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PACIFIC MISSILE RANGE

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A STUDY OF NONMILITARY SHIPPING IN THE PACIFIC OCEAN AREA

By
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Approved by:

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ACKNOWLEDGMENT

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SUMMARY

The geographical interests of the Pacific Missile Range cover the entire Pacific Ocean Area and part of the Indian Ocean (to longitude 90° E). Before the interests of the Pacific Missile Range in the Indian Ocean were specifically defined, a study was initiated to determine the density and characteristics of all nonmilitary shipping in the Pacific Ocean. This report presents the results of this study.

Numerous sources of data on Pacific shipping were thoroughly searched in this study, including government publications from many nations, books and periodicals, and information procured directly from shipping companies. This vast quantity of available data was sifted to obtain information on the location and density of Pacific shipping and on the size, speed, number of people onboard, and nationality of the vessels employed in various areas for various uses. The nonmilitary shipping was divided into three categories of traffic, (1) that which travels on sea lanes or trade routes, (2) that which operates in coastal or other "local" zones, and (3) that which engages in pelagic fishing (away from coastal or local zones).

The primary results of the study are summarized in three charts (charts 2, 3, and 4) which show the density of lane, local, and fishing traffic throughout the Pacific Ocean. These results show that the greatest shipping densities were concentrated primarily near focal points of Pacific trade, in the South and East China Seas, and on the routes between Yokohama and San Francisco, Honolulu and the California coast, and from the Panama Canal north along the west coast of Central and North America.

INTRODUCTION

The operation of the Pacific Missile Range requires a great amount of information about conditions and activities throughout the Pacific Ocean Area.* This report is intended to provide a portion of this information in the form of estimates of the quantity and nature of nonmilitary shipping in this area. The study upon which this report is based concerned the actual number of ships or ship trips per year as well as selected characteristics of the ships for various portions of the Pacific Ocean Area, as opposed to studies published for other purposes, which concentrate on total tonnage of shipping and monetary values of trade or movement of people.

The references and bibliography suggest the extent to which the search for Pacific shipping data was pursued. Information was obtained for as many foreign countries as was possible; however, it should be noted that the data sources were almost exclusively from the non-communist community of nations. The few items of information available on shipping by communist countries were usually of such form that they were of little, if any, use.

Two sources of Pacific shipping data which were not used, but which were consulted for comparative purposes, were the Navy's Fleet Operational Control Centers at San Francisco and Honolulu, Hawaii. These centers maintain, for all of the Pacific Ocean, underway position information on those commercial vessels for which reports are submitted. If reports were submitted on all vessels, there would be no need for writing the present report; however, all vessels are not reported into the Operational Control Centers. Discussions with personnel at the Center in San Francisco did not reveal any estimates of the number that fail to be reported. Therefore, this report should provide a more exhaustive indication of total Pacific shipping than would data from the Operational Control Centers.

In this study, the boundaries of the Pacific Ocean Area are defined more rigorously than is usually done. The Pacific Ocean Area is usually considered to be bounded on the north by the Arctic Ocean at latitude 66°30' N, on the south by the Antarctic Ocean at latitude 66°30' S, on the east by the continent of the Americas, and on the west by the continent of Asia. Areas of uncertainty exist along the southwest and the south-southeast edge of the area. Therefore, the southwest boundary of the Pacific Ocean Area is defined for this study as rhumb lines from Singapore to Djambi (Sumatra), Djambi to Djakarta (Java), Djakarta to Darwin (Australia), Darwin to Hobart (Tasmania), Hobart to Bluff (New Zealand), and then the meridian of Bluff, 168°19' E, from Bluff to latitude 66°30' S. The south-southeast boundary of the area is defined for this study as the meridian of Cape Horn, 67°16' W, from the Cape to latitude 66°30' S.

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*A part of the Indian Ocean (to longitude 90° E) is also of interest to the Pacific Missile Range. However, this study was initiated before interests in the Indian Ocean were specifically defined; therefore, this area is not covered in this report.

As a result of World War II, a new shipping pattern is emerging in the Pacific Ocean Area, particularly in the Pacific Island groups. In this report, the situation for the years 1959 and 1960 is estimated, but no attempt is made to provide a forecast of future developments.

DEFINITIONS

When Alfred Thayer Mahan propounded the first consistent theory of sea power, he wrote the following in "The Influence of Sea Power Upon History, 1660-1783," published in Boston in 1890.

> The first and most obvious light in which the sea presents itself from the political and social point of view is that of a great highway; or better, perhaps, of a wide common, over which men may pass in all directions, but on which some well worn paths show that controlling reasons have led them to choose certain lines of travel rather than others. These lines of travel are called trade routes (shipping lanes in this Pacific Ocean Area study); and the reasons which have determined them are to be sought in the history of the world.

Mahan emphasizes that the sea transport of goods in the past has been faster and cheaper than land transport. In many parts of the world this still holds true. Since Mahan's time, air transport has become competitive with sea and land transport, at least as far as the transportation of people is concerned. However, sea transport at this time seems to remain the most efficient method of carrying bulk cargo.

Mahan's concern with fishing seems to be less positive, except as a source of sea-wise recruits for a nation's naval forces. However, with the world's constantly expanding population, the world-wide importance of fishing is continuously increasing, and one of the nations whose existence is most affected by this harvesting of the sea, Japan, is located in the Pacific Ocean Area.

For purposes of data gathering and presentation, the total shipping traffic has been subdivided into lane traffic, local traffic, and fishing traffic.

Lane Traffic

Lane traffic is characterized by ship travel between ports over fairly well defined sea lanes and consists of the following types of traffic:

1. Liner traffic, which is characterized by regularity of departure and arrival and repeated travel over the same routes to the same ports-of-call.
2. Tramp traffic, which is characterized by opportunistic ship movement as cargo presents itself.

The liner traffic degenerates by imperceptible degrees to tramp traffic. Since the dividing line between liner and tramp traffic is not sharp, the listing of ship trips in schedules such as reference 1 or similar publications has been accepted in this study as a general indication that the ship is a liner.

Local Traffic

Local traffic is characterized by ship travel confined to the immediate neighborhood of the country or port of registry or travel by ships chartered to operate in waters under the control of a single nation. For the purpose of this study, local traffic consists of vessels which travel exclusively within an island group or confine themselves to areas within 50 nautical miles of a coast.

Local traffic includes traffic in the coastal trade, pleasure and fishing craft which hug the shore, and a special class of shipping called "ocean station vessels," which are floating weather observation stations.

Coastal trade is rather difficult to define. In reference 2, for instance, the interpretation of the use of this term in statistical tables of the reference is gone into at considerable length. The main difficulty arises from the fact that ocean-going vessels arriving at a continent from distant shores may thereafter operate in a form of coastal trade along the shore of that continent. For example, a ship coming from Europe and transiting the Panama Canal may well unload portions of its European cargo in several ports along the South American Shore. In each port-of-call it may also load local products for transportation either to other ports on the South American Continent or for transportation to Europe. Hence, in a way, this vessel is engaged in coastal trade. The statistical rules of reference 2 treat the coastal portion of such a vessel's journey as engagement in coastal trade. Nevertheless, where vessels were found to be scheduled in this manner, they were not considered active in coastal trade for the purposes of this study. Traffic from the U.S. Atlantic Coast to the U.S. Pacific Coast is called coastwise shipping in U.S. mercantile statistics. In this study, traffic of this type is not distinguished from any other traffic transiting the Panama Canal; only ships in continuous coastwise trade have been classified as local traffic.

Fishing Traffic

Fishing traffic is characterized by ships engaged in pelagic fishing (in the general sense rather than the specific biological sense) at distances greater than 50 nautical miles off the coast of the country of registry.

Military Traffic

Military traffic is characterized as consisting of the movement of fighting ships and the direct or indirect movement of ships engaged in logistic support of military units. This type of shipping is not considered in this study.

DATA SOURCES

All publications examined for use as data sources in this study are listed in the References and Bibliography sections. Data sources are usually related to the type of ship traffic considered.

Lane Traffic

Liner Traffic

References 1 and 3 through 6 provide the names of 129 shipping companies operating scheduled traffic in the Pacific Ocean Area. An additional operating company was found as the result of an inquiry about the schedule of a different company. All of these 130 companies are listed in appendix A. In numerical order, the five references provide approximately 62, 18, 12, 6, and 1 per cent of the shipping company names. The references also provide adequate schedules for 97 of the 130 shipping companies. Of the remaining 33 companies, 5 could not be located in the available registry books and their addresses were not available; 4 companies, 2 in South America, 1 in New Zealand, and 1 in Australia, were considered to operate under the classification of local traffic and therefore were not considered as liner traffic. Letters requesting information on the traffic scheduled for the Pacific Ocean Area were sent to the remainder of the companies. Answers were received from all but four companies. Therefore, schedule data were finally available from 117 companies. All of these data were used in this study.

Size, speed, crew and passenger capacity, and nationality (flag) were the ship characteristics of interest in this study. To determine some of these characteristics, references 7 and 8 were searched to find which ships were owned by a sample of 53 of the 130 listed companies. Of the 53 companies, 19 were not listed in references 7 and 8. On the other hand, some of the listed companies were operators of vessels belonging to other listed or unlisted companies.

Passenger capacity was established partially from references 3 and 9.

Since most of the U.S. shipping companies take advantage of the government subsidies available, their ships must conform to standards and designs of the U.S. Maritime Administration. Details concerning these vessels were obtained from reference 9.

Tramp Traffic

As Steward R. Bross explains in his book "Ocean Shipping" (reference 10), all present-day shipping has its origins in the tramp service, and this service still comprises the greater part of the world's total merchant shipping. Unfortunately, information on tramp shipping appears to be only in the form of travel stories or descriptions of the pitfalls and difficulties of tramp vessel operation. Nothing useful for this study could be found in any of the libraries consulted. The only recourse left was to estimate the amount of tramp traffic in the Pacific Ocean Area by an indirect method, as described in later sections of this report.

Local Traffic

Data on local traffic of the "non-fishing" variety were obtained from references 4 through 6 and 11 through 16. Data on the number of local mercantile and fishing vessels for various locations were obtained from references 17 through 21, and the sizes of some local fishing fleets were estimated from references 2 and 22 through 30. The positions of the ocean station vessels located in the Pacific Ocean Area (table 1) were obtained from reference 31; characteristics of these vessels before conversion to their present use are listed in reference 32.

Table 1. Location of Ocean Station Vessels in Pacific Ocean Area

Vessel Designation	Position		Nationality
	Latitude	Longitude	
N (nectar)	30° N	140° W	U. S. A
P (papa)	50° N	145° W	Canada
T (tango)	29° N	135° E	Japan
V (victor)	34° N	164° E	U. S. A

Note: Compiled from H.O. publication No. 206 and a National Geographic Magazine Pacific Ocean Map.

Fishing Traffic

Fishing traffic information, except for size and value of yearly catch, is difficult to find. Data on fishing areas were obtained from references 33 through 42. Other data on fishing traffic were obtained from references 23 through 25 and 33 through 45.

LOCATION OF SHIPPING

Shipping Lanes

The locations of the shipping lanes ascertained in this study are shown in chart 1. The existence of a shipping lane between any two ports was determined by studying all available data on liner traffic. Because of the lack of information, tramp traffic was assumed to use only the shipping lanes already established by investigation of the liner data. However, there is every reason to suspect that additional ports-of-call and shipping lanes would have been established if information on tramp traffic could have been obtained.

This study established 367 shipping lanes for liner traffic and 113 ports-of-call. Some of these shipping lanes run concurrently with others for great distances.

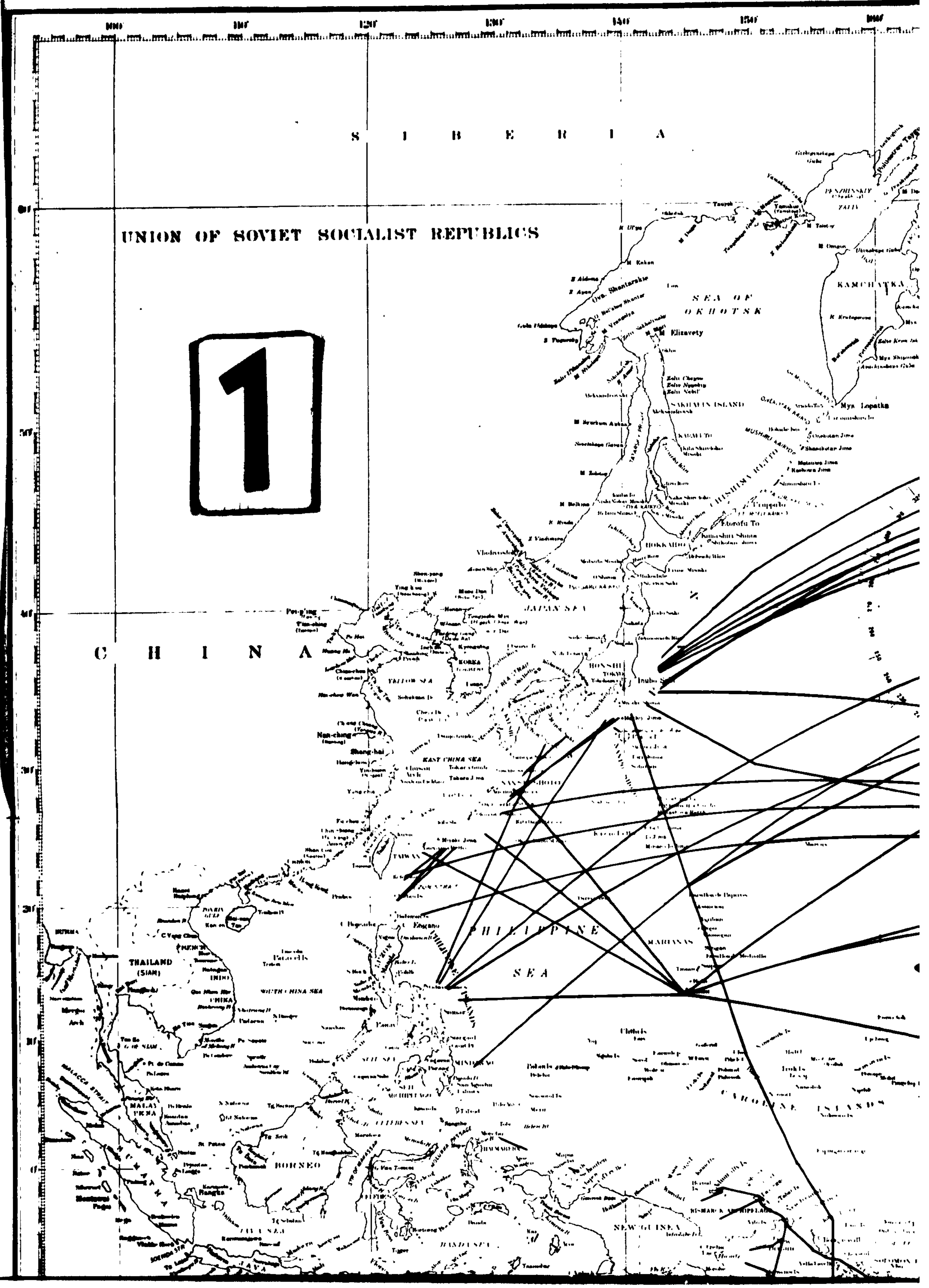
Of the 113 ports-of-call, 8 lie on the periphery of the Pacific Ocean Area and are designated as exit and entry ports because these are the only points at which vessels enter or leave the area under study. The exit and entry ports are as follows:

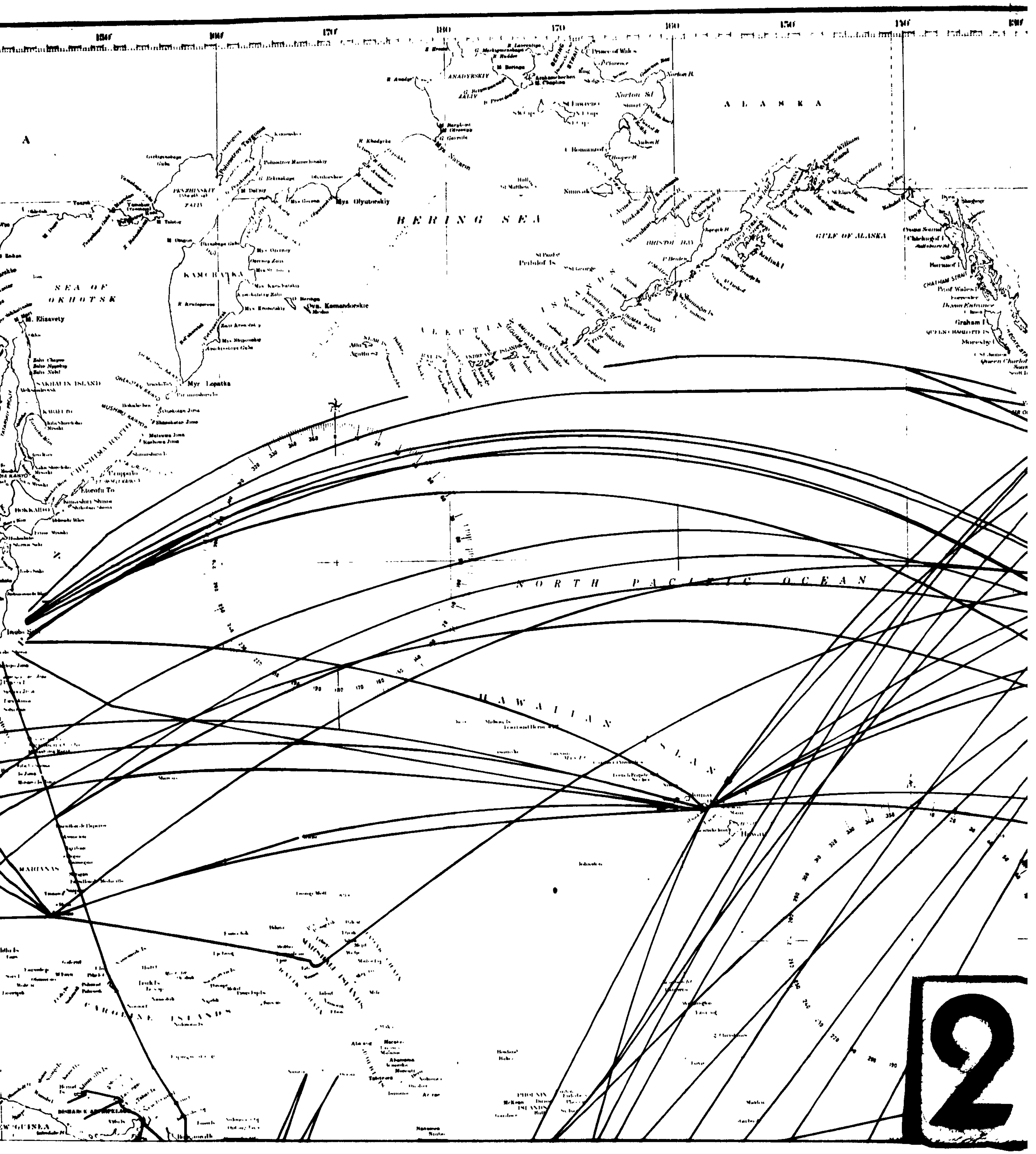
Eastern boundary:	Panama (Balboa)
	Punta Arenas
Western boundary:	Singapore
	Djakarta (formerly called Batavia)
	Port Darwin
	Melbourne
	Hobart
	Bluff

No regular shipping lane penetrated the Antarctic Seas. A regular seasonal shipping lane through the Bering Strait is used by Russian vessels traveling between Siberia and the Russian Far East possessions. This shipping lane was not included in this study because its location and the number of ships traveling on it was incompletely known.

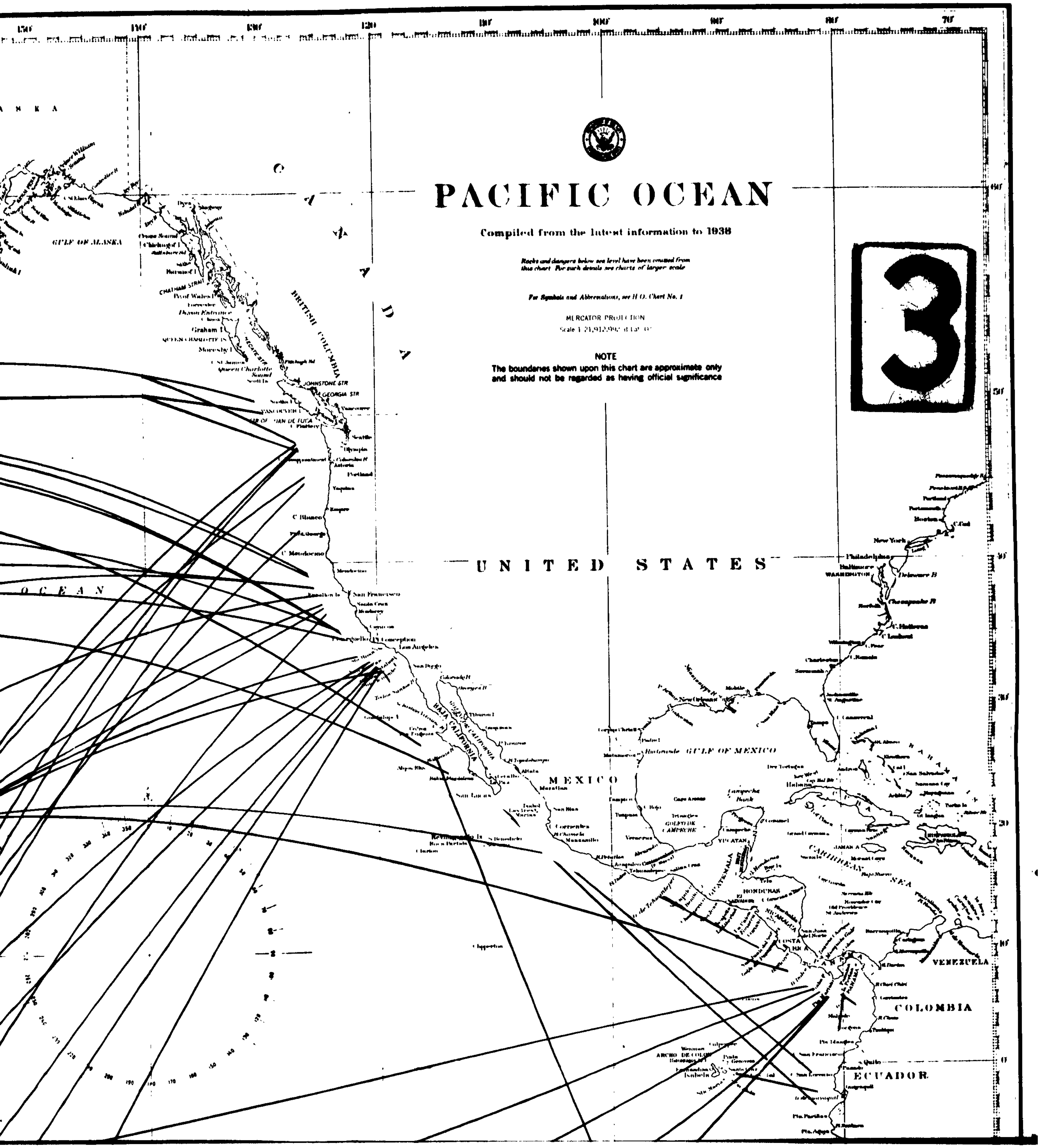
The maritime custom and law of "the shortest and fastest course" was assumed to prevail for shipping lane traffic in general, because of the absence of a track agreement for the Pacific Ocean Area.* In addition, the geographical

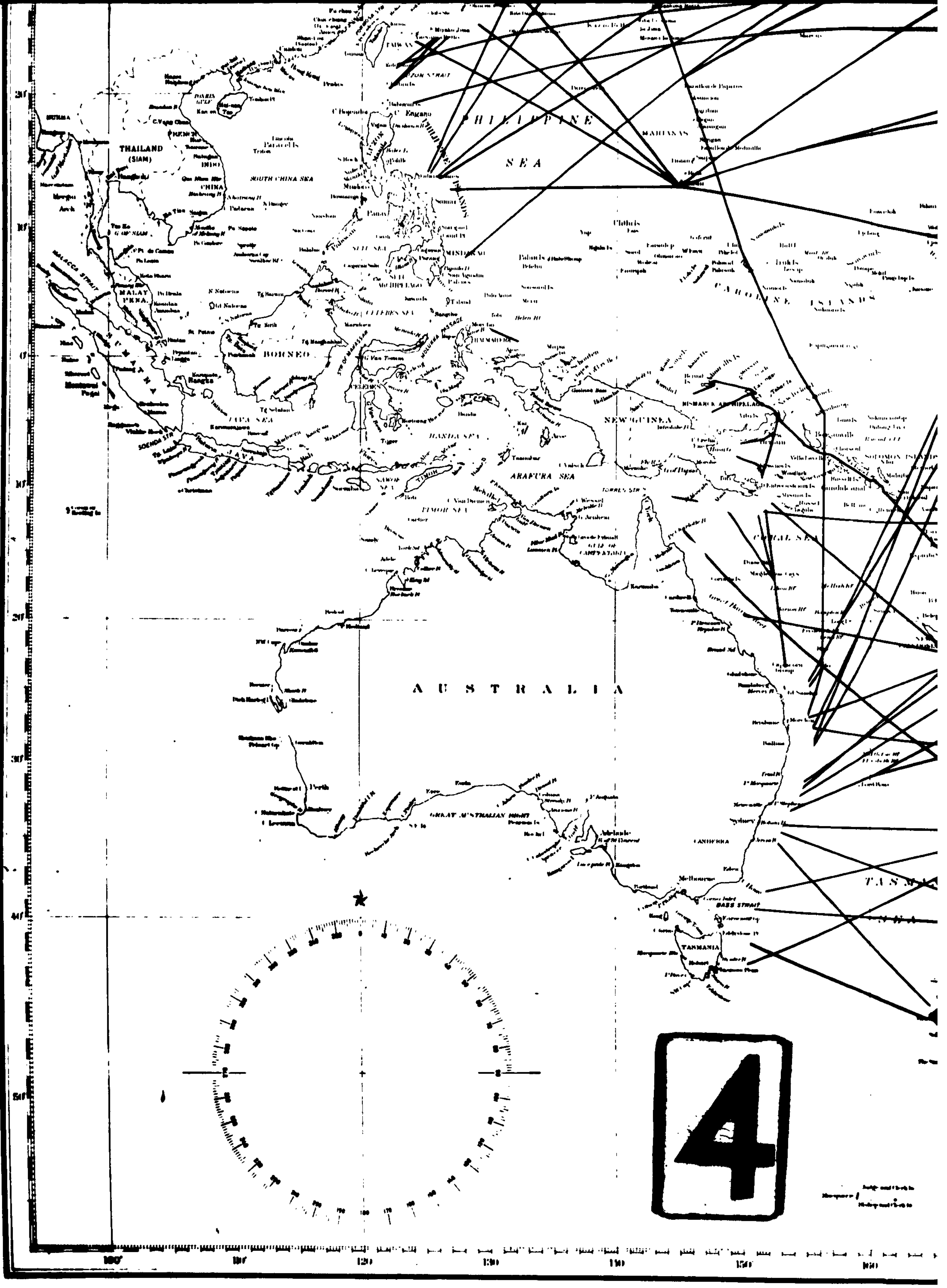
*For the North Atlantic Area, a U.S. Government statute requires U.S. operated vessels to follow three specific lane routes eastward of the 70th meridian. At least 10 operating companies adhere to the so-called North Atlantic Track Agreement; but many ships are still free to follow their own notion of "shortest and fastest course to proceed to their destination" as required by present maritime custom and law. In the Stockholm-Andrea Doria disaster, neither operating company was a signatory of the track agreement, and considerable discussion was caused by the fact that the Stockholm was several miles north of the eastbound standard track (references 46 and 47).

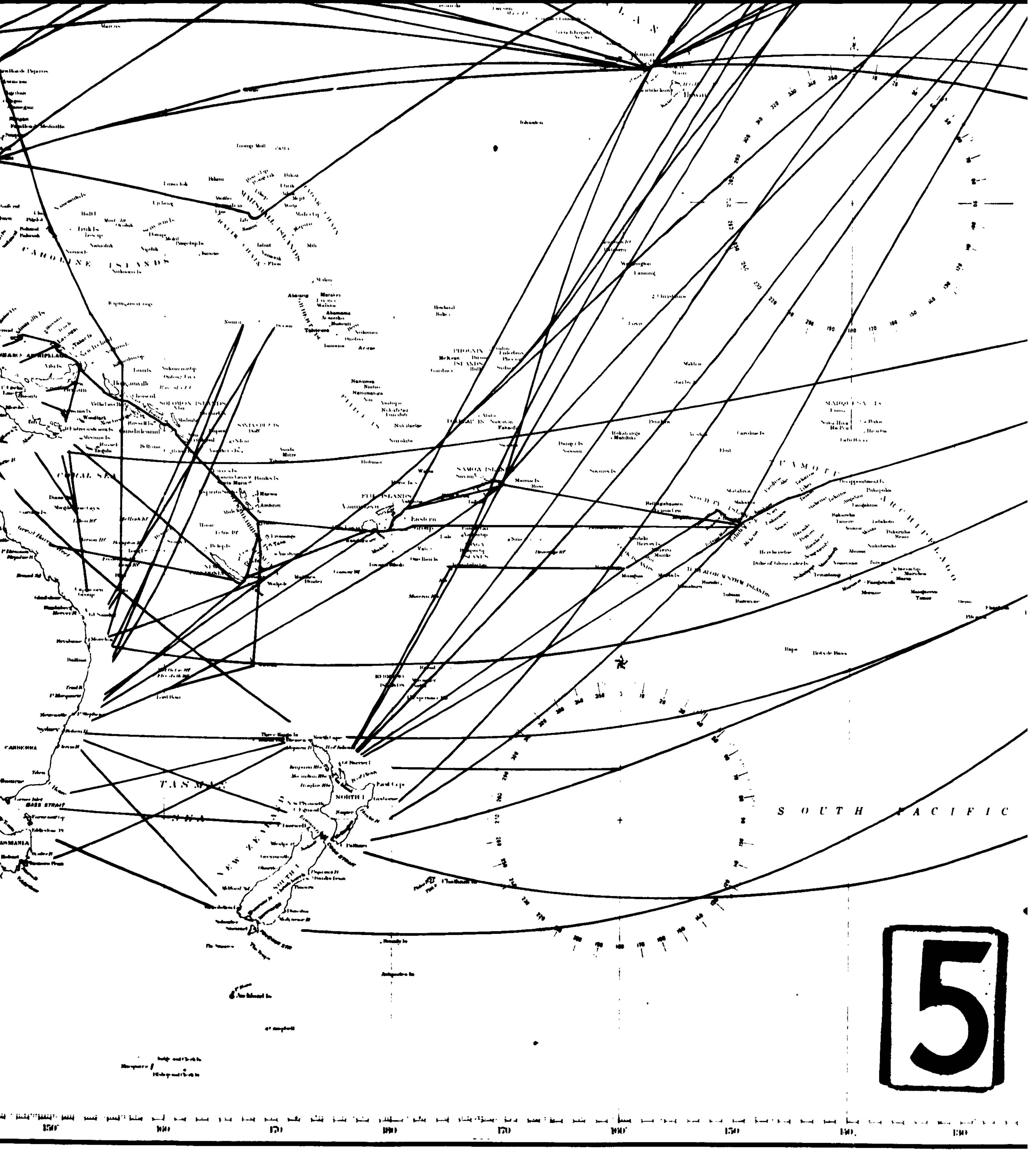

1
S I B E R I A
UNION OF SOVIET SOCIALIST REPUBLICS
C H I N A
SEA OF OKHOTSK
KAMCHATKA
Mys Lopatka
Elizavety
SAKHALIN ISLAND
Etorofu To
HOKKAIDO
JAPAN SEA
KOREA
YELLOW SEA
HONSHU
TOKYO
Inubo Saki
Vladivostok
Shang-hai
Nan-ching
EAST CHINA SEA
TAIWAN
PHILIPPINE SEA
MARIANAS
THAILAND (SIAM)
SOUTH CHINA SEA
BORNEO
CAROLINE ISLANDS
NEW GUINEA



ALASKA
BERING SEA
SEA OF OKHOTSK
NORTH PACIFIC OCEAN
HAWAIIAN ISLANDS
GULF OF ALASKA
BRISTOL BAY
KAMCHATKA
Mys Olyutorskiy
Ova. Komandorskie
M. Elisavety
Norton Sd
Pribilof Is
Etorofu To
HOKKAIDO
Graham I
Dixon Entrance
CHATHAM STRAIT
CAROLINE ISLANDS
MARIANAS
2


PACIFIC OCEAN
Compiled from the latest information to 1938
Rocks and dangers below sea level have been omitted from this chart. For such details see charts of larger scale
For Symbols and Abbreviations, see H.O. Chart No. 1
MERCATOR PROJECTION
NOTE
The boundaries shown upon this chart are approximate only and should not be regarded as having official significance
3
GULF OF ALASKA
CANADA
BRITISH COLUMBIA
OCEAN
UNITED STATES
MEXICO
GULF OF MEXICO
CARIBBEAN SEA
VENEZUELA
COLOMBIA
ECUADOR
BAJA CALIFORNIA
GULF OF CALIFORNIA
San Francisco
Los Angeles
San Diego
Seattle
Portland
C. Blanco
C. Mendocino
Clipperton
New York
Philadelphia
Boston
Baltimore
WASHINGTON
Chesapeake B.
Delaware B.
C. Hatteras
Charleston
Savannah
New Orleans
Mobile
HONDURAS
NICARAGUA
COSTA RICA
PANAMA
YUCATAN
Revillagigedo Is.
Guadalupe I.
Quito
JOHNSTONE STR
GEORGIA STR
CHATHAM STRAIT
Graham I.
Moresby I.
Vancouver


PHILIPPINE
SEA
THAILAND
(SIAM)
SOUTH CHINA SEA
MALAY PEN.
BORNEO
MINDANAO
CELEBES SEA
CAROLINE ISLANDS
NEW GUINEA
BISMARCK ARCHIPELAGO
BANDA SEA
JAVA SEA
ARAFURA SEA
TIMOR SEA
CORAL SEA
AUSTRALIA
Perth
Adelaide
Melbourne
Sydney
Brisbane
CANBERRA
GREAT AUSTRALIAN BIGHT
BASS STRAIT
TASMANIA
4
100°
110
120
130
140
150
160


CAROLINE ISLANDS
SOLOMON ISLANDS
CORAL SEA
FIJI ISLANDS
SAMOA ISLANDS
CANBERRA
BASS STRAIT
TASMAN
SOUTH PACIFIC
5

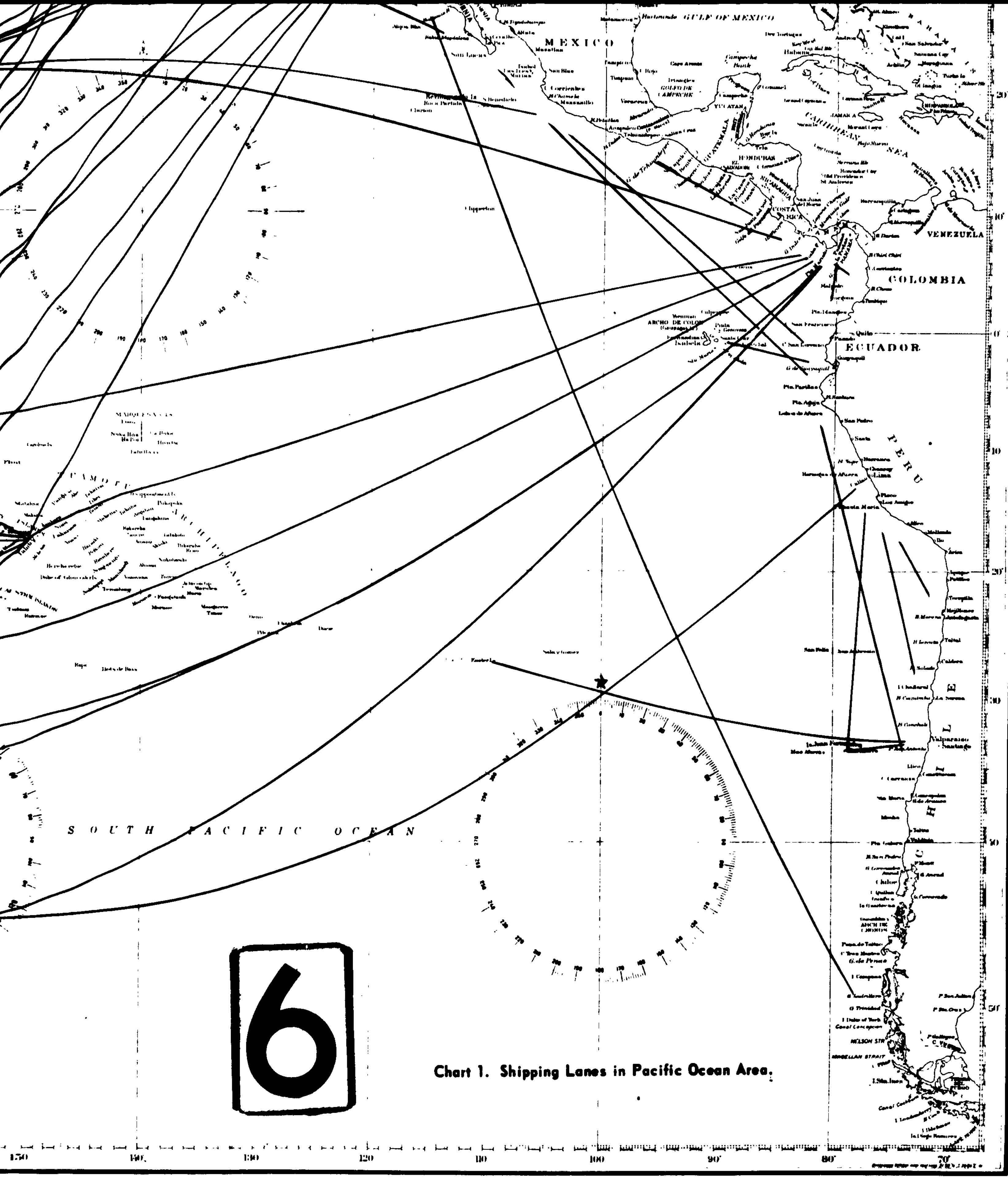


Chart 1. Shipping Lanes in Pacific Ocean Area.

locations of the shipping lanes were selected to correspond with the recommendations of references 48 and 49 or, where these references fail to provide data, were estimated from references 50 and 51. Distances between ports, obtained from references 52 and 53, are tabulated in table 2. In most cases, the direction of travel between ports is of no importance because a single preferred shipping lane exists between two ports. However, in 11 cases, dual lanes are specified, the prime example being the lanes between Yokohama and the ports of Oregon, Washington, and British Columbia, for which a more northerly lane is preferred for eastward travel and a more southerly lane for westward travel. While references 48 through 53 help to establish the center lines of shipping lanes, few if any ships travel consistently upon these center lines. The question arises as to how far ships normally deviate from the center lines. It has been estimated that in favorable conditions a ship should be able to stay within 5 nautical miles of the center line of the shipping lane. However, conditions are not always favorable; as a matter of fact, on long voyages almost invariably a portion of the trip will occur in less favorable weather conditions. Since it can be assumed that a Captain will try to take advantage of any aid wind and waves will provide, or at least will want to minimize the adverse effect of these forces, he will pursue a path as close to the shortest track available, conformant to the weather conditions he meets on the way. The amount of perpendicular deviation of a ship from the center line of a shipping lane will of course depend on the total length of the shipping lane. It is estimated that, except in disaster conditions, the maximum economically permissible deviation from the center of the shipping lane is one-twentieth of the length of the lane.

Local Traffic Areas

The local traffic areas determined in this study are presented on chart 2. Local traffic areas were located whenever data on local shipping could be obtained; i.e., when descriptions or statistics of a country, province, or island group provided the number of vessels permanently stationed along its coasts. If such data could be found, then, for a continental shore line, a strip of sea 50 nautical miles wide and extending along the shore of the country from national boundary to national boundary was indicated as the local traffic area. For an isolated island or group of islands, the 50-mile strip is continuous. Local traffic areas for Trust Territories containing more than one island group, such as the U.S. Trust Territory of Pacific Islands, were considered to extend to the borders of the Trust Territory.

The nominal position of each ocean station vessel (table 1) is the center of a 10-nautical-mile square in which the ship normally operates.

Fishing Areas

The locations of fishing areas determined in this study (extracted from references 33 through 42 and 45) are indicated on chart 3.

Table 2. High-Sea Distances Between Ports

PORT OF DEPARTURE \ PORT OF ARRIVAL	ACAPULCO	ALEXISHAFEN	AMAPALA	ANTOFAGASTA	APIA	ARICA	AUCKLAND	AVARUA	BALI	BLUFF	BORA-BORA	BRISBANE	BUENAVENTURA	CAIRNS	CALLAO	CHANARAL	CHILUNG (KEELUNG)	CHIMBOTE	COOS BAY	DA NANG (TOURANE)	DARVEL BAY	DILI	DJAKARTA	EASTER ISLAND	EL SALVADOR	ENSENADA	GALAPAGOS ISLANDS	GOLFITO	GLACIER BAY	GUAM	GUATEMALA	GUAYAQUIL	
ACAPULCO	X																														574		
ALEXISHAFEN		X																															
AMAPALA			X																						19								
ANTOFAGASTA				X		325									813	173																	
APIA					X																												
ARICA				325		X									593																		
AUCKLAND					1581		X																										
AVARUA								X																									
BALI									X			2908																					
BLUFF										X																							
BORA-BORA								539			X																						
BRISBANE												X		783					3482														
BUENAVENTURA													X		1126										1160							578	
CAIRNS														X																			
CALLAO				813		593							1126		X			206														712	
CHANARAL																X																	
CHILUNG (KEELUNG)																	X													1470			
CHIMBOTE															206			X															
COOS BAY																			X														
DA NANG (TOURANE)																				X													
DARVEL BAY																					X												
DILI																						X											
DJAKARTA									615														X										
EASTER ISLAND																								X									
EL SALVADOR			19																						X						304		
ENSENADA																										X							10
GALAPAGOS ISLANDS																											X					686	
GOLFITO																												X					
GLACIER BAY																													X				
GUAM																														X			
GUATEMALA	574																								[illegible]						X		15
GUAYAQUIL													608		712												680					X	
GUAYMAS																										1017					1530		X
HOBART							1521																										
HOLLANDIA																					1510	1174											
HONG KONG																	473						1782										
HONIARA																																	
HONOLULU	[illegible]																																
ILOILO; CEBU																							1476										
INCHON																	788																
JESSELTON																																	
JUAN FERNANDEZ IS.																																	
JUNEAU																																	
KAOHSIUNG (TAKAO)																	222																
KAVIENG																																	
KETCHIKAN																																	
KITIMAT																																	
KOBE																	933																62
KRUNG THEP (BANGKOK)									1805														1367										
KWAJALEIN																														1400			
LABUAN																					420												
LAE																																	
LOMBRUM																																	
LORENGAU																																	
LOS ANGELES	1501						5658					6274	3015													141		[illegible]					
MADANG																																	

1

Table 2. High-Sea Distances Between Ports

ACAPULCO	ALEXISHAFEN	AMAPALA	ANTOFAGASTA	APIA	ARICA	AUCKLAND	AVARUA	BALI	BLUFF	BORA-BORA	BRISBANE	BUENAVENTURA	CAIRNS	CALLAO	CHANARAL	CHILUNG (KEELUNG)	CHIMBOTE	COOS BAY	DA NANG (TOURANE)	DARVEL BAY	DILI	DJAKARTA	EASTER ISLAND	EL SALVADOR	ENSENADA	GALAPAGOS ISLANDS	GOLFITO	GLACIER BAY	GUAM	GUATEMALA	GUAYAQUIL	GUAYMAS	HOBART	HOLLANDIA	HONG KONG	HONIARA		
X																														574								
	X																																					
		X																						19														
			X		325									813	173																							
				X																																		
			325		X									593																								
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													X																									
			813		593							1126		X			206														712							
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																X													1470						473			
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574																								1626						X		1520						
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						1521																											X					
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																						1476													698			
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																222																			339			
																933																6280			1372			
								1805														1367													1530			
																													1400									
																				423																		
1801						5658					3274	3015													141		2541			2064								

(Continued on next page).

2

Table 2 (Part 2).

PORT OF DEPARTURE / PORT OF ARRIVAL	HONOLULU	ILOILO; CEBU	INCHON	JESSELTON	JUAN FERNÁNDEZ IS.	JUNEAU	KAOHSIUNG (TAKAO)	KAVIENG	KETCHIKAN	KITIMAT	KOBE	KRUNG THEP (BANGKOK)	KWAJALEIN	LABUAN	LAE	LOMBRUM	LORENGAU	LOS ANGELES	MADANG	MAKASAR	MANILA	MANZANILLO	MAZATLÁN	MELBOURNE	MIRI	MOLLENDO	NAURU	NICARAGUA	NORFOLK IS.	NOUMÉA	
ACAPULCO	3300																	1801										791			
ALEXISHAFEN																			7												
AMAPALA																															
ANTOFAGASTA																															
APIA																															
ARICA																										137					
AUCKLAND	3830																	5650						1649							
AVARUA																															
BALI																				330	1530										
BLUFF																															
BORA-BORA																															
BRISBANE															1390			6370			3319						1861				191
BUENAVENTURA																		3015													
CAIRNS																					2729										
CALLAO					1235																					469					
CHAÑARAL																															
CHILUNG (KEELUNG)			780				222				933	1862									771										
CHIMBOTE																															
COOS BAY																															
DA NANG (TOURANE)																															
DARVEL BAY																															
DILI																															
DJAKARTA		1423																			1569										
EASTER ISLAND																															
EL SALVADOR																						1067									
ENSENADA																		141													
GALAPAGOS ISLANDS																															
GOLFITO																		2640													
GLACIER BAY									250																						
GUAM	3310		1857																		1499										
GUATEMALA																		2354													
GUAYAQUIL																		2915													
GUAYMAS																		1156					300								
HOBART																								472							
HOLLANDIA																															
HONG KONG	4850			1060			336				1372	1360		1090				6300			631										
HONIARA																															
HONOLULU	X																	2230			4707										
ILOILO; CEBU		X									1632										281										
INCHON			X								720																				
JESSELTON				X										60																	
JUAN FERNÁNDEZ IS.					X																										
JUNEAU						X																									
KAOHSIUNG (TAKAO)							X																								
KAVIENG								X								260			300												
KETCHIKAN						235			X																						
KITIMAT										X																					
KOBE							1130				X										1563	6300						7400			
KRUNG THEP (BANGKOK)		2000										X									1435										
KWAJALEIN													X																		
LABUAN												1030		X																	
LAE															X															1560	
LOMBRUM																X	5														
LORENGAU																	X														
LOS ANGELES	2230																	X			6530										
MADANG															272				X												

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Table 2 (Part 2).

HONOLULU	ILOILO, CEBU	INCHON	JESSELTON	JUAN FERNANDES IS.	JUNEAU	KAOHSIUNG (TAKAO)	KAVIENG	KETCHIKAN	KITIMAT	KOBE	KRUNG THEP (BANGKOK)	KWAJALEIN	LABUAN	LAE	LOMBRUM	LORENGAU	LOS ANGELES	MADANG	MAKASAR	MANILA	MANZANILLO	MAZATLAN	MELBOURNE	MIRI	MOLLENDO	NAURU	NICARAGUA	NORFOLK IS.	NOUMEA	OCEAN ISLAND	OKINAWA	PAGO PAGO	PAITA	PANAMA CANAL	PAPEETE	PORT ALBERNI		
[illegible]																	1801										792							1426				
																		7																				
																									137													
[illegible]																	[illegible]						1049											3616	611			
																			[illegible]	1536																		
														1356			6274			[illegible]						1661				1939				7687				
																	3015																	352				
																				2733																		
				1325																					468									1350				
		788				222				933	[illegible]									771											357							
																																	296					
																																		[illegible]				
	[illegible]																			1560														10002				
																					1067													748				
																	141																	2772				
																	2646																					
								[illegible]																														
[illegible]		1037																		1480											1229							
																	2854																	886				
																	2218																	824				
																	1156					[illegible]																
																							472															
[illegible]			1048			[illegible]				1372	[illegible]		[illegible]				[illegible]			631											[illegible]							
X																	2228			4767														[illegible]				
	X									[illegible]										351																		
		X								738																					744							
			X										68																									
				X																																		
					X																																	
						X																																
							X								266			280																				
					288			X																														
									X																													
						1128				X										1563	[illegible]						7400				761			7906				
	[illegible]										X									1435																		
												X																										
											[illegible]		X																									
														X															1568									
															X	8																						
																X																						
[illegible]																	X			6539												1163		[illegible]	3571			
														272				X																				

(Continued on next page).

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Table 2 (Part 3).

PORT OF ARRIVAL / PORT OF DEPARTURE	PORTLAND	PORT MORESBY	PUERTO MONTT	PUNTA ARENAS	PUNTARENAS	PUSAN	RABAUL	RAROTONGA	SAIGON	SALAVERRY	SAMARAI	SAN ANTONIO	SANDAKAN	SAN DIEGO	SAN FRANCISCO	SEATTLE	SHANGHAI	SINGAPORE	SKAGWAY	SURABAJA	SUVA	SYDNEY	TALARA	TALCAHUANO	TARAKAN	TAWAU	TIENTSIN	TONGA ISLANDS	TOWNSVILLE	TSINGTAO
ACAPULCO															1830															
ALEXISHAFEN																														
AMAPALA					330																									
ANTOFAGASTA																														
APIA																														
ARICA																														
AUCKLAND	6072														5680			5220			1140	1280								
AVARUA																												884		
BALI																				165										
BLUFF																														
BORA-BORA																														
BRISBANE		1153									1071							3878				520			3280				866	
BUENAVENTURA					883																									
CAIRNS																														
CALLAO																														
CHAÑARAL																														
CHILUNG (KEELUNG)						664									5462												1012			
CHIMBOTE																														
COOS BAY															391															
DA NANG (TOURANE)									494																					
DARVEL BAY													151												137					
DILI																		2080												
DJAKARTA															7561			525		400									2894	
EASTER ISLAND																														
EL SALVADOR																														
ENSENADA	1180													68	580															
GALAPAGOS ISLANDS																														
GOLFITO																														
GLACIER BAY																														
GUAM																														
GUATEMALA																														
GUAYAQUIL										440													180							
GUAYMAS																														
HOBART																														
HOLLANDIA																														
HONG KONG						1144			917						6044			1464				4670			1307		1410			
HONIARA							600																							
HONOLULU	2220													2270	2091	2370					2770									
ILOILO; CEBU									1051									1260												
INCHON						402																								
JESSELTON																														
JUAN FERNANDEZ IS.																														
JUNEAU																			100											
KAOHSIUNG (TAKAO)						837																								
KAVIENG																														
KETCHIKAN																														
KITIMAT																														
KOBE						351											780	2862									1032			886
KRUNG THEP (BANGKOK)									680									812		1640										
KWAJALEIN																														
LABUAN													270																	
LAE							433				388																			
LOMBRUM																														
LORENGAU																														
LOS ANGELES	865					5250		5084						92	350	1140						6511	3130							
MADANG																														

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Table 2 (Part 3).

'AL	PORTLAND	PORT MORESBY	PUERTO MONTT	PUNTA ARENAS	PUNTARENAS	PUSAN	RABAUL	RAROTONGA	SAIGON	SALAVERRY	SAMARAI	SAN ANTONIO	SANDAKAN	SAN DIEGO	SAN FRANCISCO	SEATTLE	SHANGHAI	SINGAPORE	SKAGWAY	SURABAJA	SUVA	SYDNEY	TALARA	TALCAHUANO	TARAKAN	TAWAU	TIENTSIN	TONGA ISLANDS	TOWNSVILLE	TSINGTAO	UCLUELET	VALPARAISO	VANCOUVER	VILA	WAKE	WELLINGTON	WEWAK	YOKOHAMA	
															1838																								
					339																																		
																																578							
																																	4698						
																																852							
	5072														5050			5329			1140	1250														[illegible]			
																												[illegible]											
																				165																			
		1153									1071							3078				520			1250				986									3925	
					883																																		
																																1290							
																																418							
						944									5562												1012												
															301																		600						
									584																														
													161												137													2220	
																		1659																					
															7041			525		480									3394									3394	
																																1307							
	1160													40	880																		1313					4080	
										440													180																
																																						1091	
						1144			917						5046			1454				5479			1267		1418						4617					1544	
							680																																
	5220													2270	5501	2270					2770												5122		2004			4520	
									2651									1300																					
						402																																	
																																2601							
																			100																				
						897																																1220	
																																	220						
																																	438						
						361											780	2580									1032			882			5341					316	
9									680									842		1010																			
													278																										
							422				386																										438		
																																					292		
	885					1220		3404						92	380	1140						1511	3120													3697		1790	

(Continued on next page).

Table 2 (Part 4).

PORT OF ARRIVAL / PORT OF DEPARTURE	ACAPULCO	ALEXISHAFEN	AMAPALA	ANTOFAGASTA	APIA	ARICA	AUCKLAND	AVARUA	BALI	BLUFF	BORA-BORA	BRISBANE	BUENAVENTURA	CAIRNS	CALLAO	CHAÑARAL	CHILUNG (KEELUNG)	CHIMBOTE	COOS BAY	DA NANG (TOURANE)	DARVEL BAY	DILI	DJAKARTA	EASTER ISLAND	EL SALVADOR	ENSENADA	GALAPAGOS ISLANDS	GOLFITO	
MAKASAR									[illegible]																				
MANILA												[illegible]					771						1559						
MANZANILLO																													
MAZATLÁN																													
MELBOURNE							[illegible]					[illegible]																	
MIRI																													
MOLLENDO						137									[illegible]														
NAURU												[illegible]																	
NICARAGUA			[illegible]																						72				
NORFOLK IS.																													
NOUMÉA																													
OCEAN IS.												[illegible]																	
OKINAWA																	[illegible]												
PAGO PAGO																													
PAITA																		[illegible]											
PANAMA CANAL	1426						[illegible]					[illegible]	[illegible]		[illegible]										748	2772			
PAPEETE							[illegible]				[illegible]																		
PORT ALBERNI																													
PORTLAND							[illegible]												[illegible]										
PORT MORESBY																													
PUERTO MONTT																													
PUNTA ARENAS																													
PUNTARENAS			[illegible]										[illegible]																
PUSAN																													
RABAUL												[illegible]																	
RAROTONGA							[illegible]																						
SAIGON																				504									
SALAVERRY															[illegible]														
SAMARAI												[illegible]																	
SAN ANTONIO				[illegible]																									
SANDAKAN																													
SAN DIEGO																										49			
SAN FRANCISCO	1833						[illegible]										[illegible]												
SEATTLE																													
SHANGHAI																													
SINGAPORE												[illegible]										1522	525						
SKAGWAY																													11
SURABAJA							[illegible]		[illegible]														450						
SUVA					667		[illegible]																						
SYDNEY							[illegible]					[illegible]											3029						
TALARA																													
TALCAHUANO																													
TARAKAN												[illegible]																	
TAWAU																					82								
TIENTSIN																													
TONGA ISLANDS							[illegible]																						[illegible]
TOWNSVILLE												[illegible]											2594						
TSINGTAO																													
UCLUELET																													
VALPARAÍSO				[illegible]		[illegible]									[illegible]									1992					
VANCOUVER												[illegible]							909							1313			
VILA																													
WAKE																													
WELLINGTON							[illegible]			456					[illegible]														
WEWAK		161																											
YOKOHAMA																													

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Table 2 (Part 4).

IVAL	ACAPULCO	ALEXISHAFEN	AMAPALA	ANTOFAGASTA	APIA	ARICA	AUCKLAND	AVARUA	BALI	BLUFF	BORA-BORA	BRISBANE	BUENAVENTURA	CAIRNS	CALLAO	CHAÑARAL	CHILUNG (KEELUNG)	CHIMBOTE	COOS BAY	DA NANG (TOURANE)	DARVEL BAY	DILI	DJAKARTA	EASTER ISLAND	EL SALVADOR	ENSENADA	GALAPAGOS ISLANDS	GOLFITO	GLACIER BAY	GUAM	GUATEMALA	GUAYAQUIL	GUAYMAS	HOBART	HOLLANDIA	HONG KONG	HONIARA		
									389																														
												[illegible]					771						1559													631			
																																	388						
							1040					[illegible]																						472					
						137									680																								
												[illegible]																											
			72																						72														
												[illegible]																											
																	[illegible]																						
																		[illegible]																					
	1426						[illegible]					[illegible]	[illegible]		1250										748	2772						834	2370						
							[illegible]				141																												
							2072												[illegible]																				
			[illegible]										[illegible]																										
																																				1144			
												[illegible]																											
							[illegible]																																
																				504																917			
															[illegible]																								
												2071																											
				[illegible]																																			
																										49													
	1632						[illegible]										[illegible]													5053									
																																				834			
												[illegible]										1522	525													1454			
																													113										
							[illegible]		[illegible]														450																
					[illegible]		[illegible]																																
							[illegible]					[illegible]											3029											638					
												[illegible]																											
																					82																		
																																				1418			
							[illegible]																																
												[illegible]											2594																
				576		[illegible]									[illegible]									1992															
												[illegible]							609							1313													
																																					739		
																														1336									
							[illegible]			[illegible]					[illegible]																								
		161																																	180				
																																	6125			1544			

(Continued on next page).

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Table 2 (Part 5).

PORT OF DEPARTURE \ PORT OF ARRIVAL	HONOLULU	ILOILO; CEBU	INCHON	JESSELTON	JUAN FERNANDEZ IS.	JUNEAU	KAOHSIUNG (TAKAO)	KAVIENG	KETCHIKAN	KITIMAT	KOBE	KRUNG THEP (BANGKOK)	KWAJALEIN	LABUAN	LAE	LOMBRUM	LORENGAU	LOS ANGELES	MADANG	MAKASAR	MANILA	MANZANILLO	MAZATLÁN	MELBOURNE	MIRI	MOLLENDO	NAURU	NICARAGUA	NORFOLK IS.	NOUMÉA
MAKASAR																				X										
MANILA		361									1536	1435						6530			X				720					
MANZANILLO																						X	297							
MAZATLAN																							X							
MELBOURNE																					1534			X			2941			
MIRI																					720				X					
MOLLENDO																										X				
NAURU																								2941			X			
NICARAGUA																												X		
NORFOLK IS.																													X	
NOUMÉA															1565															X
OCEAN IS.																														
OKINAWA	4057										761										957									
PAGO PAGO	2276																													
PAITA																														
PANAMA CANAL	4686																	2913			9347		2006	7928						
PAPEETE																		3571												
PORT ALBERNI																														
PORTLAND	2229																	885												
PORT MORESBY																														
PUERTO MONTT																														
PUNTA ARENAS																		5871												
PUNTARENAS																												200		
PUSAN			402								361										1402									
RABAUL								130																						
RAROTONGA																														
SAIGON		1051										609						7403												
SALAVERRY																														
SAMARAI															366															
SAN ANTONIO																														
SANDAKAN														278																
SAN DIEGO	2278																	92												
SAN FRANCISCO	2091		5309										4126					360			6221									
SEATTLE	2276																				5804									
SHANGHAI																														
SINGAPORE		1268										842									1330				630					
SKAGWAY																														
SURABAJA																		7622												
SUVA	2776																													734
SYDNEY																								582			2359		901	1069
TALARA																		3126												
TALCAHUANO																														
TARAKAN																					813									
TAWAU																														
TIENTSIN											1108																			
TONGA ISLANDS																														
TOWNSVILLE																					2610									900
TSINGTAO																														
UCLUELET																														
VALPARAISO																														
VANCOUVER	2423								553	436	4541							1172			6019									
VILA																														370
WAKE																														
WELLINGTON																														
WEWAK																														
YOKOHAMA	3354										316							4798			1717		5741							

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Table 2 (Part 5).

HONOLULU	ILOILO; CEBU	INCHON	JESSELTON	JUAN FERNÁNDEZ IS.	JUNEAU	KAOHSIUNG (TAKAO)	KAVIENG	KETCHIKAN	KITIMAT	KOBE	KRUNG THEP (BANGKOK)	KWAJALEIN	LABUAN	LAE	LOMBRUM	LORENGAU	LOS ANGELES	MADANG	MAKASAR	MANILA	MANZANILLO	MAZATLÁN	MELBOURNE	MIRI	MOLLENDO	NAURU	NICARAGUA	NORFOLK IS.	NOUMÉA	OCEAN ISLAND	OKINAWA	PAGO PAGO	PAITA	PANAMA CANAL	PAPEETE	PORT ALBERNI
																			X																	
	361									1536	1435						6530			X				720										9347		
																					X	297														
																						X												2006		
																				1534			X			2941								7928		
																				720				X												
																									X											
																							2941			X										
																											X									
																												X								
														1565															X							
																														X						
4057										761										957											X					
2276																																X			1236	
																																	X			
4686																	2913			9347		2006	7928											X	4493	
																	3571															1236		4493	X	
																																				X
2229																	885																	3766		
																	5871																			
																											269									
		402								361										1402											630					
							130																													
	1051										609						7403																			
														366																						
													278																							
2276																	92																	2843		
2091		5309										4126					360			6221														3245		
2276																				5804														3887		
	1268										842									1330				630												
																	7622																			
2776																													734			688			1838	
																							582			2359		901	1069	2233				7674		
																	3126																37	[illegible]		
																																		2805		
																				813																
										1108																										
																				2610									900							
																																				44
2423								553	436	4541							1172			6019														4032		
																													370						2470	
																																		8505	2348	
3354										316							4798			1717		5741									795			7641		

(Continued on next page).

Table 2 (Part 6).

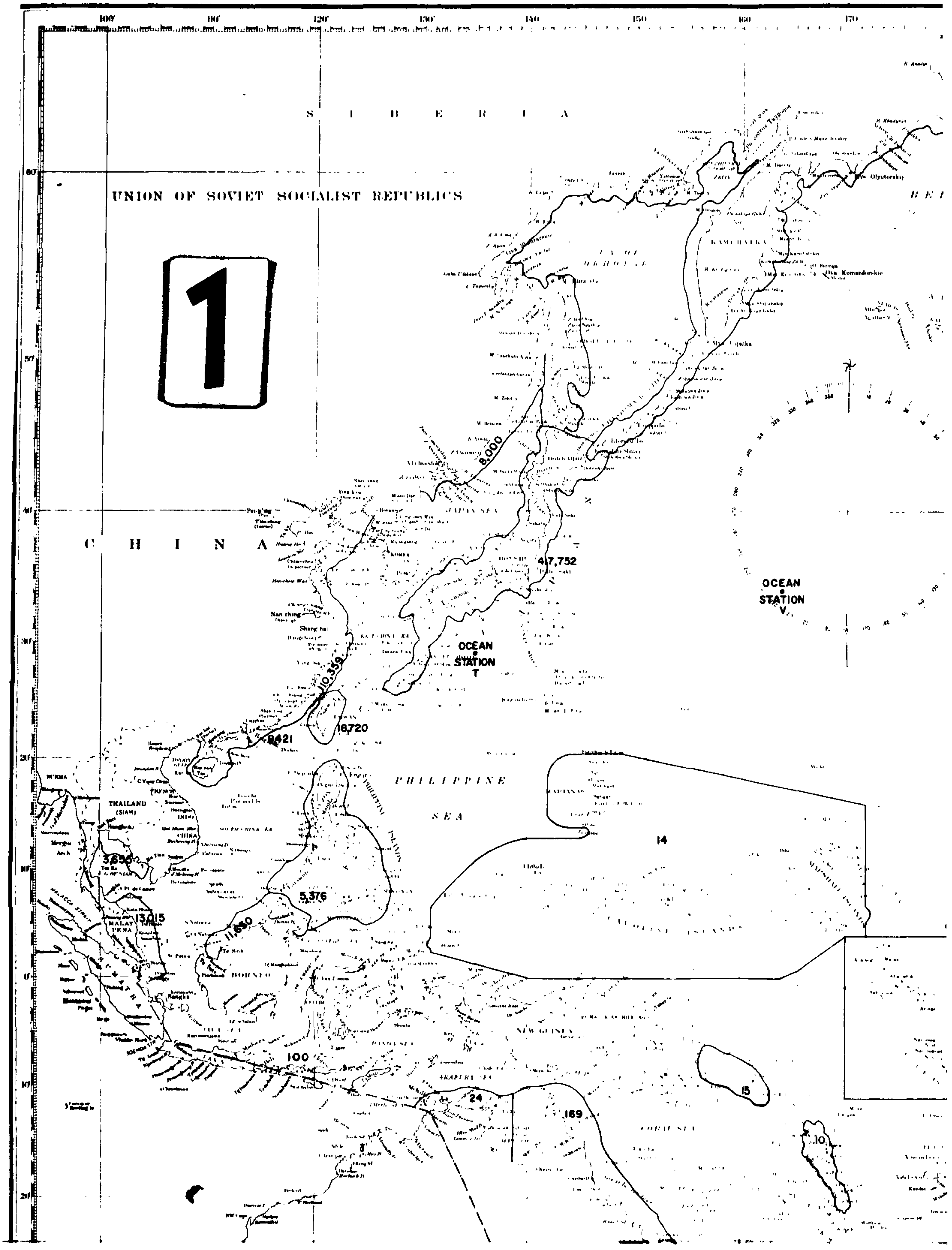
PORT OF ARRIVAL / PORT OF DEPARTURE	PORTLAND	PORT MORESBY	PUERTO MONTT	PUNTA ARENAS	PUNTARENAS	PUSAN	RABAUL	RAROTONGA	SAIGON	SALAVERRY	SAMARAI	SAN ANTONIO	SANDAKAN	SAN DIEGO	SAN FRANCISCO	SEATTLE	SHANGHAI	SINGAPORE	SKAGWAY	SURABAJA	SUVA	SYDNEY	TALARA	TALCAHUANO	TARAKAN	TAWAU	TIENTSIN	TONGA ISLANDS	
MAKASAR																													
MANILA									907						6221	5836		1330		1540		3948							
MANZANILLO																													
MAZATLAN																													
MELBOURNE																						592							
MIRI																		637											
MOLLENDO																													
NAURU																						2350							
NICARAGUA					289																								
NORFOLK IS.																													
NOUMEA																					730	1060							9
OCEAN IS.																						2453							
OKINAWA						620																							
PAGO PAGO																					680	2377							
PAITA																							37						
PANAMA CANAL	3706				471									2843	3245							7674	836						
PAPEETE																													
PORT ALBERNI																													
PORTLAND	X														648	130													
PORT MORESBY		X									239																		
PUERTO MONTT			X	896																									
PUNTA ARENAS				X																				1260					
PUNTARENAS					X																								
PUSAN						X																							
RABAUL							X				391											1844							
RAROTONGA								X																					
SAIGON									X						6878			649											
SALAVERRY										X																			
SAMARAI							391				X											1600							
SAN ANTONIO												X												178					
SANDAKAN													X												288	233			
SAN DIEGO	1071													X	452														
SAN FRANCISCO	640								6878					452	X	671													
SEATTLE	130														671	X													
SHANGHAI																	X												
SINGAPORE									649									X		783									32
SKAGWAY																			X										
SURABAJA																		783		X									20
SUVA																					X	1730							
SYDNEY																					1730	X							
TALARA										295													X						
TALCAHUANO				1225																				X					
TARAKAN																									X	56			
TAWAU																										X			
TIENTSIN																	740										X		
TONGA ISLANDS																												X	
TOWNSVILLE																				2326									X
TSINGTAO																	410												
UCLUELET																													
VALPARAISO			623									63																	
VANCOUVER	288														812	126													
VILA																													
WAKE																													
WELLINGTON																						1234							
WEWAK																													
YOKOHAMA	4207														4495	4071		2848				4280							

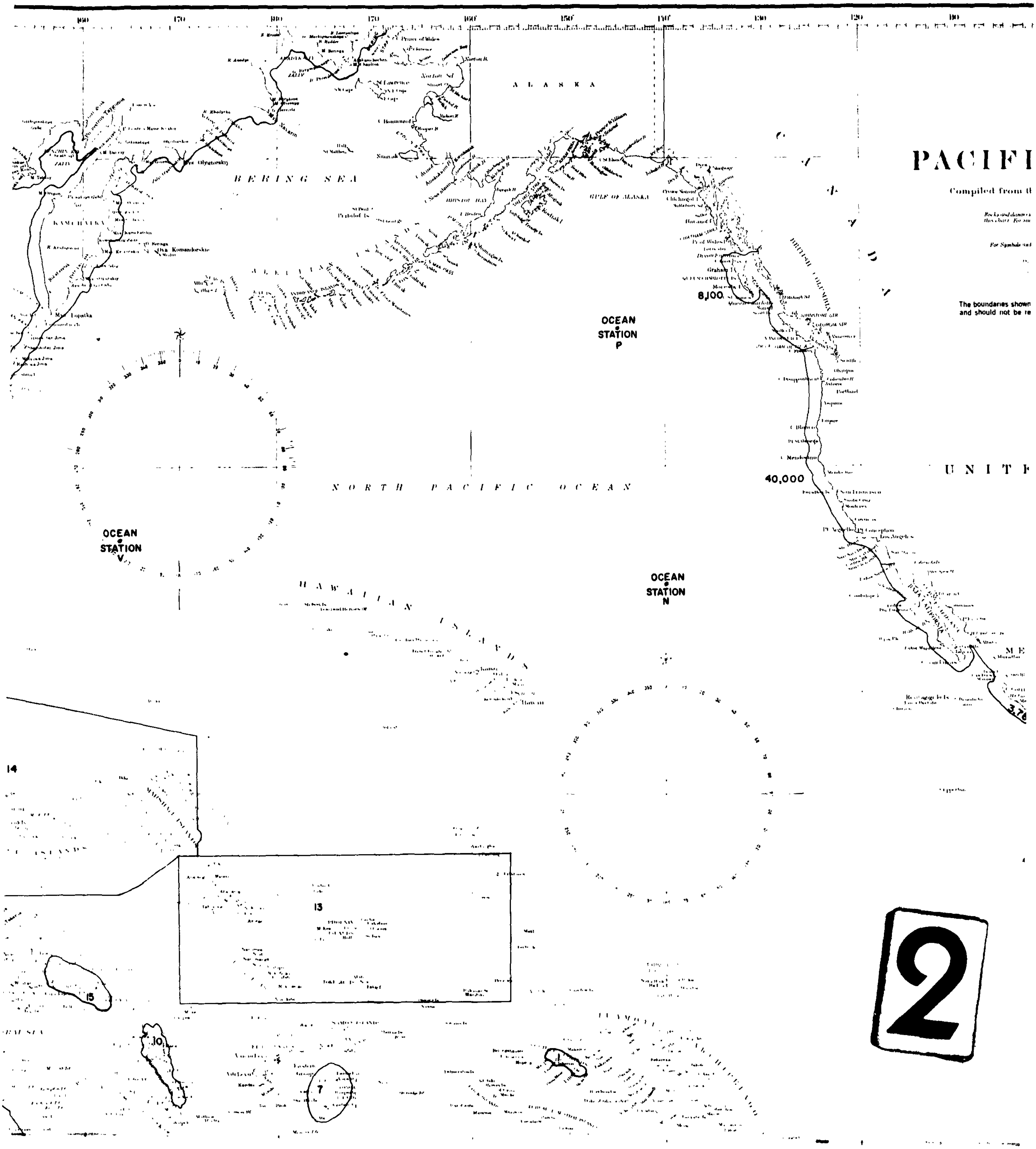
1

Table 2 (Part 6).

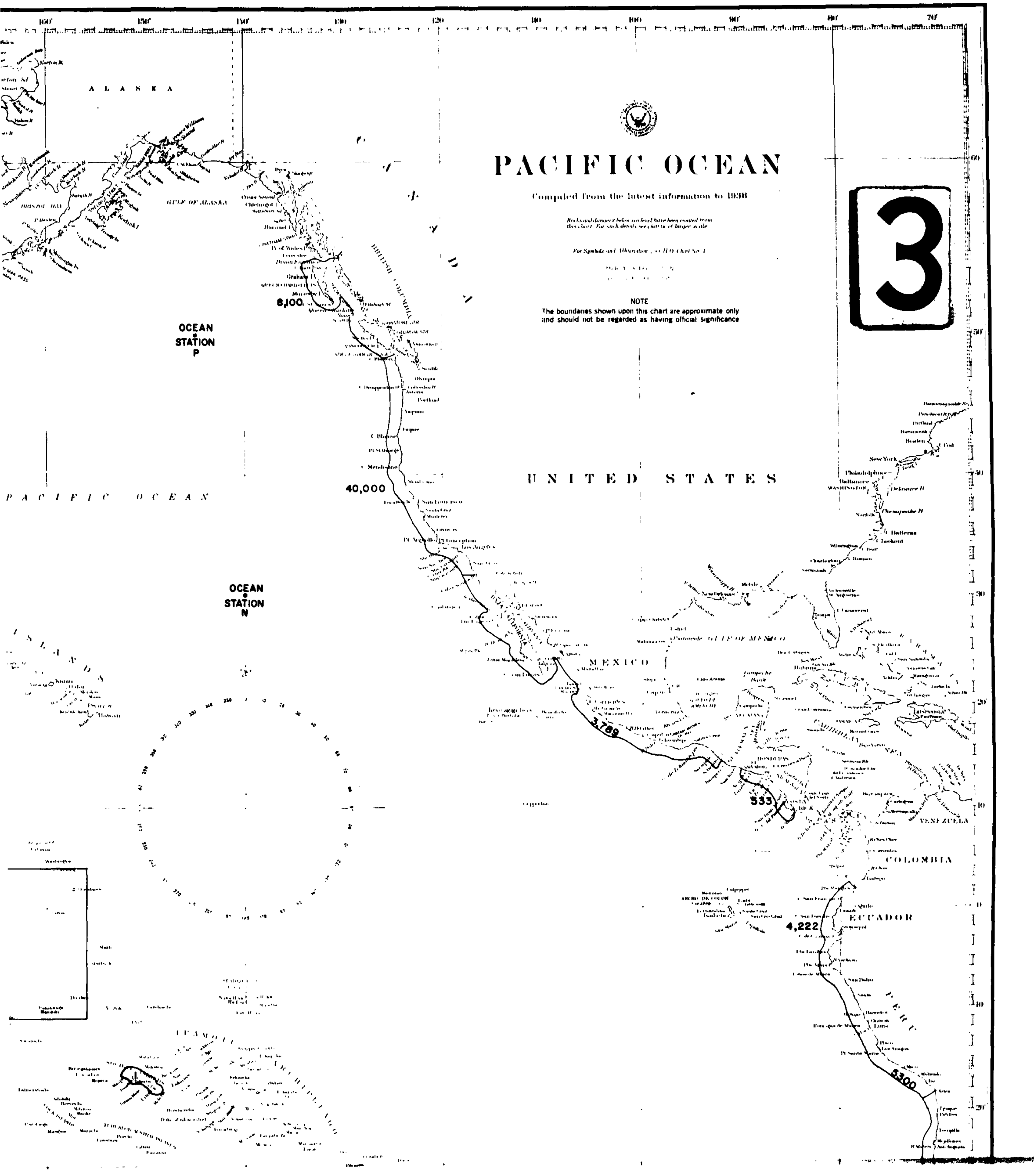
PORTLAND	PORT MORESBY	PUERTO MONTT	PUNTA ARENAS	PUNTARENAS	PUSAN	RABAUL	RAROTONGA	SAIGON	SALAVERRY	SAMARAI	SAN ANTONIO	SANDAKAN	SAN DIEGO	SAN FRANCISCO	SEATTLE	SHANGHAI	SINGAPORE	SKAGWAY	SURABAJA	SUVA	SYDNEY	TALARA	TALCAHUANO	TARAKAN	TAWAU	TIENTSIN	TONGA ISLANDS	TOWNSVILLE	TSINGTAO	UCLUELET	VALPARAÍSO	VANCOUVER	VILA	WAKE	WELLINGTON	WEWAK	YOKOHAMA
								907						3221	5836		1330		1540		3048											8019					1717
																					592																
																	637																				
																					2350																
				250																																	
																																	940				
																				730	1000							900					370				
																					2453																
					630																																
																				680	2377																
																						37															
2708				471									2843	3245							7676	836										4032			1506		2841
																																	2479				
																														48							
X														648	130																	261					4179
	X									230																											
		X	886																																		
			X																				1260														
				X																																	
					X																																665
						X				391											1844																
							X																														
								X						6878			649																				
									X																												
						391				X											1600																
											X												178														
												X												288	233												
1071													X	452																							
648								6878					452	X	671																	812					4495
130														671	X																	126					4071
																X																					
								649									X		783									3391									2848
																		X																			
																	783		X									3008									
																				X	1730											5190					
																				1730	X											6810			1234		
									296													X															
			1225																				X								241						
																								X	56												
																									X												
																740										X			436								
																											X										
																			2236									X									
																410													X								
																														X							
		623									63																				X						
260														812	126																	X					4221
																																	X				
																																		X			
																					1234														X		
																																				X	
4287														4495	4071		2848				4280											4118					X

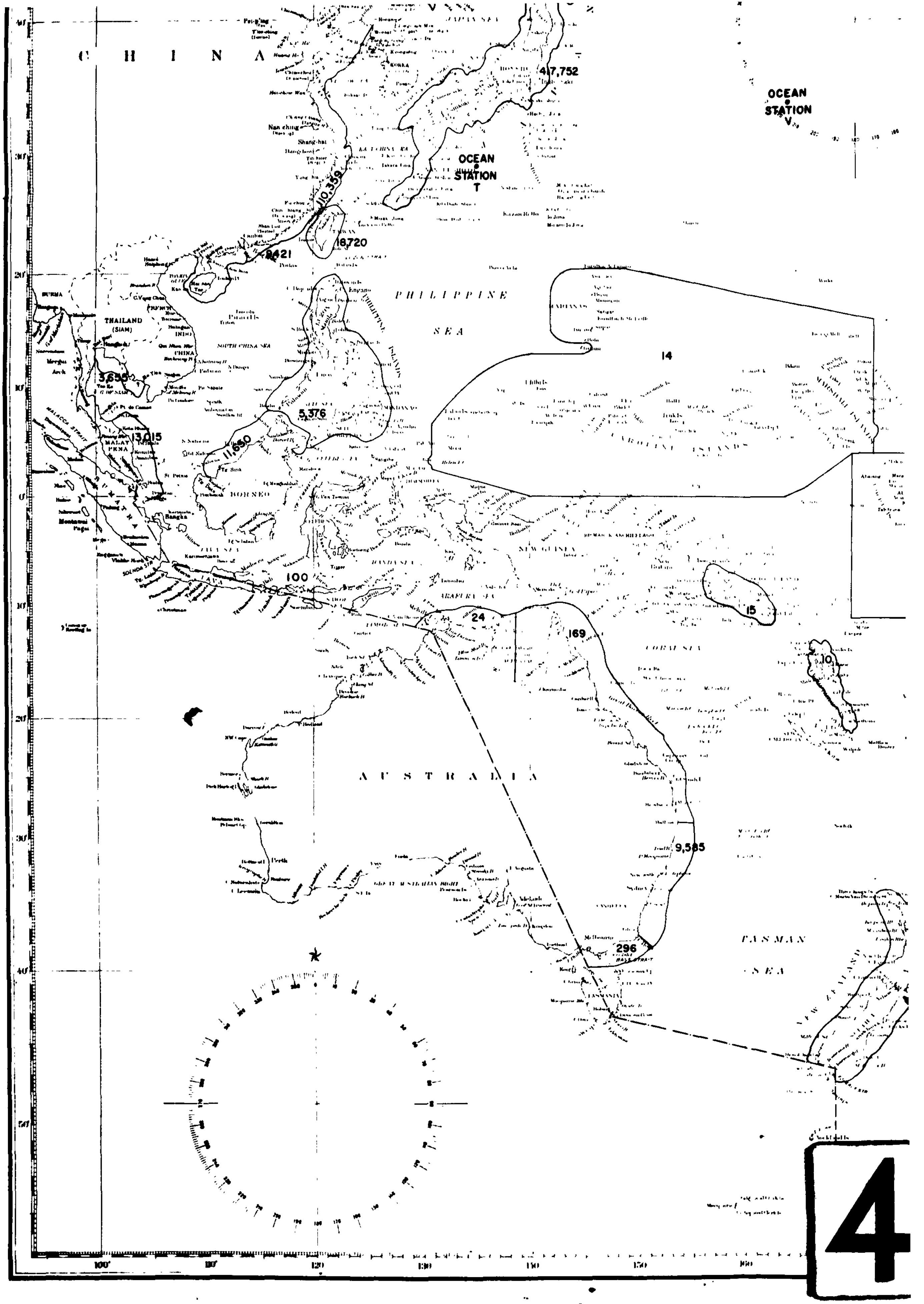
2


1
SIBERIA
UNION OF SOVIET SOCIALIST REPUBLICS
CHINA
THAILAND (SIAM)
BORNEO
NEW GUINEA
PHILIPPINE SEA
OCEAN STATION T
OCEAN STATION V
8,000
417,752
110,359
18,720
2,421
3,655
13,015
11,650
5,376
100
24
169
14
15
10



PACIFI
Compiled from th
A L A S K A
B E R I N G S E A
KAMCHATKA
GULF OF ALASKA
BRITISH COLUMBIA
OCEAN STATION P
8,100
The boundaries shown
and should not be re
N O R T H P A C I F I C O C E A N
40,000
U N I T E
OCEAN STATION V
OCEAN STATION N
H A W A I I A N I S L A N D S
14
13
15
10
7
2


PACIFIC OCEAN
Compiled from the latest information to 1938
NOTE
The boundaries shown upon this chart are approximate only and should not be regarded as having official significance
3
ALASKA
GULF OF ALASKA
BRITISH COLUMBIA
OCEAN STATION P
OCEAN STATION N
PACIFIC OCEAN
UNITED STATES
MEXICO
GULF OF MEXICO
VENEZUELA
COLOMBIA
ECUADOR
PERU
8,100
40,000
3,789
533
4,222
5300



CHINA
OCEAN STATION V
OCEAN STATION T
47,752
110,359
18,720
2421
PHILIPPINE SEA
THAILAND (SIAM)
BURMA
3,655
13,015
5,376
11,650
BORNEO
14
CAROLINE ISLANDS
NEW GUINEA
100
24
169
15
10
CORAL SEA
ARAFURA SEA
BANDA SEA
AUSTRALIA
9,585
296
TASMAN SEA
NEW ZEALAND
TASMANIA
4

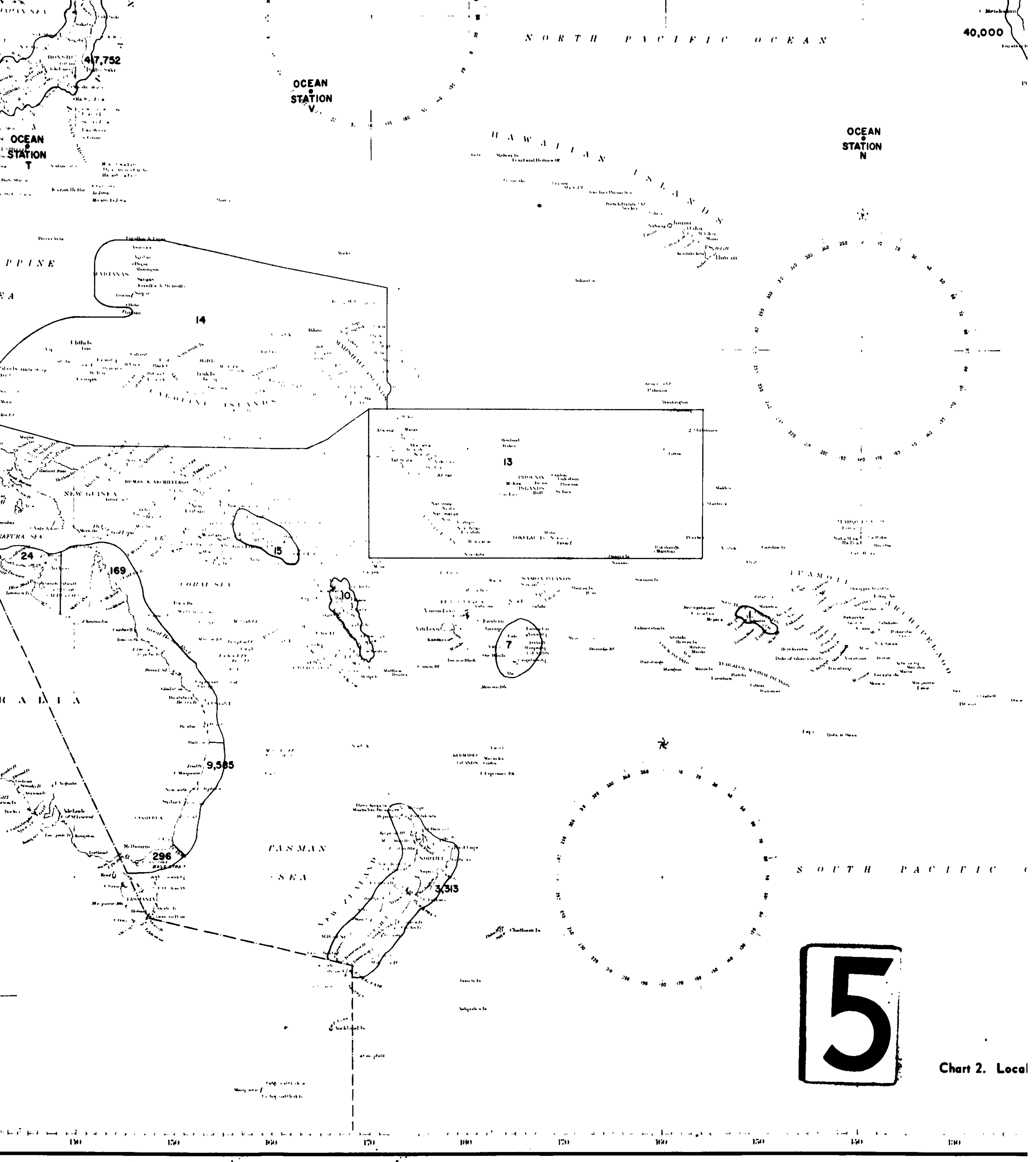


Chart 2. Local

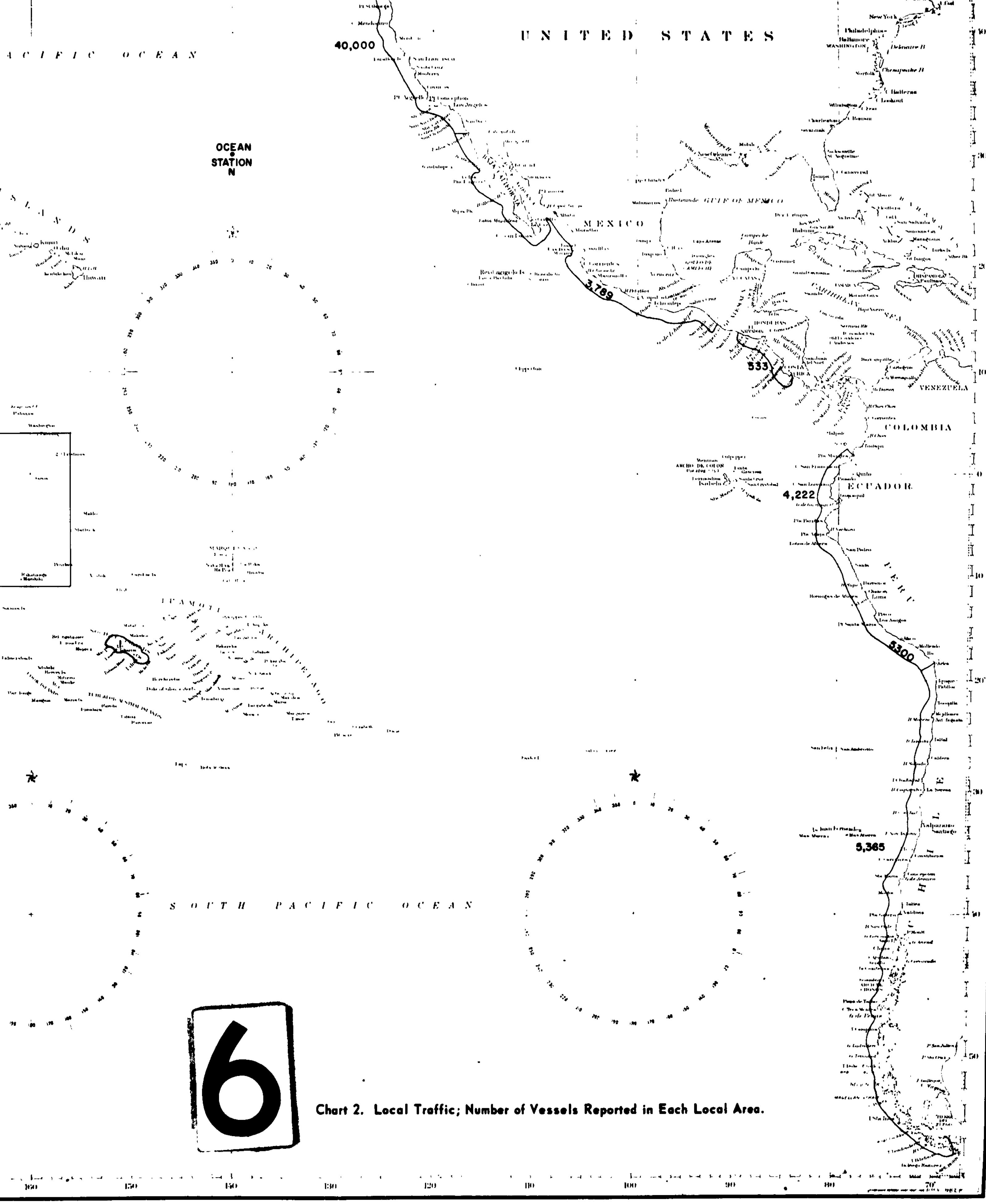
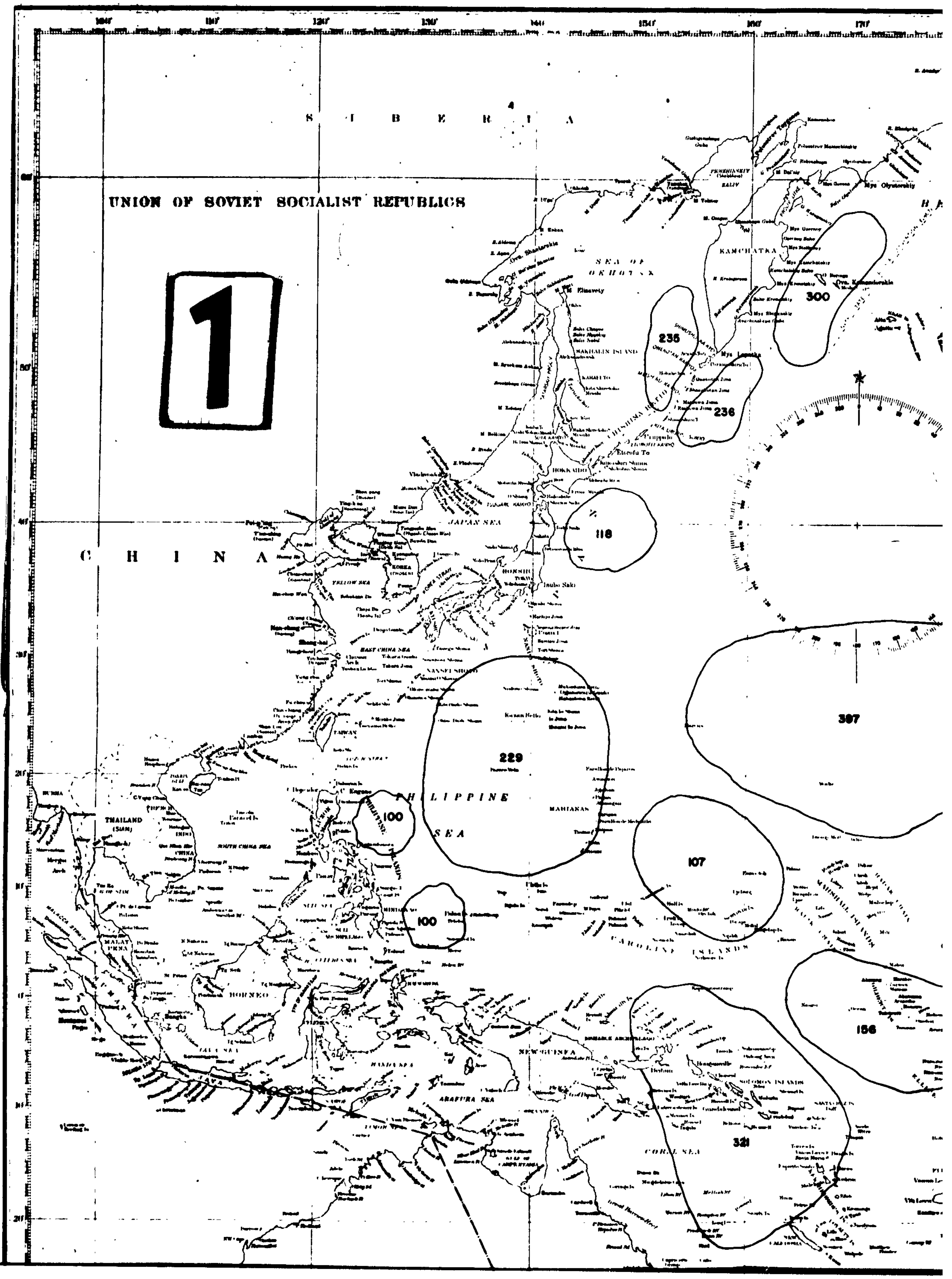
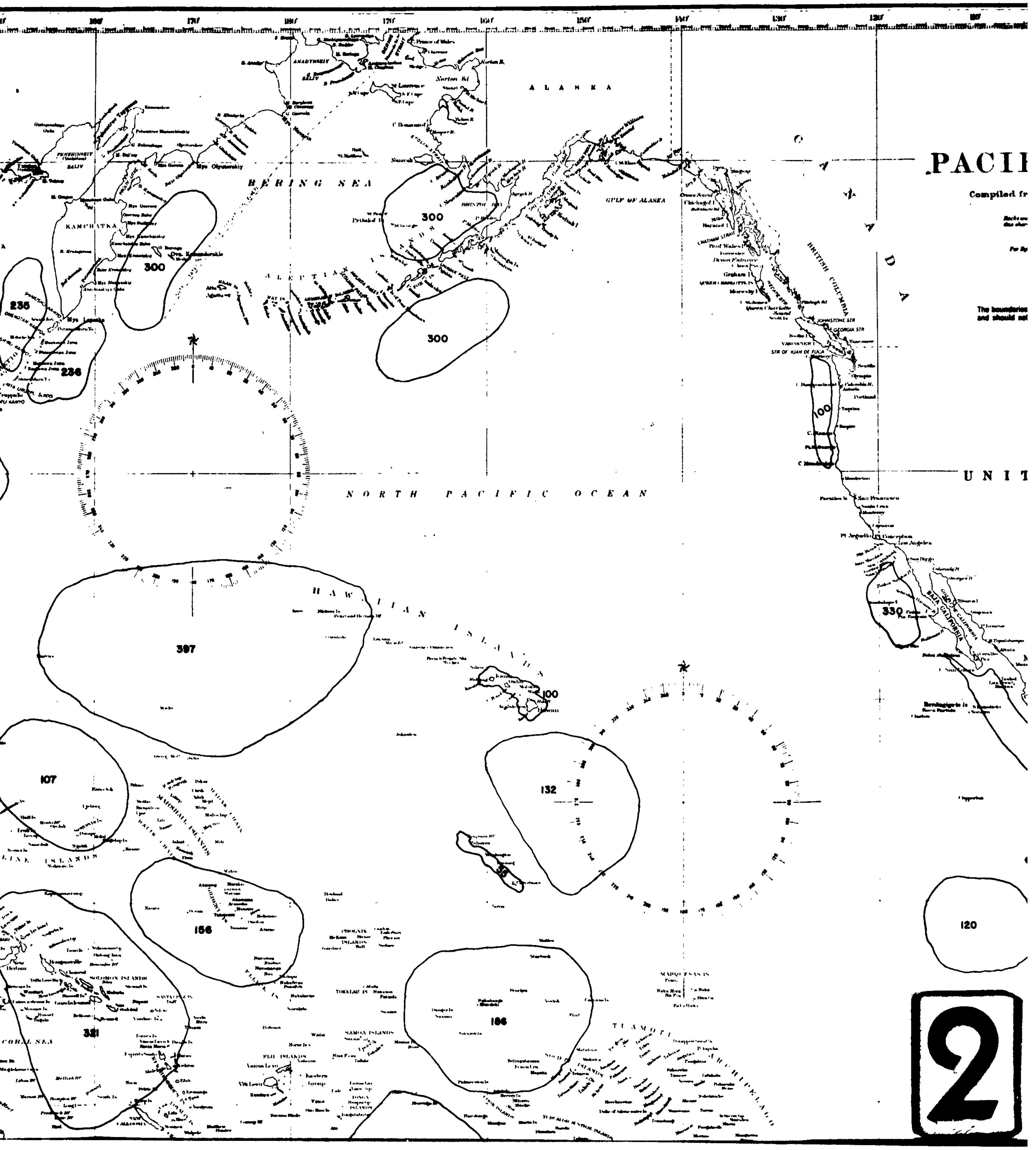
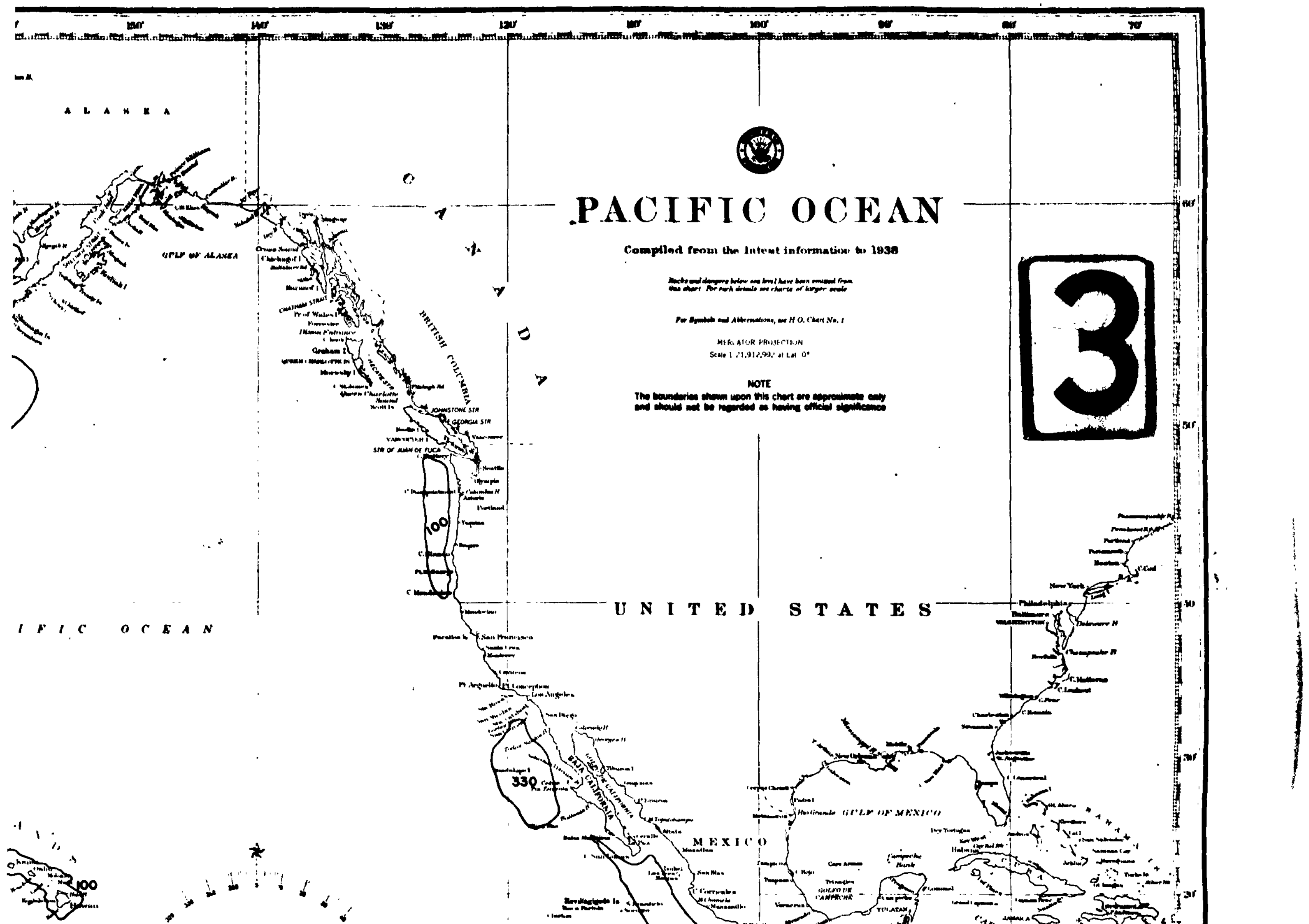
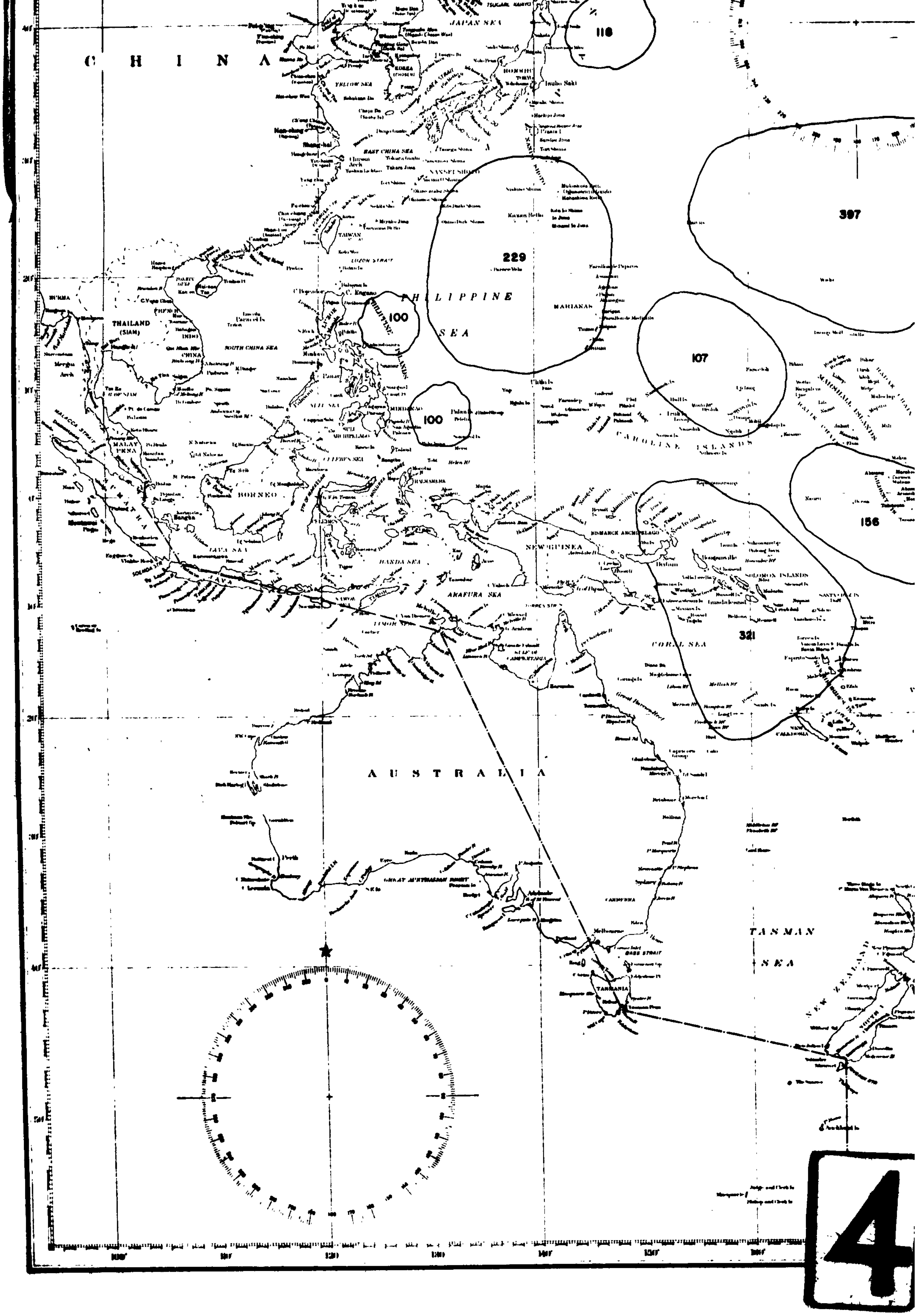


Chart 2. Local Traffic; Number of Vessels Reported in Each Local Area.


1
SIBERIA
UNION OF SOVIET SOCIALIST REPUBLICS
CHINA
SEA OF OKHOTSK
KAMCHATKA
Mys Olyutorskiy
Mys Lopatka
SAKHALIN ISLAND
HOKKAIDO
Etorofu To
Inubo Saki
JAPAN SEA
YELLOW SEA
KOREA
Shanghai
EAST CHINA SEA
TAIWAN
PHILIPPINE SEA
MARIANAS
SOUTH CHINA SEA
THAILAND (SIAM)
BORNEO
NEW GUINEA
SOLOMON ISLANDS
ARAFURA SEA
CORAL SEA
CAROLINE ISLANDS
300
235
236
118
387
229
100
100
107
156
321


PACI
Compiled fr
BERING SEA
ALASKA
CANADA
GULF OF ALASKA
BRITISH COLUMBIA
KAMCHATKA
ALEUTIAN
NORTH PACIFIC OCEAN
HAWAIIAN ISLANDS
UNIT
MARSHALL ISLANDS
SOLOMON ISLANDS
CORAL SEA
FIJI ISLANDS
SAMOA ISLANDS
TOKELAU IS
PHOENIX ISLANDS
TUAMOTU ARCHIPELAGO
BAJA CALIFORNIA
300
300
300
235
236
397
100
100
107
132
156
186
321
330
120
2


PACIFIC OCEAN
Compiled from the latest information to 1938
MERCATOR PROJECTION
NOTE
The boundaries shown upon this chart are approximate only and should not be regarded as having official significance
3
ALASKA
CANADA
BRITISH COLUMBIA
GULF OF ALASKA
UNITED STATES
MEXICO
GULF OF MEXICO
BAJA CALIFORNIA
VENEZUELA
COLOMBIA
ECUADOR
PERU
100
330
589
120
132
186



C H I N A
JAPAN SEA
YELLOW SEA
KOREA
EAST CHINA SEA
Shang-hai
TAIWAN
LUZON STRAIT
118
397
229
PHILIPPINE SEA
MARIANAS
100
100
107
156
321
BURMA
THAILAND (SIAM)
SOUTH CHINA SEA
SULU SEA
MINDANAO
MALACCA STRAIT
BORNEO
CELEBES SEA
JAVA SEA
BANDA SEA
ARAFURA SEA
TIMOR SEA
NEW GUINEA
BISMARCK ARCHIPELAGO
CAROLINE ISLANDS
MARSHALL ISLANDS
SOLOMON ISLANDS
CORAL SEA
NEW CALEDONIA
A U S T R A L I A
GREAT AUSTRALIAN BIGHT
Perth
Melbourne
Sydney
CANBERRA
BASS STRAIT
TASMANIA
TASMAN SEA
NEW ZEALAND
4

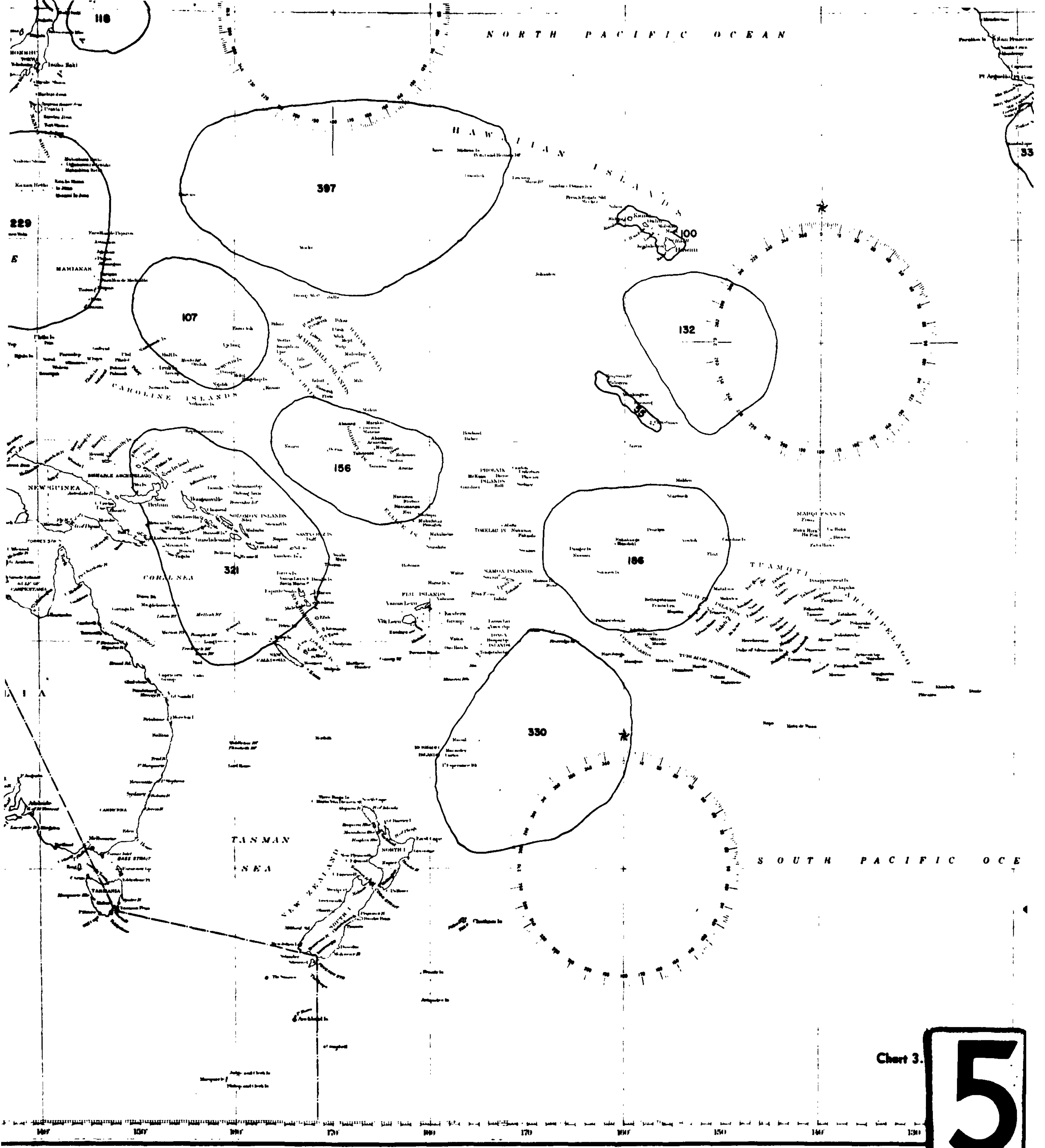

NORTH PACIFIC OCEAN
HAWAIIAN ISLANDS
118
229
397
100
107
132
156
321
186
330
MARIANAS
CAROLINE ISLANDS
MARSHALL ISLANDS
NEW GUINEA
SOLOMON ISLANDS
CORAL SEA
SAMOA ISLANDS
FIJI ISLANDS
TUAMOTU ARCHIPELAGO
TASMAN SEA
NEW ZEALAND
TASMANIA
SOUTH PACIFIC OCE

Chart 3.

5

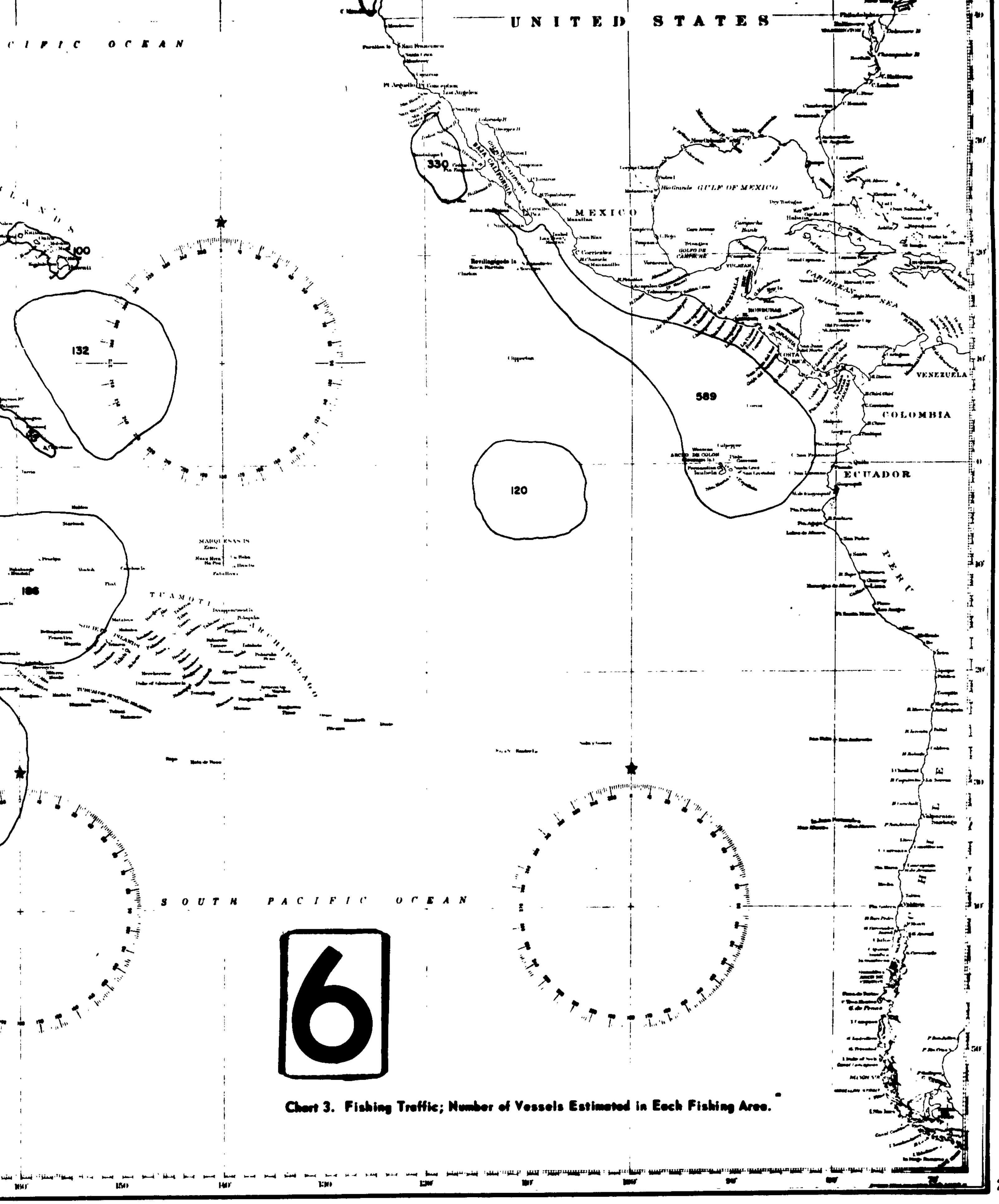


Chart 3. Fishing Traffic; Number of Vessels Estimated in Each Fishing Area.

The pelagic fishing fleets which have been considered as operating in the various fishing areas of the Pacific Ocean are composed exclusively of Japanese, U.S., or U.K. vessels. There is good reason to believe that the Russian fishing fleet operates in the Pacific Ocean Area (see reference 44), but unfortunately, neither the size of that fishing fleet nor its areas of operation are known.

Information on areas in which the pelagic fishing operations are conducted is not easily obtained. Probably one of the reasons for this is the shifting of fishing areas from year to year and season to season. Indications of this type of shift appear to be present in references 33 through 42. The location of a fishing area is therefore considerably more tenuous than the lines on chart 3 suggest.

In general, tunny fishing is conducted in the fishing areas from approximately latitude 40° N to latitude 40° S. Crabbing is conducted along the east side of the Kurile Islands and in Bristol Bay, Alaska, and cod and halibut dragging is conducted on both sides of the Kurile Islands, east of Kamchatka, and south of the Aleutian Islands.

The U.S. tunny fleet operates east of longitude 170° W, and the New Zealand tunny fleet operates in the fishing areas of the southeast portion of the Pacific Ocean Area.

DENSITY OF SHIP TRAFFIC

The methods of counting vessels vary with the various classes of traffic and will be explained under the appropriate traffic headings. Seasonal variations were neglected in order to keep the study within manageable bounds, and hence, total yearly shipping was estimated where appropriate.

Lane Traffic

For lane traffic, it was decided to determine the number of ship trips per year along each traffic lane which could be located. This does not mean that each trip is made by a different ship. A ship trip is counted when a vessel clears a port for a direct run to another specified port. The recommended track for the voyage constitutes the center line of the shipping lane between those two ports (see "Location of Shipping" section). One difficulty arose because many ships continually enter and leave the Pacific Ocean Area on interocean voyages. Therefore, this area does not really constitute a closed system, although, for simplification, it was considered such in this study by assuming that the total number of ships entering the area per year at the eight ports of entry is equal to the number of ships departing the area per year at these eight ports.

Liner Traffic

Liner traffic counts are listed by port-of-call in table 3. The numbers in table 3 are not estimates; documentary evidence from the sources named in the "Data Sources" section can be cited for every ship counted. It is entirely possible that some unknown shipping companies conduct additional scheduled traffic on the same or other shipping lanes, but it is certain that the given numbers of ship trips were scheduled on the given shipping lanes in 1960. Hence, the table represents a lower bound of both liner and lane traffic in the Pacific Ocean Area.

Table 3 was generated by considering each of the 117 shipping companies for which schedules were available and the travels of its ships from port to port. The trips were listed on file cards, each card representing a shipping lane from a port of departure to a port of arrival. Each individual listing showed the number of yearly trips, followed by the code number of the shipping company in parentheses. When the data had been extracted from all schedules, the sum of all yearly trips on each file card was recorded and transferred to the appropriate position in the table. Subsequently, a short notation indicating the geographical location and character of the shipping lane (rhumb line or great circle course) was appended to the majority of the file cards.

Total Lane Traffic

The total lane traffic for the Pacific Ocean Area is presented in table 4. This table presents the total estimated number of ships traveling from and to all of the 113 Pacific ports included in this study. The number of ship trips per year on the lanes which are to seaward of a line about 100 nautical miles off the shores of the more continuous land masses is shown on chart 4.

It was not possible to show on chart 4 the trips per lane closer to shore. A look at chart 1 will reveal the excessive detail which would have been required if trips per lane had been carried up to the coastline. Consequently, ambiguities will appear in perusal of chart 4. If resolution is desired, reference to the port-to-port lane traffic reported in table 4 and the lane locations of chart 1 will be necessary. However, it must be noted that some lane segments will have traffic from and to numerous ports.

Estimation of the total lane traffic in the Pacific Ocean Area required the addition of tramp traffic to the established liner traffic. Unfortunately, there was no practical data gathering method which could be used to count this traffic separately. Such separate counting would have been vastly preferable, because there is every reason to suspect that other shipping lanes and ports-of-call would have been located, in addition to those already known from the liner traffic data. However, there is also every reason to believe that a majority of the tramp traffic would tend to use the same shipping lanes as those used by the established liner traffic, thereby essentially reinforcing the liner traffic for seasonal transport.

Table 3. Liner Traffic by Port-of-Call

PORT OF DEPARTURE \ PORT OF ARRIVAL	ACAPULCO	ALEXISHAFEN	AMAPALA	ANTOFAGASTA	APIA	ARICA	AUCKLAND	AVARUA	BALI	BLUFF	BORA-BORA	BRISBANE	BUENAVENTURA	CAIRNS	CALLAO	CHAÑARAL	CHILUNG (KEELUNG)	CHIMBOTE	COOS BAY	DA NANG (TOURANE)	DARVEL BAY	DILI	DJAKARTA	EASTER ISLAND	EL SALVADOR	ENSENADA	GALAPAGOS ISLANDS
ACAPULCO	X																										
ALEXISHAFEN		X																									
AMAPALA			X																						74		
ANTOFAGASTA				X		29									52	52											
APIA					X																						
ARICA				128		X									75												
AUCKLAND					7		X																				
AVARUA								X																			
BALI									X			3															
BLUFF										X																	
BORA-BORA								1			X																
BRISBANE												X		8					14								
BUENAVENTURA													X		17										21		
CAIRNS														X													
CALLAO				26		68							17		X			17									
CHAÑARAL																X											
CHILUNG (KEELUNG)																	X										
CHIMBOTE															17			X									
COOS BAY																			X								
DA NANG (TOURANE)																				X							
DARVEL BAY																					X						
DILI																						X					
DJAKARTA									3														X				
EASTER ISLAND																								X			
EL SALVADOR			29																						X		
ENSENADA																										X	
GALAPAGOS ISLANDS																											X
GOLFITO																											
GLACIER BAY																											
GUAM																											
GUATEMALA	29																								41		
GUAYAQUIL													72		126												6
GUAYMAS																										57	
HOBART							12																				
HOLLANDIA																					17	208					
HONG KONG																	141						12				
HONIARA																											
HONOLULU	12																										
ILOILO, CEBU																							12				
INCHON																	66										
JESSELTON																											
JUAN FERNANDEZ IS.																											
JUNEAU																											
KAOHSIUNG (TAKAO)																	26										
KAVIENG																											
KETCHIKAN																											
KITIMAT																											
KOBE																	98										
KRUNG THEP (BANGKOK)									1														37				
KWAJALEIN																											
LABUAN																					1						
LAE																											
LOMBRUM																											
LONGVIEW																											
LORENGAU																											
LOS ANGELES	54						13					4	12														
MADANG																											
SUBTOTAL	96	0	29	154	7	97	25	1	4	0	0	7	101	8	287	52	331	17	14	0	18	208	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table 3. Liner Traffic by Port-of-Call

ALEXISHAFEN	AMAPALA	ANTOFAGASTA	APIA	ARICA	AUCKLAND	AVARUA	BALI	BLUFF	BORA-BORA	BRISBANE	BUENAVENTURA	CAIRNS	CALLAO	CHAÑARAL	CHILUNG (KEELUNG)	CHIMBOTE	COOS BAY	DA NANG (TOURANE)	DARVEL BAY	DILI	DJAKARTA	EASTER ISLAND	EL SALVADOR	ENSENADA	GALAPAGOS ISLANDS	GOLFITO	GLACIER BAY	GUAM	GUATEMALA	GUAYAQUIL	GUAYMAS	HOBART	HOLLANDIA	HONG KONG	HONIARA	HONOLULU	SUBTOTAL
																													29							12	41
X																																					0
	X																						74														74
		X		29									52	52																							133
			X																																		0
		128		X									75																								203
			7		X																															6	13
						X																															0
							X			3																											3
								X																													0
						1			X																												1
										X		8					14																				22
											X		17										21							169							207
												X																									0
		26		68							17		X			17														135							263
														X																							0
															X													10						22			32
													17			X																					17
																	X																				0
																		X																			0
																			X															12			12
																				X													208				208
							3														X																3
																						X															0
	29																						X						107								136
																								X							17						17
																									X					6							6
																										X											0
																											X										0
																												X								10	10
																							41						X		12						82
											72		126												6					X							204
																								57					12		X						69
					12																											X					12
																			17	208													X				225
															141						12													X		10	163
																																			X		0
																																				X	12
																					12													86			98
															66																						66
																																					0
																																					0
																																					0
															26																			38			64
																																					0
																																					0
																																					0
															98																5			199			302
							1														37													12			50
																												5									5
																			1																		1
																																					0
																																					0
																																					0
																																					0
					13					4	12													42		28			12							97	262
																																					0
0	29	154	7	97	25	1	4	0	0	7	101	8	287	52	331	17	14	0	18	208	61	0	136	99	6	28	0	15	160	310	34	0	208	369	0	135	3016

(Continued on next page).

2

Table 3 (Part 2).

PORT OF ARRIVAL / PORT OF DEPARTURE	ILOILO; CEBU	INCHON	JESSELTON	JUAN FERNANDEZ IS.	JUNEAU	KAOHSIUNG (TAKAO)	KAVIENG	KETCHIKAN	KITIMAT	KOBE	KRUNG THEP (BANGKOK)	KWAJALEIN	LABUAN	LAE	LOMBRUM	LONGVIEW	LORENGAU	LOS ANGELES	MADANG	MAKASAR	MANILA	MANZANILLO	MAZATLÁN	MELBOURNE	MIRI	MOLLENDO	NAURU	NICARAGUA
ACAPULCO																		29										21
ALEXISHAFEN																			8									
AMAPALA																												
ANTOFAGASTA																												
APIA																												
ARICA																										12		
AUCKLAND																		2						7				
AVARUA																												
BALI																				17	1							
BLUFF																												
BORA-BORA																												
BRISBANE														17				8			10						36	
BUENAVENTURA																		14										
CAIRNS																					8							
CALLAO				1																						118		
CHAÑARAL																												
CHILUNG (KEELUNG)		53				42				94	6										36							
CHIMBOTE																												
COOS BAY																												
DA NANG (TOURANE)																												
DARVEL BAY																												
DILI																												
DJAKARTA	12																				24							
EASTER ISLAND																												
EL SALVADOR																						14						
ENSENADA																		81										
GALAPAGOS ISLANDS																												
GOLFITO																		28										
GLACIER BAY								91																				
GUAM		5																			16							
GUATEMALA																		33										
GUAYAQUIL																		7										
GUAYMAS																		8					29					
HOBART																								5				
HOLLANDIA																												
HONG KONG			12			38				247	73		2					12			202							
HONIARA																												
HONOLULU																		82			18							
ILOILO; CEBU	X									6											30							
INCHON		X								70																		
JESSELTON			X										12															
JUAN FERNANDEZ IS.				X																								
JUNEAU					X																							
KAOHSIUNG (TAKAO)						X																						
KAVIENG							X								8				9									
KETCHIKAN					91			X																				
KITIMAT									X																			
KOBE						12				X											45	5						14
KRUNG THEP (BANGKOK)	12										X										26							
KWAJALEIN												X																
LABUAN											17		X															
LAE														X														
LOMBRUM															X		8											
LONGVIEW																X												
LORENGAU																	X											
LOS ANGELES																		X			48							
MADANG														17					X									
SUBTOTAL	24	58	12	1	91	92	0	91	0	417	96	0	14	34	8	0	8	304	17	17	463	19	29	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table 3 (Part 2).

ILOILO; CEBU	INCHON	JESSELTON	JUAN FERNÁNDEZ IS.	JUNEAU	KAOHSIUNG (TAKAO)	KAVIENG	KETCHIKAN	KITIMAT	KOBE	KRUNG THEP (BANGKOK)	KWAJALEIN	LABUAN	LAE	LOMBRUM	LONGVIEW	LORENGAU	LOS ANGELES	MADANG	MAKASAR	MANILA	MANZANILLO	MAZATLÁN	MELBOURNE	MIRI	MOLLENDO	NAURU	NICARAGUA	NORFOLK IS.	NOUMÉA	OCEAN ISLAND	OKINAWA	PAGO PAGO	PAITA	PANAMA CANAL	PAPEETE	PORT ALBERNI	PORTLAND	SUBTOTAL
																	29										21							17				67
																		8																				8
																																						0
																																						0
																																						0
																									12													12
																	2						7											27	10		8	54
																																						0
																			17	1																		18
																																						0
																																						0
													17				8			10						36				12				8				91
																	14																	98				112
																				8																		8
			1																						118									82				201
																																						0
	53				42				94	6										36											26							257
																																	17					17
																																		3				3
																																						0
																																						0
																																						0
12																				24														36				72
																																						0
																					14													12				26
																	81																	42			4	127
																																						0
																	28																					28
							91																															91
	5																			15											5							25
																	33																	45				78
																	7																	146				153
																	8					29																37
																							5															5
																																						0
		12			38				247	73		2					12			202											48							634
																																						0
																	82			18														20			29	149
X									6											30																		36
	X								70																						76							146
		X										12																										12
			X																																			0
				X																																		0
					X																																	0
						X								8				9																				17
				91			X																															91
								X																														0
					12				X											45	5						14				27			48				151
12										X										26																		36
											X																											0
										17		X																										17
													X																5									5
														X		8																						8
															X																						42	42
																X																						0
																	X			48												14		691	25		31	809
													17					X																				17
36	58	12	1	91	92	0	91	0	417	96	0	14	34	8	0	8	304	17	17	463	19	29	12	0	130	36	35	0	5	12	182	14	17	1275	35	0	114	3062

(Continued on next page).

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Table 3 (Part 3).

PORT OF ARRIVAL / PORT OF DEPARTURE	PORT MORESBY	PUERTO MONTT	PUNTA ARENAS	PUNTARENAS	PUSAN	RABAUL	RAROTONGA	SAIGON	SALAVERRY	SAMARAI	SAN ANTONIO	SANDAKAN	SAN DIEGO	SAN FRANCISCO
ACAPULCO														7
ALEXISHAFEN														
AMAPALA				29										
ANTOFAGASTA														
APIA														
ARICA														
AUCKLAND														2
AVARUA														
BALI														
BLUFF														
BORA-BORA														
BRISBANE	8									17				
BUENAVENTURA				29										
CAIRNS														
CALLAO														
CHAÑARAL														
CHILUNG (KEELUNG)					78									26
CHIMBOTE														
COOS BAY														27
DA NANG (TOURANE)								12						
DARVEL BAY												17		
DILI														
DJAKARTA														3
EASTER ISLAND														
EL SALVADOR														
ENSENADA													43	11
GALAPAGOS ISLANDS														
GOLFITO														
GLACIER BAY														
GUAM														
GUATEMALA														
GUAYAQUIL									47					
GUAYMAS														
HOBART														
HOLLANDIA														
HONG KONG					12			37						40
HONIARA						12								
HONOLULU													3	336
ILOILO, CEBU								36						
INCHON					68									
JESSELTON														
JUAN FERNANDEZ IS.														
JUNEAU														
KAOHSIUNG (TAKAO)					16									
KAVIENG														
KETCHIKAN														
KITIMAT														
KOBE					204									
KRUNG THEP (BANGKOK)								75						
KWAJALEIN														
LABUAN												13		
LAE						8				17				
LOMBRUM														
LONGVIEW														
LORENGAU														
LOS ANGELES					6		10						106	1110
MADANG														
SUBTOTAL	8	0	0	58	384	20	10	148	47	34	0	30	151	1562

PORT OF ARRIVAL / PORT OF DEPARTURE	SEATTLE	SHANGHAI	SINGAPORE	SKAGWAY	SURABAJA	SUVA	SYDNEY	TALARA	TALCAHUANO	TARAKAN	TAWAU	TIENTSIN	TONGA ISLANDS	TOWNSVILLE
ACAPULCO														
ALEXISHAFEN														
AMAPALA														
ANTOFAGASTA														
APIA														
ARICA														
AUCKLAND			9			37	51							
AVARUA													1	
BALI					17									
BLUFF														
BORA-BORA														
BRISBANE			12				98			7				19
BUENAVENTURA														
CAIRNS														
CALLAO														
CHAÑARAL														
CHILUNG (KEELUNG)												52		
CHIMBOTE														
COOS BAY														
DA NANG (TOURANE)														
DARVEL BAY										1				
DILI			208											
DJAKARTA			236		28									3
EASTER ISLAND														
EL SALVADOR														
ENSENADA														
GALAPAGOS ISLANDS														
GOLFITO														
GLACIER BAY														
GUAM														
GUATEMALA														
GUAYAQUIL								26						
GUAYMAS														
HOBART														
HOLLANDIA														
HONG KONG			254				14			14		12		
HONIARA														
HONOLULU	23					16								
ILOILO, CEBU			12											
INCHON														
JESSELTON														
JUAN FERNANDEZ IS.														
JUNEAU				91										
KAOHSIUNG (TAKAO)														
KAVIENG														
KETCHIKAN														
KITIMAT														
KOBE		32	12									53		
KRUNG THEP (BANGKOK)			189		26									
KWAJALEIN														
LABUAN														
LAE														
LOMBRUM														
LONGVIEW	6													
LORENGAU														
LOS ANGELES	6						9	10						
MADANG														
SUBTOTAL	35	32	932	91	71	53	172	36	0	22	[illegible]	[illegible]	[illegible]	[illegible]

Table 3 (Part 3).

[illegible]	PUERTO MONTT	PUNTA ARENAS	PUNTARENAS	PUSAN	RABAUL	RAROTONGA	SAIGON	SALAVERRY	SAMARAI	SAN ANTONIO	SANDAKAN	SAN DIEGO	SAN FRANCISCO	SEATTLE	SHANGHAI	SINGAPORE	SKAGWAY	SURABAJA	SUVA	SYDNEY	TALARA	TALCAHUANO	TARAKAN	TAWAU	TIENTSIN	TONGA ISLANDS	TOWNSVILLE	TSINGTAO	UCLUELET	VALPARAISO	VANCOUVER	VILA	WAKE	WELLINGTON	WEWAK	YOKOHAMA	SUBTOTAL	GRAND TOTAL
													7																								7	115
																																					0	8
			20																																		20	103
																																					102	235
																															14						14	14
																														46							46	261
													2			9			37	61														37			136	303
																										1											1	1
																		17																			17	38
																																					0	0
																																					0	1
8									17							12				98			7				19									10	171	294
			20																																		20	368
																																					0	8
																														20							20	403
																														52							52	52
				78									26												52												156	446
																																					0	36
													27																		14						41	44
							12																														12	12
											17												1													12	30	42
																208																					208	416
													3			236		28									3									25	295	370
																														2							2	2
																																					0	162
												43	11																		17					24	95	230
																																					0	6
																																					0	30
																																					0	91
																																					0	35
																																					0	100
								47													26																73	430
																																				4	4	110
																																					0	17
																																					0	228
				12			37						40			284				14			14		12						10					284	677	1474
					12																																12	12
												3	336	23					16												15		10			58	461	822
							26									12																					38	170
				68																																	68	280
																																					0	12
																														1							1	1
																	91																				91	91
				16																																12	28	92
																																					0	17
																															91						91	182
																															12						12	12
				394											32	12									53			12			12					798	1123	1570
							75									189		26																			290	378
																																					0	5
											13																										13	21
					8				17																										17		42	47
																																					0	8
														6																	12						18	60
																																			8		8	8
				6		16						106	1110	6						9	10													6		112	1374	3648
																																					0	17
8	0	0	40	574	20	16	148	47	34	0	30	152	1562	35	32	932	91	71	53	172	36	0	22	0	117	1	22	12	0	232	197	0	10	42	25	1339	5494	12572

(Continued on next page).

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Table 3 (Part 4).

PORT OF DEPARTURE \ PORT OF ARRIVAL	ACAPULCO	ALEXISHAFEN	AMAPALA	ANTOFAGASTA	APIA	ARICA	AUCKLAND	AVARUA	BALI	BLUFF	BORA-BORA	BRISBANE	BUENAVENTURA	CAIRNS
MAKASAR									17					
MANILA												10		
MANZANILLO														
MAZATLAN														
MELBOURNE							9					14		
MIRI														
MOLLENDO						118								
NAURU												36		
NICARAGUA			45											
NORFOLK IS.														
NOUMÉA														
OCEAN ISLAND												12		
OKINAWA														
PAGO PAGO														
PAITA														
PANAMA CANAL	19						21					8	197	
PAPEETE							15				1			
PORT ALBERNI														
PORTLAND							8							
PORT MORESBY														
PUERTO MONTT														
PUNTA ARENAS														
PUNTARENAS			[illegible]										50	
PUSAN														
RABAUL												8		
RAROTONGA							10							
SAIGON														
SALAVERRY														
SAMARAI												17		
SAN ANTONIO				52										
SANDAKAN														
SAN DIEGO														
SAN FRANCISCO	1						2							
SEATTLE														
SHANGHAI														
SINGAPORE												17		
SKAGWAY														
SURABAJA							12		17					
SUVA					7		7							
SYDNEY							87					131		
TALARA														
TALCAHUANO														
TARAKAN												4		
TAWAU														
TIENTSIN														
TONGA ISLANDS							1							
TOWNSVILLE												12		
TSINGTAO														
UCLUELET														
VALPARAISO				29		46								
VANCOUVER												8		
VILA														
WAKE														
WELLINGTON							6			12				
WEWAK		8												
YOKOHAMA														
SUBTOTAL	20	8	74	81	7	164	178	0	34	12	1	277	247	0
GRAND TOTAL	115	8	103	235	14	351	203	1	38	12	1	284	348	8

PORT OF DEPARTURE \ PORT OF ARRIVAL	CALLAO	CHAÑARAL	CHILUNG (KEELUNG)	CHIMBOTE	COOS BAY	DA NANG (TOURANE)	DARVEL BAY	DILI	DJAKARTA	EASTER ISLAND	EL SALVADOR	ENSENADA	GALAPAGOS ISLANDS	GOLFITO
MAKASAR														
MANILA			15						24					
MANZANILLO														
MAZATLAN														
MELBOURNE														
MIRI														
MOLLENDO	12													
NAURU														
NICARAGUA											14			
NORFOLK IS.														
NOUMÉA														
OCEAN ISLAND														
OKINAWA			93											
PAGO PAGO														
PAITA				17										
PANAMA CANAL	26										12	93		
PAPEETE														
PORT ALBERNI														
PORTLAND					26									
PORT MORESBY														
PUERTO MONTT														
PUNTA ARENAS														
PUNTARENAS														
PUSAN														
RABAUL														
RAROTONGA														
SAIGON						12								
SALAVERRY	73													
SAMARAI														
SAN ANTONIO														
SANDAKAN														
SAN DIEGO												30		
SAN FRANCISCO			6											
SEATTLE														
SHANGHAI														
SINGAPORE								208	205					
SKAGWAY														
SURABAJA									66					
SUVA														
SYDNEY									12					
TALARA														
TALCAHUANO														
TARAKAN														
TAWAU							24							
TIENTSIN														
TONGA ISLANDS														
TOWNSVILLE									6					
TSINGTAO														
UCLUELET														
VALPARAISO	90									2				
VANCOUVER					4							17		
VILA														
WAKE														
WELLINGTON	5													
WEWAK														
YOKOHAMA														
SUBTOTAL	206	0	114	17	30	12	24	208	313	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
GRAND TOTAL	493	52	445	34	44	12	42	416	374	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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Table 3 (Part 4).

IVAL	ACAPULCO	ALEXISHAFEN	AMAPALA	ANTOFAGASTA	APIA	ARICA	AUCKLAND	AVARUA	BALI	BLUFF	BORA-BORA	BRISBANE	BUENAVENTURA	CAIRNS	CALLAO	CHAÑARAL	CHILUNG (KEELUNG)	CHIMBOTE	COOS BAY	DA NANG (TOURANE)	DARVEL BAY	DILI	DJAKARTA	EASTER ISLAND	EL SALVADOR	ENSENADA	GALAPAGOS ISLANDS	GOLFITO	GLACIER BAY	GUAM	GUATEMALA	GUAYAQUIL	GUAYMAS	HOBART	HOLLANDIA	HONG KONG	HONIARA	HONOLULU	SUBTOTAL
									17																														17
												10					15						24													491			540
																																							0
																																	50						50
							9					14																						1					24
																																							0
						118									12																								130
												36																											36
			45																						14														59
																																							0
																																							0
												12																											12
																	93																					22	115
																																						15	15
																		17																					17
	19						21					8	197		26										12	93						120	24					18	538
							15				1																												16
																																							0
							8												36																			17	61
																																							0
																																							0
																																							0
			29										50																										79
																																				12			12
												8																											8
							10																																10
																				12																93			105
															73																								73
												17																											17
				52																																			52
																																							0
																										30												3	33
	1						2										6													10								287	306
																																						32	32
																																				121			121
												17										208	205													230			660
																													91										91
							12		17														66																95
					7		7																															16	30
							87					131											12											5					235
																																							0
																																							0
												4																											4
																					24																		24
																																				28			28
							1																																1
												12											6																18
																																							0
																																							0
				29		46									90									2															167
												8							4							17												6	35
																																					12		12
																														10									10
							6			12					5																								23
		8																																	17				25
																																	2			131		71	204
	20	8	74	81	7	164	178	0	34	12	1	277	247	0	206	0	114	17	30	12	24	208	313	2	26	140	0	0	91	20	0	120	76	6	17	1106	12	487	4130
	115	8	103	236	14	261	393	1	30	12	1	284	346	8	493	52	445	34	44	12	42	416	374	2	162	230	6	28	91	38	100	430	110	6	226	1474	12	623	7146

(Continued on next page).

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Table 3 (Part 5).

PORT OF DEPARTURE \ PORT OF ARRIVAL	ILOILO; CEBU	INCHON	JESSELTON	JUAN FERNANDEZ IS.	JUNEAU	KAOHSIUNG (TAKAO)	KAVIENG	KETCHIKAN	KITIMAT	KOBE	KRUNG THEP (BANGKOK)	KWAJALEIN	LABUAN	LAE	LOMBRUM	LONGVIEW	LORENGAU	LOS ANGELES	MADANG	MAKASAR	MANILA	MANZANILLO	MAZATLÁN	MELBOURNE	MIRI	MOLLENDO	NAURU	NICARAGUA	NORFOLK IS.
MAKASAR																				X									
MANILA	128									23	90							24			X				22				
MANZANILLO																						X	19						
MAZATLÁN																							X						
MELBOURNE																					156			X			12		
MIRI																					16				X				
MOLLENDO																										X			
NAURU																								12			X		
NICARAGUA																												X	
NORFOLK IS.																													X
NOUMÉA														5															
OCEAN ISLAND																													
OKINAWA										67											6								
PAGO PAGO																													
PAITA																													
PANAMA CANAL																		767			107		29	8					
PAPEETE																		10											
PORT ALBERNI																													
PORTLAND																18		55											
PORT MORESBY																													
PUERTO MONTT																													
PUNTA ARENAS																		34											
PUNTARENAS																												45	
PUSAN		212								125											12								
RABAUL							17																						
RAROTONGA																													
SAIGON	6										81							3											
SALAVERRY																													
SAMARAI														8															
SAN ANTONIO																													
SANDAKAN													17																
SAN DIEGO																		118											
SAN FRANCISCO		10										5						1019			180								
SEATTLE																6					8								
SHANGHAI																													
SINGAPORE	12										111										155				16				
SKAGWAY																													
SURABAJA																		3											
SUVA																													
SYDNEY																								371			36		1
TALARA																		10											
TALCAHUANO																													
TARAKAN																					7								
TAWAU																													
TIENTSIN										12																			
TONGA ISLANDS																													
TOWNSVILLE																					7								
TSINGTAO																													
UCLUELET																													
VALPARAÍSO																													
VANCOUVER								91	12	12						36		31			24								
VILA																													
WAKE																													
WELLINGTON																													
WEWAK																													
YOKOHAMA										920								77			222		2						
SUBTOTAL	146	222	0	0	0	0	17	91	12	1159	282	5	17	13	0	60	0	2141	0	0	900	0	50	391	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
GRAND TOTAL	179	280	12	1	91	92	17	182	12	1576	378	5	31	47	8	60	8	2645	17	17	1303	19	79	403	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table 3 (Part 5).

ILOILO, CEBU	INCHON	JESSELTON	JUAN FERNÁNDEZ IS.	JUNEAU	KAOHSIUNG (TAKAO)	KAVIENG	KETCHIKAN	KITIMAT	KOBE	KRUNG THEP (BANGKOK)	KWAJALEIN	LABUAN	LAE	LOMBRUM	LONGVIEW	LORENGAU	LOS ANGELES	MADANG	MAKASAR	MANILA	MANZANILLO	MAZATLÁN	MELBOURNE	MIRI	MOLLENDO	NAURU	NICARAGUA	NORFOLK IS.	NOUMÉA	OCEAN ISLAND	OKINAWA	PAGO PAGO	PAITA	PANAMA CANAL	PAPEETE	PORT ALBERNI	PORTLAND	SUBTOTAL
																				X																					0
138	P								23	90							34			X				22										27				314
																					X	19																		19
																						X												29				29
																			156			X			12								8				176
																			16				X																16
																								X															0
																						12			X												12
																											X													0
																												X												8
													5																X									5
																													X									0
									67											6										X							73
																																X			10			10
																																	X					0
																	767			107		20	8											X	12		12	936
																	10															10		30	X			50
																																			X		0
															18		55																		30			X	103
																																						0
																																						0
																	34																					34
																											45											45
	212								125	)										12											12							361
						17																																17
																																						0
6										81								3																					90
																																						0
													8																									8
																																						0
												17																											17
																	118																	30			6	161
	10										5						1019			180														278			303	1796
															6						8														12			276	300
																																						0
12										111										155				16														294
																																						0
																	3																					3
																													10			25			4			39
																							371			36		12	12	12				8				451
																	10																17	7				34
																																		8				8
																			7																		7
																																						0
									12																													12
																																						0
																			7									5									12
																																						0
																																				156		156
																																						0
							91	12	12						36		31			24															12			191	400
																													12						12			24
																																						0
																																		18	4			22
																																						0
									920								77			222		2										6			24			12	1263
360	222	0	0	0	0	17	91	12	1150	282	5	17	13	0	60	0	2141	0	0	900	0	50	391	38	0	48	45	12	39	12	18	35	17	530	43	156	796	7296
170	280	12	1	91	92	17	182	12	1576	378	5	32	47	6	60	6	2648	17	17	1383	19	79	403	38	130	86	60	12	44	24	200	49	34	1600	78	156	910	10061

(Continued on next page).

Table 3 (Part 6).

PORT OF DEPARTURE \ PORT OF ARRIVAL	PORT MORESBY	PUERTO MONTT	PUNTA ARENAS	PUNTARENAS	PUSAN	RABAUL	RAROTONGA	SAIGON	SALAVERRY	SAMARAI	SAN ANTONIO	SANDAKAN	SAN DIEGO	SAN FRANCISCO	SEATTLE	SHANGHAI	SINGAPORE	SKAGWAY	SURABAJA	SUVA	SYDNEY	TALARA	TALCAHUANO	TARAKAN	TAWAU	TIENTSIN
MAKASAR																										
MANILA								62						12	14		64		15		156					
MANZANILLO																										
MAZATLÁN																										
MELBOURNE																					253					
MIRI																	22									
MOLLENDO																										
NAURU																					36					
NICARAGUA				21																						
NORFOLK IS.																										
NOUMÉA																				10	12					
OCEAN ISLAND																					12					
OKINAWA					12																					
PAGO PAGO																				10	14					
PAITA																						17				
PANAMA CANAL				45									80	117							20	7				
PAPEETE																										
PORT ALBERNI																										
PORTLAND														385	207											
PORT MORESBY	X									8																
PUERTO MONTT		X	1																							
PUNTA ARENAS			X																				8			
PUNTARENAS				X																						
PUSAN					X																					
RABAUL						X				6											6					
RAROTONGA							X																			
SAIGON								X						3			48									
SALAVERRY									X																	
SAMARAI						17				X											6					
SAN ANTONIO											X												64			
SANDAKAN												X												1	12	
SAN DIEGO													X	23												
SAN FRANCISCO								6					6	X	128											
SEATTLE														102	X											
SHANGHAI																X										
SINGAPORE								30									X		15							
SKAGWAY																		X								
SURABAJA																	6		X							
SUVA																				X	9					
SYDNEY																				16	X					
TALARA									26													X				
TALCAHUANO			12																				X			
TARAKAN																								X	12	
TAWAU																									X	
TIENTSIN																25										X
TONGA ISLANDS																										
TOWNSVILLE																			6							
TSINGTAO																64										
UCLUELET																										
VALPARAISO		1									116															
VANCOUVER														104	317											
VILA																										
WAKE																										
WELLINGTON																					13					
WEWAK																										
YOKOHAMA														541	93		26				15					
SUBTOTAL	0	1	13	66	12	17	0	98	26	14	116	0	86	1287	759	89	104	0	36	36	552	24				
GRAND TOTAL	8	1	13	136	306	37	10	246	73	48	116	30	217	2040	794	121	1096	91	107	62	724	60				

Table 3 (Part 6).

IVAL	PORT MORESBY	PUERTO MONTT	PUNTA ARENAS	PUNTARENAS	PUSAN	RABAUL	RAROTONGA	SAIGON	SALAVERRY	SAMARAI	SAN ANTONIO	SANDAKAN	SAN DIEGO	SAN FRANCISCO	SEATTLE	SHANGHAI	SINGAPORE	SKAGWAY	SURABAJA	SUVA	SYDNEY	TALARA	TALCAHUANO	TARAKAN	TAWAU	TIENTSIN	TONGA ISLANDS	TOWNSVILLE	TSINGTAO	UCLUELET	VALPARAÍSO	VANCOUVER	VILA	WAKE	WELLINGTON	WEWAK	YOKOHAMA	SUBTOTAL	GRAND TOTAL
																																						0	17
								62						12	14		64		15		156											12					174	509	863
																																						0	19
																																						0	79
																					253																	253	453
																	22																					22	38
																																						0	120
																					36																	36	86
				21																																		21	80
																																	12					12	12
																				10	12							5					12					39	44
																					12																	12	24
					12																																	12	290
																				10	14																	24	40
																						17																17	34
				45									60	117							20	7										12			6		66	333	1697
																																	12					12	78
																														156								156	156
														385	207																	116					48	756	916
	X									8																												8	8
		X	1																																			1	1
			X																				8															8	32
				X																																		6	136
					X																																23	23	290
						X				6											6																	12	37
							X																															0	10
								X						3			48																					51	240
									X																													0	73
						17				X											6																	23	40
											X												64															64	116
												X												1	12													13	30
													X	23																								23	217
								6					6	X	128																	177					431	748	2800
														102	X																	324					36	462	794
																X																						0	121
								30									X		15									6									36	77	1090
																		X																				0	91
																	6		X									3										9	107
																				X	9											11						20	89
																				16	X											13			9			38	734
									26													X																26	60
			12																				X								52							64	72
																								X	12													12	23
																									X													0	24
																25										X			52									77	117
																											X											0	1
																			6									X										6	36
																64													X									64	64
																														X								0	156
		1									116																				X							117	286
														104	317																	X					83	504	948
																																	X					0	36
																																		X				0	10
																					13														X			13	58
																																				X		0	25
														541	93		24				15											66					X	750	2228
	0	1	12	66	12	17	0	98	26	14	116	0	66	1287	760	89	164	0	36	36	562	24	72	1	24	0	0	14	52	156	52	751	36	0	15	0	907	6436	[illegible]
	0	1	13	136	290	37	10	240	73	40	116	30	217	2800	794	121	1090	91	107	89	734	60	72	23	24	117	1	36	64	156	286	948	36	10	58	25	[illegible]	[illegible]	[illegible]

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Table 4. Lane Traffic by Port-of-Call

PORT OF DEPARTURE \ PORT OF ARRIVAL	ACAPULCO	ALEXISHAFEN	AMAPALA	ANTOFAGASTA	APIA	ARICA	AUCKLAND	AVARUA	BALI	BLUFF	BORA-BORA	BRISBANE	BUENAVENTURA	CAIRNS	CALLAO	CHAÑARAL	CHILUNG (KEELUNG)	CHIMBOTE	COOS BAY	DA NANG (TOURANE)	DARVEL BAY	DILI	DJAKARTA	EASTER ISLAND	EL SALVADOR	ENSENADA	GALAPAGOS ISLANDS	GOLFITO	GLACIER BAY	
ACAPULCO	X																													
ALEXISHAFEN		X																												
AMAPALA			X																						199					
ANTOFAGASTA				X		78									139	141														
APIA					X																									
ARICA				367		X									198															
AUCKLAND					14		X																							
AVARUA								X																						
BALI									X			10																		
BLUFF										X																				
BORA BORA								1			X																			
BRISBANE												X		206					22											
BUENAVENTURA													X		46										56					
CAIRNS														X																
CALLAO				70		183							46		X			46												
CHAÑARAL																X														
CHILUNG (KEELUNG)																	X													2
CHIMBOTE															46			X												
COOS BAY																			X											
DA NANG (TOURANE)																				X										
DARVEL BAY																					X									
DILI																						X								
DJAKARTA									19														X							
EASTER ISLAND																								X						
EL SALVADOR			151																						X					
ENSENADA																										X				
GALAPAGOS ISLANDS																											X			
GOLFITO																												X		
GLACIER BAY																													X	
GUAM																														X
GUATEMALA	78																								63					
GUAYAQUIL													245		204												6			
GUAYMAS																										101				
HOBART							120																							
HOLLANDIA																					45	668								
HONG KONG																	347						36							
HONIARA																														
HONOLULU	89																													
ILOILO, CEBU																							36							
INCHON																	159													
JESSELTON																														
JUAN FERNÁNDEZ IS.																														
JUNEAU																														
KAOHSIUNG (TAKAO)																	398													
KAVIENG																														
KETCHIKAN																														
KITIMAT																														
KOBE																	228													
KRUNG THEP (BANGKOK)									3														111							
KWAJALEIN																														8
LABUAN																					8									
LAE																														
LOMBRUM																														
LONGVIEW																														
LORENGAU																														
LOS ANGELES	87						21					12	16																	
MADANG																														
SUBTOTAL	254	0	151	437	14	261	141	1	22	0	0	22	307	206	633	141	1132	46	22	0	53	668	183	0	318	1[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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Table 4. Lane Traffic by Port-of-Call

RIVAL / RE	ACAPULCO	ALEXISHAFEN	AMAPALA	ANTOFAGASTA	APIA	ARICA	AUCKLAND	AVARUA	BALI	BLUFF	BORA-BORA	BRISBANE	BUENAVENTURA	CAIRNS	CALLAO	CHAÑARAL	CHILUNG (KEELUNG)	CHIMBOTE	COOS BAY	DA NANG (TOURANE)	DARVEL BAY	DILI	DJAKARTA	EASTER ISLAND	EL SALVADOR	ENSENADA	GALAPAGOS ISLANDS	GOLFITO	GLACIER BAY	GUAM	GUATEMALA	GUAYAQUIL	GUAYMAS	HOBART	HOLLANDIA	HONG KONG	HONIARA	HONOLULU	SUBTOTAL
	X																														78							89	167
		X																																					0
			X																						199														1[illegible]
				X		78									139	141																							358
					X																																		0
				367		X									198																								565
					14		X																															20	34
								X																															0
									X			10																											10
										X																													0
								1			X																												1
												X		206						22																			228
													X		46										56							457							559
														X																									0
				70		183							46		X			46														444							789
																X																							0
																	X													24						42			66
															46			X																					46
																			X																				0
																				X																			0
																					X															23			23
																						X													668				668
									19														X																19
																								X															0
			151																						X						172								323
																										X							31						31
																											X					6							6
																												X											0
																													X										0
																														X								77	77
	78																								63						X		22						163
													245		204												6					X							455
																										101					22		X						123
							120																											X					120
																					45	668													X				713
																	347						36													X		305	688
																																					X		0
	89																																					X	89
																							36													232			268
																	159																						159
																																							0
																																							0
																																							0
																	398																			581			979
																																							0
																																							0
																																							0
																	228																9			576			813
									3														111													52			166
																														8									8
																					8																		8
																																							0
																																							0
																																							0
																																							0
	87						21					12	16													48		33			16							299	532
																																							0
	254	0	151	437	14	261	141	1	22	0	0	22	307	206	633	141	1132	46	22	0	53	668	183	0	318	149	6	33	0	32	288	907	62	0	668	1506	0	790	94[illegible]

(Continued on next page).

Table 4 (Part 2).

PORT OF DEPARTURE \ PORT OF ARRIVAL	ILOILO, CEBU	INCHON	JESSELTON	JUAN FERNÁNDEZ IS.	JUNEAU	KAOHSIUNG (TAKAO)	KAVIENG	KETCHIKAN	KITIMAT	KOBE	KRUNG THEP (BANGKOK)	KWAJALEIN	LABUAN	LAE	LOMBRUM	LONGVIEW	LORENGAU	LOS ANGELES	MADANG	MAKASAR	MANILA	MANZANILLO	MAZATLÁN	MELBOURNE	MIRI	MOLLENDO	[illegible]
ACAPULCO																		47									
ALEXISHAFEN																			31								
AMAPALA																											
ANTOFAGASTA																											
APIA																											
ARICA																										32	
AUCKLAND																		4						21			
AVARUA																											
BALI																				46	3						
BLUFF																											
BORA-BORA																											
BRISBANE														27				19			24						[illegible]
BUENAVENTURA																		21									
CAIRNS																					206						
CALLAO				1																						336	
CHAÑARAL																											
CHILUNG (KEELUNG)		101				643				175	12										66						
CHIMBOTE																											
COOS BAY																											
DA NANG (TOURANE)																											
DARVEL BAY																											
DILI																											
DJAKARTA	78																				174						
EASTER ISLAND																											
EL SALVADOR																						21					
ENSENADA																		125									
GALAPAGOS ISLANDS																											
GOLFITO																		33									
GLACIER BAY								98																			
GUAM		13																			16						
GUATEMALA																		49									
GUAYAQUIL																		11									
GUAYMAS																		15					57				
HOBART																								50			
HOLLANDIA																											
HONG KONG			96			881				638	172		26					19			483						
HONIARA																											
HONOLULU																		245			444						
ILOILO, CEBU	X									16											81						
INCHON		X								172																	
JESSELTON			X										96														
JUAN FERNÁNDEZ IS.				X																							
JUNEAU					X																						
KAOHSIUNG (TAKAO)						X																					
KAVIENG							X								31				34								
KETCHIKAN					91			X																			
KITIMAT									X																		[illegible]
KOBE						184				X											59	7					
KRUNG THEP (BANGKOK)	52										X										80						
KWAJALEIN												X															
LABUAN											13		X														
LAE														X													
LOMBRUM															X		31										
LONGVIEW																X											
LORENGAU																	X										
LOS ANGELES																		X			76						
MADANG														65					X								
SUBTOTAL	[illegible]	114	96	1	91	[illegible]	0	98	0	[illegible]	[illegible]	0	114	92	31	0	31	[illegible]	65	46	1713						

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Table 4 (Part 2).

AL	ILOILO, CEBU	INCHON	JESSELTON	JUAN FERNÁNDEZ IS.	JUNEAU	KAGOSHIMA (TAKAO)	KAVIENG	KETCHIKAN	KITIMAT	KOBE	KHONG THEP (BANGKOK)	KWAJALEIN	LABUAN	LAE	LOMBRUM	LONGVIEW	LORENGAU	LOS ANGELES	MADANG	MAKASAR	MANILA	MANZANILLO	MAZATLÁN	MELBOURNE	MIRI	MOLLENDO	NAURU	NICARAGUA	NORFOLK ISLAND	NOUMÉA	OCEAN ISLAND	OKINAWA	PAGO PAGO	PAITA	PANAMA CANAL	PAPEETE	PORT ALBERNI	PORTLAND	SUBTOTAL
																		47										35							32				114
																			31																				31
																																							0
																																							0
																																							0
																										32													32
																		4						21											46	10		16	97
																																							0
																				46	3																		49
																																							0
																																							0
														27				19			24						51				16				21				158
																		21																	186				207
																					206																		206
				1																						336									186				523
																																							0
		101				643				176	12										80											40							1052
																																		46					46
																																			6				6
																																							0
																																							0
																																							0
	76																				174														80				330
																																							0
																						21													22				43
																		125																	80			7	212
																																							0
																		33																					33
								91																															91
		13																			15											13							41
																		49																	76				125
																		11																	269				280
																		15					57																72
																								50															50
																																							0
			96			[illegible]				[illegible]	172		16					19			483											120							2136
																																							0
																		245			444														75			56	820
	X									16											81																		97
		X								172																						205							377
			X										96																										96
				X																																			0
					X																																		0
						X																																	0
							X								31				34																				65
					91			X																															91
									X																														0
						184				X											59	7						37				72			91				450
	52										X										80																		132
												X																											0
											139		X																										139
														X																13									13
															X		31																						31
																X																						72	72
																	X																						0
																		X			76												97		1306	27		84	1580
														65					X																				65
	128	114	96	1	91	[illegible]	0	91	0	[illegible]	[illegible]	0	114	92	31	0	31	580	65	46	1713	28	57	71	0	368	51	72	0	13	16	468	97	46	2464	37	0	205	9024

(Continued on next page).

Table 4 (Part 3).

PORT OF DEPARTURE \ PORT OF ARRIVAL	PORT MORESBY	PUERTO MONTT	PUNTA ARENAS	PUNTARENAS	PUSAN	RABAUL	RAROTONGA	SAIGON	SALAVERRY	SAMARAI	SAN ANTONIO	SANDAKAN	SAN DIEGO	SAN FRANCISCO	SEATTLE	SHANGHAI	SINGAPORE	SKAGWAY	SURABAJA	SUVA	SYDNEY	TALARA	TALCAHUANO	TARAKAN	TAWAU	TIENTSIN	TONGA ISLANDS	TOWNSVILLE	TSINGTAO	UCLUELET
ACAPULCO														11																
ALEXISHAFEN																														
AMAPALA				78																										
ANTOFAGASTA																														
APIA																														
ARICA																														
AUCKLAND														4			31			102	181									
AVARUA																											1			
BALI																			46											
BLUFF																														
BORA-BORA																														
BRISBANE	24									51							25				301			13				144		
BUENAVENTURA				77																										
CAIRNS																														
CALLAO																														
CHAÑARAL																														
CHILUNG (KEELUNG)					148									47												96				
CHIMBOTE																														
COOS BAY														33																
DA NANG (TOURANE)								56																						
DARVEL BAY												68												3						
DILI																	668													
DJAKARTA														5			786		164									23		
EASTER ISLAND																														
EL SALVADOR																														
ENSENADA													116	18																
GALAPAGOS ISLANDS																														
GOLFITO																														
GLACIER BAY																														
GUAM																														
GUATEMALA																														
GUAYAQUIL									235													138								
GUAYMAS																														
HOBART																														
HOLLANDIA																														
HONG KONG					32			174						52			810				128			50		100				
HONIARA						128																								
HONOLULU													20	1008	178					69										
ILOILO, CEBU								112									40													
INCHON					166																									
JESSELTON																														
JUAN FERNÁNDEZ IS.																														
JUNEAU																		91												
KAOHSIUNG (TAKAO)					245																									
KAVIENG																														
KETCHIKAN																														
KITIMAT																														
KOBE					482											86	40									143			32	
KRUNG THEP (BANGKOK)								372									579		40											
KWAJALEIN																														
LABUAN												106																		
LAE						21				48																				
LOMBRUM																														
LONGVIEW															16															
LORENGAU																														
LOS ANGELES					10		11						170	1833	11						32	10								
MADANG																														
SUBTOTAL	24	0	0	155	1083	147	11	714	236	99	0	174	306	3011	205	86	2979	91	250	171	650	148	0	66	0	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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Table 4 (Part 3).

PORT MORESBY	PUERTO MONTT	PUNTA ARENAS	PUNTARENAS	PUSAN	RABAUL	RAROTONGA	SAIGON	SALAVERRY	SAMARAI	SAN ANTONIO	SANDAKAN	SAN DIEGO	SAN FRANCISCO	SEATTLE	SHANGHAI	SINGAPORE	SKAGWAY	SURABAJA	SUVA	SYDNEY	TALARA	TALCAHUANO	TARAKAN	TAWAU	TIENTSIN	TONGA ISLANDS	TOWNSVILLE	TSINGTAO	UCLUELET	VALPARAÍSO	VANCOUVER	VILA	WAKE	WELLINGTON	WEWAK	YOKOHAMA	SUBTOTAL	GRAND TOTAL
													11																								11	292
																																					[illegible]	31
			78																																		78	[illegible]
																														276							276	634
																															23						23	23
																														111							111	708
													4			31			102	181														244			562	693
																										1											1	1
																		46																			46	105
																																					0	0
																																					0	1
24									51							25				301			13				144									18	576	962
			77																																		77	843
																																					0	206
																														63							63	1375
																														141							141	141
				148									47												96												291	1406
																																					0	92
													33																		23						56	68
							56																														56	56
											68												3													23	94	117
																668																					668	1336
													5			786		164									23									163	1141	1460
																														2							2	2
																																					0	366
												116	18																		28					30	192	435
																																					0	6
																																					0	33
																																					0	91
																																					0	118
																																					0	288
								235													138																373	1106
																																				7	7	202
																																					0	170
																																					0	713
				32			174						52			810				136			50		100						16					669	2039	4853
					126																																126	126
												20	1008	176					69												41		60			705	2081	2990
							112									40																					152	517
				166																																	166	702
																																					0	98
																														1							1	1
																	91																				91	91
				245																																184	429	1408
																																					0	65
																															139						139	230
																															61						61	61
				492											86	40									143			32			19					2091	2903	4166
							372									579		40																			991	1289
																																					0	6
											106																										106	253
					21				48																										45		114	127
																																					0	31
														16																	18						34	106
																																			31		31	31
				10		11						170	1833	11						32	10													50		196	2323	4415
																																					0	65
24	0	0	155	1093	147	11	714	235	99	0	174	306	3011	203	86	2979	91	250	171	650	148	0	66	0	339	1	167	32	0	594	368	0	60	294	76	4086	[illegible]	[illegible]

(Continued on next page).

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Table 4 (Part 4).

PORT OF ARRIVAL / PORT OF DEPARTURE	ACAPULCO	ALEXISHAFEN	AMAPALA	ANTOFAGASTA	APIA	ARICA	AUCKLAND	AVARUA	BALI	BLUFF	BORA-BORA	BRISBANE	BUENAVENTURA	CAIRNS	CALLAO	CHAÑARAL	CHILUNG (KEELUNG)	CHIMBOTE	COOS BAY	DA NANG (TOURANE)	DARVEL BAY	DILI	DJAKARTA	EASTER ISLAND	EL SALVADOR	ENSENADA	GALAPAGOS ISLANDS	GOLFITO
MAKASAR									46																			
MANILA												32					48						72					
MANZANILLO																												
MAZATLÁN																												
MELBOURNE							28					39																
MIRI																												
MOLLENDO						336									32													
NAURU												51																
NICARAGUA			48																						26			
NORFOLK ISLAND																												
NOUMÉA																												
OCEAN ISLAND												16																
OKINAWA																	211											
PAGO PAGO																												
PAITA																		46										
PANAMA CANAL	36						42					26	376		35										22	177		
PAPEETE							16				1																	
PORT ALBERNI																												
PORTLAND							16												34									
PORT MORESBY																												
PUERTO MONTT																												
PUNTA ARENAS																												
PUNTARENAS			78										160															
PUSAN																												
RABAUL												30																
RAROTONGA							11																					
SAIGON																				56								
SALAVERRY															389													
SAMARAI												51																
SAN ANTONIO				96																								
SANDAKAN																												
SAN DIEGO																										81		
SAN FRANCISCO	2						4										18											
SEATTLE																												
SHANGHAI																												
SINGAPORE												57										668	683					
SKAGWAY																												
SURABAJA							36		37														201					
SUVA					9		46																					
SYDNEY							297					502											351					
TALARA																												
TALCAHUANO																												
TARAKAN												25																
TAWAU																					64							
TIENTSIN																												
TONGA ISLANDS							1																					
TOWNSVILLE												91											46					
TSINGTAO																												
UCLUELET																												
VALPARAISO				101		111									259									2				
VANCOUVER												20							6							24		
VILA																												
WAKE																												
WELLINGTON							55			95					47													
WEWAK		31																										
YOKOHAMA																												
SUBTOTAL	38	31	126	197	9	447	552	0	83	95	1	940	536	0	742	0	277	46	40	56	64	668	1363					
GRAND TOTAL	292	31	277	634	23	708	693	1	105	95	1	962	843	206	1375	141	1409	92	62	56	117	1336	1530					

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Table 4 (Part 4).

RRIVAL / RE	ACAPULCO	ALEXISHAFEN	AMAPALA	ANTOFAGASTA	APIA	ARICA	AUCKLAND	AVARUA	BALI	BLUFF	BORA-BORA	BRISBANE	BUENAVENTURA	CAIRNS	CALLAO	CHAÑARAL	CHILUNG (KEELUNG)	CHIMBOTE	COOS BAY	DA NANG (TOURANE)	DARVEL BAY	DILI	DJAKARTA	EASTER ISLAND	EL SALVADOR	ENSENADA	GALAPAGOS ISLANDS	GOLFITO	GLACIER BAY	GUAM	GUATEMALA	GUAYAQUIL	GUAYMAS	HOBART	HOLLANDIA	HONG KONG	HONIARA	HONOLULU	SUBTOTAL
									46																														46
												32					48						72													1325			1477
																																	92						[illegible]
							28					39																						10					77
																																							0
						336									32																								368
												51																											51
			48																						26														74
																																							0
																																							0
												16																											16
																	211																					147	358
																																						50	50
																		46																					46
	36						42					26	376		35										22	177						201	45					95	1055
							16				1																												17
																																							0
							16												34																			34	84
																																							0
																																							0
																																							0
			78										160																										238
																																				32			32
												30																											30
							11																																11
																				56																449			505
															369																								369
												51																											51
				96																																			96
																																							0
																										81												20	101
	2						4										18													26								797	847
																																						214	214
																																				350			350
												57										668	683													763			2171
																													91										91
							36		37														201																274
					9		46																															76	131
							297					502											351											50					1200
																																							0
																																							0
												25																											25
																					64																		64
																																				75			75
							1																																1
												91											46																137
																																							0
																																							0
				101		111									259									2															473
												20							6							28												16	70
																																					126		126
																														60									60
							55			95					47																								197
		31																																	45				76
																																	3			353		751	1107
	38	31	126	197	9	447	552	0	83	95	1	940	536	0	742	0	277	46	40	56	64	668	1353	2	48	286	0	0	91	86	0	201	140	60	45	3347	126	2200	12933
	292	31	277	434	23	708	693	1	105	95	1	982	843	206	1375	141	1409	92	62	56	117	1330	1526	2	366	435	6	33	91	118	288	1108	202	60	713	4053	126	[illegible]	[illegible]

Table 4 (Part 5).

PORT OF DEPARTURE \ PORT OF ARRIVAL	ILOILO, CEBU	INCHON	JESSELTON	JUAN FERNANDEZ IS.	JUNEAU	KAOHSIUNG (TAKAO)	KAVIENG	KETCHIKAN	KITIMAT	KOBE	KRUNG THEP (BANGKOK)	KWAJALEIN	LABUAN	LAE	LOMBRUM	LONGVIEW	LORENGAU	LOS ANGELES	MADANG	MAKASAR	MANILA	MANZANILLO	MAZATLÁN	MELBOURNE	MIRI	MOLLENDO	NAURU	NICARAGUA
MAKASAR																				X								
MANILA	318									68	[illegible]							36			X				67			
MANZANILLO																						X	28					
MAZATLÁN																							X					
MELBOURNE																					632			X			17	
MIRI																					53				X			
MOLLENDO																										X		
NAURU																								17			X	
NICARAGUA																												X
NORFOLK ISLAND																												
NOUMÉA														13														
OCEAN ISLAND																												
OKINAWA										146											16							
PAGO PAGO																												
PAITA																												
PANAMA CANAL																		1534			204		54	20				
PAPEETE																		10										
PORT ALBERNI																												
PORTLAND																31		78										
PORT MORESBY																												
PUERTO MONTT																												
PUNTA ARENAS																		33										
PUNTARENAS																												90
PUSAN		572								388											61							
RABAUL							66																					
RAROTONGA																												
SAIGON	29										[illegible]							12										
SALAVERRY																												
SAMARAI														22														
SAN ANTONIO																												
SANDAKAN													120															
SAN DIEGO																		199										
SAN FRANCISCO		16										8						1725			239							
SEATTLE																16					21							
SHANGHAI																												
SINGAPORE	40										[illegible]										516				53			
SKAGWAY																												
SURABAJA																		5										
SUVA																												
SYDNEY																								1482			52	
TALARA																		15										
TALCAHUANO																												
TARAKAN																					12							
TAWAU																												
TIENTSIN										28																		
TONGA ISLANDS																												
TOWNSVILLE																					53							
TSINGTAO																												
UCLUELET																												
VALPARAÍSO																												
VANCOUVER								129	61	19						59		51			39							
VILA																												
WAKE																												
WELLINGTON																												
WEWAK																												
YOKOHAMA										2567								129			537		5					
SUBTOTAL	387	588	0	0	0	0	66	129	61	3271	[illegible]	8	120	35	0	106	0	3827	0	0	2383	0	87					
GRAND TOTAL	517	702	90	1	91	[illegible]	66	[illegible]	61	[illegible]	[illegible]	8	253	127	31	106	31	4415	65	46	4096	28	144					

Table 4 (Part 5).

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E

ILOILO, CEBU	INCHON	JESSELTON	JUAN FERNANDEZ IS.	JUNEAU	KAOHSIUNG (TAKAO)	KAVIENG	KETCHIKAN	KITIMAT	KOBE	KRUNG THEP (BANGKOK)	KWAJALEIN	LABUAN	LAE	LOMBRUM	LONGVIEW	LORENGAU	LOS ANGELES	MADANG	MAKASAR	MANILA	MANZANILLO	MAZATLÁN	MELBOURNE	MIRI	MOLLENDO	NAURU	NICARAGUA	NORFOLK ISLAND	NOUMÉA	OCEAN ISLAND	OKINAWA	PAGO PAGO	PAITA	PANAMA CANAL	PAPEETE	PORT ALBERNI	PORTLAND	SUBTOTAL
																			X																			0
318									62	[illegible]							36			X				67										51				750
																					X	28																28
																						X												52				52
																				632			X			17								29				678
																				53				X														53
																									X													0
																							17			X												17
																											X											0
																												X										0
													13																X									13
																														X								0
									145											16											X							161
																																X			11			11
																																	X					0
																	1534			204		54	20											X	14		24	1850
																	10															11		32	X			53
																																				X		0
															31		78																	60			X	169
																																						0
																																						0
																	33																					33
																											90											90
	892								[illegible]											61											32							1031
						65																																65
																																						0
39										[illegible]							12																					434
																																						0
													22																									22
																																						0
												139																										139
																	199																	93			7	299
	16										8						1725			239														502			451	2941
															16					21														60			529	636
																																						0
40										[illegible]										516				53														966
																																						0
																	5																					5
																													36			89			4			129
																							1482			52		161	276	17				40				2030
																	15																46	12				73
																																		51				51
																				12																		12
																																						0
									32																													32
																																						0
																				53									38									91
																																						0
																																				206		208
																																						0
							139	61	19						59		51			39														23			325	716
																													48						13			61
																																						0
																																		68	4			72
																																						0
									2447								129			537		5									51			62			47	3378
[illegible]	[illegible]	0	0	0	0	65	139	61	[illegible]	[illegible]	8	139	35	0	106	0	3827	0	0	2383	0	87	1519	120	0	69	90	161	398	17	83	100	46	1135	46	208	1383	17337
[illegible]	908	98	1	91	[illegible]	65	[illegible]	61	[illegible]	[illegible]	8	253	127	31	106	31	4415	65	46	4096	28	144	1590	120	368	120	162	161	411	33	551	197	92	3599	83	208	1588	27262

(Continued on next page).

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Table 4 (Part 6).

PORT OF DEPARTURE / PORT OF ARRIVAL	PORT MORESBY	PUERTO MONTT	PUNTA ARENAS	PUNTARENAS	PUSAN	RABAUL	RAROTONGA	SAIGON	SALAVERRY	SAMARAI	SAN ANTONIO	SANDAKAN	SAN DIEGO	SAN FRANCISCO	SEATTLE	SHANGHAI	SINGAPORE	SKAGWAY	SURABAJA	SUVA	SYDNEY	TALARA	TALCAHUANO	TARAKAN	TAWAU	TIENTSIN	TONGA ISLANDS	TOWNSVILLE	TSINGTAO
MAKASAR																													
MANILA								291						15	37		210		20		810								
MANZANILLO																													
MAZATLÁN																													
MELBOURNE																					973								
MIRI																	67												
MOLLENDO																													
NAURU																					52								
NICARAGUA				88																									
NORFOLK ISLAND																													
NOUMÉA																				36	311							36	
OCEAN ISLAND																					17								
OKINAWA					32																								
PAGO PAGO																				24	112								
PAITA																						46							
PANAMA CANAL				85									114	217							78	13							
PAPEETE																													
PORT ALBERNI																													
PORTLAND														587	431														
PORT MORESBY	X									24																			
PUERTO MONTT		X	9																										
PUNTA ARENAS			X																				92						
PUNTARENAS				X																									
PUSAN					X																								
RABAUL						X				16											84								
RAROTONGA							X																						
SAIGON								X						12			210												
SALAVERRY									X																				
SAMARAI						48				X											18								
SAN ANTONIO											X												242						
SANDAKAN												X												3	32				
SAN DIEGO													X	30															
SAN FRANCISCO								25					10	X	170														
SEATTLE														130	X														
SHANGHAI																X													
SINGAPORE								131									X		26									46	
SKAGWAY																		X											
SURABAJA																	40		X									23	
SUVA																				X	123								
SYDNEY																				188	X								
TALARA									134													X							
TALCAHUANO			57																				X						
TARAKAN																								X	32				
TAWAU																									X				
TIENTSIN																92										X			140
TONGA ISLANDS																											X		
TOWNSVILLE																			46									X	
TSINGTAO																172													X
UCLUELET																													
VALPARAISO		9									338																		
VANCOUVER														102	535														
VILA																													
WAKE																													
WELLINGTON																					219								
WEWAK																													
YOKOHAMA														648	251		81				156								
SUBTOTAL	0	9	66	173	32	48	0	447	134	40	338	0	124	1741	1424	264	608	0	92	248	2953	59	334	3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
GRAND TOTAL	34	9	66	328	1125	195	11	1161	360	130	338	174	430	4752	1629	350	3567	91	342	419	3607	297	334	60	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

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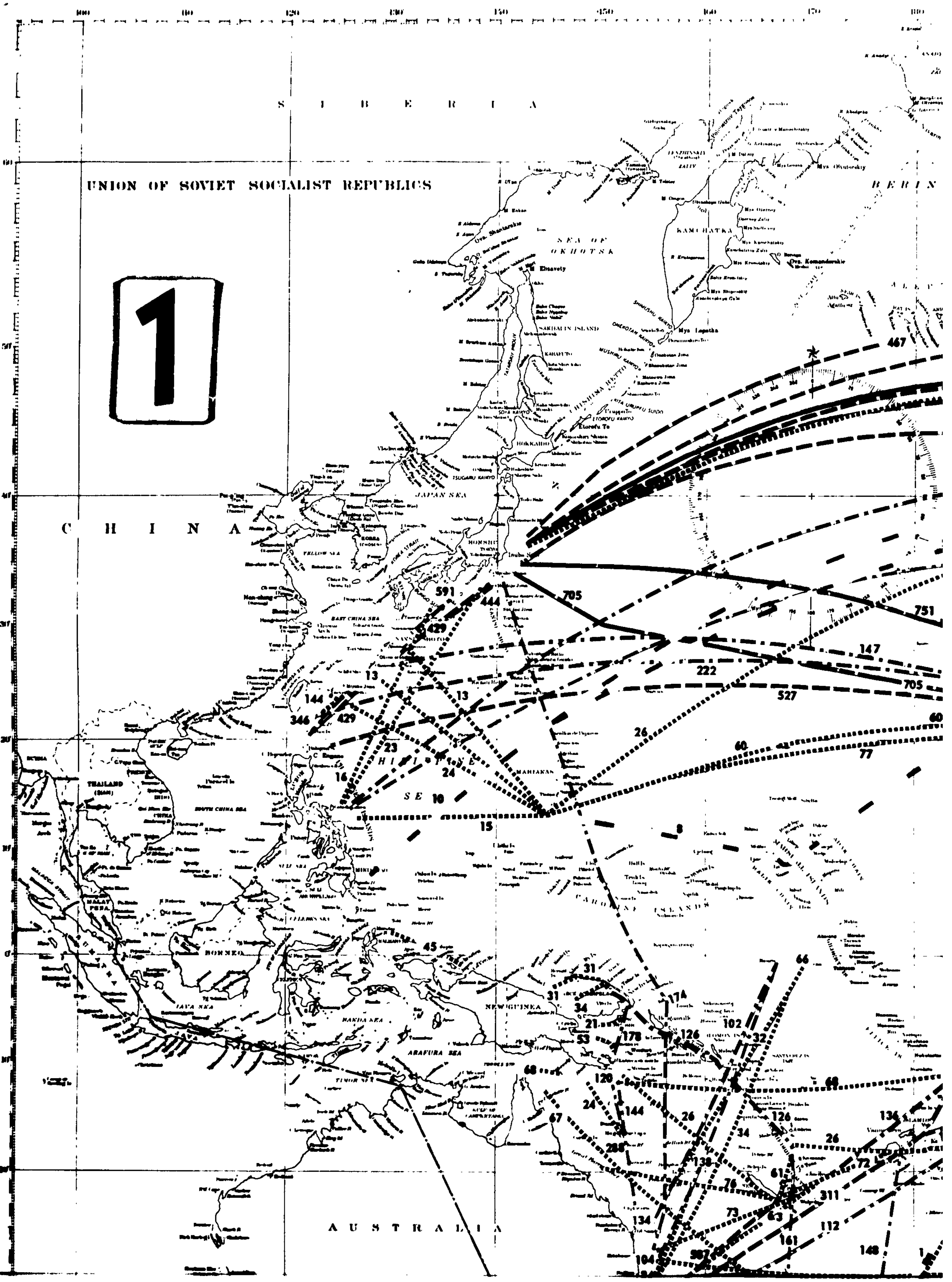
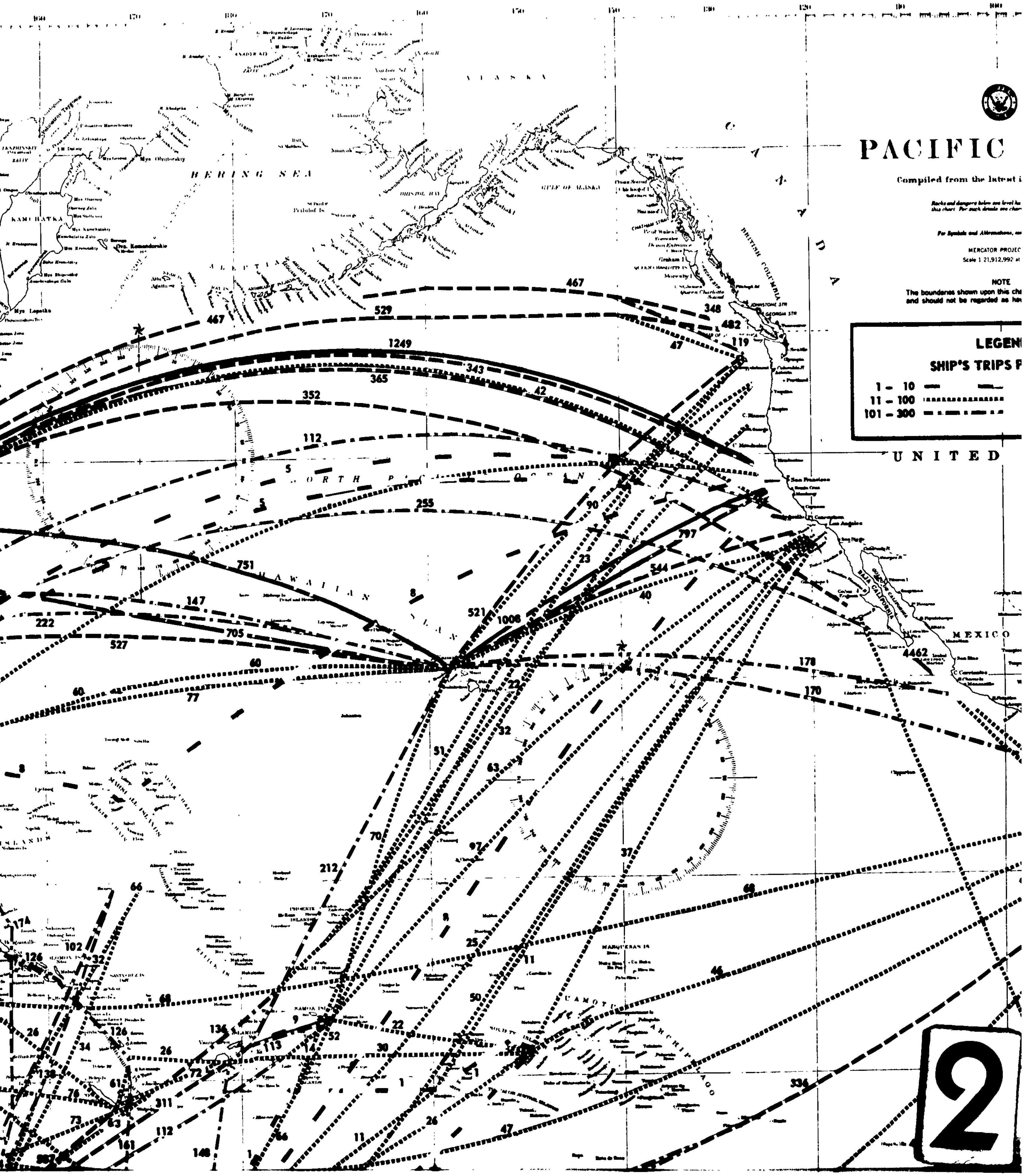
Table 4 (Part 6).

IVAL	PORT MORESBY	PUERTO MONTT	PUNTA ARENAS	PUNTARENAS	PUSAN	RABAUL	RAROTONGA	SAIGON	SALAVERRY	SAMARAI	SAN ANTONIO	SANDAKAN	SAN DIEGO	SAN FRANCISCO	SEATTLE	SHANGHAI	SINGAPORE	SKAGWAY	SURABAJA	SUVA	SYDNEY	TALARA	TALCAHUANO	TARAKAN	TAWAU	TIENTSIN	TONGA ISLANDS	TOWNSVILLE	TSINGTAO	UCLUELET	VALPARAISO	VANCOUVER	VILA	WAKE	WELLINGTON	WEWAK	YOKOHAMA	SUBTOTAL	GRAND TOTAL
																																						0	46
								291						15	37		210		20		810											17					469	1869	4008
																																						0	28
																																						0	144
																					973																	973	1728
																	67																					67	130
																																						0	288
																					52																	52	120
				88																																		88	162
																																	161					161	161
																				36	311							38					13					398	411
																					17																	17	33
					32																																	32	601
																				24	112																	136	197
																						46																46	98
				85									114	217							78	13										18			38		136	699	2604
																																	13					13	83
																														208								208	208
														587	451																	196					119	1353	1509
	X									24																												24	24
		X	9																																			9	9
			X																				92															92	135
				X																																		0	228
					X																																62	62	1125
						X				16											84																	100	195
							X																															0	11
								X						12			210																					222	1161
									X																													0	209
						40				X											18																	58	130
											X												242															242	330
												X												3	32													35	174
													X	30																								30	430
								25					10	X	170																	223					536	964	4752
														130	X																	532					127	789	1629
																X																						0	350
								131									X		26									46									86	289	3436
																		X																				0	91
																	40		X									23										63	342
																				X	123											36						159	419
																				188	X											31			156			375	3807
									134													X																134	207
			57																				X								226							283	334
																								X	32													32	69
																									X													0	64
																92										X			140									232	330
																											X											0	1
																			46									X										46	274
																172													X									172	172
																														X								0	208
		9									338																				X							347	820
														102	535																	X					142	779	1868
																																	X					0	187
																																		X				0	80
																					219														X			219	488
																																				X		0	76
														648	251		81				156											142					X	1278	6763
	0	9	66	173	32	40	0	447	134	40	338	0	124	1741	1424	264	608	0	92	248	2953	59	334	3	64	0	0	107	140	208	226	1197	187	0	194	0	1677	[illegible]	[illegible]
	24	9	66	228	1125	195	11	1161	209	130	330	174	430	4752	1629	350	3587	91	342	419	3807	207	334	69	64	330	1	274	172	208	820	1568	187	80	488	76	6763	[illegible]	[illegible]

2


1
SIBERIA
UNION OF SOVIET SOCIALIST REPUBLICS
CHINA
AUSTRALIA
SEA OF OKHOTSK
KAMCHATKA
SAKHALIN ISLAND
HOKKAIDO
JAPAN SEA
YELLOW SEA
EAST CHINA SEA
SOUTH CHINA SEA
THAILAND (SIAM)
BORNEO
JAVA SEA
BANDA SEA
ARAFURA SEA
TIMOR SEA
NEW GUINEA
MARIANAS
CAROLINE ISLANDS


PACIFIC
Compiled from the latest i
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SHIP'S TRIPS P
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11 – 100
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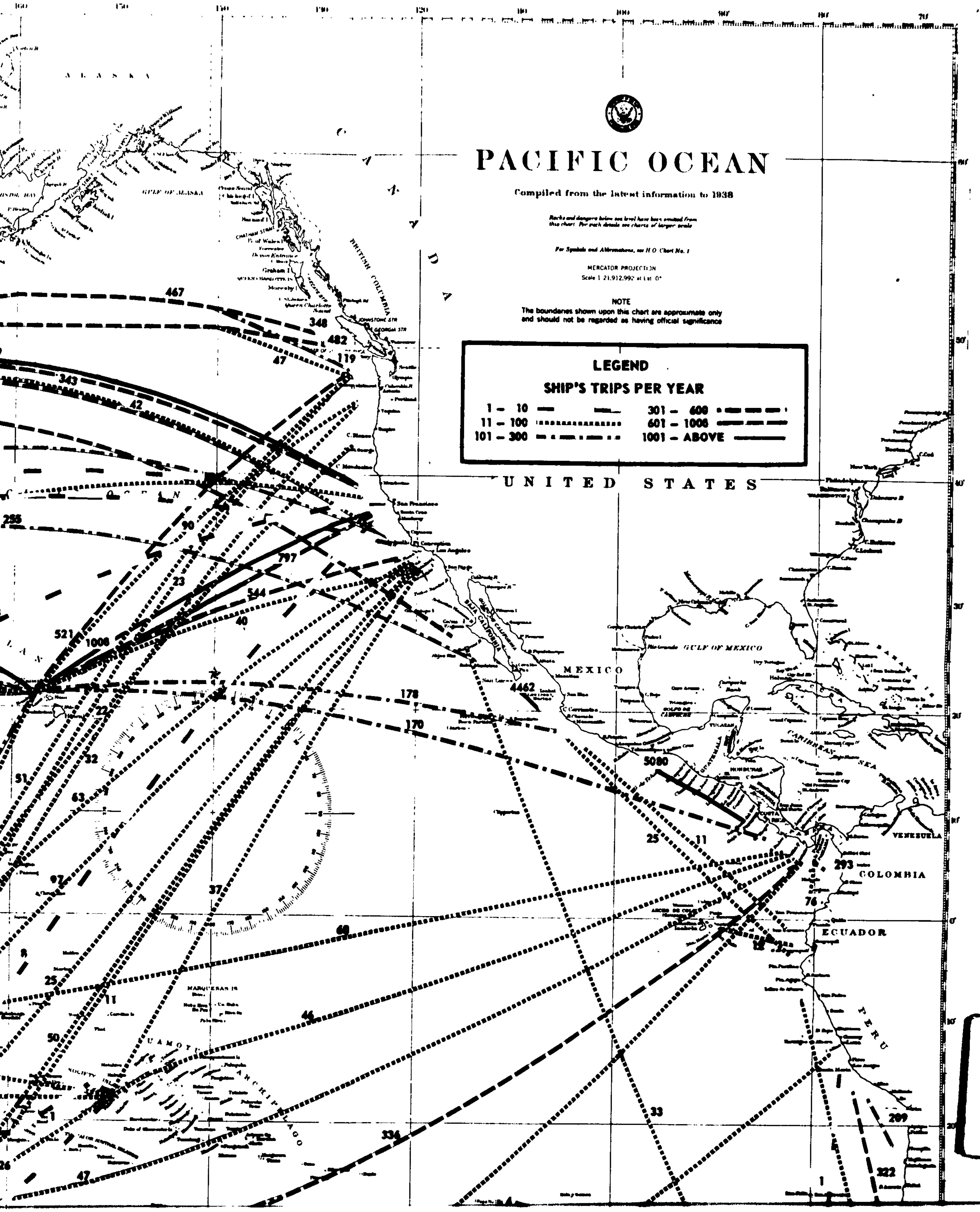
MEXICO
BERING SEA
BRITISH COLUMBIA
BAJA CALIFORNIA
KAMCHATKA
2



PACIFIC OCEAN
Compiled from the latest information to 1938
MERCATOR PROJECTION
NOTE
The boundaries shown upon this chart are approximate only and should not be regarded as having official significance
LEGEND
SHIP'S TRIPS PER YEAR
1 – 10
11 – 100
101 – 300
301 – 600
601 – 1000
1001 – ABOVE
A L A S K A
GULF OF ALASKA
BRITISH COLUMBIA
UNITED STATES
MEXICO
GULF OF MEXICO
CARIBBEAN SEA
VENEZUELA
COLOMBIA
ECUADOR
PERU
MARQUESAS IS
467
348
482
119
47
343
42
255
90
797
23
544
40
521
1008
178
170
4462
5080
22
32
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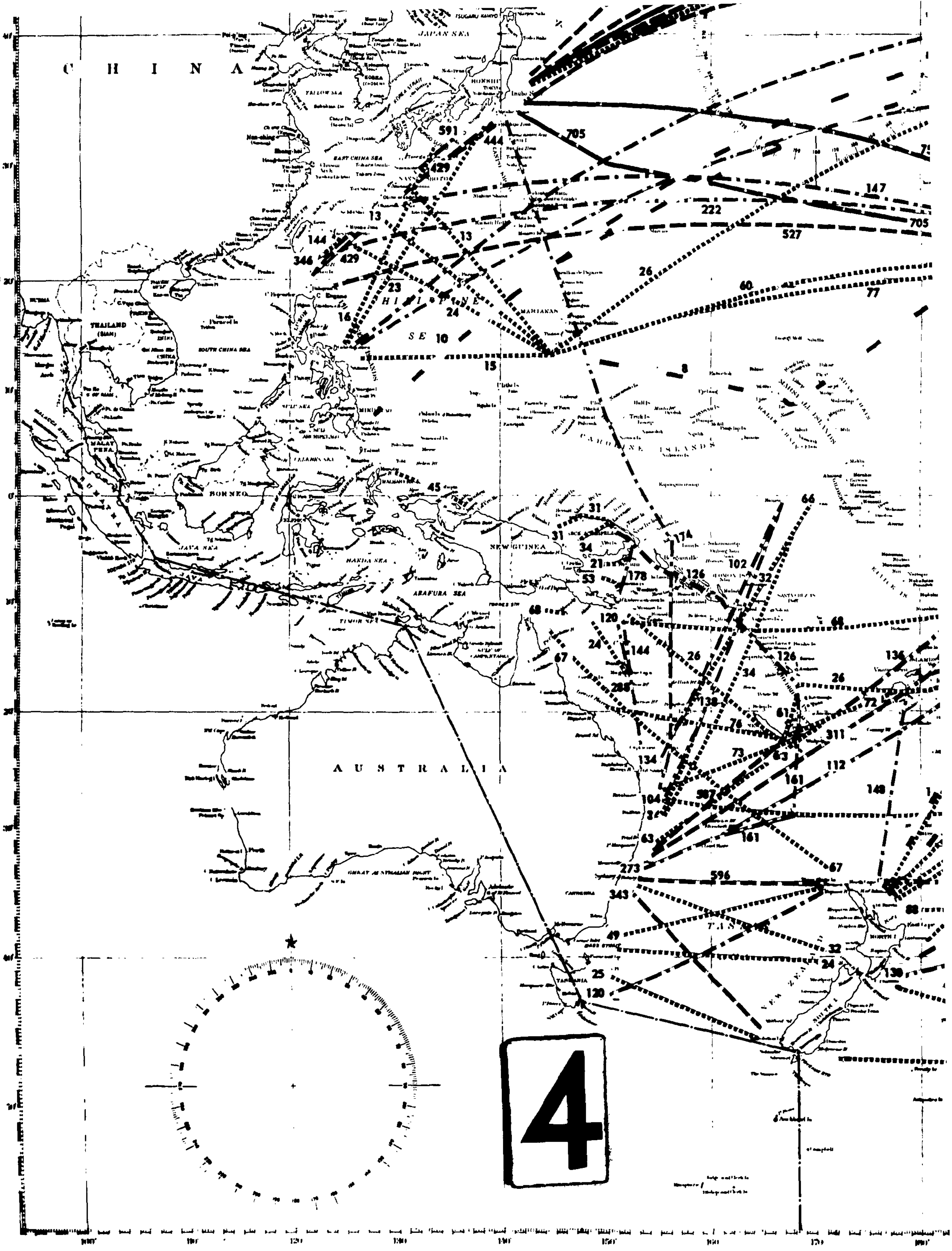
209
322
1

3


C H I N A
JAPAN SEA
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SOUTH CHINA SEA
THAILAND (SIAM)
BORNEO
JAVA SEA
BANDA SEA
ARAFURA SEA
TIMOR SEA
NEW GUINEA
MARIANAS
CAROLINE ISLANDS
MARSHALL ISLANDS
A U S T R A L I A
GREAT AUSTRALIAN BIGHT
TASMANIA
NEW ZEALAND
705
591
444
429
147
222
527
13
144
346
26
60
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120
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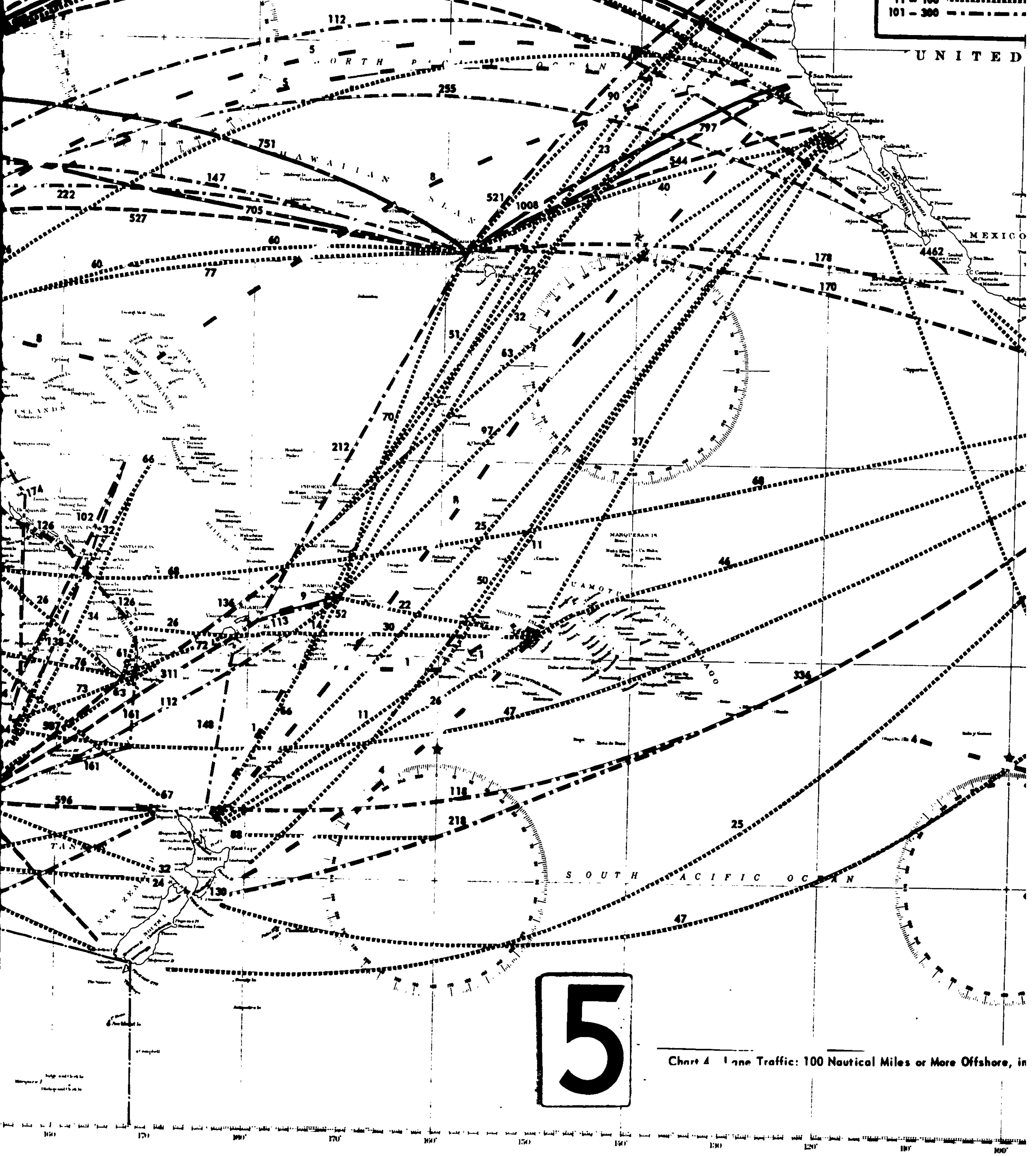

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Chart 4 Lane Traffic: 100 Nautical Miles or More Offshore, in

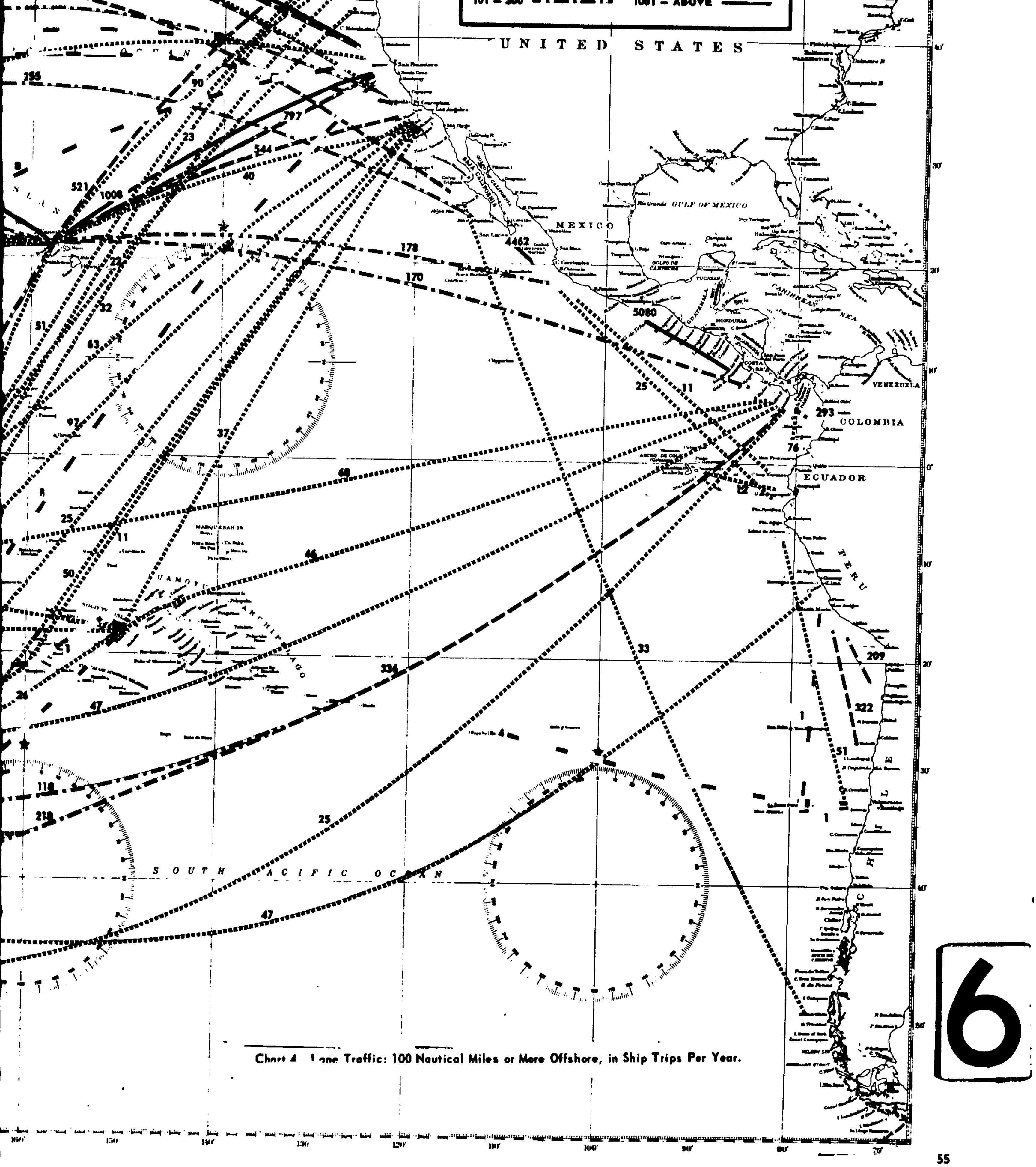

Chart 4. Lane Traffic: 100 Nautical Miles or More Offshore, in Ship Trips Per Year.

In the complete absence of tramp traffic data, it was decided to increase the number of ship trips for established liner traffic by using a correction factor to arrive at an estimate of the total lane traffic.

The correction factor for use in estimating total lane traffic was determined from data obtained on the number of ships reported entering each port. Data were obtained for as many of the listed ports-of-call as possible. For each port, the ratio between the reported total yearly ship entrances and the entrances counted for the corresponding liner traffic was used as the correction factor (α) for that individual port. Table 5 shows the data obtained for 31 out of 113 listed ports and the individual correction factors derived from these data.

Correction factors thus obtained are applicable to the ports only; therefore, it was necessary to deduce the various lanes used by the traffic terminating in the ports. This deduction was accomplished by using an iterative process in which the following conditions were maintained:

1. Ships cannot be lost at sea or "stored" in port. This condition led to the following rule: In all ports, except the eight ports-of-entry specified previously, the number of vessels arriving per year must be equal to the number of vessels departing per year.
2. The ship population for a given year is considered a constant; hence, ships which enter the Pacific Ocean Area must also leave it. This condition led to the following rule: The aggregate number of vessels arriving in the eight ports-of-entry per year must be equal to the aggregate number of vessels departing these ports per year.
3. The 31 ports for which the yearly number of ship entries are known must show this particular number of entries on final analysis.
4. Only ports and shipping lanes generated by analysis of the liner traffic are to be considered.
5. Total lane traffic on any specific lane, after all allowances for tramp traffic have been made, must be equal to or larger than the liner traffic previously counted on this lane.
6. Choices must be made, if all other indications are lacking, on the basis of the known resources and trade patterns for the ports and regions involved.

Conditions 1 and 2 were necessary for the computations to be internally consistent. Although the yearly records of entrances and exits in a particular port hardly ever conform to condition 1, the error is trivial in most cases and will tend to disappear if entrances and exits of successive years are examined. The errors are caused by the selection of an arbitrary time period and the variation of time in port for the various vessels. Condition 2 was imposed because the creation of a rate of change of the lane traffic with time was considered to be beyond the bounds of this study. The rule of condition 2 was imposed specifically to allow for traffic which entered and left the area under study by different ports

Table 5. Comparison of Total Shipping Traffic to Liner Traffic

Port	Number of Vessels Entering Ports Per Year				Ratio of Overseas Vessels to Liners	Source
	Total Shipping (Reported)	Local Shipping (Estimated)	Overseas Shipping	Liners (Counted)		
Sydney	4,433	830	3,603	724	4.98:1	Official Year Book of the Commonwealth of Australia, #45-1959 (Reference 2)
Melbourne	2,583	1,075	1,508	373	4.04:1	
Brisbane	1,217	255	962	284	3.39:1	
Cairns	260	54	206	28	25.75:1	
Townsville	347	73	274	36	7.61:1	
Hobart	471	291	180	18	10:1	
Auckland	--	--	693	203	3.41:1	The New Zealand Official Year Book, 1959 (Reference 22)
Bluff	--	--	95	12	7.92:1	
Wellington	--	--	488	58	8.41:1	
Nauru	120	--	120	84	1.43:1	Ports of the World, 13th Edition, 1959 (Reference 54)
Papeete	83	--	83	78	1.06:1	
Ocean Island	33	--	33	24	1.38:1	
Labuan	253	--	253	31	8.15:1	
Saigon	1,161	--	1,161	246	4.72:1	
Singapore	3,426	--	3,426	1,030	3.33:1	
Kaohsiung	1,408	--	1,408	92	15.30:1	
Chilung	1,409	--	1,409	445	3.17:1	
Hawaiian Ports	2,990	--	2,990	622	4.81:1	
San Antonio	--	--	338	116	2.91:1	
Talcahuano	334	--	334	72	4.64:1	
Guaymas	192*	91*	101**	110	1.84:1	
Salaverry	369	--	369	73	5.05:1	
Panama Canal***	9,187	--	9,187	3,599	2.55:1	
Kitimat	61	--	61	12	5.08:1	
Port Alberni	--	--	208	156	1.33:1	
Vancouver	1,565	--	1,565	948	1.65:1	
Portland	1,588	--	1,588	910	1.75:1	
Los Angeles	4,415	--	4,415	2,445	1.81:1	
San Francisco	4,752	--	4,752	2,849	1.67:1	
Samarai and Port Moresby (Papua)	163	--	163	56	2.92:1	Pacific Islands Handbook (Reference 5)
Fiji	317	--	317	89	3.56:1	

* Appears to be reported for half year.
** Assumed twice for full year.
*** Transits.

and which connected the area, by water, with the rest of the earth's surface. Conditions 3 through 6 appear to be self explanatory.

The process of initial estimation of the traffic on a lane, prior to the iteration process, involved two correction factors, one deriving from the other. The correction factor α, for each port, has already been explained and will henceforth be called "port factor" to differentiate it from the correction factor β, the "lane factor," which is needed to estimate the traffic on each individual lane in the Pacific Ocean Area. The lane factors had to be deduced from the available port factors. There are three different situations, each of which will be considered separately, although in the aggregate they form a single over-all picture.

The first situation exists when the lane connecting two ports terminates at one end in a port for which a port factor is available and at the other end in a port for which a port factor could not be generated. In this case, regardless of the situations for the other lanes terminating in these two ports, the lane under consideration is considered to have a lane factor equal to the known port factor. That is, $\beta = \alpha$. No conceptual difficulty attaches to this procedure.

The second situation exists when port factors are available for both ports in which the shipping lane terminates. In this case, a lane factor is chosen somewhere between the two port factors. The factor chosen must be such that it will not swamp the smaller port nor unduly penalize the larger port. For this reason, the following formula was used to determine the lane factor:

$$\beta = \frac{C_1 \alpha_2 + C_2 \alpha_1}{C_1 + C_2}$$

where subscripts 1 and 2 are used tc identify the port and the symbol C is used for the number of ship entrances reported per year for a port. This formula yields a weighted mean and has the following desirable properties: As C_1 becomes very much larger than C_2, the value of the lane factor β tends to approach the port factor of the smaller port, α_2; if C_1 approaches equality with C_2, the lane factor β approaches the arthmetic mean of the two port factors; if α_1 and α_2 approach equality (α_o), then the lane factor β approaches α_o. In addition, the lane factor β is always assured of having a value between the larger and the smaller port factor.

The third situation exists when port factors have not been generated for either of the two ports in which the shipping lane terminates. In this case, the two ports are assumed to have equal factors which have a value identical to the average correction for the 31 ports considered. This correction factor was computed to be 2.7.

The lane traffic in the Pacific Ocean Area was estimated, port by port and region by region, on the basis of the preceding conditions and rules. The work was started with the 31 ports for which port factors were available. The port with the fewest shipping lanes was corrected first. Each correction increased the estimated number of yearly ship trips on the lanes radiating from this port until the aggregate number of yearly arrivals for all the lanes terminating in this port equaled the number of yearly arrivals reported for this port. The operation was repeated with the port having the next to the fewest number of lanes, etc., until about 15 ports had been treated in this fashion. By that time it became necessary to treat groups of ports, generally in the same region of the Pacific Ocean Area, as interacting units and to adjust the estimates of traffic flow between them with great care. The final adjustments necessary to meet the postulated conditions had to be performed on an area-wide basis for the Pacific Ocean Area.

It should be understood that this problem does not admit a unique solution. There exists, rather, a great number of possible solutions, one of which has been computed and presented in table 4 as the lane traffic of the Pacific Ocean Area. The ratio of the total lane traffic in ship trips per year versus the total liner traffic in ship trips per year is very nearly 2.7 to 1, which checks well against the computed average port factor of 2.7.

Local Traffic

Estimates of the number of ships considered as local traffic for various areas are shown in chart 2. In general, these represent estimates of the maximum number of vessels of all sizes occupying this sea area permanently. Counting procedures for local traffic consisted largely of determining the number of vessels permanently stationed in one area. However, the data sources vary and were completely lacking for some areas. For instance, some of the members of the British Commonwealth of Nations even include rowboats in the number of registered vessels listed for themselves and their dependencies. On the other hand, in some other areas, notably the United States Trust Territory in the Pacific, Government publications merely list the vessels officially engaged in interisland trade, neglecting the sometimes sizable native craft. (This view is supported in reference 54, Sea Transportation section, pp. 3-11.) Occasional cursory mention of the existence of schooners employed in interisland trade indicates that some of the counts in the Pacific Island Area are low. In general, where numbers below 100 appear on chart 2, it can be assumed that the vessels are sizable (50- to 500-ton burden) and that the number represents only an unknown fraction of the indigenous shipping of that area.

In contrast, the number of vessels noted in areas such as the United States Pacific Coast includes a great number of small pleasure craft or craft which are used for family fishing, etc. Such craft are used only periodically and probably not all at the same time. The numbers in these areas represent, therefore, a maximum possible number of vessels afloat. The number of mercantile vessels compared with the number of family craft in these areas is less than 10 per cent, although these vessels may be much larger than the family craft and may carry many people.

Fishing Traffic

Very little information could be obtained on the number of fishing vessels in the various fishing areas, therefore, the estimates for the number of fishing vessels in the various areas, as shown on chart 3, should be taken as probable maximums.* Since fishing is an intermittent operation, the number of fishing vessels in a fishing area may drop to zero at times.

CHARACTERISTICS OF VESSELS

Exact determination of the names and characteristics of those ships employed at any one time in the Pacific Ocean trade was considered impossible. Therefore, those ships which were operated by the companies engaged in the trade of the area were listed, on the theory that one thereby examined the fleet which was actually or potentially in use. The original attempt at a complete listing of these ships failed, partially because about 30 per cent of the initial sample companies were not listed in either reference 7 or 8, and partially because the labor of searching and listing, when better appreciated, was considered excessive. For search purposes, the shipping organizations were listed alphabetically. (See appendix A.) Only 106 companies were on the list during the sampling procedure. Another 24 were added to the list subsequently. Of the first 40 companies investigated, 13 were not listed and some of the listed companies were found to have 45 or more ships, each of which required separate investigation. Therefore, after the first 40 companies had been investigated, only every fifth company was studied and its vessels listed. If several of the vessels of the company were found to be identical in the four characteristics of interest, only one ship name was recorded, with a notation of the number of similar ships.

This method of sampling the remainder of the shipping organizations was based on the assumption that they appeared, as far as the four ship characteristics are concerned, in random order upon the list. The assumptions are not quite correct. It appears that the number of medium and small shipping companies in the United Kingdom is much greater, proportionally, than in the United States and Japan, for instance, where shipping seems to be concentrated in fewer and larger companies. Moreover, the merchant fleets of the various countries are based on different needs, and hence ship characteristics are likely to depend, at least to some extent, on the company's nationality. However, it is considered that the size and the speed of the vessels in a certain type of service would be less affected by considerations of nationality than by considerations of use; hence, for these two characteristics, the sample appears to be an adequate representation of shipping characteristics in the Pacific Ocean Area.

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*A recent publication, arriving too late to be included in this study, provides additional information which would have permitted more accurate estimates for the distribution of Japanese fishing vessels. In general, the number of vessels per Japanese fishing area would have been estimated differently had this publication been used, and the numbers given would vary by 20 to 30 per cent. The publication is "L'expansion de la Peche Japonaise," by M. Alain Huetz de Lemps, Les Cahiers d'Outre-Mer, No. 49, 18me Année, Jan-March 1960, published by the Institute of Geography of the Facility of Letters in Bordeaux, Bordeaux, France.

Passenger and crew capacity and ship nationality were investigated by using different techniques. These techniques will be explained under the traffic heading for each particular characteristic.

The sizes of vessels used for mercantile purposes vary from 6 to 1,031 feet in length and from 2 to 119 feet in beam. Gross weight of ships versus block surface area (length times beam) is shown in figure 1. Naturally, size varies with purpose, and hence, is considered under the traffic class.

Ship speed has historically been governed by economics and technology, although other considerations frequently enter into the decisions. In general, as propulsion technology develops, unit power is obtained either by smaller and lighter installations or with a greater economy of fuel. In either case, the ship can become faster by the installation of more units of power in equal space, can carry greater loads if power and hull size is maintained, or can carry the same load with the same power on a smaller hull with a corresponding increase in speed. Since the speed of a vessel is usually the result of a compromise of various requirements, the choice of the individual solution rests with the purchaser of the vessel; therefore, the speed of a vessel of given size has a tendency to vary with the year the ship was built or refitted with new engines, as well as with the requirements of the owner, and a considerable speed variation exists for ships of identical size.

The nationality of a merchant vessel is defined in law (reference 55) as the existence of a genuine link between the ship and a state. Such a link entitles the vessel to fly the flag of that particular nation, which thereupon governs the internal discipline of the ship while at sea and to a limited degree when in port. The vessel and its commanding officer must, of course, obey the international laws and in addition are bound by any agreement the flag nation may have with any other nation.

The primary document attesting to nationality is called the registry, the document upon which most statistical treatments of world shipping are based. It should be noted that the nationality of the owner of the vessel and the nationality of the vessel itself are not the same thing. For instance, in 1959, 27 per cent of the U.S. foreign commerce was carried in ships owned by U.S. companies but flying so-called flags of convenience or necessity, being registered in Honduras, Liberia, and Panama (reference 56). Only 20 per cent of the U.S. foreign trade of the same year moved in U.S. registered bottoms. References 9, 56, and many others indicate a steady decline of the number of U.S. flag vessels since the second world war, such that in 1958 approximately six times more foreign flag dry cargo ships than U.S. flag vessels entered and cleared U.S. ports in the U.S. foreign trade. The private U.S. fleet represents only 10 per cent of the world's shipping today, one-half that of Great Britain which moreover is rapidly modernizing its merchant fleet.

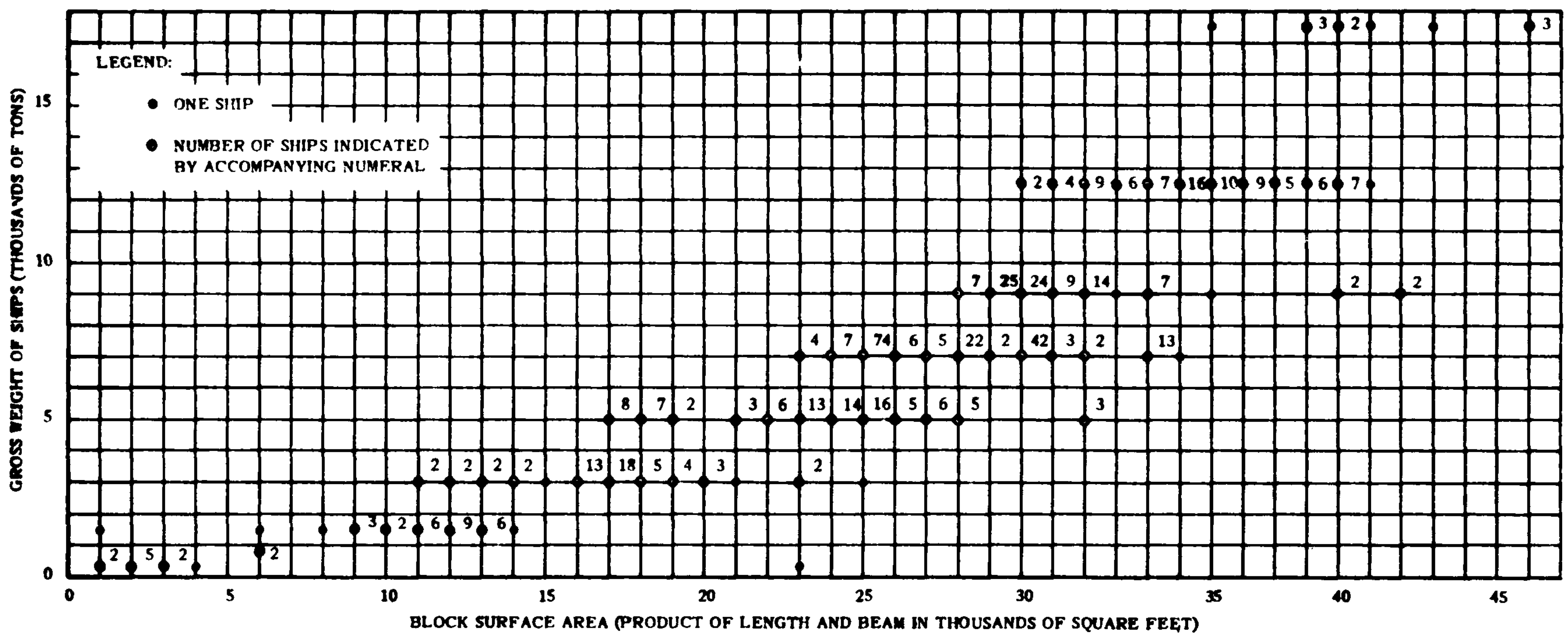

Figure 1. Gross Weight of Ships Versus Block Surface Area.

Lane Traffic

Vessel Size

The distribution of vessels in the lane traffic class by size and the method of obtaining this distribution are shown in appendix B. Vessel sizes were listed in terms of gross tons, with the ship considered to have a capacity of 100 cubic feet per ton, the most universally acceptable measure of ship size. (For information on the measurement rules of ships see references 10 and 57.)

The characteristics of principal types of U.S. vessels (table 6) were used as a guide in estimating the length of the medium vessel employed in lane traffic. The length of such a vessel was estimated at 456 feet and its beam at 62 feet.

Table 6. Characteristics of Principal Types of U. S. Vessels*

Type of Vessel	Over-All Length (Ft In.)	Beam (Ft In.)	Gross Weight (Tons)	Speed (Knots)	Passenger Capacity	Number in Crew
Liberty EC2-S-C1	441 6	58 10¾	7,170	11.0	None	40
Victory VC2-S-AP2	455 3	62	7,600	17.0	None	52
C1-A	412 3	60	5,155	14.0	12	49
C1-B	417 9	60	6,829	14.0	12	49
C2	459 3	63	6,200	15.5	8	54
C3	492	69 6	7,900	16.5	12	53
Mariner C4	563 7¾	76	9,215	20.0	12	58
Tanker T2-SE-A1	523 6	68	10,200	14.5	None	51
Passenger P2-SE2-R3	609 5¼	75 6	15,359	19.0	550	338
Passenger G3-SBR1	455 3	62	8,481	17.0	95	98
Reefer R2-ST-AU1	455 5	61	7,074	18.5	12	62

* Compiled from data contained in reference 10.

The medium ship is a vessel of about 7,100 gross tons, with a block surface area of about 28,000 square feet. The notion of block surface area was used only to correlate tonnage and liner dimensions.

Vessel Speed

Speed versus the block surface area of a sample of ships used in the lane traffic is shown in figure 2. It is apparent that vessel speed, s, increases with vessel size. The general relation was estimated and found to approximate

$$s = 0.211 \times a + 8.68,$$

where "a" is the block surface area of the vessel in thousands of square feet. For the average lane traffic vessel, this relationship indicates a speed of 14.6 knots or, considering the steady increase of ship speeds in the last few years, a rounded-off speed of 15 knots.

Number of People Onboard

The human population on a vessel consists of crew and passengers. The two groups must be considered separately. The number of crew personnel on a specific vessel will, under near-normal conditions, vary only within a small tolerance. The number of passengers onboard can, however, vary from zero to a maximum depending solely on the whim of the traveling public.

By common agreement, a cargo vessel may carry a maximum of 12 passengers. If 13 or more passengers are carried, the vessel becomes either a combination passenger and cargo vessel or a passenger vessel. Assuming that all passenger spaces are filled, the crew of a cargo vessel will outnumber the passengers by a ratio of 4 to 1 or greater. This ratio decreases as more passenger accommodations are provided, such that at a passenger capacity of 100, the ratio is slightly less than unity, and at a passenger capacity of approximately 1,000, the ratio tends toward one-half. Indication of this trend is apparent in table 6. These factors become important when it is necessary to estimate the number of people onboard a vessel, because no source has been located which gives a complete description of this shipping characteristic. Information on the passenger capacity of vessels capable of carrying 500 or more passengers is contained in reference 9, which, however, does not provide the size of the crew. Examination of the information in reference 9 indicates that there is a relationship between the size of the vessel, the passenger capacity of the vessel, and the nationality of the vessel. As an aid in estimating the number of people onboard a vessel, an illustration, figure 3, has been prepared to show the passenger capacity of vessels versus their ratio of gross-weight-to-dead-weight tonnage for different nationalities.

Estimating the number of people onboard a vessel is complicated by the fact that not all the passenger spaces need be filled. Statistics on air traffic are compiled by the use of a measure named "load factor" which is the ratio between the occupied seats and the seating capacity of the aircraft. No similar measure of the use of passenger vessels was found in the shipping literature; however, the term is used in this study to describe the ratio between the number of passengers onboard and the passenger capacity of the vessel.

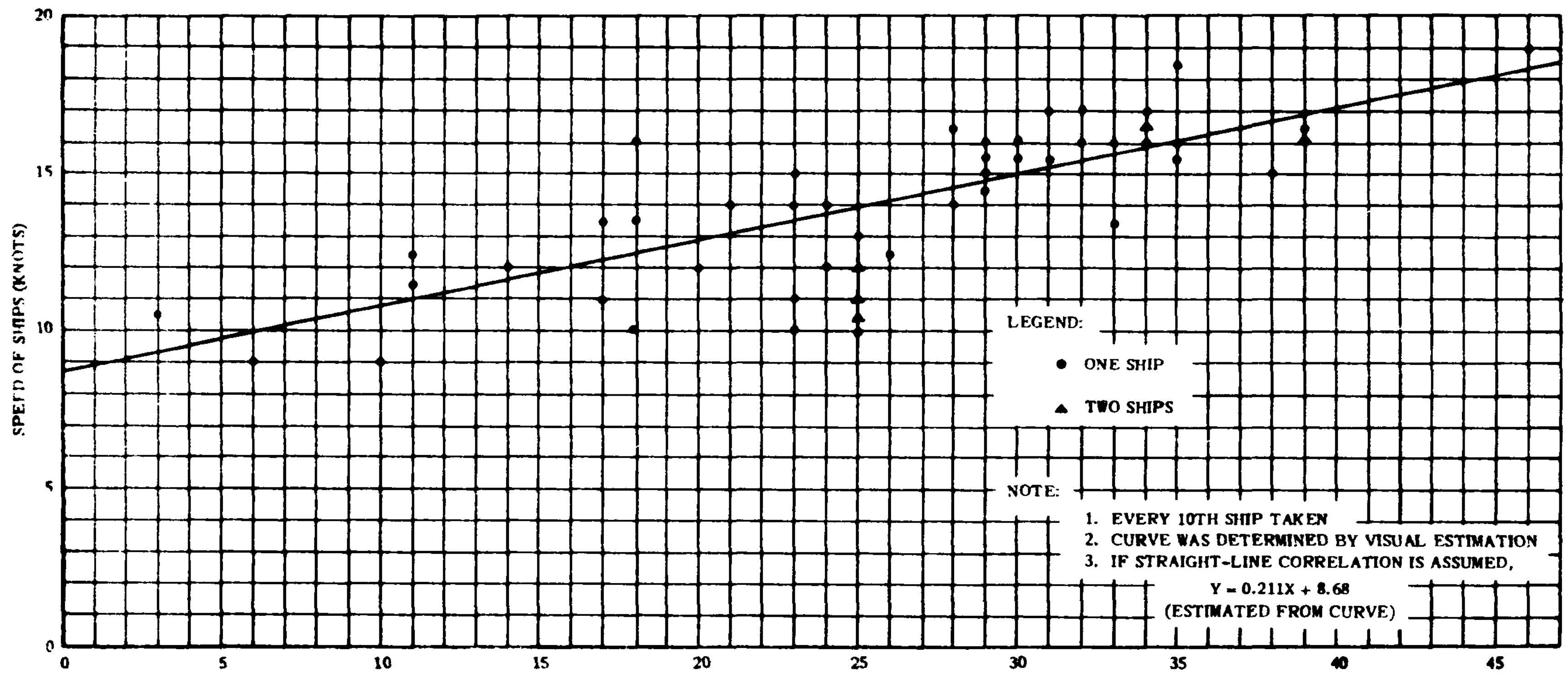

Figure 2. Speed of Ships in Lane Traffic Versus Block Surface Area.

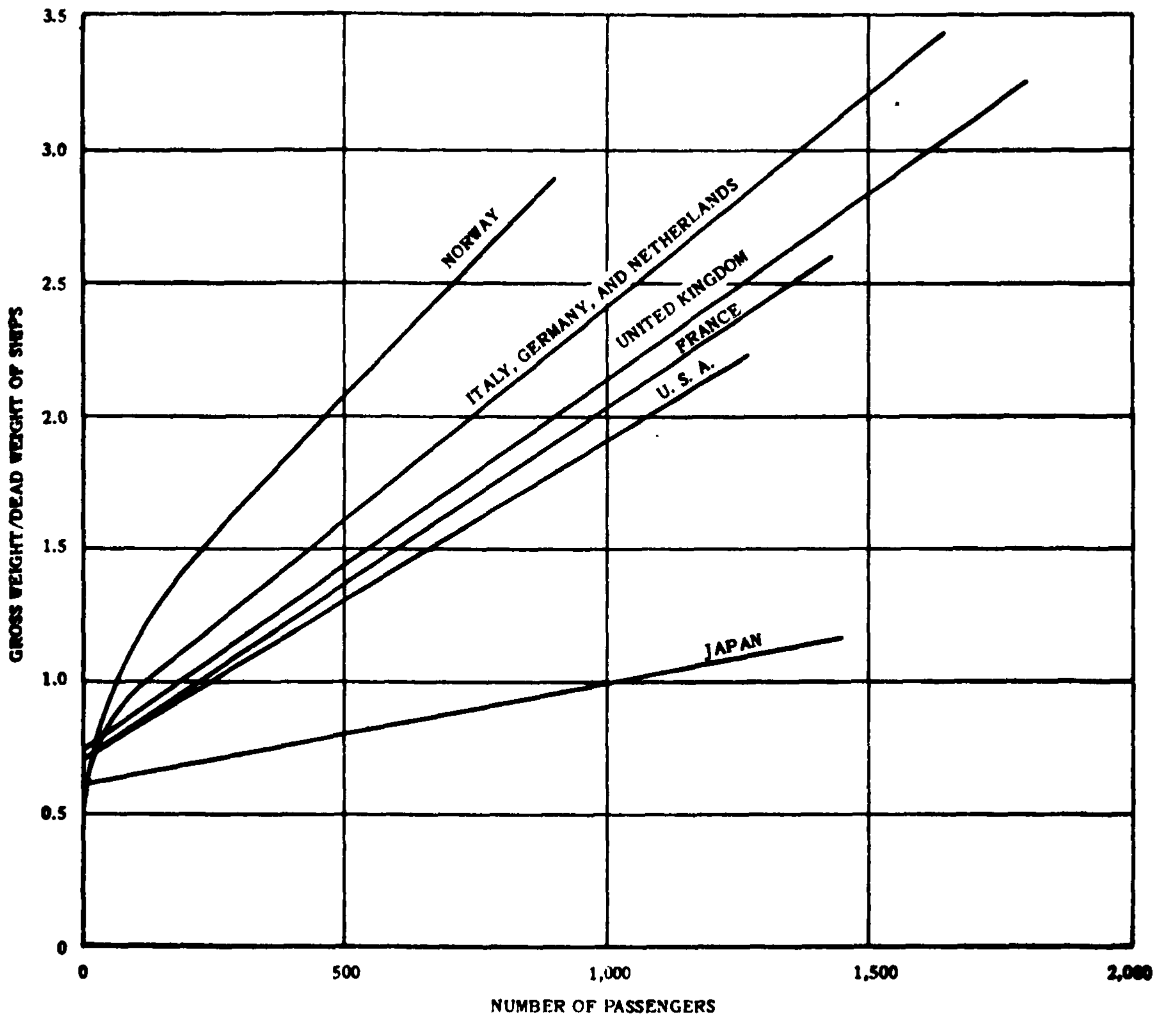

Figure 3. Estimate of Passenger Capacity Versus Ratio of Gross Weight to Dead Weight of Ships, by Nation.

Extensive reading of the literature indicates that the airlines are more sensitive to load factor than are the shipping companies; that is, to operate profitably, the airline needs a higher load factor than does the shipping line. The World Almanac for 1960 quotes a world-wide airline load factor of 0.61. The load factor for world-wide shipping is probably below this figure.

Work is continuing on the problem of estimating the average number of people onboard per vessel on the various shipping lanes, and estimates, on the basis of a load factor of 1.0, are being prepared for a later addendum to this report.

Nationality (Flag)

The average distribution of ships by nationality in the lane traffic over the

Pacific Ocean Area has been estimated, and percentages of the total traffic attributable to the various nations are shown in table 7. This table was derived by computing the percentage of liner trips conducted under the flag of each nation versus total liner trips, and then estimating the proportional engagement of various nations in the tramp traffic. Reference 9 indicates that, because of high operating costs, the U.S. flag tramp vessel is rapidly vanishing. The tenor of these remarks led to the assumption that, although tramp traffic as a whole outnumbers liner traffic, the U.S. flag tramp traffic is in the order of 5 per cent of the U.S. flag liner traffic. The remaining tramp traffic was assumed to be distributed proportionally to the liner traffic of the other flag nations. From these figures, the estimates of the average distribution of the ships in the lane traffic by nationality were computed. The figure of 12 per cent for the U.S. flag vessels checks fairly well with the 10 per cent of world shipping sailing under the U.S. flag, and the figure of 26 per cent for British Commonwealth of Nations flag vessels checks well with the world-wide ratio of 2 to 1 between British and U.S. flag vessels.

Table 7. Estimate of Nationality of Vessels in Pacific Ocean Area

Nation	Per Cent of Liner Traffic	Per Cent of Estimated Lane Traffic
Chile	0.69	0.88
Columbia	0.35	0.45
Denmark	3.80	4.81
Ecuador	0.04	0.05
France	1.20	1.54
Germany	7.50	9.53
British Commonwealth	20.70	26.24
Honduras	0.24	0.31
Italy	1.50	1.91
Japan	14.10	17.85
Netherlands	9.60	12.19
Norway	7.00	8.84
Panama	0.03	0.04
Philippines	0.46	0.60
Sweden	2.00	2.54
U. S. A.	30.60	11.96
Unknown	0.20	0.26

Local Traffic

Vessel Size

The size of vessels in local traffic varies more widely than the size of vessels in any other traffic class.

Along the shores of continents, essentially three classes of ships can be found, the sizable vessel for ferrying freight and passengers in the immediate vicinity of the coast, the commercial fishing vessel used on the continental shelf, and the small family or individual-use type of vessel. Vessels of the first type, numbering a few hundred along a long stretch of coast, can be about 400 feet in length, 50 feet in beam, and have a 5,000-gross-ton burden, although most are smaller. The commercial fishing vessels, the second type, are between 20 and 100 feet in length and from 7 to 40 feet in beam. These vessels number in the thousands. Family-size vessels rarely exceed 35 feet in length and 12 feet in beam, but they are the most numerous type of vessel.

On the basis of these dimensions, a typical local craft along a continental shore was estimated to be 30 feet long with a beam of 10 feet.

Interisland trade vessels are usually in the 50- to 500-gross-ton range, and a typical vessel has been described as similar in size to a tuna clipper.

The ocean station vessels are generally converted seaplane tenders (WAVP) or frigates (FFE), about 300 feet long and 30 feet in beam (reference 32).

Vessel Speed

Speed variation among vessels in local traffic is as extreme as size variation. Speeds range from that of a poled or rowed vessel to the 45 knots of a skimming speedboat.

In general, the large mercantile vessels operating close to the coast have speeds comparable to that of an average vessel in the lane traffic, an estimated 15 knots. The average commercial fishing vessel has a speed of about 8 knots (table 8). The average small family-size craft probably makes about 5 knots in these days of outboard motors.

Number of People Onboard

The number of people onboard large mercantile vessels operating close to the coast is estimated in conjunction with the estimation of the number of people onboard similar ships employed in the lane traffic. People onboard coastal fishing vessels vary from 1 to 13 and average approximately 6 per vessel. The average pleasure craft or family-type vessel is considered to carry three persons. Interisland vessels are considered to carry 15 persons. The ocean station vessels are government operated and carry a crew of 70 to 200 people.

Table 8. Characteristics of U. S. Commercial Fishing Vessels*

Type of Vessel	Over-All Length (Ft)	Beam (Ft)	Net Weight (Tons)	Speed (Knots)	Number in Crew	Endurance (Days)
Tuna Clipper	68-150	20-32	60-300	10-12	9-21	35-85
Halibut Schooner	55-85	15-23	30-55	6-10	5-10	20
Salmon Troller	25-60	8-18	5-26	6-10	1-3	14
Pacific Dragger	48-100	15-25	20-90	9-12	4-7	1-10
Beam Trawler	45-60	13-40	14-30	6-9	3-4	1
Salmon Purse Seiner	35-80	16.5-22	7-40	8.5-14	4-9	1-2
Herring and Salmon Purse Seiner	50-90	14-28	20-100	8-15	5-12	1-5
Sardine and Tuna Purse Seiner	65-100	19-28	50-150	8-10	10-13	1-30
Salmon Gill Netter	22-32	7-16.5	1/2-7	7-22	1-2	1-2
Shark Gill Netter	30-60	10-15	6-25	8-11	4-6	2-6
Dungeness Crab Trap	30-65	10-14	- -	8-14	2-3	1-10

*Compiled from data contained in reference 25.

Nationality (Flag)

The vessels in local traffic carry the flag of the nation in whose waters they are operated. In the case of joint ownership of archipelagos such as the French-British Condominium of the Samos Islands, known vessels are considered to be divided between the appropriate flags in proportion to the number of nationals of each country residing in the area.

The nationality of ocean station vessels is noted in table 1.

Fishing Traffic

Vessel Size

The characteristics of a majority of the United States fishing vessels, coastal as well as pelagic, by type are shown in table 8. Since tunny fishing is considered the primary use of the pelagic fishing fleets, the average size of a tuna clipper was considered representative of a typical pelagic fishing vessel. Hence, a typical fishing vessel has a length of 109 feet and a beam of 26 feet.

Vessel Speed

From table 8, the speed of the average tunny fishing vessel is estimated at 11 knots. The salmon and halibut fishing vessels are a bit slower, so that 10 knots appears as a reasonable value for the average pelagic fishing vessel.

Number of People Onboard

Pelagic fishing vessels carry a crew of from 5 to 21 people. Casual references to Japanese fishing vessels in various issues of reference 58 indicate that the crews of Japanese tuna vessels are larger; from 25 to 30 people. It is therefore considered that in the tunny fishing areas east of longitude 170° W, average crew size is 15 persons; west of longitude 170° W, average crew size is 25 persons. In the crabbing and halibut fishing grounds, crew size is estimated to average 10 persons per vessel.

Nationality (Flag)

The fishing fleets of the Pacific Ocean Area primarily fly the Japanese and U.S. flags. A relatively small number of New Zealand vessels fish in the southwestern area of the Pacific. The number of fishing ships and the location of fishing areas shown in chart 3 give indication of the flag of the vessels because it was assumed that (1) Japanese fishing is conducted west of longitude 170° W, (2) U.S. fishing east of 170° W, and (3) New Zealand fishing south of the equator. The cod and halibut fishing areas near the Kurile Islands, Kamchatka, and south of the Aleutians are used primarily by Japanese flag vessels. Japanese crabbing vessels are active east of the Kurile Islands and in Bristol Bay, Alaska.

DISCUSSION

Aside from the natural focal points of world shipping in the Pacific Ocean Area, such as Singapore, Panama, San Bernardino Straits, etc., the areas of greatest shipping density are the South and East China Seas and the area between Honolulu and the California Coast. The South China Sea is traversed by all ship traffic to and from Hong Kong, a matter of almost 10,000 ship trips a year, with a large portion of the vessels entering the East China Sea on the way to Japan and other points. Along the California Coast, the ports of San Francisco and Los Angeles constitute trading centers of almost equal magnitude, each being a center for about 9,500 ship trips per year, of which less than one-half are coastal trips.

Of the great trans-Pacific shipping routes shown in chart 4, the most frequented is that between Yokohama and San Francisco (1,249 ship trips per year), with the Honolulu-San Francisco route second (1,008 ship trips per year), and the San Francisco-Honolulu route third (797 ship trips per year).

A great amount of traffic was found to be moving from Panama north along the west coast of Central and North America. If the impression created by some of the sources is correct, the traffic must formerly have been much greater since many sources indicate a decline of shipping on these routes.

The largest vessels, averaging 456 feet in length and 62 feet in beam, are used in lane traffic; the next largest vessels, averaging 109 feet in length and 26 feet in beam, are used in pelagic fishing, and the smallest vessels, averaging 30 feet in length and 10 feet in beam, consist of local craft.

Vessels in lane traffic, as a group, have the greatest speed, averaging 15 knots; vessels in local traffic vary in speed from 5 to 15 knots; and fishing vessels average 10 knots in speed.

The number of people onboard lane traffic vessels was not determined, but the number of people onboard local traffic vessels varies from an average of 3 for family-type craft to 15 for interisland vessels. Ocean station vessels have crews of 70 to 200 people. The crews of pelagic fishing vessels vary from 5 to 30 people.

Approximately 75 per cent of the vessels used in lane traffic fly the flags of 5 nations: British Commonwealth of Nations, 26 per cent; Japan, 18 per cent; U.S., 12 per cent; Germany, 10 per cent; and Norway, 9 per cent. Most pelagic fishing vessels fly the flag of Japan or the U.S., although some fly the flag of New Zealand.

This study has produced an approximate picture of the nonmilitary shipping situation in the Pacific Ocean Area for the 1959-1960 period. The various portions of the picture, however, are of different accuracy. The estimate of area-wide mercantile high-sea shipping, in ship trips per year, shown in table 4 and on charts 1 and 4 is probably most accurate. This does not mean that the accuracy is uniformly good for all portions of the Pacific Ocean Area, although a U.S. Coast Guard count of vessels reporting weather information for portions of November 1957, when crudely evaluated for the San Francisco-Honolulu run, appears to be in very close agreement (within 4 per cent) with the estimates of this study for that run. Because the source material was primarily of U.S. origin and hence delt primarily with travel originating in or departing from the U.S., it is probable that the accuracy of the lane traffic estimates for the Western Pacific is lower than that for the Eastern Pacific, in the aggregate as well as for individual lanes.

However, even the lane traffic picture presented herein should not be considered a precise representation of Pacific lane traffic. The decision to consider all estimated non-scheduled traffic as going over those routes for which liner traffic had been established was obviously an oversimplification. Tramps, for example, will certainly make trips over routes for which schedules do not exist, including routes to ports not even included herein. The best that can actually be said of the estimated lane traffic presented here is that it does provide an approximate estimate of the lane traffic density throughout the Pacific Ocean.

No other known source of information has attempted to provide such an estimate on a comprehensive basis.

As mentioned before, the Navy's Fleet Operation Control Centers maintain information on the tracks of many merchant vessels. Comparison of data from the Hawaiian Operation Control Center (HOCC) for the month of November 1960 with those obtained herein revealed the following:

1. Table 4 of this report shows greater traffic on the lanes established herein than did the HOCC data.

2. On the other hand, the HOCC data showed some ships traveling on routes for which no traffic is indicated in table 4. The HOCC data show these routes as having a low volume of traffic compared to the major routes for which traffic is listed in table 4. There are at least two possible reasons for the omission of routes in table 4 for which HOCC shows traffic. One was previously given; i.e., some tramp traffic undoubtedly travels on routes on which liners are not scheduled. The other is that liner schedules from some companies probably were not obtained for this study.

Data for July 1960 from the San Francisco Operational Control Center (SFOCC) did not show ports of origin, therefore, the above type of comparisons were not directly possible. Attempts at determining the ports of origin were made, however, and the data for routes from Los Angeles and San Francisco to Honolulu were in approximate agreement with the HOCC data. One other means of comparison was employed with the SFOCC data. With this method, the number of ships traversing a 300-nautical-mile length of lane between 11°-14° N and 91°-96° W during July 1960 was determined (271 ships). Extrapolating the data for this month yields an estimate of 3,250 ships per year on this lane segment. For the same segment, chart 4 shows slightly over 5,000 ships per year - a discrepancy in the direction expected.

The accuracy of local traffic estimates is only as good as the statistical data provided by the various countries. The figures quoted are for registered vessels. No attempt has been made to estimate usage rates which would vary seasonally as well as show weekly cycles in some instances. Since the cycle variations could be of several orders of magnitude, it was considered advisable to merely describe a maximum population available for use.

The estimates of total number of vessels employed in pelagic fishing are believed to be accurate within 5 per cent except that no data on the Russian fleet could be obtained. The estimated distribution of these fishing vessels in the various fishing areas is much less accurate, since it is largely based on descriptive rather than numerical material; aside from the seasonal factor, the numbers assigned to the various areas could be off by as much as 50 per cent in some areas. The estimates were deliberately kept high to account for possible participation by vessels of nations that did not submit recent reports to the international bodies from whose statistics most of the numerical information was extracted.

Accuracy of route location is believed to be as good as the chart scale will permit. The accuracy of the fishing area boundaries is questionable because exact information on boundaries is lacking and because of suspected variation of boundaries from season to season and year to year.

Characteristics of the vessels employed are, in general, well documented, except for the number of crewmen and passengers carried. In this characteristic, reliance had to be placed on descriptive data and extrapolation from rather scarce and possibly biased numerical data.

The accuracy of this study could certainly be improved by additional work. However, it is believed that the effort required would be disproportionate to the amount of improvement. If interest is concentrated in specific, small, geographic areas, other more direct methods of counting and observing can be employed.

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APPENDIX A

SHIPPING COMPANIES

Shipping Companies and their addresses, where available:

Alaska Cruiser, Inc.*

American Australian Line*
Norton, Lilly and Co.
26 Beaver Street
New York, New York

American Mail Line
The Stuart Bldg.
Seattle, Washington

American Pioneer Line*
(U.S. Lines)

American President Lines
311 California Street
San Francisco, California

Australasian United Steam Nav., Co. Ltd
122 Leadenhall Street
London E.C. 3
(Australian United SN, Co.)

Australia-Oriental Line-China Nav.Co.
(Joint Service)
3, Queens R, Central, Victoria, Hong Kong
Box 424B, GPO, 6 Bridge St., Sydney, Australia 3, Old Broad Street
London, E.C. 2

The Bank Line Ltd
24 State Street
New York, New York
(Mgrs: Weir, Andrew, Shipping & Trading Co., Baltic Exchange Bldg, 26, Bury Street, London, E.C. 3)

Barber Steamship Lines
Dunstone House
Dunstone Park Road
Paignton, Devon

Barkley Sound Transport Co.*
(Port Alberni B.C. Canada)

Blue Funnel Line
See: Alfred Holt & Co.
India Bldgs.
Water Street
Liverpool 2, London

Blue Star Line
Albion House
34 Leadenhall Street
London, E.C. 3

British India Steam Nav. Co., Ltd
122 Leadenhall Street
London, E.C. 3

British Phosphate Commissioners
515 Collins Street
Melbourne, Australia

Burns Philp Line & Co. Ltd
5-11 Bridge Street
Box 543, GPO
Sydney, N.S.W., Australia

Canadian Transport Co., Ltd.

Chilian Line*
29 Broadway
New York, New York

*Not listed in registry.

China, Nav. Co. Ltd.
called: Cunard Steam Ship Co. Ltd.
25 Broadway
New York 4, New York

Cia. Colombiana de Cabotage Ltda.
Apartada Aereo 1276
Cali, Colombia

Cia. Naviera de los Estados De Mexico, S.A.
(Mexican State Lines)
Apartado 53
Mazatlan, Mexico

Coldemar Line*
U.S. Navigation
17 Battery Place
New York, New York

The Colonial Sugar Refining Co. Ltd.
1 O'Connell Street
Sydney, Australia

Compagnie Maritime des Chargeurs Reunis
3 Boulevard Malesherbes
Paris, France

Compañia Chilena de Navegación Interocéanica
Edificio Interoceano Plaza Justicia 59,
Valparaiso, Chili

Compañía de Muelles de la Poplación Vergara
Calle Blanco 951
Valparaiso, Chili

Compañía Marítimo de los FFCC del Estado*
Calle Errazuriz, 711
Edificio Estación
Puerto, Valparaiso

Compañía Naviera Haverbeck and Skalweit S.A.
Calle General Lagos 1931
Valdivia, Chili

Compañia Sud American de Vapores
Calle Blanco 895
Valparaiso, Chili

Crusader Line

Daido Line
General Agent: General SS Co.
added as result of inquiring on Transatlantic SS Co.

De La Rama Lines
Suite 518
25 Broadway
New York, New York

Dutch Lines*

The East Asiatic Comp. Ltd.
24 State Street
New York, New York

Eastern and Australian SS Ltd.
122 Leadenhall
London, E.C. 3

Everett S.S. Corp.
155 Juan Luna
P. O. Box 1846
Manila, P.I.

Federal Steam Navigation Co. Ltd.
138 Leadenhall Street
London, E.C. 3

Fern-Ville Far East Line*
39 Broadway, New York

*Not listed in registry.

Flota Mercante Grancolombiana, S. A.
Carrera S. Apartado Aereo 4482
Bogota, Colombia

Fred Olsen Line*
No. Pacific Service
Fred Olsen Line Agency Ltd.
465 California Street
San Francisco, California

French Line*
General SS Co.
432 California Street
San Francisco 4, California

Fruit Express Line*

Furness Line
(Bermuda & West Indies SS Co., Ltd.)
Furness House
Leadenhall Street, London, E.C. 3

Furness Prince Line
See Furness Line

Global Transport Line

Grace Line
2 Pine Street
San Francisco, California

Gulf & So. American SS Co., Inc.
620 Gravier Street
New Orleans

Hamburg-American Line

Hanseatic Line

Hawaiian Marine-Freightways, Inc.

Holland-American Line
No. Pacific Coast Service
457 Post Street
San Francisco 2, California

Holland-Australia Line
c/o Holland-American Line

Holland-East Asia Line*
c/o Holland-American Line

IINO Kaiun Kaisha Ltd.
Yokohama Service from
N. Y., Montreal, L.A.
24 State Street
New York, New York

Independent Line*
Costa Rica

The Indo-China S.N. Co. Ltd.
Jardine, Matheson & Co. Ltd.
18 Pedder Street, Victoria,
Hong Kong and 3 Lombard St.,
London, E.C. 3

Interocean Line
310 Sansome Street
San Francisco, California

Isbrandtsen Co. Inc.
26 Broadway
New York 4, New York

Isthmian Lines
71 Broadway
New York 4, New York

Italian Line
c/o General SS Co.
Italian Government
Rome, Italy

Italnavi Line

Ivaran Lines*
17 Battery Place
New York, New York

Java Pacific & Hoegh Lines

*Not listed in registry.

Johnson Line
2 Pine Street
San Francisco, California

Kawasaki Kisen Kaisha, Ltd.

Klaveners Line
c/o Oversea Shipping Co.
310 Sansome Street
San Francisco, California

Knutsen Line

Koninklijke Paketvaart-Maatschappij

Laeisz Line
Stelp & Leighton Ltd.
9-13 Fenchurch Bldgs.
Fenchurch Street, London, E.C. 2
(Laeisz, F. Line)
(Trastbrücke 1)
(Hamburg 11, Germany)

Lauro Line

Lloyd Triestino

Luckenback SS Co., Inc.

Lykes Bros. SS Co., Inc.

Maersk Line

Marina Mercante Nicaraguense, SA
Apartado Postale 508
Mangua, Nicaragua

Matson Line

Messageries Maritimes

Mexican Mail SS Co.*

Mitsubishi Line

Mitsui SS Co., Ltd.

Moore, J. J. Co.

Moore-McCormack Lines

Nedlloyd Line

New Zealand Government
(Marine Dept.)
P. O. Box 2395 Wellington, C.I.
New Zealand

The New Zealand Shipping Co. Ltd.
Rochester Bldg.
138 Leadenhall Street
London, E.C. 3 also
Wellington, New Zealand

Nippon Yusen Kaisha (N.Y.K.)
Line

Nisson Pacific Line

Nitto Line

North German Lloyd
Hamburg-American Line

Norwegian-American Line
(Around the world cruises)

Orient & Pacific Lines*

Orient Line

Osaka Shosei Kaisha (O.S.K.) Line

Ostasiatiske Kompagni
Aktieselskabet, Det.
Holbersgade 2
Copenhagen k., Denmark

Pacific Australia Direct Line

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*Not listed in registry.

Pacific Carribean Line

Pacific Far East Line, Inc.
311 California Street
San Francisco, California
(office in L.A.)

Pacific Islands Transport Line

Pacific Micronesian Line, Inc.*

Pacific Orient Express Line*
c/o General SS
432 California Street
San Francisco 4, California

Pacific Republics Line
c/o Moore McCormack

Pacific Shipowners LTD
Renwick Road (P. O. Box 299)
Suva, Fiji

The Pacific Steam Navigation Co.

Peninsular & Oriental Steam Nav. (P&O)
122 Leadenhall Street
London, E. C. 3

Peru Line

Philippine National Line

Pope & Talbot, Inc.
(Pacific Argentine Brazil Line, Inc.)
320 California Street
San Francisco 11, California

Port and Associated Lines
(The Cunard Steam-Ship Co.)

Puget Sound Nav. Co.

Royal Interocean Lines

Royal Mail Lines, Limited
c/o Furness Witly & Co. Ltd.
108 W. 6th Street
Los Angeles, California
Lloyd's Reg: Royal Mail House
Leadenhall Street, London,
E.C. 3

The Royal Netherlands SS Co.

Saguenay Shipping

S.A. Importadora y Exportadora
de la Patagonia
Avenida Roque Saenz Peña, 555
Buenos Aires

Scottish Shire Line Ltd.
4 St Mary Axe
London, E.C. 3

Seekontor Line

Shaw Savill Line

Shinnihon Line

Societa di Navigatione "Italia"*

Societa Italiana, "Litmor"
Via P.E. Bensa 1, Genoa, Italy

Standard Fruit & SS Co.

States Line
262 California Street
San Francisco 11, California

States Marine Lines

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*Not listed in registry.

Swedish American Line
(single cruise)

The Tonga Shipping Agency*

Transatlantic SS Co., Ltd.
General Agent:
General SS Corp.
240 Battery Street
San Francisco, California

Union SS Co. of New Zealand, Ltd.
230 California Street
San Francisco 11, California

United Fruit Co.

United States Nav. Co. Inc.
(listed under Associated Lines)

Waterman Line
c/o Waterman SS Corp.
61 St. Joseph Street
Mobile, Alabama

Westfal-Larsen Comp. Line

Weyerhaeuser SS Co.

Yamashita Line

*Not listed in registry.

APPENDIX B

ESTIMATION OF COMBINED LINER AND TRAMP TRAFFIC DISTRIBUTION IN PACIFIC OCEAN AREA BY GROSS TONNAGE

INTRODUCTION

An estimation of the gross tonnage per vessel in the Pacific Ocean carrying trade has been made to obtain an idea of the size of vessels habitually present in that area of the world. The choice of gross tonnage as the criterion was determined by its ready availability in the great majority of the reference materials examined, since the British favor its use as a yardstick of measurement.

Gross tonnage is used as a measure of the internal capacity of the vessel under consideration, 100 cubic feet per ton, in accordance with the measurement rules of one of the internationally recognized classification agencies. (See reference 57, page 16, for a partial list.)

METHODS OF ESTIMATION

The names of the shipping companies operating in the Pacific Ocean Area were obtained as a by-product of determining the number of voyages per year over the various shipping routes. These companies were listed alphabetically. The ships owned or operated by individual companies were then found, principally in Lloyd's Register, and certain of the ship characteristics noted. Not all of the companies listed were used in the sample, because the names of some could not be found in the registry books. Also, after searching for the first 40 company names on the list, this practice was abandoned as too laborious, and a sample of the remaining companies was procured by searching only for every fifth name on the list. This process produced a listing of 663 vessels and their gross tonnages, after a number of vessels known to be used solely in traffic in the Atlantic Ocean Area had been eliminated. The gross-tonnage figures were assembled into the same categories as those used in Lloyd's statistical tables. These figures formed the basis of the estimation of the distribution of gross tonnage per vessel for liner traffic (figure 1B and columns 1, 2, and 3 of table 1B). It was further reasoned that large ships were less likely to be used in tramp traffic, especially that ships of 15,000 tons gross weight or above would in all probability be reserved for liner traffic use, where their greater capacity could be used to better advantage. (See reference 57, pages 261 and 262, under definition of liners.) On the other hand, converted C3 ships could exceed 10,000 tons gross weight. Hence, an estimation of the gross tonnage per vessel

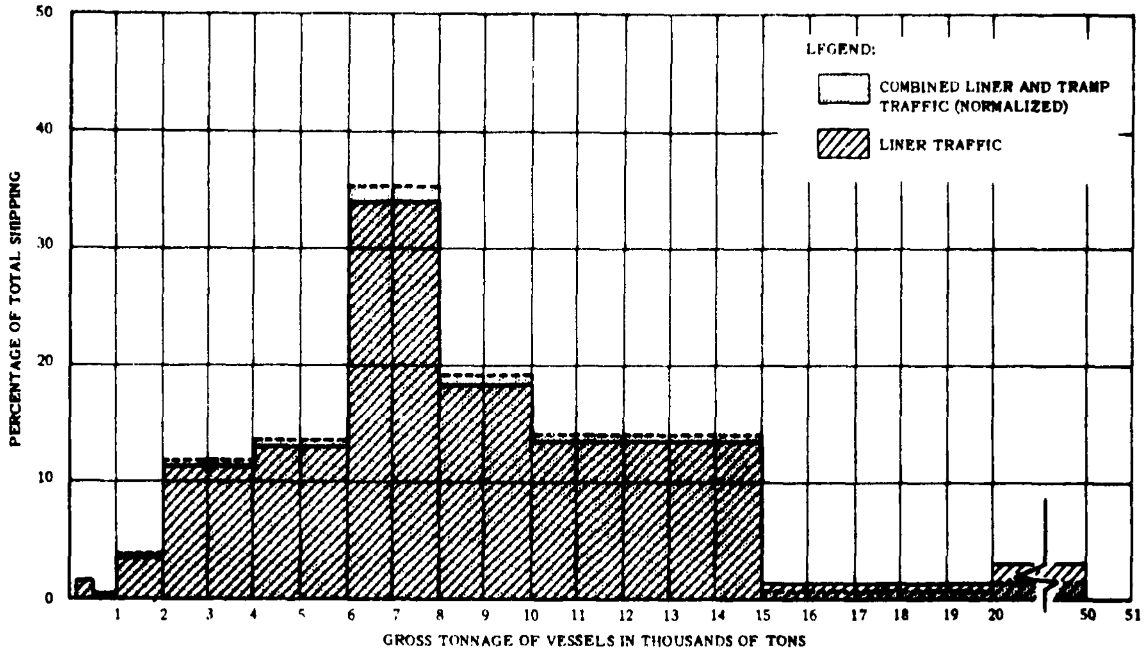

Figure 1B. Estimated Distribution of Gross Tonnage Per Vessel in Pacific Ocean Liner Traffic and Combined Liner and Tramp Traffic.

distribution for tramp traffic was made (column 4 of table 1B) by truncating the liner traffic estimate and normalizing the remaining portion, that below 15,000 tons gross weight.

Estimation of the ocean-wide proportion of tramp versus liner traffic is based on the liner count and the ship entrance data of tables 2 and 3 in the main body of this report. These tables establish that the total traffic for the 31 reporting ports relates to the total counted liner traffic for these ports by a ratio of 2.7 to 1.

It is likely that the survey of liner traffic conducted for this study is not complete; i.e., that some liner traffic has not been listed because schedules were not available. Therefore, it was assumed that the individual tonnage distributions for the liner traffic count needed revision upward by a factor of 10 per cent before being combined (column 5 of table 1B). The distribution for tramp tonnage was similarly weighted in column 6 of table 1B to account for the estimated total shipping. The distribution for combined traffic tonnage was obtained by adding the liner and tramp weighted proportions for the various tonnage intervals and normalizing the distribution (columns 7 and 8 of table 1B). Figure 1B presents the estimated tonnage distribution of the combined liner and tramp traffic in the Pacific Ocean Area.

Table 1B. Computation of Estimated Gross Tonnage Distribution Per Vessel for Liner, Tramp, and Combined Traffic in Pacific Ocean Area

1	2	3	4	5	6	7	8
Gross Tonnage Intervals (Tons)	Number of Ships From Liner Sample	Per Cent of Ships That Are Liners	Per Cent of Ships That Are Tramps (Estimated - Remainder of Distribution Times 1.047)	Correction for Missing Liners (Column 3 (Times 1.10)	Correction for Missing Tramps (Column 4 Times 1.6)	Combined Traffic (Column 5 Plus Column 6)	Combined Traffic Normalized (Column 7 Times 1/2.7)
100-500	9	1.4	1.47	1.54	2.35	3.89	1.44
501-1,000	2	0.3	0.31	0.33	0.50	0.83	0.31
1,001-2,000	23	3.5	3.66	3.85	5.86	9.71	3.60
2,001-4,000	75	11.2	11.73	12.32	18.77	31.09	11.51
4,001-6,000	87	13.1	13.72	14.41	21.95	36.36	13.47
6,001-8,000	226	34.1	35.70	37.51	57.12	94.63	35.05
8,001-10,000	121	18.3	19.17	20.13	30.67	50.80	18.81
10,001-15,000	90	13.6	14.24	14.96	22.78	37.74	13.98
15,001-20,000	10	1.5	0.00	1.65	0.00	1.65	0.61
20,001-plus	20	3.0	0.00	3.30	0.00	3.30	1.22