counter current ensures that this oil residue is deposited along the coast of Mozambique. Mauritius and Madagascar are, however, affected by the westward-flowing Equatorial Current bringing the oil pollution from discharges of tankers bound for the Far East after rounding the Cape of Good Hope.

66. The above conclusion is also supported by the findings of the East African Marine Fisheries Research Organization who, in 1972 and 1973, carried out investigations in this field. The Annual Report of 1972 concludes that there is fairly strong circumstantial evidence that dumping and spillage of oil along the international tanker routes between the Middle East and the Cape of Good Hope are mainly responsible for the region's chronic oil pollution problem.

STATUS OF OIL POLLUTION CONTROL

Legislation and regulation

67. The main ports of the region have over the years produced a number of regulations in respect of oil pollution in harbour areas. Most of these are outdated and deal largely with punitive actions in cases of discharge of oil or oily residues in harbour limits and territorial waters.

68. Port authorities are the executive agencies in dealing with oil pollution within harbour limits. Outside these limits there are no clear indications of responsibilities except in Kenya.

69. The reason for the lack of executive agencies for areas outside harbour limits is due mostly to the fact that no major accidents have yet occurred in the region causing major oil spills affecting the coast of one or more countries. However, because of the increase in tanker traffic, some countries like Kenya, Mauritius,

70. The present national laws of most countries of the region deal therefore with harbour limits of major ports and in some cases territorial seas. The following is an example of national pollution regulations that are limited in scope:

"Il est interdit:

- De jeter des terres, des escarbilles, des décombres, des ordures ou des matières quelconques dans les eaux du port;

- De rejeter à la mer, à l'intérieur des limites du port les résidus et les eaux de nettoyage des cales et soutes des navires ayant contenu des huiles végétales ou minérales;

- De verser dans les limites du port des liquides insalubres et inflammables ou salissants;

- De faire des dépots quelconques sur les parties des quais réservés à la circulation;

- De circuler sur les parties interdites des quais, terre-pleins, digues;

- D'ouvrir un chantier à l'intérieur de l'enceinte du port sans l'accord de l'autorité portuaire;

- De ramasser des coquillages sur les ouvrages quels qu'ils soient, sauf autorisation particulières de l'autorité portuaire."

71. In other countries, no special regulations exist in respect of pollution caused by oil exploration, and existing regulations deal mostly with harbour limits and areas of up to 100 miles offshore such as the Kenya Merchant Shipping Regulation, Part XI, Pollution. The Seychelles Harbour Subsidiary Regulations, Sections 17 to 19; the Petroleum Mining (Pollution Control) Act, 1976; the Meritime Zones Act, 1977; the Merchant Shipping (Oil pollution) (Seychelles) Order 1975 are existing regulations in Seychelles in respect of harbour limits, territorial waters, Exclusive Economic Zone (E.E.Z.) limits and oil exploration control. The Tanzanian Harbour Regulations deal with harbour limits, reference Tanzania Merchant Shipping Act 1967, paragraphs 39 and 310, and the East African Harbour Regulations 1970.

72. The Mauritius Ports Act 1975 provides for management and control of pollution within harbour limits and territorial waters. The Maritime Zones Acts 1977, appendix 'E', provides for management beyond the 12 miles territorial water limit of the outer edge of the continental shelf or up to 200 miles from the baseline - the E.E.Z. limit.

Oil spill response equipment

73. In order to combat oil pollution in the area, the main ports hold limited stocks of equipment and dispersant as shown below:

Somalia : Nil

Kenya : Mombasa

Port Authority - 1 Sea-pack floating boom of 1,500 metres, 200 litres of dispersant at Port Authority Jetty and 2 tonnes in storage, 12 portable sprays of 20 litres each, 1 skimmer of 20 tons capacity and one barge of 200 tons. In addition, the Port Authority is acquiring a tug before the end of 1981 equipped with oil pollution combating equipment of 24 tons capacity for dispersant and 2 spray nozzles.

Refinery - 200 plastic bags, 4 tonnes of sand and 200 litres of dispersant.

Tanzania : Dar es Salaam

Port Authority - 1 skimmer of 20 tons capacity (out of order), 1 sea-pack floating boom (out of order), one hundred 200-litre drums of dispersant.

Refinery - nil.

Mozambique: Maputo

Nil. In case of spills in the harbour, the fire brigade is called in to assist.

Refinery - nil.

Madagascar: Toamasina

Port Authority - 400 litres dispersant and one pump.

Refinery - nil.

Comoros : Grande Comore, Moheli and Anjouan

Ports - nil.

Storage tanks - nil.

Mauritius : Port Louis

Port - nil. Now planning to set up a pollution combat unit. Not finalized.

Tank farm - nil.

Seychelles: Port Victoria.

Port - 2 units with foam compound monitors, one on tug and one portable. 1,500 litres of dispersant.

Contingency planning

74. In the whole region the Port of Mombasa alone has a formulated contingency plan in case of oil pollution. Mozambique, Mauritius and Seychelles are proposing to produce a contingency plan but require expert advice on equipment and personnel. The other countries have not yet decided to develop a plan despite expressed interest: either they could not afford the equipment required or they needed expert advice. Mozambique is programming an anti-pollution unit with contingency plan for Maputo in 1983 and for Sofala (Beira) and Nacula in 1983 and 1984 respectively. Assistance has been requested from IMO for this purpose.

75. The Mombasa Contingency Plan is outlined in a document produced by the National Environment Secretariat entitled "The National Marine Anti-Pollution Committee". This is a committee consisting of a chairman (Kenya Ports Authority in Mombasa), a vice-chairman (of the National Environment Secretariat in Nairobi), a secretary (Kenya Ports Authority in Mombasa), and members of different government departments and the oil refinery. The Chairman is also the Marine Pollution Control Officer and the Vice-Chairman the National Oil Pollution Executive. The headquarters of the National Oil Pollution Centre is situated in Nairobi and for major spills will be transferred to Mombasa. There are two main action plans, one for the Mombasa harbour area called the "Kilindini Oil Spill Contingency Plan" and one for the coastal area called the "Kenya Coast Oil Spill Contingency Plan".

76. The "Kilindini Oil Spill Contingency Plan" deals with actions to be taken at the two areas most vulnerable to oil spills, viz. the Kipevu Oil Terminal and the Shimanzi Oil Terminal. Other areas of the harbour are also taken into consideration.

77. The "Kenya Coast Oil Spill Contingency Plan" deals with three levels of pollution: the "chronic pollution" which is mainly of tarry lumps found on beaches; the "small spill" which is spills of up to 50 tonnes of oil; and the "large spills" of over 50 tonnes.

78. A list of equipment to be provided and their locations are laid down together with other equipment that can be made use of, such as planes for spraying, harbour and commercial vessels for transport and the assignment of special emergency radio frequencies.

79. Apart from Kenya where the Marine Anti-Pollution Committee was formed in 1977, there are no national institutions clearly responsible for anti-oil pollution activities. In all cases, the Port Authority with the assistance of the navy and other government departments carry out cleaning operations on an ad hoc basis.

80. It can be said, therefore, that in certain cases, with the exception of Kenya, there is no established lead agency or national institution entrusted with the responsibility for response to marine spillage incidents or the threat of spillage in the harbour and coastal areas.

81. There is practically no surveillance for marine pollution or it is carried out simply on an ad hoc basis. It is, therefore, difficult to determine the origin of oil after it has been deposited for some time on the beaches.

82. Many ports have no oil spill response equipment available or in working order to deal with small-scale harbour oil pollution and large-scale coastal pollution.

(a) establish formal procedures for use of resources from other government departments or other agencies in the event of an oil spill;

(b) to outline the responsibilities of each department and its personnel;

(c) to provide available equipment and means of transport;

(d) to co-ordinate all activities in a central focal point;

(e) to introduce preventive measures.

84. National or local port contingency plans will be able to deal with most small spills, and some of medium size. For a major spill which can be caused by collisions at sea involving one large tanker, stranding on reefs within the region or explosions resulting in damage to the tanker, no one country in the area will be able to combat the pollution successfully. The possibility of such a mishap obviously exists and with the main flow of the Indian Ocean Currents first towards the land and then parallel to it, a vast area could be affected. Furthermore, the southern area is subject to cyclones for four months of the year and vessels are thus exposed to severe weather conditions.

85. Having established national contingency plans in all countries of the region in line with local requirements and bearing in mind the vast area to be covered, the long distances between ports and the limited amount of resources available, it is recommended that a Regional Contingency Plan be established, the basic elements of which should include those developed by IMO (see annex I).

Oil pollution prevention and international regulation

86. Though the oil pollution problems of the Western Indian Ocean are regional in character, they inevitably take an international dimension since any action to control such pollution involves actions not only by the regional States but also international shipping interests and other countries.

87. In this respect, countries of the region firmly believe that prevention is better than cure. Prevention obviously involves other countries engaged in the transportation of oil, while the cure chiefly involves countries of the region. Since most of the pollution is caused by foreign tankers using the tanker routes Middle East to the Cape, to the Suez Canal, to the Far East and the Cape to the Far East, it is suggested that the areas delineated in figure I become an oil-discharge-free zone, by the procedures laid down in MARPOL, 1973.

88. The International Conventions relating to pollution of the sea by oil should be studied carefully by the States of the region. Assistance will be required to outline the meanings of these conventions with the advantages to the participants and national contributions expected from them.

89. The "OILPOL Convention of 1954" prohibited discharges of oily mixtures in excess of a specified concentration within 50 miles of a coast. OILPOL 54/62 created additional prohibited zones, prohibited discharges of the specified mixtures by new ships, and lowered the tonnages of vessels covered by the Convention. OILPOL 54/62, however, allowed discharges in "special circumstances", such as where there was a lack of appropriate shore reception facilities. As there are practically no

could be met in practice by the "Load-on-Top" system which permits dirty water to be placed into slop tanks for gravity separation prior to discharge. OIL 54/69 allows discharge only (1) when en route; (2) when the rate of discharge does not exceed a given concentration; (3) when the total volume of oil is less than a stated percentage of the total cargo, and (4) when more than 50 miles from the nearest land. In addition, the total quantity of oil which may be discharged by a tanker on a ballast voyage must not exceed 1/15,000 of the total cargo-carrying capacity. MARPOL 73/78 deals with location and limitation of size of tanks. "MARPOL 73/78", upon entry into force, will supersede OILPOL 54/69. This is therefore the convention which is of greatest interest to the region. Among other advantages it halves the maximum permissible discharge; it requires the installation of oil discharge monitoring and control system, adequate slop tanks for L.O.T. operations, and segregated ballast tanks for new tankers of over 70,000 dwt. There is also the procedure to adopt "special areas" where even stricter prohibitions on the discharge of oil are applied. It should be noted that MARPOL 73 has been amended by the MARPOL Protocol of 1978 and therefore Governments should address themselves to this instrument when considering ratification and implementation.

90. The other conventions such as Civil Liability (CLC), International Fund (FUND) and possibly Intervention on the High Seas are of importance to these countries. SOLAS 1974 is obviously a primary requirement as this deals with the safety of the vessel. It has been noted that most States of the region have not ratified any of the above conventions. Kenya and Madagascar however have ratified most. Seychelles has still not ascertained whether the Devolution Agreement applies to IMO Conventions ratified by the United Kingdom before independence in 1976. Conventions ratified to date are shown in table 4.

CONCLUSIONS AND RECOMMENDATIONS

91. Although this report is only a brief survey of the main sources of oil pollution and the status of oil pollution prevention and control in the region, it is possible to draw pertinent conclusions and make recommendations for future activities within the framework of the development of an action plan for the protection of the marine environment of the region.

92. It is evident that the countries of the region are suffering to a greater or lesser degree from the effects of chronic oil pollution as a result of the discharge of oily residues from tankers traversing the region to and from the Middle East area in the Western Indian Ocean. In addition, there is evidence of oil pollution caused by local tanker and general cargo traffic due in part to the lack of adequate oily waste reception facilities in ports and inadequate local regulations, surveillance and control.

93. The countries of the region are also at risk from pollution caused by maritime accidents, both on the high seas and inshore, and during related terminal and port operations. There is in general an acute lack of national oil spill contingency planning backed up by the existence of oil spill response equipment, material and trained personnel.

94. Taking into account this necessarily preliminary assessment of the problems treated in this Report, the following recommendations could be made.

Table 4 : Main IMO Conventions relating to pollution of the sea by oil

(as at 28 April 1982)

	1954 OIL POL (Amended 1962 and 1969)	Amendments		1973 MARPOL	1978 MARPOL PROTOCOL	1969 INTERVENTION	1973 INTERVENTION PROTOCOL	1969 CIVIL LIABILITY	1971 FUND	SOLAS 1960
		1971 (Great Barrier Reef)	1971 (Tanks)							
COMOROS										
KENYA	R			R		P		P		R
MADAGASCAR	S					S		S		R
MAURITIUS										
MOZAMBIQUE										
SEYCHELLES	X					X		X	X	R
SOMALIA										R
TANZANIA										

Note: R - Ratified
S - Signatory-not yet ratified
P - In process of Ratification
X - The Seychelles Government to determine if the Devolution Agreement applies.

should be taken to ratify and implement international conventions relating to the protection of the marine environment, in particular those listed in table 4. Several of the countries of the region may require technical assistance from IMO in this task.

96. The countries of the region which have not already done so should develop national oil spill contingency plans which should include the basic elements mentioned in annex II. It will be essential for those Governments requiring it to seek technical advice in carrying out an exercise of this nature. Such advice will be needed to determine the appropriate equipment and material requirements taking into account local conditions.

97. The Governments of the region should make a concerted effort to develop regional co-operative arrangements for combating oil pollution and consider the desirability and feasibility of establishing regional and/or subregional technical units for its implementation. Such regional contingency plans should contain the basic elements mentioned in annex I.

98. National seminars and workshops on oil pollution prevention, control and combating should be regularly convened and organized to provide the necessary training to enable all levels of personnel within the country to play their respective role in the response to an oil pollution emergency.

99. The opinion and advice of IMO may be sought in connection with the desirability and feasibility of designating the marine environment of the region as a "Special area" under the International Convention for the Prevention of Pollution from Ships (MARPOL 73/78) taking into account the oceanographical and ecological conditions of the region and the character of the maritime traffic.

100. The Governments should co-operate in the determination and protection of marine and coastal areas that are particularly vulnerable to pollution from oil exploration, production and transport.

Annex I

FRAMEWORK FOR REGIONAL MARINE OIL SPILL CONTINGENCY PLAN

Introduction

This framework is intended to identify those elements which should be included in a Regional Contingency Plan in order to ensure that general agreements between Governments to co-operate in combating oil pollution are given effect at the operational level. This framework therefore should be considered as complementary to any existing regional, subregional or bilateral inter-governmental agreement, which may exist and which normally sets out in general terms the obligations of Governments to co-operate with each other.

The Plan presupposes that each State, which would participate in a Regional Contingency Plan, would have developed and implemented a detailed national oil spill contingency plan which is the sine qua non for regional co-operation. These plans should be drawn up in close consultation with the oil industry which can provide technical expertise in risk assessment, behaviour on the sea of likely pollutants, possible methods of treatment and availability of industry oil spill response equipment.

Whilst each national plan will differ in details, they should follow the same general principles, particularly with regard to the size of oil spill which can be effectively dealt with at the national level (see section on Reporting and Alerting Mechanism).

Definition of geographical area(s) and division of responsibility

The geographical area covered by the Plan should be clearly defined, either by use of suitably annotated maps of the region attached to the Plan, or by use of latitude and longitude co-ordinates.

Within the region, areas should be clearly defined, preferably on the aforementioned map, in which individual States or several States jointly, may be responsible for taking actions such as surveillance, reporting and subsequent activities.

Co-operation between participating governments

This Plan is intended to establish the framework within which Governments co-operate to facilitate the operational aspects oil spill surveillance and response. This can include, but is not limited to, bilateral or subregional arrangements to optimize the use of vessels, aircraft and oil spill response equipment; agreement on the assumption of the lead role by the State in whose waters a pollution incident occurs; identification of priority coastal and sea [illegible] operation in, or overflying of, the territory of other States and the

Reporting and alerting mechanism

The Plan must include, as an annex, agreed lists for each individual State, detailing the individuals assigned responsibility under the national plan. This annex should identify personnel and their alternates with telephone and/or telex numbers which must be available on a 24 hour basis. It is recommended that wherever possible existing facilities be utilized, such as Defence and Police Headquarters, to receive and disseminate reports. A typical format is shown below.

Methods of communication must be agreed to ensure a free flow of information between Governments as the incident develops, including a format for requesting, offering and accepting assistance. To facilitate radio communications, prior agreement between Governments on the assignment of specific operating frequencies for operational response to an oil spill, is essential. Financial implications must be agreed and accepted by those involved and this detailed in the Plan.

When a spill occurs, the responsible Government must immediately inform neighbouring States if it appears likely that the spill may threaten their sea areas and shorelines, giving as much detail as possible and should include date, time, position, type and amount of oil spilled, the prevailing and forecast weather conditions and proposed actions. As the situation develops, information to these States must be updated continuously, and a regular synopsis provided to keep them informed. Typical formats for reporting and updating are shown below.

The spill must be tracked from the air as soon as possible, its movement monitored and the relevant information disseminated to enable adjacent Governments to assess whether any additional surveillance will be required and any response operations necessary.

Logistics and administration

It is vital for the implementation of a Regional Contingency Plan to be able to move equipment, materials and personnel to the places where needed without undue delay of formality. It is therefore essential that each State participating in the Regional Contingency Plan make administrative arrangements to expedite customs, immigration and other control of material and personnel entering or leaving its territory for the purposes of assisting it or another State in combating oil pollution or the threat thereof.

Details of such arrangements should be included in the Regional Contingency Plan and promulgated to all States participating in the Plan and to international organizations or other States, which may be called upon to assist in the case of an oil pollution incident. Such details should include the essential information which is required by the appropriate national authority (customs, immigration, etc.) in order to facilitate special arrangements. Ideally, such arrangements should include provisions for the rapid granting of entry visas as well as the temporary importation of oil spill clean-up equipment and material free of duty or import taxes.

Each State should maintain individual records of action taken and equipment and other resources used to respond to the incident. Such records may take the form of a chronological summary and a cost analysis of equipment and manpower resources assigned, including associated transportation costs.

Identification of the nature and degree of active co-operation

(a) Mutual reporting of spills

Agreement on and method of mutual reporting of spills which threaten any State in the region is mandatory. Such reports can be acquired from aircraft and ships operating in the area and transmitted to the appropriate national reporting system. Any routine surveillance being carried out by States will be of great benefit in rapid identification of a spillage and immediate response.

(b) Observation and prediction of spill behaviour and movement

Available meteorological and hydrographic data should be analysed to give rough early predictions of general spill movement. More sophisticated spill movement prediction methods may be used subsequently. However, visual observation of any spill is essential and the responsible individual under the appropriate national plan should use those resources already identified, such as charter, military or civil aircraft for surveillance. It is essential that the results of such observations and prediction be transmitted to other Governments which may be affected by the spilled oil until it no longer threatens any State in the region.

(c) Assistance in combating spills

The State in which the spill occurs will assume the lead role and be initially responsible for all the actions taken related to both tracking the spill and any response necessary. The basis on which responbility is transferred from one State to another must be laid down in the Plan. Any State involved may escalate the response activities to call upon assistance from other States within the region or from States or organizations outside the region. An inventory of resources available should be compiled from the information in national contingency plans for the region and annexed to the Plan. Private and Government resources outside the region which may be readily available, should also be identified in this annex. All States maintain discretion over the provision of their national resources.

(d) Joint contingency plans

Regional Contingency Plans, when no central secretariat is available, must remain simple and easy to operate. Within the overall framework, subregional or bilateral agreements may be prepared by those States in close proximity. Levels of response will very with each incident. However, mechanisms are required to permit activation by stages on a set of pre-arranged signals and to identify how States may initiate such action.

Resources required to implement regional plans

It is assumed that each national plan will make provision for the supply of adequate resources to deal with spills of up to 500 barrels of oil in its waters.

The totality of combined national resources within a region may well be found still to fall short of what is desired. It may, therefore, be necessary to agree upon an increase in individual holding or, alternatively, make arrangements to maintain a common supplemental holding or stockpile of equipment.

It should be borne in mind that it may not be possible to mount a fully effective response to the maximum credible spill, e.g. the total loss of an oil tanker and its cargo or from offshore exploration and production activities.

The Regional Plan should also contain information on resources available from

Review and update of the plan

The Plan should be reviewed on a periodic basis to incorporate experience gained from regular exercises and actual incidents in the region. Periodic updates of focal point contacts and equipment inventories should be made, using the information provided by individual States.

REPORTING AND ALTERTING MECHANISM - A TYPICAL FORMAT

Country	National Focal Point	Telex	Telephone No
Eden	Mr. A. Polluter	032-543	675 8910
Ruritania	Cdr. I.M. Ready	617-531	884 9172
Paradise	Capt. I. Tipple	457-621	766 8130
Erewhon	Mr. C. Leanees	41-268	455 7541
Shangri-la	Mr. A. Drip	047-241	8251
Hispaniola	Capt. B. Courageous	0132	7632
El Dorado	Eng. B. Digger	677	5411

POLREP Format (1)

From: (State requesting the alert)

To : (Focal Point in neighbouring State)

POLREP number (sequential number of report) (Brief title of the incident including source or potential source, location and time of incident)

1. Situation (provide full details of the incident as known)

2. Action Taken (describe the action taken initially, or since last report, in response to the discharge or threat)

3. Future Plan (describe the action contemplated in response to the discharge or threat)

4. Assistance Requested (identify assistance desired by particular State)

5. Alert (a) identify State to whom the alert is to be re-addressed, (b) advising Flag State following message quote - unquote

POLREP Format (2)

From: Erewhon

To : Eden, Ruritania and Paradise

POLREP NR1 Fire Tank Vessel Neversink (flag) 13-20 N, 50-00 W approximately 010300 GMT

1. Situation

   (a) 010400 GMT Neversink reported to Nonsuch, Erewhon, experiencing fire in engine-room, vessel disabled and adrift. Cargo 700,000 barrels crude oil (origin unknown).

   (b) Presently no repeat no discharge.

   (c) Weather: Wind from NE 25-30 kts Seas NNE 10-12 ft. Overcast in rain. Forecast unchanged.

2. Action Taken

   (a) Erewhon national oil spill contingency plan activated.

   (b) Alerted Eden, Ruritania and Paradise.

3. Future Plan

   (a) Dispatch aircraft to investigate when weather suitable.

   (b) Maintain close liaison with Neversink to determine developments.

   (c) Keep appropriate States informed.

4. Assistance Requested

   (a) Request National Authority Eden provide 2,000 ft inshore boom.

   (b) Request salvage company place emergency pumping system on standby.

5. Alert

   (a) Re-address this message to Shangri-la, Hispaniola, El Dorado.

   (b) Advise Flag State following Quote Tank vessel Neversink reports engine-room fire at 010300 GMT, location 13-20 N, 50-00 W, 700,000 barrels plus bunker oil on board. Presently no discharge. Request name and contact points of owners unquote.

6. Status of Situation. Case pending.

Annex II

FRAMEWORK FOR A NATIONAL MARINE POLLUTION CONTINGENCY PLAN

General

The density of marine traffic, especially oil tankers, in close proximity and particularly off the South Coast, presents a fairly high risk of marine pollution from collisions, stranding and other marine accidents. Such pollution can threaten amenity beaches, sea birds, marine life in the inter-tidal zones and the fishery with subsequent loss of revenue and protein sources.

Scope and introduction

This plan is intended to delineate responsibilities for the operational response to marine incidents which could result in spillage of oil or other noxious materials into the waters. Such waters are defined in the Maritime Zones Law and the Territorial Seas Act. A central agency or body (e.g. the Directorate of Merchant Shipping) should have lead agency responsibility for any incidents involving shipping and is empowered by law to intervene and take whatever measures are deemed necessary to prevent pollution or to expedite the flow of marine traffic when an accident occurs.

This plan provides the framework of co-ordination of an integrated response by government agencies to protect the environment from the deleterious effects of pollution from spillages of oil or other noxious substances. It is intended to promote the development of local plans in the major ports to respond to such incidents.

The objectives of this plan are:

1. To develop appropriate systems for the detection and reporting of spillages of oil or other noxious materials or of incidents related to the operation of shipping which could result in such a spillage.

2. To ensure prompt response is made to either prevent pollution or to restrict the spread of the contaminants.

3. To ensure that adequate protection is provided for the public health and welfare and the marine environment.

4. To ensure that the correct response techniques are used to clean up the pollution and that disposal of recovered product is carried out in an environmentally acceptable manner.

5. To ensure that complete and accurate records are maintained of all expenditures to facilitate cost recovery.

The following government departments may act as resources agencies as required to support the actions of the responsible central body; e.g. the Directorate of Merchant Shipping:

The Ports Authority;

The Defence Force;

The Ministry Responsible for Health, Agriculture and Environment;

The Petroleum Corporation;

The Ministry of Foreign Affairs;

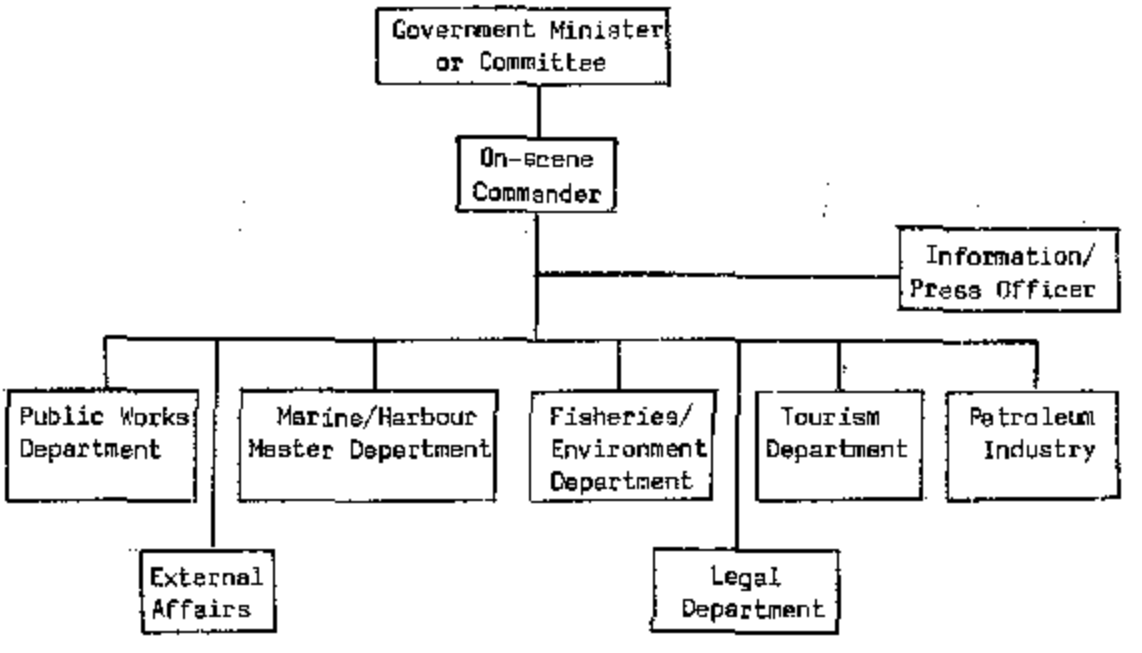
The Ministry of Fisheries;

The Police Force.

Notification and alerting procedures

When an incident occurs which could result in marine pollution, or there is an actual spillage of oil, this should be reported to the Communications Centre who will advise firstly the Merchant Marine Department for action, and other departments for information, in accordance with the following scheme:

TYPICAL OIL SPILL RESPONSE ORGANIZATION



The reports may also be made to the nearest Port Authority or Civil Aviation Authority who will then relay the report to the Communications Centre for dissemination.

Organization

The Director of Merchant Marine has the overall responsibility of ensuring that the appropriate response is made to any incident in the waters. He will direct the various aspects of the operation and will be assisted by the Director of the Marine Pollution Authority, who will be the on-site representative for the Merchant Marine Department and act to co-ordinate all activities. He will pass regular situation reports to the Communications Centre and will also relay requests for additional resources through this Centre.

The Ports Authority Master Attendant and his staff are appointed as Pollution Prevention Officers and will lead initial response to incidents within the port limits; if additional assistance is required they should request this through the Marine Pollution Authority.

The designated pollution prevention officers are responsible for:

(a) directing the employment of needed resources for prevention of pollution, containment, clean-up and disposal of any pollutants and restoration of the site;

(b) providing a focal point of information for all agencies concerned;

(c) preparing cost analyses and a detailed report covering all aspects of the spill; and

(d) collecting samples for possible analysis.

The Defence or Police Force will make the facilities of the Communications Centre available to receive and disseminate reports of marine accidents or pollution. If it is deemed necessary one or more patrol craft will be dispatched to the incident site to act as the on-scene command centre with the mandate to intervene if so ordered by the Minister of Trade and Shipping.

The Defence Force will provide fixed-wing aircraft or helicopters to conduct surveillance or provide logistic support in movement of men and materials to the incident site. They will also provide a ground to air communications link at the site for use by the On-Scene Co-ordinator.

The Ports Authority will provide tugs and pollution control equipment at the incident site and, if required, will rig one or more tugs with dispersant spraying equipment.

The Petroleum Corporation will provide tankers or tank barges for storage of recovered oil or oil in water emulsions and will arrange for storage and eventual disposal of recovered oil.

The Ministry of Foreign Affairs will be responsible for all negotiation with the vessel and cargo owners and insurers and will also conduct all negotiations regarding compensation and indemnification.

The Ministry of Fisheries will provide scientific advice to the Director of Merchant Marine regarding species at risk, shore-line sensitivity, use of dispersant chemicals, beach cleaning methods, etc.

A final consideration is the streamlining of administative procedures such as

cleared for landing and delivery. In too many cases expensive and specialized equipment has been held up at the airport because of customs formalities: aircraft bringing technical experts have been unable to obtain landing clearances, or the experts have been delayed in immigration because of visa requirements. Countries should establish the necessary legislation to ensure speedy and simple entry of the resources required for pollution response in the event of marine emergency.

In order to facilitate the foregoing division of tasks the Marine Pollution Authority will form an Advisory Committee with representation from all these agencies. This Committee will formulate procedures for provision of resources and technical assistance and will deal with the various administrative and logistic problems which can be foreseen.

Spill control and clean-up procedures

An accurate assessment of a spill incident is essential before appropriate spill controls and clean-up procedures can be implemented. Generally, containment and recovery are preferred, but in some instances it may be necessary to use dispersant chemicals. Details of these various methods of oil spill clean-up may be found in Part IV of the IMO Manual on Oil Pollution, "Practical information on means of dealing with oil spillages" and the Canadian publication "The Basics of Oil Spill Cleanup".

In most instances, it will become necessary to remove oil and oily debris from beach areas and the water surfaces within bays, lagoons, etc. Some consideration should be given to methods of removal of oiled beach material and the possible future erosion in the coastal zones. Experience in many spills around the world has been that it is frequently necessary to replace any soiled beach material and some knowledge of the sediment transport processes in the coastal zones would be of great value in ensuring that minimal damage is caused during clean-up operations. A further aspect is that of disposal of the oiled sand and debris. With the high ambient temperatures which prevail in most of the developing countries, both land farming and sanitary land fill operations would appear to be environmentally acceptable disposal methods. However, some preliminary studies would be required to determine whether disposal sites are adjacent to water courses or if there is a danger of oil leaching back into the marine environment.

Disposal of contaminants

Disposal of recovered oil as opposed to oily debris is a particularly difficult problem and it would be desirable to plan an excavation of disposal pits close to the shoreline which could be lined with plastic and used as temporary storage until such time as arrangements can be made to transport the oil to a refinery or processing facility.

Arrangements should be made for reception, storage and disposal of recovered oil or oil in water emulsions. Depending on the type of oil, e.g. crude, refined or residual, it can be stored, separated and either refined or sold as fuel. With regard to contaminated debris, this can be disposed of by burning or burying. Technical assistance should be obtained from the appropriate officials of the Environment, Health or Agriculture Departments or Ministry of Fisheries in the selection of disposal sites close to the shoreline resources.

PUBLICATIONS IN THE UNEP REGIONAL SEAS REPORTS AND STUDIES SERIES

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