Australian Government
Bureau of Meteorology

Tropical Cyclone *Nicholas*

11 – 20 February 2008

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A. Summary

A low that developed off the Kimberley coast on 11 February reached cyclone strength late on 12 February. The system experienced a period of weakening during 13 February as it began to move to the south east before re-intensifying to cyclone strength and moving in a south westerly direction, executing a loop in its track.

Nicholas then continued in a south westerly direction, paralleling the Pilbara coastline and intensifying to category 3 strength. *Nicholas* began to weaken to the north of Exmouth before turning to the south and then south east, finally crossing the upper west coast approximately 60 kilometres south southwest of Coral Bay on the morning of 20 February. *Nicholas* was a category 1 cyclone as it crossed the coast and dissipated to below cyclone strength some 6 hours later.

Nicholas was an unusually slow moving system, the average speed of movement until 16 February was between 4 and 10 km/h. In the later stages the speed increased to about 10 to 13 km/h. The system was also a long lived cyclone, lasting 10 days.

Heavy rain fell through the west Gascoyne and Murchison extending into the adjacent Goldfields and northern parts of the South West Land Division. There were scattered falls in excess of 100 mm and Burnerbinmah in the Murchison recorded 203 mm of rain over three days.

Advices were issued for the Kimberley coastline as *Nicholas* formed. The watch/warning area was moved down the Pilbara coastline as *Nicholas* tracked south westerly and FESA issued community alerts for the appropriate communities. The impact to industry was significant with *Nicholas* affecting, at differing times, the entire Pilbara coastline and offshore rigs for a total period of 10 days.

B. Meteorological Description

Intensity analysis

Initially an active trough offshore from the Kimberley coast was evident on satellite imagery during 10 February. By 11 February a circulation could be seen in the convection which continued to develop until cyclone strength was reached by 2100 WDT (1200 UTC) 12 February. Shear analyses show a strong shear gradient to the north of the system with about 35 km/h (20 knots) of NE shear over the centre.

During 13 February a secondary vortex became apparent about 4 degrees to the west of *Nicholas*. This vortex moved northwards for about 12 hours before dissipating but during this time it appeared to have some effect on the intensity of *Nicholas*. *Nicholas* seemed to be developing at a normal rate until the vortex became evident on imagery at 1500 WDT (0600 UTC) 13 February where upon development stopped and the system showed signs of weakening. About 12 hours later the secondary vortex dissipated and *Nicholas* developed a Central Cold Cover (CCC) pattern which generally indicates arrested development. By 0300 WDT (1800 UTC) 13 February *Nicholas* had weakened to below cyclone strength. During the morning of 14 February the CCC pattern weakened and *Nicholas* showed signs of re-intensifying, quickly reaching cyclone strength again by 1500 WDT (0600 UTC) 14 February.

From 14 February *Nicholas* continued to develop despite being under 35 km/h (20 knots) of north easterly shear. Microwave imagery showed a clear low level cloud centre (LLCC) with convection in the western quadrants. During 15 February convection wrapped around the LLCC and a small microwave eye appeared on the 1511 WDT (0611 UTC) 16 February image. A small, ragged eye was also apparent on a single visible satellite image on 16 February (refer Fig. 2). *Nicholas* appeared to reach peak intensity of 150 km/h (80 knots) at this time which it maintained until 1500 WDT (0600 UTC) 18 February. After this *Nicholas* weakened steadily under 35 to 55 km/h (20 to 30 knots) of easterly shear until finally dissipating over land on 20 February.

Motion

Nicholas moved very slowly though most of its lifetime. Initially the steering influence was very weak as *Nicholas* was located between the 500 hPa ridge to the south and the westerlies to the north. During this time *Nicholas* was stationary and then subsequently drifted northwards. During 13 February its motion appeared to be influenced by a secondary vortex to the west and *Nicholas* moved south southeast in response to the other vortex moving northwards. This resulted in *Nicholas* completing a loop.

Once the second vortex dissipated *Nicholas* began to move slowly in a south westerly direction, steered by the 500 hPa ridge. *Nicholas* continued to move south westerly and increased slightly on speed until 18 February when a middle level trough approached the west coast. *Nicholas* then turned southerly and eventually south easterly ahead of the trough before crossing the coast and dissipating.

Structure

Nicholas was an average sized cyclone which experienced moderate to strong shear from the east for its entire lifetime. During its early stages the LLCC was located to the north east of the deep convection and the system was strongly asymmetric. Gales only extended about 55 km (30 nm) in eastern quadrants and 110 km (60 nm) in western quadrants. After *Nicholas* had re-intensified on 14 February the LLCC was more closely associated with the deep convection and the system had well developed spiral bands. The system was still slightly asymmetric with gales extending 130 km (70 nm) in eastern quadrants and up to 220 km (120 nm) in western quadrants. During 15 and 16 February convection became wrapped around the LLCC and a small microwave eye appeared. *Nicholas* became more symmetric until 18 February when shear effects became apparent

again. Microwave imagery showed at times deep convection was in western quadrants only. By the time *Nicholas* crossed the coast nearly all deep convection had dissipated.

C. Impact

Nicholas crossed the upper west coast at Gnarloo Station, about 60 kilometres south southwest of Coral Bay with little impact on communities. However, *Nicholas* had significant impact to industry both along the Pilbara coastline and to offshore operations. Dampier Port was closed for 39 hours and Port Hedland was closed for 56 hours. Many offshore operators were evacuated or put into lock down mode as *Nicholas* passed by. Total losses are estimated to run in the hundreds of millions of dollars.

D. Observations

Wind

Exmouth reported gale force winds for a period of 4 and ½ hours from 0720 to 1150 WDT 19 February.

Rainfall

Burnerbinmah in the Murchison recorded 203 mm of rain over three days.

E. Forecast Performance

Table 2 is a summary of advices issued by Perth TCWC. A watch was first issued at 1000 WDT 10 February for coastal areas between Kalumburu and Mardie. The first warning was issued at 1600 WDT 13 February for the coast between Kuri Bay and Bidyadanga. This warning area was updated in the following days as Nicholas moved to the southwest then south. Once *Nicholas* crossed the coast and weakened below cyclone intensity advices were cancelled at 1500 WDT 20 February.

Table 1. Best track summary for *Nicholas,* 11 – 20 February 2008.

Year	Month	Day	Hour (UTC)	Position Latitude S	Position Longitude E	Position Accuracy nm	Max wind 10min knots	Max gust knots	Central Pressure hPa	Rad. of Gales nm	Rad. of storm force winds	Radius Max. Wind (RMW)
2008	2	11	00	16.0	121.0	60	20	45	996			40
2008	2	11	06	16.0	121.0	60	25	45	996			40
2008	2	11	12	16.0	121.0	60	25	45	994			40
2008	2	11	18	15.9	120.8	60	25	45	994			40
2008	2	12	00	15.8	120.5	60	25	45	992			40
2008	2	12	06	15.6	120.4	60	30	45	990			30
2008	2	12	12	15.1	120.3	60	35	50	986	45		20
2008	2	12	18	14.9	120.3	60	35	50	986	45		20
2008	2	13	00	14.6	120.4	30	35	50	986	45		20
2008	2	13	06	14.7	120.9	10	35	50	986	45		20
2008	2	13	12	14.8	121.4	20	35	50	986	45		20
2008	2	13	18	15.3	121.3	20	30	45	990			20
2008	2	14	00	15.6	121.0	20	30	45	992			20
2008	2	14	06	15.8	120.7	20	45	65	986	89		20
2008	2	14	12	15.9	120.4	20	50	70	978	89	30	20
2008	2	14	18	15.8	119.9	15	50	70	974	88	30	20
2008	2	15	00	15.8	119.8	15	55	80	970	89	40	20
2008	2	15	06	16.0	119.5	15	65	90	964	90	40	20
2008	2	15	12	16.2	119.0	20	65	90	960	105	40	15
2008	2	15	18	16.0	118.6	25	70	100	958	105	40	15
2008	2	16	00	16.4	118.3	15	75	105	956	105	40	15
2008	2	16	06	17.1	118.0	15	80	115	948	98	40	10
2008	2	16	12	17.8	117.2	20	80	115	948	98	40	10
2008	2	16	18	17.6	116.9	20	80	115	948	98	40	10
2008	2	17	00	18.0	116.4	15	80	115	948	98	40	10
2008	2	17	06	18.3	115.8	25	80	115	948	105	40	10
2008	2	17	12	18.6	115.3	20	75	105	956	105	40	10
2008	2	17	18	18.9	114.8	15	80	115	948	113	40	10
2008	2	18	00	19.4	114.4	15	75	105	956	113	40	15
2008	2	18	06	20.0	114.1	20	75	105	956	90	40	20
2008	2	18	12	20.4	113.9	15	60	85	968	90	40	20
2008	2	18	18	20.9	113.5	20	60	85	970	90	40	20
2008	2	19	00	21.5	113.4	20	55	80	970	90	40	20
2008	2	19	06	22.0	113.5	20	55	80	972	90	40	20
2008	2	19	12	22.4	113.6	15	50	70	980	70	30	20
2008	2	19	18	23.0	113.6	15	45	65	980	50		25
2008	2	20	00	23.6	113.7	20	40	55	988	40		30
2008	2	20	06	24.6	114.1	20	35	50	994			40
2008	2	20	12	25.5	114.6	25	30	45	996			

Table 2. Tropical Cyclone Advice summary for TC *Nicholas.*

Date/Time (WDT)	Action	Location
10/2/2008 1000	TC Watch issued.	Kalumburu to Mardie
11/2/2008 1600	Watch area changed.	Kalumburu to Pardoo
13/2/2008 1000	Watch area changed.	Kuri Bay to Pardoo
13/2/2008 1600	Warning issued	Kuri Bay to Bidyadanga
14/2/2008 2200	Warning area changed.	Cockatoo Island to Bidyadanga
14/2/2008 1600	Warning area changed.	Cape Leveque to Bidyadanga
15/2/2008 1000	Warning area changed.	Wallal to Whim Creek
16/2/2008 1600	Warning area changed.	Mardie to Pardoo
16/2/2008 2200	Warning area changed	Pardoo to Exmouth
17/2/2008 0400	Warning area changed	Whim creek to Exmouth
17/2/2008 1600	Warning area changed	Dampier to Exmouth
18/2/2008 0700	Warning area changed	Dampier to Coral Bay
18/2/2008 1000	Warning area changed	Mardie to Minilya
19/2/2008 0100	Warning area changed	Mardie to Cape Cuvier
19/2/2008 1000	Warning area changed	Mardie to Carnarvon
19/2/2008 1300	Warning area changed	Onslow to Carnarvon
19/2/2008 2200	Warning area changed	Exmouth to Carnarvon
20/2/2008 0100	Warning area changed	Coral Bay to Carnarvon
20/2/2008 1500	Warning cancelled	

Figure 1. Track of Tropical Cyclone *Nicholas* 11 – 20 February 2008.

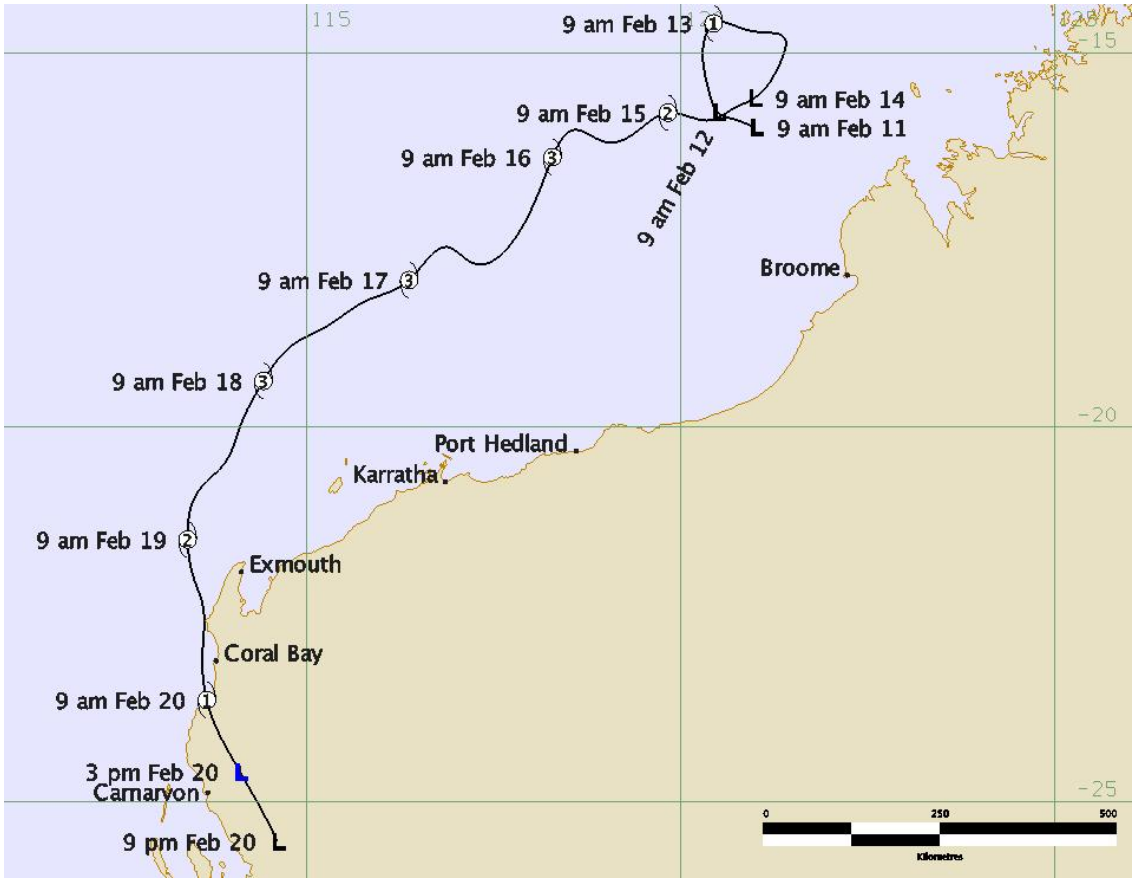

Figure 2. Microwave (85 GHz) image at 1511 WDT (0611UTC) 16/02/2008, near peak intensity.

(Image courtesy of US NRL: http://www.nrlmry.navy.mil/)