

Tropical Cyclone Vern 27/01/1978 to 03/02/1978

(i) General

Tropical cyclone "Vern" was the third system of the season to reach tropical cyclone intensity in the Northwestern Australian Region. It was the first to threaten the tropical parts of the State and was the only cyclone of the season to cross the northwest coast.

"Vern" was an intense storm which caused high seas, very heavy swells and winds estimated at 145 km/h. Heavy falls of rain were recorded in the West Kimberley and in the De Grey partly as a result of the cyclone and partly because of a continuation of the northwest monsoon.

Damage due to wind action was not serious although some small buildings near the storm's path were demolished; windmills and trees were also damaged. Widespread flooding caused silting and undermining of roads in the West Kimberley. The cost of repairs was estimated to be over \$50,000.

(ii) Development

A broad area of thunderstorm activity had existed over the northern part of Western Australia and the adjacent waters of the eastern Indian Ocean for several days. A low pressure trough extended from the Cocos Island area to the Kimberley and eastward to Queensland. Several centres of circulation were contained in this trough. The northwesterly monsoonal flow to the north of the trough was relatively strong and steady at about 56 km/h. On 27 January a cell of high pressure moved from the Indian Ocean into the Great Australian Bight. Easterly winds as far north as Port Hedland and Learmonth strengthened. The extra vorticity provided in the area off the northwest coast may have resulted in one of the low pressure centres rapidly deepening on 27 January into a tropical cyclone which was subsequently named "Vern".

The cyclone continued to deepen at about a typical rate over the next few days and was a mature storm when it made landfall near Anna Plains. It is estimated that the central pressure in the mature cyclone was about 965 mb.

After landfall the tropical cyclone degenerated into a rain bearing depression which filled on 3 February.

The lowest pressure reported was 985 mb by the ship "Star Victoria" when it was 130 km to the southsoutheast of the centre.

(iii) Features of the Track

The track followed by "Vern" is shown in Figure 3.1. It was active for seven days and travelled about 3300 km during that time.

For the first 24 hours the cyclone moved westward at about 15 km/h. During the next 24 hours it recurved quickly to the south and then began travelling eastward. It maintained this easterly direction at speeds ranging from 8 km/h to 40 km/h until about 310100 GMT when it was 250 km northwest of Broome. From that position it veered more southeasterly and then southerly as it passed the latitude of Broome.

"Vern" crossed the coast near Anna Plains at about 010300 GMT. Once inland it assumed a southwesterly track just inland from the coast passing close to Sandfire Roadhouse and Mandora, both of which experienced a calm period as the "eye" passed over. When it was some 190 km to the east of Port Hedland "Vern's" track became southerly once again before it dissipated completely.

During "Vern's" early westward movement a cell of high pressure moved from the Indian Ocean into the Great Australian Bight. As this high continued to move eastward there developed over the western half of the State a broad low pressure trough which was reflected through the atmosphere. The eastward movement of the cyclone may have been related to the development of this extensive trough.

(iv) Rainfall and Flooding

Heavy rain associated with "Vern" was reported from stations between Cape Leveque and Broome and from locations near the landfall point. Cumulative isohyets for the period 0900 WST 31 January to 0900 WST 4 February are shown in Figure 3.2. The maximum rainfall during this period occurred in the West Kimberley inland from Derby but was related more to a continuance of the northwesterly monsoonal flow than to a direct effect of cyclone "Vern".

Considerable flooding occurred in the West Kimberley during the period that "Vern" was operating. Damage to roads in the West Kimberley owing to silting and undermining was estimated at more than \$50,000. The rain was generally welcomed by inhabitants of the affected area.

(v) Seas, Swell and Storm Surges

Very rough seas and a heavy swell were reported from the "Star Victoria" at 280900 GMT when it was 70 km to the west of the centre of the tropical cyclone. "Vern" was still in its early development stage at this time. By 281130 GMT the same vessel was reporting high seas. Details of reports from selected ships near the centre are given in Table 3.1.

The highest sea waves reported were 6 m at the "Anna Bakke" at 300300 GMT. The highest swell reported was 11 m from the westnorthwest at the ship "Niizurumaru" at 301200 GMT and 301500 GMT when the ship was within 125 km of the centre.

No storm surge was reported near "Vern's" landfall. Higher than normal tides were reported at Derby, Cockatoo Island and Cape Leveque, but not at stations closer to the cyclone centre. At Cockatoo Island the tide was higher by 1-1.5 m.

(vi) Winds and Wind Damage

Winds about the cyclone had reached gale force by 281130 GMT when the "Star Victoria" reported force 8 westsouthwest winds. Thereafter winds exceeding gale force were reported frequently until "Vern" crossed the coast on 1 February.

From satellite data it was estimated that maximum winds near the centre would have reached about 145 km/h on 31 January and 1 February before landfall. The highest reported wind was northwest at 105 km/h experienced at the ship "Niizurumaru" at

301200 GMT when it was 90 km to the north of the centre. Wind data is included in the selected ship reports in Table 3.1.

Over land the maximum winds were estimated at Sandfire Roadhouse as southeasterly 160 km/h and at Mandora as southwest 110 km/h.

Small buildings were demolished at Nita Downs and Sandfire Roadhouse. Three caravans at Sandfire Roadhouse also suffered minor damage. At Mandora some slight damage to buildings occurred but windmills were badly damaged. At other locations slight damage to trees and shrubs were reported.

(vii) Satellite Analysis

NOAA 4 and NOAA 5 photographs were most helpful in determining the location and intensity of tropical cyclone "Vern". A summary of the data contained in the satellite photographs is given in Table 3.2.

On 25 and 26 January the satellite photographs showed a broad area of convective cloud over the Kimberley and the adjacent waters of the Timor Sea. The westernmost part of this cloud mass was further west on 26 January than on the previous day. On 27 January low level banding near the dense convective mass indicated that a distinguishable circulation was developing centred at 16.0°S 114.9°E. It was designated T 1.5 in the Dvorak scheme with further deepening anticipated. The system developed at about the typical rate gaining a CDO on 28 January. The CDO became gradually larger, reaching its maximum size on 1 February when the classification was estimated to be T 5. On 30 and 31 January some internal structure including a cloud covered "eye" was visible within the CDO.

After landfall on 1 February the higher cloud sheared from the lower level circulation. The high level cloudiness extended rapidly to the southeastern part of the State while the broad remnant of lower level cloud covered most of the Pilbara east of longitude 118°E.

(viii) Radar Observations

Cyclone "Vern" was tracked by meteorological radar at the Broome and Port Hedland Meteorological Offices. The centre could be determined on the Broome radar returns by means of spiral overlays during the period 310345 to 010715GMT.

The centre was plotted at Port Hedland between 312035 GMT and 020535 GMT. During the period when both stations were tracking the cyclone differences of up to 35 km in the position of the centre were noted. These can be attributed to the fact that the cyclone was located near the operating limit of both radars. Consequently both stations were plotting the centre of the cyclone at mid-tropospheric levels. The Broome positions were preferred as the cyclone was operating closer to this station at those times.

During the period of overland travel the positions given by the Port Hedland radar conform well with the track established from surface observations of the eye movement.

Table 3.

Selected Ship Reports

Ship	Position		Date/ Time (GMT)	Bearing/ Distance from centre (km)	Wind Direction/ Speed (km/h)	Sea (m)	Swell (m)	Weather	Pressure (mb)
	°S	°E							
Star Victoria	15.5	108.3	280430	270/250	W 56	Rough			1000
Star Victoria	15.5	109.0	280900	270/ 80	S 56	Very Rough	Short Heavy		999
Star Victoria	15.6	109.5	281130	350/ 60	WSW 69	High	Heavy SW		999
Star Victoria	15.8	110.2	281500	340/ 95	WSW 35	Very Rough	SW	Occasional rain	1000
Star Victoria	16.6	111.6	290000	250/120	SSE 82	High	Heavy	Rain	985
Star Victoria	17.0	112.0	290300	230/160	SE 63	Very Rough		Continuous rain	996
Star Victoria	18.0	112.1	290900	210/290	SE 69	Very Rough	Rains	Squalls	992
Aurora	16.2	111.0	291700	260/360	260/ 69	2	SW 3		997.8
Aurora	16.6	110.9	292000	260/410	260/ 69	2	SW 3		997.8
Anne Bakke	15.3	114.8	300000	300/ 85	230/ 93	2		Heavy continuous rain	986.6
Anne Bakke	15.4	114.6	300300	290/145	270/93	6		Heavy continuous rain	990.6
Vietduck	13.5	115.2	300400	240/260	NW 95				995
Niizuru Maru	15.4	118.0	300600	080/145	330/ 72	3.5	NNW 8	Past showers	995.5
Anne Bakke	15.4	114.5	300600	290/220	270/ 74	4		Heavy continuous rain	994.6
Anne Bakke	15.7	114.3	300900	280/290	270/ 70		3.5	Moderate continuous rain	995.6
Niizuru Maru	15.3	117.8	301200	010/ 90	310/ 105	5	WNW 11	Violent rain showers	994.5
Niizuru Maru	15.3	117.6	301500	330/125	300/ 89	5	WNW 11	Violent rain showes	996.5
Niizuru Maru	14.9	116.9	310000	300/400	280/ 74	4	WNW 6	Moderate continuous rain	1002.0
Lady Cynthia	18.2	121.8	310600	130/160	025/ 65	1	NW 4.5	Rain squalls	997
Lady Cynthia	18.4	121.3	310900	160/ 80	050/ 83	1	NW 3.5		991

Ship	Position		Date/ Time (GMT)	Bearing/ Distance from centre (km)	Wind Direction/ Speed (km/h)	Sea (m)	Swell (m)	Weather	Pressure
	°S	°E							
Stirling Bridge	16.8	118.8	311800	300/330	250/ 89	2	W 5	Moderate intermittent drizzle	1000.1
Chikumasan Maru	15.1	119.5	311900	330/410	280/ 63	3.5	W 5	Past Showers	1004.0
Stirling Bridge	16.4	119.0	010300	320/400	240/ 63	2	WNW5		1001.1

Table 3.2 Data from Satellite Photographs

Satellite Name	Orbit Number	Date/ Time (GMT)	Estimated posn. of centre		Final T No.	Min. Sea Level Pressure (mb)
			°S	°E		
NOAA 5	6762	270023	16.0	114.9	1.5	999
	6775	280136	15.7	111.3	3	994
	6787	290055	16.1	112.6	4	985
	6799	300008	15.7	115.2	4.5	975
	6811	302327	16.8	119.6	5	965
	6824	010036	18.8	121.4	5	965
	6836	012352	20.9	120.3	-	
	6849	030105	23.7	121.0	-	