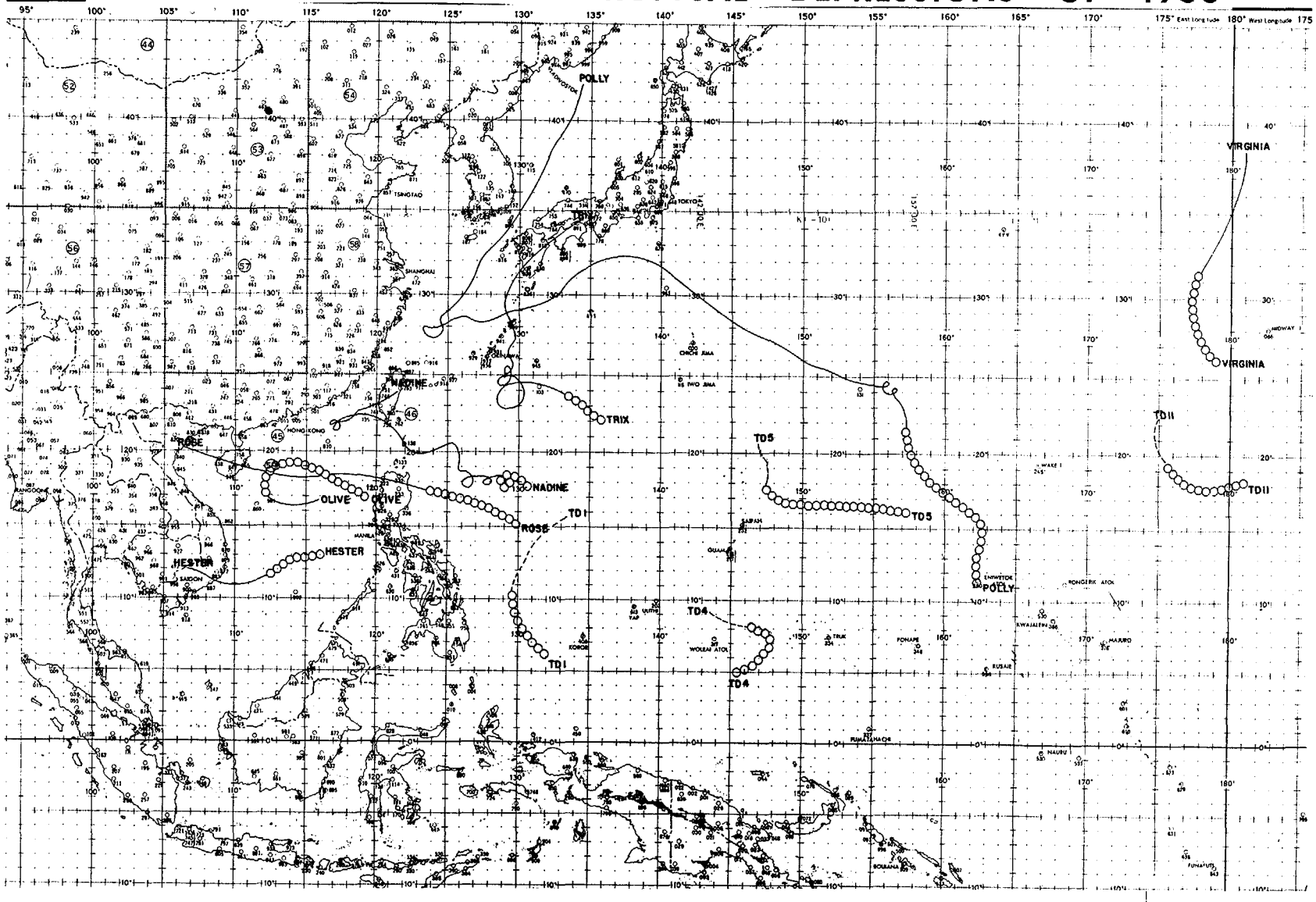
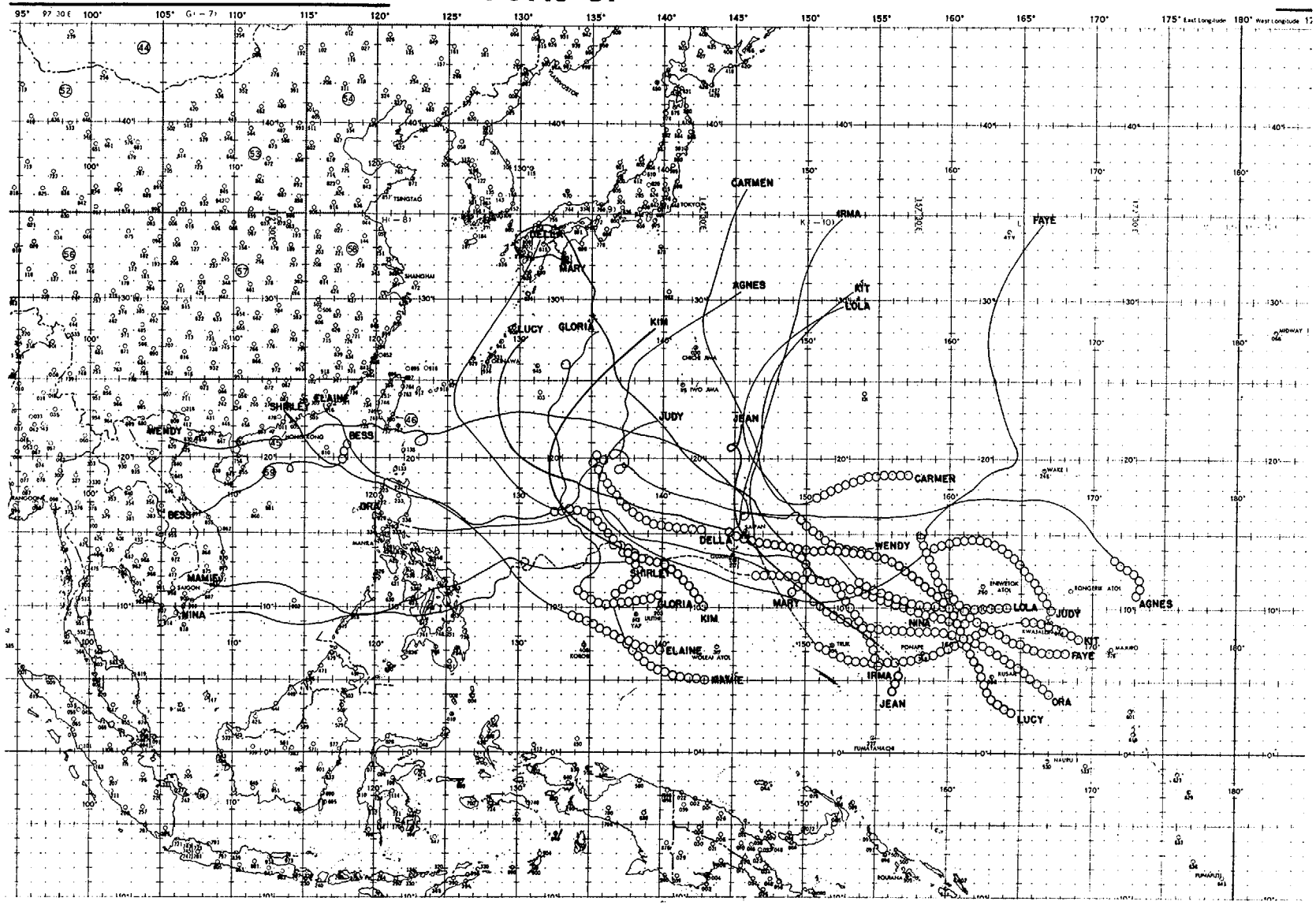
CHAPTER IV

SUMMARY OF TROPICAL CYCLONES 1968

TROPICAL STORMS AND TROPICAL DEPRESSIONS OF 1968



TYPHOONS OF 1968



During 1968, the Joint Typhoon Warning Center issued warnings on a total of 31 Tropical cyclones. Although only in a warning status for 142 days, 48% or 68 of these days JTWC was issuing warnings on two or more cyclones.

JTWC passed one cyclone, Tropical Storm Virginia, to HWO, Pearl Harbor, Hawaii. There were no cyclones passed to JTWC from outside its area of responsibility.

There were five "Super Typhoons" (maximum sustained surface winds of 130 knots or greater) during the 1968 season compared with four during 1967 and three during 1966 (see Table 4-2). Of these super typhoons, Agnes and Elaine were the most intense with maximum sustained surface winds of 150 knots.

The following figures and tables are provided to present representative statistical data from the 1968 tropical cyclone season and provide a ready reference for comparison with past seasons.

SUMMARY OF WESTERN PACIFIC
TROPICAL CYCLONES
OF 1968

	1960-1966	1967	1968
TOTAL NUMBER OF WARNINGS	752	957	822
CALENDAR DAYS OF WARNING	156	185	142
NUMBER OF WARNING DAYS WITH TWO OR MORE CYCLONES	59	62	68
NUMBER OF WARNING DAYS WITH THREE OR MORE CYCLONES	15	17	15
TROPICAL DEPRESSIONS	6	6	4
TROPICAL STORMS	10	15	7
TYPHOONS	21	20	20
TOTAL TROPICAL CYCLONES	37	41	31

TABLE 4-1

* SUPER TYPHOONS DURING 1968

CYCLONE NUMBER	NAME	INCLUSIVE DATES	MAX INTENSITY	MIN SLP	MIN 700MB HT
07	MARY	20 - 30 JULY	130KNOTS	924MB	2441m
16	WENDY	27 AUG -9 SEP	140KNOTS	917MB	2356m
17	AGNES	28 AUG - 9 SEP	150KNOTS	904MB	2240m
22	ELAINE	24 SEP - 1 OCT	150KNOTS	908MB	2234m
23	FAYE	2 OCT - 9 OCT	145KNOTS	911MB	2298m

* Typhoons with maximum sustained surface winds of 130 knots or greater.

TABLE 4-2

1968 TROPICAL CYCLONES

CYCLONE	TYPE	NAME	*DATE	CALENDAR DAYS OF WARNING	*MAX SFC WND	MIN OBS SLP	MAX RADIUS SFC CIRC	TOTAL NO. WARNINGS ISSUED	*6HR PERIODS OF TYPHOON INTENSITY	*DISTANCE TRAVELED
01	TD		28 FEB-1 MAR	3	30	997	180	8	0	378
02	T	JEAN	6 APR-15 APR	10	110	932	600	40	20	1374
03	T	KIM	30 MAY-5 JUN	7	100	948	420	23	16	1164
04	TD		2 JUN	1	30	006	240	4	0	192
05	TD		5 JUN-6 JUN	2	30	000	210	5	0	186
06	T	LUCY	27 JUN-2 JUL	6	110	935	360	18	10	1404
07	T	MARY	20 JUL-30 JUL	11	130	924	600	42	22	1932
08	TS	NADINE	21 JUL-28 JUL	8	60	966	420	32	0	1446
09	TS	OLIVE	24 JUL-25 JUL	2	45	987	180	7	0	228
10	TS	POLLY	5 AUG-16 AUG	12	55	964	420	48	0	3336
11	TD		6 AUG-7 AUG	3	30	NR	180	6	0	162
12	TS	ROSE	9 AUG-13 AUG	5	60	962	360	15	0	996
13	T	SHIRLEY	16 AUG-21 AUG	6	65	962	360	20	2	1218
14	TS	TRIX	23 AUG-29 AUG	7	55	977	420	25	0	1392
15	TS	VIRGINIA	25 AUG-26 AUG+	1	50	NR	240	3	0	240
16	T	WENDY	27 AUG-9 SEP	14	140	917	420	51	40	2820
17	T	AGNES	28 AUG-9 SEP	13	150	904	540	50	35	3258
18	**									

TABLE 4-3

1968 TROPICAL CYCLONES (Cont'd)

CYCLONE	TYPE	NAME	*DATE	CALENDAR DAYS OF WARNING	*MAX SFC WND	MIN OBS SLP	MAX RADIUS SFC CIRC	TOTAL NO. WARNINGS ISSUED	*6HR PERIODS OF TYPHOON INTENSITY	*DISTANCE TRAVELED
19	T	BESS	31 AUG-5 SEP	7	65	965	420	25	2	744
20	T	DELLA	16 SEP-24 SEP	10	120	930	420	37	20	1584
21	T	CARMEN	16 SEP-23 SEP	8	110	935	360	30	17	1380
22	T	ELAINE	24 SEP-1 OCT	8	150	908	540	32	19	1326
23	T	FAYE	2 OCT-9 OCT	8	145	911	600	31	21	1500
24	T	GLORIA	14 OCT-23 OCT	10	90	942	540	37	13	1236
25	TS	HESTER	18 OCT-20 OCT	3	45	987	360	8	0	348
26	T	IRMA	20 OCT-24 OCT	5	80	946	360	19	4	1764
27	T	JUDY	24 OCT-2 NOV	10	120	928	360	37	22	1950
28	T	KIT	26 OCT-4 NOV	7	70	959	360	26	8	1716
29	T	LOLA	7 NOV-12 NOV	6	105	938	300	19	10	1386
30	T	MAMIE	9 NOV-23 NOV	13	65	972	300	52	9	2154
31	T	NINA	18 NOV-27 NOV	10	70	959	360	39	13	2316
32	T	ORA	21 NOV-29 NOV	9	120	931	420	33	23	1884

*DATA TAKEN FROM BEST TRACK
**ISSUED BY PEARL
NR= NO RECON
T PASSED TO HWO, PEARL HARBOR

TABLE 4-3(Cont'd)

TROPICAL DEPRESSIONS 1968
POSITION DATA

TROPICAL DEPRESSION ONE
28 FEB-29 FEB

DTG	LAT	LONG	DTG	LAT	LONG
280600Z	10.6N	129.6E	290600Z	14.ON	131.1E
281200Z	11.3N	129.7E	291200Z	14.9N	132.1E
281800Z	12.1N	130.1E	291800Z	15.6N	133.3E
290000Z	13.ON	130.6E			

TROPICAL DEPRESSION FOUR
2 JUN

DTG	LAT	LONG	DTG	LAT	LONG
020500Z	08.1N	146.2E	021700Z	08.9N	144.2E
021100Z	08.4N	145.0E	022300Z	09.1N	143.2E

TROPICAL DEPRESSION FIVE
5 JUN-6 JUN

DTG	LAT	LONG	DTG	LAT	LONG
052300Z	17.8N	147.5E	061700Z	19.8N	147.1E
060500Z	19.ON	147.6E	062300Z	20.7N	146.9E
061100Z	19.5N	147.4E			

TROPICAL DEPRESSION ONE ONE
6 AUG-7 AUG

DTG	LAT	LONG	DTG	LAT	LONG
062300Z	19.5N	175.3E	071700Z	21.3N	174.8E
070500Z	20.1N	175.0E	072300Z	22.2N	175.0E
071100Z	20.7N	174.8E			

TROPICAL STORMS 1968
POSITION DATA

TROPICAL STORM NADINE
21 JUL-28 JUL

DTG	LAT	LONG	DTG	LAT	LONG
210500Z	18.4N	128.9E	250500Z	21.2N	121.6E
211100Z	18.4N	128.2E	251100Z	22.0N	120.8E
211700Z	18.0N	127.8E	251700Z	22.4N	119.6E
212300Z	18.2N	128.1E	252300Z	22.3N	118.4E
220500Z	18.4N	127.2E	260500Z	22.0N	117.3E
221100Z	18.2N	126.2E	261100Z	21.4N	117.0E
221700Z	17.7N	126.3E	261700Z	21.7N	117.2E
222300Z	18.2N	126.7E	262300Z	21.8N	116.8E
230500Z	18.8N	125.9E	270500Z	21.9N	117.1E
231100Z	19.8N	125.8E	271100Z	22.0N	117.6E
231700Z	20.6N	125.4E	271700Z	22.2N	118.1E
232300Z	20.4N	124.6E	272300Z	22.5N	118.7E
240500Z	20.0N	124.0E	280500Z	22.7N	119.5E
241100Z	19.8N	124.4E	281100Z	23.1N	120.5E
241700Z	19.9N	122.7E	281700Z	23.9N	121.3E
242300Z	20.4N	122.0E			

TROPICAL STORM OLIVE
24 JUL-25 JUL

DTG	LAT	LONG	DTG	LAT	LONG
241100Z	17.0N	112.3E	250500Z	16.3N	114.2E
241700Z	16.6N	112.8E	251100Z	16.4N	115.1E
242300Z	16.4N	113.5E	251700Z	16.8N	116.0E

TROPICAL STORM POLLY
5 AUG-16 AUG

DTG	LAT	LONG	DTG	LAT	LONG
050500Z	21.9N	157.2E	110500Z	31.6N	134.6E
051100Z	22.9N	157.2E	111100Z	31.1N	133.8E
051700Z	23.6N	156.9E	111700Z	30.6N	133.1E
052300Z	23.9N	156.3E	112300Z	30.0N	132.5E
060500Z	24.2N	156.6E	120500Z	29.5N	131.6E
061100Z	24.0N	156.1E	121100Z	29.2N	130.6E
061700Z	24.2N	155.8E	121700Z	29.0N	129.3E
062300Z	24.5N	156.0E	122300Z	28.4N	128.3E
070500Z	24.3N	155.6E	130500Z	28.2N	127.3E
071100Z	24.5N	154.8E	131100Z	28.5N	126.4E
071700Z	24.7N	153.9E	131700Z	28.4N	125.4E
072300Z	25.0N	152.8E	132300Z	28.0N	124.6E
080500Z	25.4N	151.7E	140500Z	27.9N	123.9E
081100Z	25.8N	150.5E	141100Z	28.0N	123.4E
081700Z	26.4N	149.1E	141700Z	27.4N	123.7E
082300Z	27.2N	147.5E	142300Z	27.6N	124.5E
090500Z	28.0N	145.6E	150500Z	28.5N	124.3E
091100Z	29.2N	143.9E	151100Z	29.1N	125.3E
091700Z	30.2N	142.2E	151700Z	30.4N	126.3E
092300Z	31.2N	140.8E	152300Z	32.2N	127.2E
100500Z	31.8N	139.3E	160500Z	34.3N	128.8E
101100Z	32.3N	137.9E	161100Z	36.4N	131.1E
101700Z	32.3N	136.6E	161700Z	39.1N	132.9E
102300Z	31.9N	135.5E	162300Z	41.9N	134.7E

TROPICAL STORM ROSE
9 AUG-13 AUG

DTG	LAT	LONG	DTG	LAT	LONG
092300Z	17.4N	123.5E	112300Z	18.7N	111.9E
100500Z	17.8N	121.9E	120500Z	18.9N	110.9E
101100Z	18.1N	120.0E	121100Z	19.2N	110.0E
101700Z	18.3N	118.3E	121700Z	19.5N	109.1E
102300Z	18.3N	116.8E	122300Z	19.8N	108.2E
110500Z	18.2N	115.5E	130500Z	19.9N	107.2E
111100Z	18.2N	114.2E	131100Z	20.1N	106.3E
111700Z	18.4N	113.1E			

TROPICAL STORM TRIX
23 AUG-29 AUG

DTG	LAT	LONG	DTG	LAT	LONG
230500Z	23.7N	133.2E	261100Z	25.1N	129.1E
231100Z	24.3N	131.9E	261700Z	25.4N	129.5E
231700Z	24.5N	130.8E	262300Z	25.9N	129.3E
232300Z	24.5N	129.8E	270500Z	26.9N	129.2E
240500Z	24.2N	128.9E	271100Z	27.1N	129.6E
241100Z	23.4N	128.6E	271700Z	27.8N	129.6E
241700Z	22.8N	129.4E	272300Z	28.5N	129.2E
242300Z	23.4N	130.2E	280500Z	29.4N	129.0E
250500Z	24.4N	130.2E	281100Z	30.4N	129.3E
251100Z	24.9N	129.4E	281700Z	31.4N	130.2E
251700Z	24.6N	128.7E	282300Z	32.8N	131.6E
252300Z	24.7N	129.4E	290500Z	34.4N	134.2E
260500Z	25.4N	129.3E			

TROPICAL STORM VIRGINIA*
25 AUG-26 AUG

DTG	LAT	LONG	DTG	LAT	LONG
250500Z	31.6N	177.9E	252300Z	35.8N	180.2E
251100Z	32.5N	178.5E	260500Z	38.4N	181.0E
251700Z	33.8N	179.3E			

TROPICAL STORM HESTER
18 OCT-20 OCT

BTG	LAT	LONG	DTG	LAT	LONG
181100Z	11.6N	112.3E	191100Z	10.9N	109.5E
181700Z	11.3N	111.7E	191700Z	11.3N	108.5E
192300Z	11.1N	111.1E	192300Z	11.8N	107.7E
190500Z	10.9N	110.4E	200500Z	12.0N	106.7E

*PASSED TO HWO, PEARL HARBOR AFTER 25/1700Z.

Forecast positions for the 24, 48 and 72 hour forecasts are verified only as long as the best track analysis estimates winds in excess of 33 knots for tropical cyclones which reach typhoon intensity.

In addition to this method of verifying absolute error distance, a computation of closest distance to the best track (right angle error) has been included to indicate the demonstrated ability to forecast the path of motion without regard to speed.

The following tables and figures are presented to graphically depict the distribution of forecasting error in JTWC forecasts.

FORECAST VERIFICATION
AVERAGE ERROR (NAUTICAL MILES)

	24 HR	48 HR	72 HR
1950-58	170	---	---
1959	*117	*267	---
1960	177	354	---
1961	136	274	---
1962	144	287	476
1963	127	246	374
1964	133	284	429
1965	151	303	418
1966	136	280	432
1967	125	276	414
1968	105	229	337

*FORECAST POSITIONS NORTH OF 35N WERE NOT VERIFIED.

TABLE 4-4

FORECAST VERIFICATION
AVERAGE ERROR IN NAUTICAL MILES

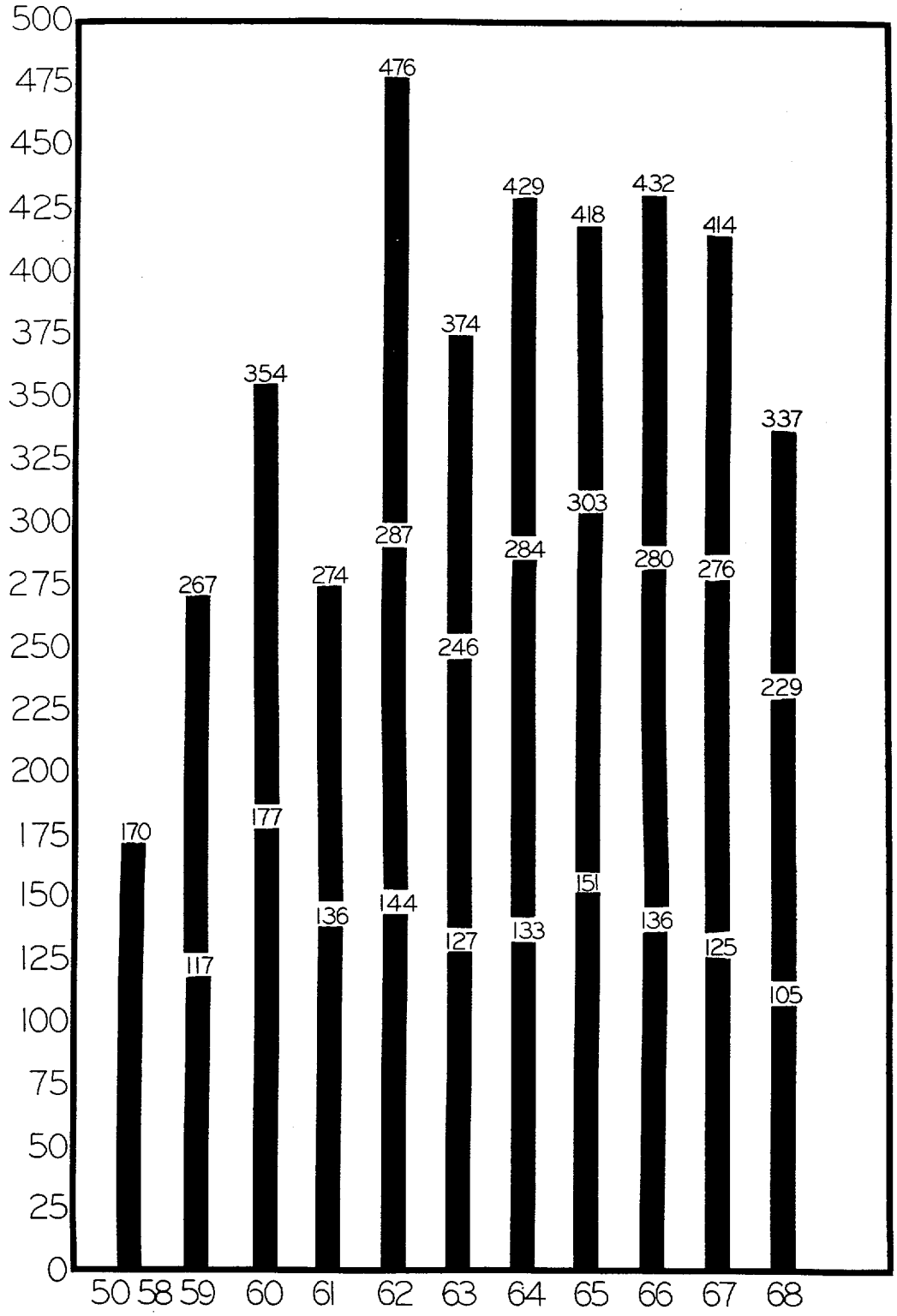


FIG 4-3

FORECAST ERROR TABULATION (MI) - 1968

	NUMBER OF CASES	MEAN ERROR (MI)
24 Hour		
Total cases and overall average	516	105
Below 20N	308	103
20N-30N	185	105
Below 30N	493	104
Above 30N	23	130
48 Hour		
Total cases and overall average	378	229
Below 20N	172	201
20N-30N	183	244
Below 30N	355	223
Above 30N	23	325
72 Hour		
Total cases and overall average	144	337
Below 20N	55	268
20N-30N	78	383
Below 30N	133	335
Above 30N	11	357

TABLE 4-5

DISTANCE BETWEEN OPERATIONAL WARNING
POSITS AND BEST TRACK POSITS

CYCLONE		CASES	CYCLONE AVERAGE (MI)	MAX (MI)	MIN (MI)
1.	T. D.	7	39	80	3
2.	JEAN	38	13	47	3
3.	KIM	23	17	62	2
4.	T. D.	4	56	78	28
5.	T. D.	5	19	25	10
6.	LUCY	18	13	42	1
7.	MARY	42	28	143	2
8.	NADINE	31	25	56	1
9.	OLIVE	6	11	24	2
10.	POLLY	48	23	91	3
11.	T. D.	5	133	153	70
12.	ROSE	15	32	115	9
13.	SHIRLEY	20	20	42	6
14.	TRIX	25	32	108	5
15.	VIRGINIA	3	4	10	0
16.	WENDY	51	16	55	0
17.	AGNES	50	20	55	1
18.	*				
19.	BESS	24	20	94	1
20.	DELLA	36	18	93	1
21.	CARMEN	29	18	70	2
22.	ELAINE	30	23	86	4
23.	FAYE	31	14	32	1
24.	GLORIA	37	26	156	2
25.	HESTER	8	24	67	5
26.	IRMA	19	22	44	2
27.	JUDY	37	18	85	1
28.	KIT	26	42	205	2
29.	LOLA	19	14	27	4
30.	MAMIE	52	22	126	3
31.	NINA	39	20	83	1
32.	ORA	32	13	40	1
	OVERALL AVERAGE:		21.8		

* NUMBER 18 ISSUED BY PEARL

TABLE 4-6

1968 AVERAGE FORECAST ERRORS (MI)*

TYPHOON	24 HR FORECASTS NO. OF CASES	24 HR FORECASTS MEAN ERROR	48 HR FORECASTS NO. OF CASES	48 HR FORECASTS MEAN ERROR	72 HR FORECASTS NO. OF CASES	72 HR FORECASTS MEAN ERROR
JEAN	33	114	25	329	10	556
KIM	19	72	13	161	4	238
LUCY	13	105	9	160	2	240
MARY	29	106	22	241	9	502
SHIRLEY	16	84	8	171	2	336
WENDY	46	97	42	196	18	282
AGNES	45	122	35	275	15	394
BESS	19	89	14	179	5	274
DELLA	29	98	21	270	8	352
CARMEN	25	87	20	172	8	305
ELAINE	25	98	18	229	7	348
FAYE	27	100	20	211	8	284
GLORIA	29	95	21	238	6	379
IRMA	15	203	5	880	--	---
JUDY	33	110	26	208	11	297
KIT	15	189	8	375	2	672
LOLA	15	122	10	262	3	490
MAMIE	28	83	19	174	8	183
NINA	29	75	21	126	9	185
ORA	26	107	21	194	9	280

AVERAGE ERROR - 24 HR FORECASTS (516 CASES)...105
AVERAGE ERROR - 48 HR FORECASTS (378 CASES)...229
AVERAGE ERROR - 72 HR FORECASTS (144 CASES)...337

*INCLUDES FORECAST ERRORS DURING TROPICAL STORM INTENSITY

TABLE 4-7

INDIVIDUAL TYPHOONS OF 1968
24 HOUR VERIFICATION ERROR

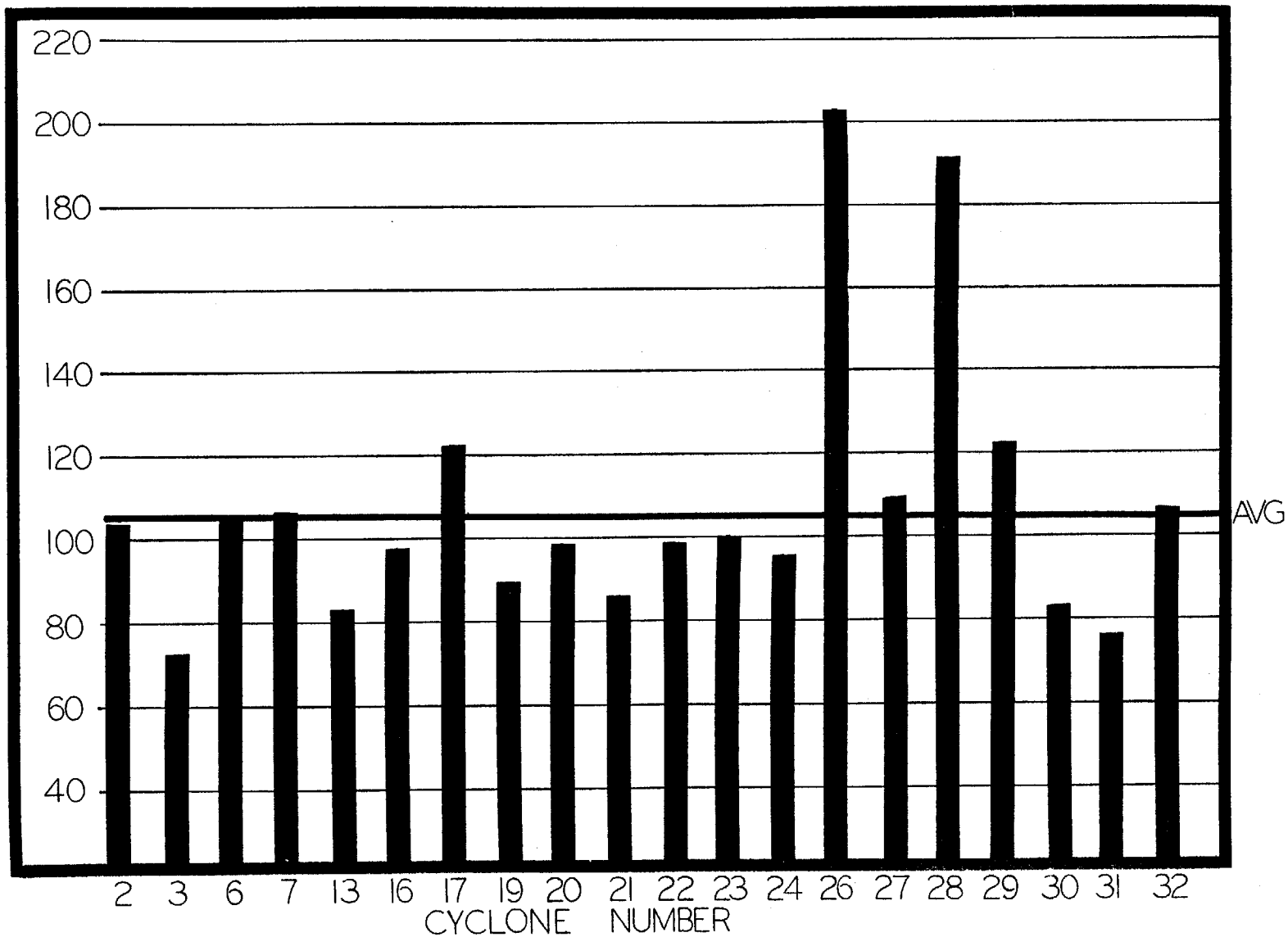


FIG 4-4

1968 FORECAST ERRORS*
(IN TERMS OF CLOSEST DISTANCE TO BEST TRACK)

TYPHOON	24 HR FORECASTS NO. OF CASES	24 HR FORECASTS MEAN ERROR(MI)	48 HR FORECASTS NO. OF CASES	48 HR FORECASTS MEAN ERROR(MI)	72 HR FORECASTS NO. OF CASES	72 HR FORECASTS MEAN ERROR(MI)
JEAN	30	87	19	206	8	428
KIM	18	46	12	89	4	133
LUCY	14	45	10	90	3	104
MARY	26	77	22	195	9	439
SHIRLEY	16	74	8	166	2	296
WENDY	47	50	43	103	18	151
AGNES	46	54	35	158	15	259
BESS	20	40	15	134	5	250
DELLA	32	59	18	98	8	135
CARMEN	25	60	20	147	8	271
ELAINE	26	75	19	205	7	335
FAYE	27	50	20	109	8	172
GLORIA	32	48	11	104	4	102
IRMA	15	97	5	276	-	---
JUDY	33	85	22	128	10	164
KIT	18	86	8	126	2	195
LOLA	15	77	10	143	2	222
MAMIE	24	35	20	78	8	78
NINA	35	60	24	93	10	141
ORA	28	81	23	117	10	130

AVERAGE ERROR - 24 HR FORECASTS (527 CASES)...64 MI
AVERAGE ERROR - 48 HR FORECASTS (364 CASES)...138 MI
AVERAGE ERROR - 72 HR FORECASTS (141 CASES)...211 MI

*INCLUDES FORECAST ERRORS DURING TROPICAL STORM INTENSITY.

TABLE 4-8

RIGHT ANGLE ERROR

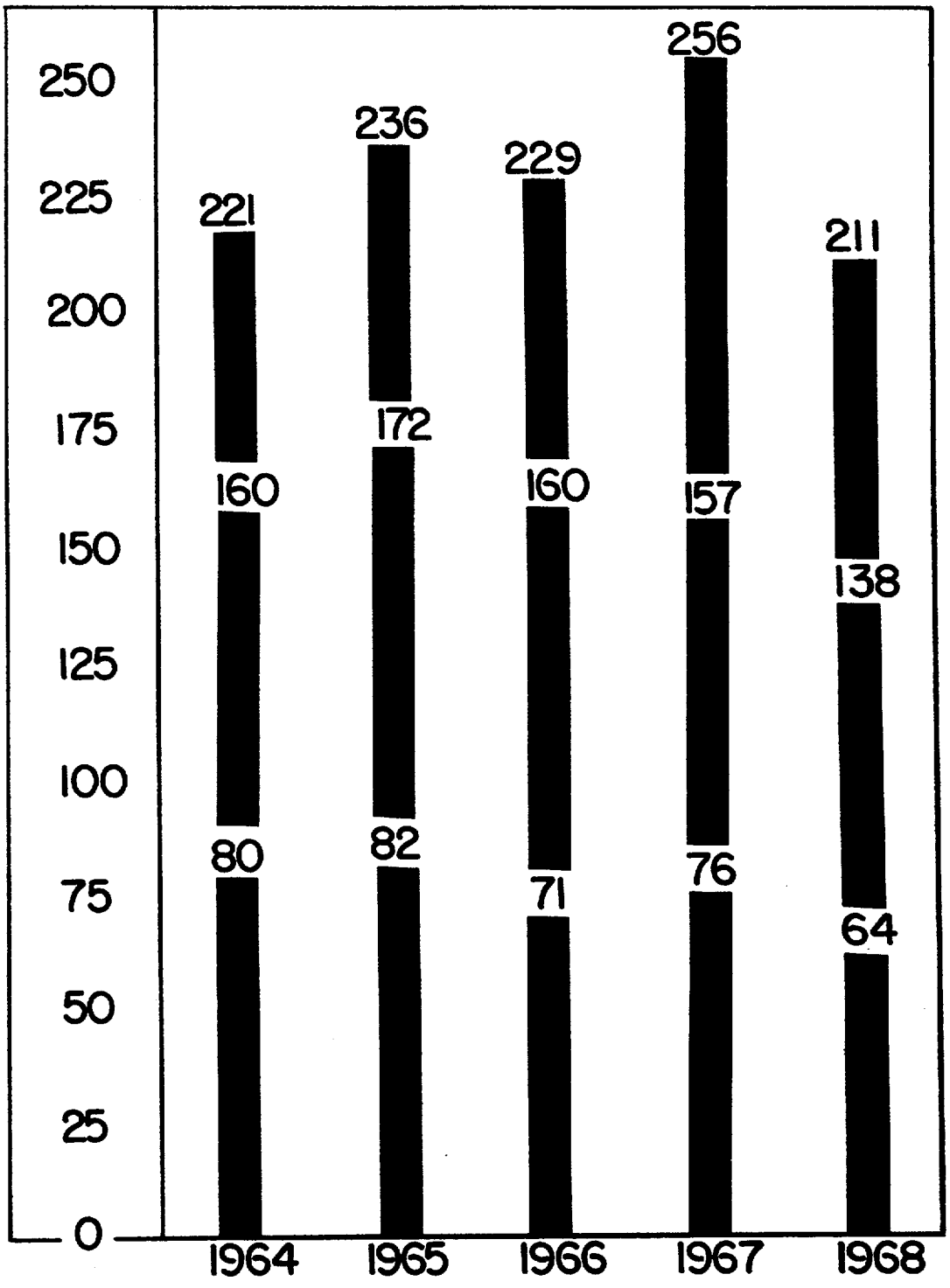


FIG 4 - 5