



AN INTRODUCTION TO LAW OF STORM

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Abstract

In the early nineteenth century, little was known about these violent tropical storms, except that they wrecked ships on the high seas and caused untold destruction and loss of life while crossing the coastline. Henry Piddington was a captain in the English merchant ship, which sailed to the East Indies and China, and later settled in Bengal, where he worked as the Keeper of the Geological Museum and worked on scientific problems, and is especially known for his pioneering research in meteorology of tropical storms and hurricanes. He noted, circular winds recorded ships caught in storms and coined the name cyclone in 1848 on the basis of his studies of tropical storms and the observation of the circular winds around a calm center. In 1833 took a cyclone hit Calcutta and Piddington is of little interest to him, but in 1838 he came upon the "Law of storms",

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INTRODUCTION

Research on tropical cyclones began within the world of Indo-European commercial enterprise in the early nineteenth century. The European knowledge served navigation in the Bay of Bengal, and was meant to offer sailing ships practical ways to avoid rotating seasonal storms. Indian meteorology in this time did not deal with oceanic events. The rules and precepts that constituted indigenous meteorology addressed mainly prediction of the monsoons, and were partially moralistic and astrological. Although based on the experience of mariners, the new knowledge was codified by officers. Meteorology was neither an academic discipline nor an administrative office at 1800. But the form of a scientific exchange and an indirect link with the government were followed. In the early nineteenth century, little was known about these violent tropical storms, except that they wrecked ships on the high seas and caused untold destruction and loss of life while crossing the coastline.

PIONEER METEOROLOGIST IN INDIA

Piddington was the second son of James Piddington of Uckfield, was bred in the mercantile marine, apparently in the East India and China trade, and was for some time commander of a ship. Piddington, Henry (1797-1858) a British-Indian scientist and meteorologist, began his career as a trainee and later as a commander in the marine service in East India and China. Sometime in 1830, he settled in Calcutta and pursued a career in science, having been associated with different scientific bodies of this newly growing city¹.

CONTRIBUTION OF HENRY PIDDINGTON

Piddington was engaged in scientific research in varied disciplines like botany, geology, mineralogy and soil chemistry, besides of course meteorology. He

published numerous papers in the Journal of the Asiatic Society of Bengal. He was also the Secretary of the Agri-Horticultural Society of India at Calcutta. About 1830, he retired from the sea, being appointed curator of the Museum of Economic Geology in Calcutta, and sub-secretary of the Asiatic Society of Bengal. In 1831 and the following years he published several short geological or mineralogical notes in the 'Journal' of the society, and in 1839 began a series of memoirs on the storms of the Indian seas, which was to lead to very positive results. His attention had been forcibly called to the subject while at sea, by the ship he commanded being dismasted in a storm, and saved only by the fortunate veering of the wind; Inspired by the great British meteorologist William Reid and the publication of 'Law of Storms' in 1838 gave him the clue for which he had been seeking. His attention to the science of weather and especially storms of the seas had been drawn when he was in the marine service. Piddington began to collect, with the support of the Government of India, massive data relating to hurricanes, gales and violent windstorms².

He immediately began collecting logs and information from different ship-captains, who, as yet unable to understand his aims, were not always complaisant or even civil. However, his labours received a semi-official recognition from the government of India, which, on 11 Sept. 1839, issued a formal notice inviting observations on 'any hurricane, gale, or other storm of more violence than usual.' 'A scientific gentleman in Calcutta,' it continued, 'has obligingly undertaken to combine all reports that may be so received into a synopsis for exhibition of the results;' and such reports, marked 'Storm Report,' might be sent, post free, to the secretary of the government.

COIL OF THE SNAKE

The word has struck fear in the hearts of many facing its fury. For others, it means only a swirl of counter clockwise winds around the low pressure center. It surfaced in the Indian city of Calcutta in the mind of an Englishman. In the early nineteenth century, little was known about these violent tropical storms, except that they wrecked ships on the high seas and caused untold destruction and loss of life while crossing the coastline. But there was one man who had unravelled their structure and visualized their rotating nature. While serving as President of the Marine Court of Calcutta, Henry Piddington, a former sea Captain, studied the stormy weather of the Indian Ocean. He had particularly focused on the devastating tropical storm of December 1789 that inundated the coastal town of Coringa with 3 monstrous storm waves that killed more than 20,000.³ By virtue of his duties dealing with the affairs of storm-damaged ships, he had access to the logs of almost all of those that had been caught in a storm and survived. He copied the position, pressure, and wind data contained in the logs, and combined them with observations taken on the coasts. The logs contained a great deal of visually descriptive data. Captains wrote in their reports accounts of waterspouts, the 'ragged edged' clouds, and the 'small storm', that had a shorter physical and temporal span but with great force.⁴

In the presentation to the Asiatic Society of Bengal around 1840 Piddington described that 1789 storm as a 'Cyclone' a storm derived from the Greek word 'Kyklon' which means moving in a circle, like the 'Coil of the snake'.⁵ The air, flow in association with cyclone and the spirally shaped cloud bands resembles the coil of a few snakes. This spiral shape of the cloud bands was first noticed by Piddington on an examination of several cloud and wind reports from ships which encountered cyclonic storms in the Bay of Bengal. The name which is very much supported by the present day satellite cloud images and radar echoes, with their spiral bands spread with gaps, thus resembling the coil of a snake.⁶

CYCLONE VS. TYPHOON VS. HURRICANE: ARE THEY ALL THE SAME?

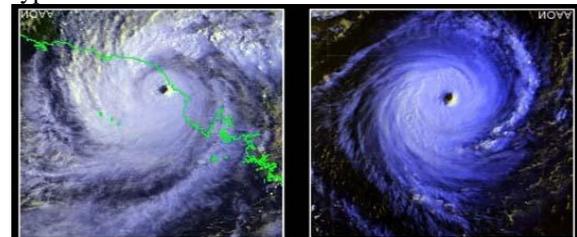
Cyclones occur in different parts of the tropical oceans. They bear different names. There is no difference between hurricanes, cyclones and typhoons. In Phillippines baguoi, in Japan Reppu, and asifa-t in the Persian Gulf, willy-willy in Australia⁷. While their names are varied, all tropical cyclones are essentially similar in origin, structure, and behavior.⁸ Piddington accumulated a vast amount of detailed information, the discussion of which was from time to time published in the 'Journal of the Asiatic Society.' In 1844 he collected the results in a small book, little more than a pamphlet, entitled 'The Horn-book for the Law of Storms for the Indian and China Seas.' Written by a seaman for seamen, it dealt with the subject in a thoroughly practical way, which won the confidence of the shipping world, and probably

obtained for its author the appointment of president of the marine court of inquiry at Calcutta. Shipping practitioners throughout the world acclaimed this work and its author was appointed President of the Marine Court of Inquiry in Calcutta⁹.

THE SAILOR'S HORN-BOOK FOR THE LAW OF STORMS

In 1848 he published an enlarged version of this book, *The Sailor's Horn-book for the Law of Storms*. This book was a great success and it immediately became the only recognised textbook on the subject¹⁰. Piddington introduced the word in 1848 the mariners' book, *The Sailors Horn Book for the law of storms* whose purpose was to explain to mariners the theory and practical use of the Law of Storms.¹¹ In the book he hoped the new word would help clear any confusion among mariners. As a practical manual it had a great and deserved success, ran through six editions, and continued to be, within its limitations, the recognised text-book on the subject for over thirty years.¹² It was in the first edition of this book (1848) that Piddington proposed the word 'cyclone' as a name for whirling storms; not, he said, 'as affirming the circle to be a true one, though the circuit may be complete, yet expressing sufficiently the tendency to circular motion in these meteors'¹³.

The term slowly gained currency, and by 1856, was being used in many parts of the world for any kind of a storm. The name was accepted by meteorologists. Piddington received an appointment as coroner, which he held till his death, at Calcutta, on 7 April 1858, aged 61.¹⁴ In 1875, the international meteorological community adopted the term to describe a low pressure system with a counter clockwise wind field. The cyclones whirl anticlockwise in the northern hemisphere and clockwise in the southern hemisphere.¹⁵ Today, however, tropical cyclones are called by this original name only in India and the adjoining seas, Arabian Sea, Bay of Bengal, and the Indian Ocean. Over other oceanic basins, they are now commonly known as hurricanes or typhoons.



The storm shaped like a coiled snake

PIDDINGTON'S SECOND BOOK ON HURRICANES

Another book in 1852, entitled 'Conversations about Hurricanes: for the Use of Plain Sailors' was all written in the style of a ship's captain training an apprentice sailor, about how to deal with storms, how to know that they are approaching, and how to take advantage of them. The books included transparent storm

cards with wind arrows that could help the captain of a ship caught in a storm to sail with the wind into safer waters.¹⁶

Piddington wanted to teach mariners how to avoid the storm's full-on winds, how best to sail within them when unavoidable, and how to profit from the tempest by using its fringe winds to speed the ship onward. The book included two transparent horn cards, one for counter-clockwise winds for the Northern Hemisphere, one for clockwise winds for the Southern Hemisphere that had wind arrows drawn on them indicating which wind direction would be blowing around the storm. The captain placed the card on his chart, matching the chart's wind arrow with the currently observed wind direction. The card now indicated the wind directions relative to the storm's center. With these cards, mariners had the hurricane in their hand. 'The Sailor's Horn Book' became an immediate and lasting success; for many years, the only recognized textbook on marine storms.¹⁷

PORT CANNING AND PIDDINGTON

Piddington was among the earliest to recognize that a cyclone wreaks most of its damage not through wind but through water, by means of the devastating wave that is known as a "storm surge." In 1853, when the British colonial authorities were planning an elaborate new port on the outer edge of Bengal's mangrove forests, he issued an unambiguous warning: "Everyone and everything must be prepared to see a day when, in the midst of the horrors of a hurricane, they will find a terrific mass of salt water rolling in ..." His warning was neglected and Port Canning was built, only to be obliterated by a cyclonic surge in 1867. His warning that the location of the port would make it highly susceptible to cyclone damage went unheeded. Port Canning, which was built to rival Bombay and Singapore, was completely swamped in 1867 and finally, abandoned five years later.

The investigations thus made were of immense use and all the results were consolidated, scrutinized and the findings were published by Piddington, as a book entitled "Piddington's Law of Storms".¹⁸ Though a few copies of it were sent to the Madras Literary Society, none of them is extant today. By using the observations and analyses, the storm tracks and epicenters of storm could be located and this breakthrough was of immense use to ships, which avoided the route or deferred the sailing till the weakening of the storm.

Meteorological experts and engineers published articles in the Royal Society proceedings. Scientific study of clouds and a better knowledge of marine geology joined hands with meteorology in creating this new field. An example of the convergence between artisanal knowledge of storms and the new scientific discipline was the cyclone research conducted by Henry Blanford, the first 'meteorological reporter' of the Government of India, and his successor John Eliot. Blanford was a geologist and mining surveyor, as well as

teacher at the Presidency College of Calcutta in the year of the Calcutta cyclone of 1864.

KNOWLEDGE OF THE LAW OF STORMS

The Law of storms offers a kind of knowledge to the seaman regarding storms. First, the best chance of avoiding the most violent and dangerous part of a hurricane, which is always near the centre of it; next, the safest way of managing his vessel, thirdly, the means of profiting by a storm. On ships at sea passing through tropical cyclones, changes in direction and force of the wind are fully understood. Knowledge of the law of storms is an essential part of the education of ships officers. To the landsman who experiences a tropical storm, the direction from which the wind blows, in relation to the position of the storm center, is sometimes puzzling. After the wind blows from one general direction for a considerable time, increasing in force, a calm succeeds, followed by a violent wind from nearly the opposite quarter. It simply means that the storm centre has passed over the place. Nevertheless, it is frequently said that the "storm came back." When the wind blows from northeast toward the southwest, the conclusion is that the storm is coming from the northeast and moving toward the southwest. When the southwest wind succeeds the calm, the conclusion is that the storm has come back and is now moving from southwest to northeast. Such conclusions are altogether erroneous. In order that seaman might easily understand and anticipate the changes in wind during the rather complex combined movements of ship and storm, Piddington used the "horn card". In the Southern hemisphere, of course, the winds turn in the opposite direction. To apply the principle of the "horn card" to the landsman's purposes is very simple.¹⁸ The dangers to a vessel in a hurricane storm (cyclone) are three, the veering of the wind; the excessive violence of it near the centre; and the sudden calms and shifts and awful sea at the centre. All these involve, damage and loss by dismasting, straining, leaks, and distress of various kinds.

"OUR NEW SCIENCE OF CYCLONOLOGY"

Piddington's mode of analysis proved to be enduring. A later work remembered him as one 'who has for a number of years conferred so much benefit on the navigation of the Indian seas by collecting facts illustrative of the laws of circular storms and by producing knowledge by which to avoid their dangers. From the 1860s, the set of artisanal guidelines that Piddington had called 'our new science of Cyclonology' were beginning to be absorbed within scientific meteorology.

All the reports on weather and tides were consolidated and preserved in London for the purpose of research on storms. In addition, the logbooks of ships were also kept for reference. When the government started evincing keen interest in the logbooks for meteorology, the captains of the vessels also bestowed much care in recording the log books. While so much of

improvement was made in the logbooks of ships, one more improvement was also suggested. Small charts showing the tracks of ships were required to be incorporated in the logbooks. For this purpose it was suggested that blank charts might be furnished, so that it would be easy for the captains to make entries and submit the same to the office of the Master Attendant of the next port of call. It was also directed that copies of the logs of the Navy should be kept in India and London, so that they could be verified and used as and when required. In all the places it was suggested that such logs should be compared with the others, and variations could be incorporated.

The study of storm tracks led to a change in the pattern of recording the logbooks, by incorporating the meteorological concepts like weather conditions, wind directions and any abnormal change in the weather. It is worth mentioning that these were hitherto not taken into consideration. In addition, it was also suggested that meteorological reports could be collected from several light houses in India so that a comprehensive study could be attempted.¹⁹ This humble beginning began to pay dividends in the field of hydrography later. The cyclone memoir was prepared in 1890 about the cyclone of August 21-25, 1888 and the track of the storm was identified with the distribution of the area, when the storm was being formed and for the first 2 to 3 days of its existence.²⁰

CONCLUSION

The recordings made at various places were put together to assist in the collection of material for the investigation of the subject which was as important as the law of storms. The Company's geographer Peddington was already working on the scientific treatise namely 'The Law of Storms'. As and when Peddington published pamphlets on such scientific matters, copies of such publications were sent to those who were associated with the work. Such guidelines offered useful information on nautical matters. The pamphlets contained, apart from vital information, some guidelines gleaned from the logbooks of vessels which recorded any discrepancy found in the sailing directions given to them. The sailing directions underwent considerable changes qualitatively with the new findings made. Considering to isolated features of the meteorology which the Diaries and papers scattered system of information have to be collected from places far and wide as under, it is obviously of importance to establish the best focal point for their concentration. Mr. Peddington has devoted himself so ardently to the investigation of these phenomena and is in direct correspondence with the Eminent Individuals and scientific Societies who are engaged in the same pursuit. The phenomenon of the storm surge has been extensively researched since Peddington's day, yet few public-response systems have drawn the obvious lesson.

The Government of India decided to set up meteorological Department on all India bases appointing

H.F. Branford as the first Imperial meteorological Reporter to the Government of India in 1875 with its headquarters at Calcutta. The historical Alipore observatory was built in 1875 where the foundation of the present system of storm warning work was laid. Since 1875 the meteorological office of Calcutta has been a pioneer in India in cyclone tracking and storm warning service to Merchant Shipping, ports, Navy and various other Public interests.

¹Henry Peddington, The Sailor's Horn-Book for the Law of Storms, New York, 1848, p.23

²I.V.Tannehil, Hurricanes, Princeton University Press,1956.p. 32.

³ Marine Consultation, 18th May 1840, Vol.No.7, p. 591.

⁴N.C.Biswas. "Storm warning Procedures / Bulletins", Meteorological report, Meteorological Department of Chennai. Chennai,p.p.1.

⁵Journal of the Asiatic Society of Bengal, Vol.No.21, 1853.

⁶I.V.Tannehil,Hurricanes,(Princeton University Press,1956).p. 45

⁷ Watson Lyall, Hodder and Stoughton , Heaven's Breath, A Natural history of the Wind,(London, 1984), p. 55

⁸R.H.Simpson& H. Roehl.,The Hurricane and its impact,(Louisiana State University press,1981), p.4.

⁹Henry Peddington, The Sailor's Horn-Book for the Law of Storms, New York, 1848, p.p. 267-272

¹⁰ Marine Consultation, 18th May 1840, Vol.No.7, p. 591.

¹¹P.K.Das.The Monsoon,(India: National Book Trust, 1968), P.P.222.

¹²Henry Peddington, A TwentyFirst The Sailor's Horn-Book for the Law of Storms,Journal of the Asiatic Society of Bengal,Vol.No.1849.

¹³Royal Society's Catalogue of Scientific Papers; British Museum Catalogue. 1859, p. 64;

¹⁴ Journal of the Asiatic Society of Bengal, 1839 pp. 559, 563, 564.

¹⁵H.KimballJames.Cloud and weather Atlas. (NewYork: (Hugh Duncan Grant),Coward. McCann, Inc., 1994),p.p.112-113.

¹⁶Journal of the Asiatic Society of Bengal, Vol.No.1849.

¹⁷ H. Simpson Robert and Herbert Riehl , The Hurricane and its Impact, Louisiana: Oxford University press,1981.p. 45

¹⁸ Letter from Peddington, Company's Astronomer to the Court of Directors, London, February 18, 1840, Marine : Vol. 6.

¹⁸Henry Peddington, The Sailor's Horn-Book for the Law of Storms, New York, 1848, p.p. 267-272.

¹⁹ Letter from Taylor, Company's Astronomer to the Chief Secretary, Fort St. George, November 11, 1839, Marine : Vol. 4.

²⁰ Cyclone Memoirs, Part-II-Bay of Bengal Cyclone of August, 21-28, 1888, Meteorological Department of Government of India, Calcutta, 1890.