

A CLIMATOLOGICAL STUDY ON THE LANDFALLING TROPICAL CYCLONES OF BANGLADESH

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1. INTRODUCTION

Bangladesh lying between 20°34' N and 26°38' N latitude, and with a 724 km long coast line is highly vulnerable to tropical cyclones and associated storm surge. Bangladesh has experienced two of the most deadly cyclones of the last century, one was in 1970 and the other was some 20 years later in 1991. The former was the deadliest in the cyclone history with death count reached over 300,000. Bangladesh is the most densely populated country of the world with a density of 2,200 people per square mile, and most of the people are very poor. So, it is understandable that a large number of people inhabit the coastal areas and these people are always affected by windstorms and storm surge with lesser resilience due to poverty aggravates the situation. Unfortunately, there is a dearth of climatological studies on tropical cyclones for Bangladesh. Sircar(1956), Raghavendra(1973) and Mooley(1980) did some studies on the Bay of Bengal which include the Bangladesh coast. The present study aims to develop a comprehensive landfalling tropical cyclone climatology for Bangladesh.

2. DATA RESOURCES

The Indian Meteorological Department and Indian scholars have done most of the research on the Bay of Bengal and North Indian Ocean. But this research was exclusively done (except a few mentioned above) for the Indian coast of the Bay of Bengal. So, not enough data were found from this research about the landfalling cyclones in Bangladesh. Although the Indian Meteorological Department keeps a record of cyclone

data and tracks for North Indian Ocean which includes of course the whole Bay of Bengal, the data is not easily obtained. It is not clear whether Bangladesh Meteorological Department has the records of land falling tropical cyclones in the Bangladesh coast, as they did not respond to emails and no literature has been found mentioning them as a source. So, the Joint Typhoon Warning Center (JTWC) at Guam is the only other source that keeps record for that area and gives it free of charge for the users. Using their data and some from National Hurricane Center, Fleet Numerical Meteorology and Oceanography Detachment (FNMOC) prepared an online version software-Global Tropical Cyclone Climatic Atlas (GTCCA Version 1.0), where all tropical cyclone data and tracks are listed for all the basins from as early as 1842. In this climatological study this website was being used as the primary source of data. These data were validated by the database of the Unisys Corporation, which also uses the same source, JTWC.

3. ORGANIZATION OF DATA

A database of landfalling tropical cyclones of Bangladesh from 1877-2001 has been developed. For the interest of this study, the coast of Bangladesh is divided into five parts where the landfalling locations are assigned. Landfalling locations are shown in Fig. 1. The locations of landfall are identified from the latitude/longitude data of the cyclone tracks by the author.

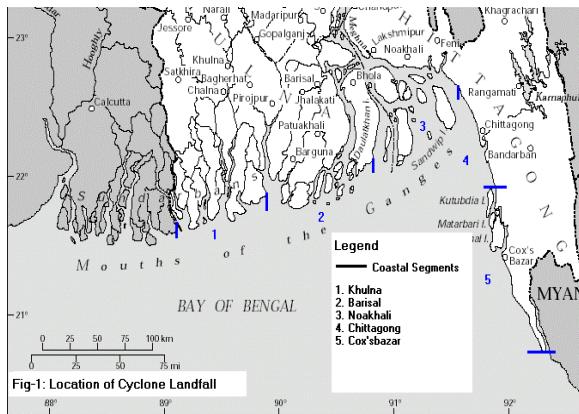
Landfalling Cyclonic Storms

Depression	42
Tropical Storm	57
Hurricane	34

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4. DATA ANALYSIS AND DISCUSSION

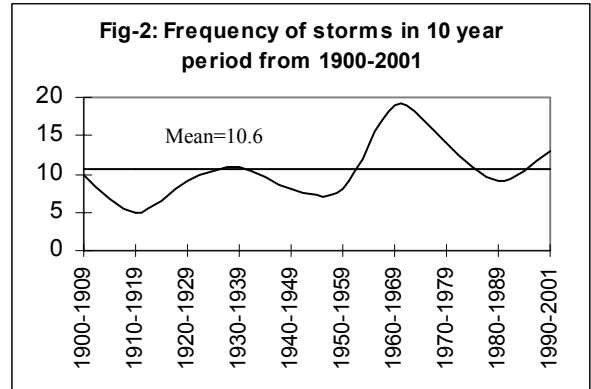
A total of 133 tropical cyclones hit the coast of Bangladesh from 1877-2001 of which 42 are tropical depressions, 57 are tropical storms and 34 reached hurricane intensity. The rate of tropical cyclones which hit the coast per 10 year in the last century (1900-2001) is 10.6 (Fig. 2), which is a rate of 1.06 per year. Since 1950, the rate of landfalling tropical cyclones in this area has increased. The rate is 1.26 per year for 1950-2001. Fig. 2 shows that the rate has vacillated in the last century. The first rise was from 1920 up to 1939. The second was from 1959 up to 1969. We are now in an increasing trend again.



Landfalling Locations	Number
Khulna	45
Barisal	33
Noakhali	18
Chittogong	28
Cox's Bazar	9

That 33% of the total cyclones between the period 1877-2001 hit the Khulna coast which is in the south west corner of Bangladesh and the Sundarbans- the largest mangrove forest in this part of the world situated here. 25% of the cyclones hit the Barisal coast and 21% hit the coast of Chittagong.

Barisal and Chittagong coasts faced large number of deaths mainly because of the two deadliest cyclones respectively in 1970 and 1991. In reality,



deaths were also encountered in others coasts as well because of these two hurricanes, as they were very synoptic; but in this study they are arranged according to the locations of cyclone landfall. The highest number of cyclones (45) hit the Khulna coast but compare to that it faced much less deaths than the other coasts. The reasoning behind this is the location of the Sundarbans forest in this coast. This depicts the importance of effective land-use to reduce hurricane damage. If the other coasts would have such green belt then the deaths might also be dwindled.

Cyclonic disturbances are nearly absent in January, February and March and frequently occur during the pre and post monsoon seasons with continuing some activities also in the monsoon period. The frequency being highest in October and May obviously are the peaks of the hurricane seasons. During the months of April-May before the start of the monsoon season and during months of October-November, after the monsoon, the average sea surface temperature in the Bay of Bengal region rises to around 27° C and the weather conditions become ideal for the formation of tropical cyclones. So, most hurricanes form around these seasons. Out of the 34 hurricanes found in this study, 25 of them (74%) struck during these months. So, based on that we can define two hurricane seasons in a year- pre monsoon and post monsoon.

5. REFERENCES: available on request.