= 1960 North Indian Ocean cyclone season =

The 1960 North Indian Ocean cyclone season featured two deadly tropical cyclones that killed approximately 20 @,@ 000 people collectively in East Pakistan (present @-@ day Bangladesh) . The Indian subcontinent divides the North Indian Ocean into two areas : the Bay of Bengal to the east and the Arabian Sea to the west . The official Regional Specialized Meteorological Centre in this basin is the India Meteorological Department (IMD) , while the Joint Typhoon Warning Center releases unofficial advisories . On average , five storms form in the North Indian Ocean every season with dual peaks in activity during May and November . Cyclones that occurred between 45 ° E and 100 ° E were included in seasonal records by the IMD .

Fifteen depressions developed during the 1960 season , with five becoming cyclonic storms . The majority of the activity took place in the Bay of Bengal , where eleven systems formed ; however , the season 's first storm formed over the Arabian Sea on May 10 . The storm produced hurricane @-@ force winds and attained a barometric air pressure of 974 mbar (hPa ; 28 @.@ 77 inHg) . The deadliest and most intense cyclone of the season was Severe Cyclonic Storm Ten , which killed 14 @,@ 174 in East Pakistan in early November . With peak winds estimated at 150 km / h (90 mph) and a pressure of 966 @.@ 7 mbar (hPa ; 28 @.@ 55 inHg) , it struck just three weeks after the previous system devastated the same area . The storm produced a 6 @.@ 1 m (20 ft) storm tide that swept 16 km (10 mi) inland , submerging several small islands . The two storms left a combined 200 @,@ 000 ? 300 @,@ 000 people homeless . These systems marked the start of an unusually active period of cyclones impacting East Pakistan , culminating ten years later with the 1970 Bhola cyclone , which killed between 300 @,@ 000 and 500 @,@ 000 people . During the 1960 season , several depressions impacted India with heavy rainfall . Collectively , these systems killed 167 people .

= = Storms = =

= = = Severe Cyclonic Storm One = = =

On May 10 , an area of low pressure was identified over the Arabian Sea roughly 400 km (250 mi) to the northwest of the Maldives . Moving northwestward , it gradually organized , becoming a depression during by the evening of May 12 . After turning more toward the west , the system continued to slowly deepen . On May 14 , the S.S. Kampala sailed into the system , encountering 55 km / h (35 mph) winds and rough seas . Over the following two days , the depression intensified into a cyclonic storm , with gale @-@ force winds extending 150 km (90 mi) from the center . During the overnight hours of May 16 through 17 , the S.S. Mohammedi sailed almost directly into the center of the cyclone , reporting a barometric pressure of 974 mbar (hPa ; 28 @.@ 77 inHg) and 9 @.@ 1 m (30 ft) waves . Several other vessels , such as the S.S. Saudi and S.S. Exchequer , encountered the storm . Both ships reported hurricane @-@ force winds , and the latter endured seas as high as 15 @.@ 2 m (50 ft) early on May 18 . Later that day , the storm weakened so rapidly the crew of the S.S. Exchequer were able to watch the pressure on their barometer actively rise . Continuing westward , the system degraded to a remnant low before dissipating on May 19 off the coast of Hadhramaut , Yemen .

As a developing cyclone , the system brought monsoon @-@ like moisture to much of the Maldives , Ceylon (present @-@ day Sri Lanka) , and southern India between May 14 and 17 . The heaviest rains fell on May 17 , with 190 mm (7 @.@ 5 in) recorded at Kochi , India , that day .

= = = Deep Depression Two = = =

On May 25 , an upper @-@ level low pressure system developed over the northern Bay of Bengal . The following day , a surface low formed in association with this feature . By May 27 , the low further consolidated into a depression while situated 285 km (175 mi) south of Kolkata , India . Tracking

northward , it intensified into a deep depression before making landfall on the Sundarbans region of West Bengal ? near the border of East Pakistan ? early on May 28 . Though it was classified a deep depression , stronger winds of up to 75 km / h (45 mph) were reported from Sagar Island . Based on measurements from nearby stations , it is estimated that the system attained a minimum pressure of 988 mb (hPa ; 29 @.@ 18 inHg) just as it moved ashore . Once inland , the system quickly weakened and accelerated northeastward . It later dissipated over Assam on May 30 .

The system produced torrential rains across eastern India and East Pakistan . In Cherrapunji , 540 mm (21 in) of rain fell during a two @-@ day span , while many other areas recorded over 100 mm (3 @.@ 9 in) . No rainfall data were available from West Bengal and Assam . Strong winds from the storm destroyed numerous homes in West Bengal , and at least seven people were killed .

= = = Deep Depression Three = = =

On June 29 , a trough , associated with an upper @-@ level low , extended over the northwestern Bay of Bengal . Following a drop in sea @-@ level pressure over the next day , a depression formed in this area . Moving slowly westward , the storm intensified into a deep depression early on July 2 . Shortly thereafter , the system made landfall near Angul , India , and accelerated toward the northwest . The system later dissipated on July 4 over Madhya Pradesh after being absorbed back into the trough that it developed from .

Widespread heavy rains accompanied the depression along portions of the coast from Orissa to West Bengal and as far inland as Madhya . Sagar Island recorded at least 360 mm (14 in) of rain over the span of two days , while Vishakhapatnam received 300 mm (12 in) in just one . As much as 100 mm (3 @.@ 9 in) of precipitation fell across Madhya Pradesh .

= = = Depression Four = = =

On June 26 , a slow @-@ moving trough developed over Gujarat . By July 2 , the system developed into a shallow land depression while situated 80 km (50 mi) north of Veraval . Winds in the area were measured up to 45 km / h (30 mph) ; however , as the system moved offshore , winds quickly increased to 65 km / h (40 mph) . Low pressures were recorded across the area , with a minimum of 990 @.@ 8 mbar (hPa ; 29 @.@ 26 inHg) measured in Dwarka . Becoming nearly stationary off the coast of Gujarat , the depression began to interact with an approaching monsoon . This interaction caused winds to increase , with two vessels reporting 75 km / h (45 mph) winds during the late morning hours of July 4 . Later that day , the system began moving to the northwest and quickly weakened . It was last noted the following day as a dissipating low over the northeastern Arabian Sea .

Between July 2 and 4 , heavy rains amounting to more than 300 mm (12 in) fell across much of the Saurashtra region of Gujarat . These rains triggered severe flooding that killed at least 35 people and left 6 @,@ 000 others homeless . At least 500 homes were destroyed in the region .

= = = Depression Five = = =

On August 6 , a westward moving area of low pressure was identified over Burma . Initially an upper @-@ level system , it gradually propagated to the surface , becoming a depression on August 9 . Tracking west @-@ northwestward , the system crossed the Indian coastline later that day near Balasore , where a pressure of 996 @.@ 1 mbar (hPa ; 29 @.@ 42 inHg) was measured . Sustained winds reached just 30 km / h (15 mph) . Once onshore , the depression degenerated into a remnant low on August 10 . The remnants continued northwestward , ultimately merging with a trough over Uttar Pradesh on August 12 .

The depression dropped heavy rains over parts of India between August 8 and August 14 . The highest totals were recorded on August 14 when 240 mm (9 @.@ 4 in) of rain fell in Jhansi . Significant flooding took place along the Ganges River as a result of the rains . Forty villages along the river near Fatehgarh were inundated .

= = = Deep Depression Six = = =

As the previous depression dissipated over India , a new circulation developed over the Bay of Bengal on August 12 . This system quickly became a depression . Moving slowly northwestward , it became a deep depression on August 14 before making landfall in the Sundarbans region . Winds up to 45 km / h (30 mph) were reported in Sandheads . Once onshore , it turned westward and slowed while maintaining its intensity . The system finally weakened on August 18 as it resumed moving northwestward again , and two days later it dissipated over southeastern Rajasthan .

Large portions of India were affected by rains from the depression , with Orissa and Madhya receiving the heaviest rains . According to Prime Minister Jawaharlal Nehru , up to 1 @,@ 000 mm (40 in) of rain fell across portions of Orissa . The tremendous precipitation triggered disastrous floods that killed at least 65 people . Continued rains over the next two weeks exacerbated the situation and by August 30 , an estimated 2 @.@ 5 million people were homeless . Most affected were areas around the Mahanadi River and its tributaries where flood waters reached 3 @.@ 7 m (12 ft) in depth . At least 85 villages were reportedly destroyed . Orissa government officials described the disaster as " the worst in living memory . " Rail lines and roads were severely damaged across the state , hampering initial relief efforts . A total of 1 @.@ 87 million acres of crops were flooded and overall damage amounted to ? 112 million .

= = = Depression Seven = = =

On August 20 , a wave of low pressure formed over Burma . Moving westwards , this upper @-@ level system triggered the development of a surface low two days later over the Bay of Bengal . Turning northwestward , the low consolidated into a depression by August 24 before making landfall in the Sundarbans region later that day . Once onshore , the depression degenerated into a remnant low ; the remnants persisted until August 28 when they were absorbed into a trough over Rajasthan Pradesh .

Heavy rains affected much of Bihar , Madhya Pradesh , Punjab , and Uttar Pradesh . The highest daily precipitation total was measured in Ghatsila at 190 mm (7 @.@ 5 in) . These rains triggered severe flooding along the Beas , Ganges , Jamuna , and Sutlej rivers . Large areas of Uttar Pradesh were left submerged , and significant crop and property damage took place in Punjab . At least 55 people were killed in Punjab alone , and losses overall amounted to $ 9 @.@ 24 million (1960 USD) .

= = = Deep Depression Eight = = =

On September 22 , an area of low pressure was identified over the Andaman Sea . Tracking northwestward , the system consolidated into a depression two days later over the Bay of Bengal . During the evening of September 24 , it further strengthened to a deep depression , with winds of 55 km / h (35 mph) . Early the next day it made landfall in Orissa between Balasore and Chandabali . Once onshore , the system slowed and turned northeastward . It later dissipated over Nepal on September 28 as it interacted with the Himalayas .

Heavy rains accompanying the depression affected much of Bihar , Orissa , and West Bengal . Many areas recorded more than 200 mm (7 @.@ 9 in) during a four @-@ day span ; the highest single @-@ day total was 270 mm (11 in) in Bahadurganj .

= = = Severe Cyclonic Storm Nine = = =

In late September , a tropical storm developed over the South China Sea . Striking Vietnam , the storm slowly moved over Indochina , ultimately crossing 100 ° E and entering the basin on October 5 while over Thailand . After crossing southern Burma , the low moved northwestward over the Bay of Bengal and reorganized . Following a report of 45 km / h (30 mph) winds from the S.S. Glenpark

on October 8 , the system was classified as a depression . Moving slowly northwestwards , the system further deepened into a cyclonic storm on October 9 . Several ships in the path of the storm recorded gale @-@ force winds , depicting its strengthening . Early on October 10 , it became a severe cyclonic storm and soon reached its peak intensity with winds of 110 km / h (70 mph) . Its central pressure at this time was estimated to be 986 mbar (hPa ; 29 @.@ 12 inHg) . The National Oceanic and Atmospheric Administration (NOAA) estimated that the storm attained one @-@ minute sustained winds of 155 km / h (100 mph) . Turning northeastward , the system made landfall between Barisal and Noakhali in East Pakistan , with the eye passing directly over the islands of Bhola , Hatia , and Ramgati . Once onshore , the system quickly weakened and ultimately dissipated over Assam early on October 12 .

Across coastal areas of East Pakistan , the storm wrought catastrophic damage . A 5 @.@ 8 m (19 ft) tidal surge washed over the islands of Hatia , Sandwip , Kutubdia . Communications across the region were crippled , and it took six days for word of the scale of damage to reach officials . Entire villages were reportedly wiped out by the storm . Approximately 35 @,@ 000 homes were destroyed , most of which were thatched huts made of bamboo and mud . About 300 schools were also damaged . The worst damage took place on Ramgati Island where 3 @,@ 500 people were killed . Roughly 95 percent of the island 's structure were destroyed , forcing residents to cling to trees for survival . Only two police officers survived and were able to inform government officials of the disaster . An estimated 6 @,@ 000 people perished while another 100 @,@ 000 were left homeless . Heavy rain accompanied the storm , with Cox 's Bazar reporting 180 mm (7 @.@ 1 in) . Relief efforts in the wake of the storm were hampered by the nation 's poor infrastructure and debris left behind . On October 18 , members of the East Pakistani military were deployed to the hardest hit areas to provide stable communication and clean drinking water .

= = = Severe Cyclonic Storm Ten = = =

On October 26 , a trough formed over the south Andaman Sea and extended into the southern Bay of Bengal . By October 28 , the system consolidated into a depression as it moved northwestward . Steadily intensifying , several ships encountered the storms increasing winds as it moved northward in the Bay . On October 30 , it attained gale @-@ force winds and further became a severe cyclonic storm early the next morning . During the evening of October 31 , the IST Barisal recorded winds of 130 km / h (80 mph) , indicating that the system had acquired a core of hurricane @-@ force winds . The maximum winds of this system is unknown , though reports indicated that winds peaked between 150 and 215 km / h (90 and 135 mph) . NOAA estimated that the storm peaked with one @-@ minute sustained winds of 195 km / h (120 mph) and a pressure of 966 @.@ 7 mbar (hPa ; 28 @.@ 55 inHg) . The storm soon made landfall with great intensity near Noakhali , East Pakistan , just three weeks after the previous storm devastated the country . Once onshore , cold , dry air quickly wrapped around the backside of the cyclone . Within four hours of landfall , little rainfall was reported near the storm 's eye . The cyclone rapidly weakened and dissipated the following day over the Lushai Hills .

Striking East Pakistan as a powerful storm , the system produced a storm tide of 6 @.@ 1 m (20 ft) that moved 16 km (10 mi) inland , devastating many communities . A storm surge of 6 @.@ 7 m (22 ft) was measured in Halishahar . In addition to the surge , there was a series of tidal waves that followed the storm , causing additional damage . Offshore , these waves were estimated at 12 @.@ 2 m (40 ft) ; though they significantly decreased before impacting land . Cittagong and surrounding communities were regarded as the hardest hit , with most being submerged in 3 m (10 ft) of water . The city 's port was largely destroyed , with almost every vessel washed ashore . Some were found 16 km (10 mi) away and one even at another port . The storm 's intense winds , estimated as high as 240 km / h (150 mph) on Sandwip Island , leveled buildings and scattered debris over large distances . Crops were flattened by the storm and in some instances had been " burnt " by the sheer force of the wind . A total of 14 @,@ 174 people perished in the storm while another 200 @,@ 000 were left homeless . Following the mass casualties from the two storms , the Government of Pakistan requested the assistance of former National Hurricane Center director , Gordon E. Dunn ,

to improve the warning system .

= = = Depression Eleven = = =

On November 5 , an area of low pressure was identified over Lakshadweep . Tracking generally northwestward , it gradually organized into a depression by November 7 . No further development took place over the following days and the system eventually degraded into a remnant low on November 10 . Though the storm itself did not impact land , associated moisture combined with a low over the Bay of Bengal to produce heavy rains across Madras State and nearby islands from November 5 to 10 .

= = = Shallow Depression Twelve = = =

On November 7 , an area of low pressure over the Bay of Bengal formed and gradually moved towards India . By November 9 , it was located just of the Coromandel Coast . The following day , it deepened into a depression while situated off the northern edge of Ceylon . Becoming nearly stationary , the system failed to develop and soon weakened into a remnant low . The low dissipated early on November 12 . Heavy rains fell across much of Madras State in association with the system ; a 24 ? hour total of 240 mm (9 @.@ 4 in) was reported in Nagapattinam . These rains triggered significant flooding that disrupted travel and communications . Severe damage took place in Madurai where 10 @,@ 000 people were left homeless . Overall , five people were killed and 150 @,@ 000 were left homeless .

= = = Cyclonic Storm Thirteen = = =

On November 14 , an area of low pressure formed to the west of Lakshadweep . Tracking generally westward , it eventually developed into a depression three days later . Gradual intensification took place over the following two days , with the system becoming a cyclonic storm on November 19 . On November 20 , the system attained its peak intensity with winds of 75 km / h (45 mph) and a minimum pressure of 994 mbar (hPa ; 29 @.@ 36 inHg) . Continuing westward , the cyclone entered the Gulf of Aden on November 22 before becoming nearly stationary . During this time , it weakened to a depression before dissipating the following day .

= = = Cyclonic Storm Fourteen = = =

A well @-@ defined area of low pressure was identified over the southwestern Bay of Bengal on November 17 . The following day , the system developed into a depression as it moved slowly northwestward . On November 20 , as it neared the coast of Tamil Nadu , it intensified into a cyclonic storm , with gusts estimated as high as 135 km / h (84 mph) . Shortly thereafter , it made landfall near Chennai . In nearby Tambaram , a pressure of 995 @.@ 7 mbar (hPa ; 29 @.@ 41 inHg) was recorded , the lowest in relation to the cyclone . A small storm , it quickly weakened once onshore and was last noted early on November 21 as a dissipating low .

Heavy rains impacted most of southern Madras State , with a maximum daily total of 110 mm (4 @.@ 3 in) in Punalur . The most significant damage took place in Madras City where gale @-@ force winds uprooted trees and disrupted transport and communications . Many poorly constructed homes were damaged or destroyed by the storm , leaving numerous low @-@ income families homeless .

= = = Depression Fifteen = = =

On November 24 , the S.S. Rajula sailed under a well @-@ defined trough over the southwest Bay of Bengal and reported 55 km / h (35 mph) winds . Two days later , a tropical wave interacted with the system and resulted in the development of a depression . Over the following several days , the

system drifted northwestward without change in intensity . By December 3 , it degenerated into a remnant low , ultimately tracking over southern India , near Circars , on December 4 before dissipating . The system brought locally heavy rains to parts of the Andaman Islands and Andhra Pradesh .

= = Season effects = =

This is a table of all storms in the 1960 North Indian Ocean cyclone season . It mentions all of the season 's storms and their names , durations , peak intensities (according to the IMD storm scale) , areas affected , damages , and death totals . Damage and death totals include the damage and deaths caused when that storm was a precursor wave or extratropical low , and all of the damage figures are in 1960 USD .