

## Brace for more cyclones as Arabian Sea heats up

JITENDRA CHOUBEY @ New Delhi

THE recent cyclone first detected on June 5 entered the record books as the longest-ever in documented history of the Arabian Sea. On June 6, it was ominously named Biporjoy, which means calamity in Bengali. Categorised as a very severe cyclone, it had a total life span of 13 days and three hours. The average life of a cyclonic storm of this category during monsoon over the Arabian Sea is six days and three hours.

Among the longer ones was the extremely powerful cyclonic storm Kyarr (October, 2019) over the Arabian Sea that had a life span of nine days and 15 hours. The longest duration of a cyclone was over the Bay of Bengal 46 years ago. It had a span of 14 days and six hours in November 1977 in the North Indian Ocean region, which includes the Bay of Bengal and the Arabian Sea. Scientists largely attribute the extended span of cyclones to the sea surface temperature (SST) going up due to global warming.

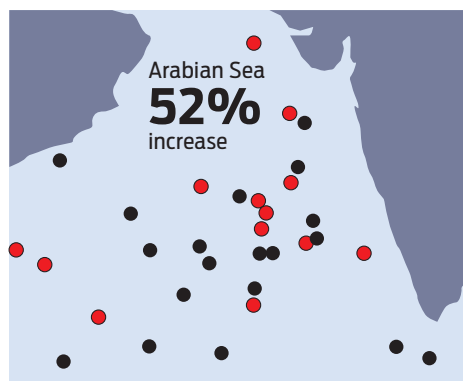
In many ways, Biporjoy caught many Indian scientists by surprise. Besides the longest span, it developed during the onset phase of the Southwest monsoon. It was also recurving, as it changed its path nine times and covered 2,525 km (depression to depression) before making landfall near Jakhau port in Gujarat.

### Rising waves in Arabian Sea

According to the IMD, about 66 cyclonic storms (with Maximum Sustained Wind  $\geq$  62 kmph) developed over the Arabian Sea during 1965-2022. Of them, eight crossed the Gujarat coast during the period.

A 2021 study on the 'Changing status of tropical cyclones in the North Indian Ocean', found that the frequency, duration and intensity of cyclones in the Arabian Sea have increased significantly. There has been a 52% increase in the number of cyclones in the Arabian Sea, while 'very severe cyclones' have increased by 150%. Moreover, the intensity of cyclones has increased in the Arabian Sea by about 20% (post-monsoon) to 40% (pre-monsoon).

Further, there has been an 80% increase in the total duration of cyclones in the Arabian Sea during the last two decades. The



● pre-monsoon ● post-monsoon

duration of very severe cyclones has increased by 260%.

Increase in cyclones in the Arabian Sea is a matter of concern, as the region feeds moisture to the Southwest monsoon, which is the backbone of the economy. Since cyclones take away the moisture, they end up weakening the monsoon.

This year, El Nino, a condition characterised by warm waters in the Pacific that weaken the monsoon, has already got stronger, further negatively impacting the monsoon.

"This time, a weak and delayed monsoon onset, along with an exceptionally warm Arabian Sea, made it favourable for the formation of Cyclone Biporjoy. The Arabian Sea surface temperatures were 2-4°C above normal, supplying extra heat and moisture necessary for an intense cyclone," said Dr Roxy Mathew Koll, Climate Scientist at the Indian Institute of Tropical Meteorology

### Weakening of monsoon

Climate change has been causing a rise in cyclogenesis in the Indian Ocean, resulting in the weakening of monsoon. The threshold value for the formation of a cyclone is 28 degree Celsius, but at the time of Biporjoy cyclogenesis, the SSTs were in the range of 30-32 degrees Celsius. Scientists attribute it to rising ocean heat due to climate change.

Also, the accumulated cyclone energy (ACE)—a measure of the total wind energy during a cyclone's lifetime in the Arabian Sea has almost tripled. It adds to the cyclone's disaster potential after landfall.

## Long cyclones tied to climate change

THE North Indian Ocean surface is getting warmer, creating favourable conditions for severe cyclones, especially over the Arabian Sea. Dr Roxy Mathew Koll, Climate Scientist at the Indian Institute of Tropical Meteorology, explains the phenomenon to Jitendra Choubey. Excerpts:

● **As Cyclone Biporjoy was recurving, it was relatively difficult to predict its path. How do you explain it?**

The upper-atmospheric winds mostly steer the path of a cyclone. It is not clear if climate change has any direct impact on the steering winds in the Arabian Sea. However, the warm sea surface temperatures and high moisture supply that kept the cyclone alive for a longer time is due to the ocean warming in response to climate change.

● **Why is there a significant change in the duration, intensity and accumulated cyclone energy (ACE) of cyclones in the Arabian Sea but not in the Bay of Bengal?**

Generally, we used to have one cyclone every two years in the Arabian Sea and three-four cyclones every year in the Bay of Bengal. Now, due to ocean warming, the frequency and intensity of cyclones have increased in the Arabian Sea, while it has remained almost the same in the Bay of Bengal. Another factor is that the

amount of moisture available in the mid-troposphere over the Bay of Bengal has slightly decreased.

● **The speed of cyclone movement in the Arabian Sea has decreased. Why?** We know that cyclone translation speed has decreased in the Arabian Sea, and the cyclones feed on warmer ocean temperatures. But we do not clearly understand why they are moving slowly. This might be related to the upper-atmospheric winds that steer the cyclones.

● **Does climate change cause stronger El Nino conditions? Is rising SST contributing to El Nino?** El Niños' frequency remains the same—they appear every 5-7 years, but due to climate change, El Niños are now becoming stronger. An El Niño generally weakens the

trade winds, dampens the monsoon circulation, and gives reduced rainfall to the Indian subcontinent—similar to what is happening right now.

● **Does climate change shape the duration of cyclones in Arabian Sea?**

The lifespan of cyclones in the Arabian Sea has increased by 80% in the past four decades. This is largely attributed to the warming of the Arabian Sea. Cyclones derive their source of energy from the warm tropical waters. Now with exceptionally warm waters in Arabian Sea, these cyclones can stay alive for long.



**INTERVIEW**  
DR ROXY MATHEW KOLL

### Reference:

Deshpande M., Singh V. K., Ganadhi M. K., Roxy M. K., Emmanuel R., and Kumar U. (2021). **Changing status of tropical cyclones over the north Indian Ocean.** *Climate Dynamics*, 57, 3545-3567.