

By the Oorias it is called *Sona Kubootra* [*i. e.* Golden Pigeon: it is also termed in some parts *Burra* (or great) *Hurrial*.]

“*Chalcophaps indicus*. Common in the deep forests, always in the vicinity of streams; and generally upon the ground, in the shelter of beds of reeds and rank grass. When flushed, it takes a short but exceedingly rapid flight, alighting as abruptly with a sudden plunge into the herbage; so that it is a most difficult bird to shoot. Its favourite food consists of the seeds of the castor-oil plant.

Columba intermedia. Exceedingly common in Chota Nagpore, breeding in all the steep lofty rocks of that country.

“*C. punicea*. Length sixteen inches, by two feet spread; wing eight inches and three-quarters. Bill greenish-yellow, with basal half livid. Iris amber-yellow, in an orange-red circle. Legs and feet dull lake. The female is similar to the male, but rather smaller and duller in plumage. This species is not uncommon to the south of Singbhoom, going in small parties of four or five, and always along the banks of rivers, which are shaded by large forest-trees. Up and down these noble avenues, which the green shades of mingling boughs above, and the clear rippling stream below, preserve at all hours and seasons pleasantly cool; these Pigeons fly, rarely taking, when disturbed, to the more open tracts distant from the stream. In January 1842, I killed five specimens on the Bytarnee river in Singbhoom. They were feeding principally on the jamoon. These birds feed chiefly in the morning and again at evening; and during the heat of the day, roost on the uppermost branches of the huge derris trees, common in that country. They are wary and difficult of approach.”

The above excellent contribution from Capt. Tickell, exemplifies exactly what I hope to be favoured with by many other correspondents.—E. B. *May 22nd*, 1846.

A FOURTEENTH MEMOIR on the *Law of Storms in India; being the Bay of Bengal, Ceylon, Malabar Coast, and Arabian Sea Storms of 29th November to 5th December, 1845*. By HENRY PIDDINGTON, *President of Marine Courts of Enquiry*.

The Storms which are the subjects of this Memoir; are of very considerable interest, for taking their rise so near to the Equator as 7° North latitude, they travel up on the usual WN. Westerly track, crossing the Island of Ceylon, the Southern extremity of India and the Laccadive Archipelago, are finally lost for us, in the Arabian Sea, the last notice we have of them being that of the ship *Monarch*, which met hers in latitude 13½° North, longitude 69° East.

This is the second instance of storms, which have been traced on the North side of the Equator, originating in so low a latitude, the first being

the *Fyzulbarry's*, detailed in my Eleventh Memoir, which had a track to the NNW., while these of our present Memoir have very distinctly one to the WNW. It will be remarked, that these storms appear to take their rise in about the same latitude North, as those in the *Storm tract*, to which I have elsewhere* alluded, do on the South side of the Equator, and about on the same meridian, but our information is, as yet, too scanty to allow us to draw any inference from this coincidence. A matter of more present importance, is, that it is a track which lies much in the way of our Steamers. It is partly on this account, and partly that I was desirous of recognising by early publication, the kind efforts of the Bombay Chamber of Commerce, which has transmitted to me, through the zealous labours of its Secretary, Mr. Scott, the documents from the West of Cape Comorin: while to Capt. Biden I as usual owe most of those on the East, that I have deferred other labours in hand to investigate it. I must not forget to acknowledge here also the attention of Capt. Twynham, Agent for the Peninsular and Oriental Steam Navigation Company; Capt. Moresby of their Steamer, the *Hindoostan*; Major General Cullen, Resident at Cochin; and Mr. Higgs, Master Attendant of H. M.'s. Naval Yard, Trincomallee, for their careful forwarding of all the information they could collect. We have also another novelty in this storm, which is, that of a fine, well appointed Steamer, (the Peninsular and Oriental Navigation Company's Steamer *Hindoostan*,) *steaming through the Western verge of the Vortex*, ! and passing the calm centre with all the changes of the wind, which she *should* have, and with the hurricane so violent as to blow away her boats, &c. I am much indebted to Capt. Moresby for his log observations and barometrical notes, which are of very great interest; for in the execution of his duty, he has also, like Capt. Finck of the *Charles Heddle*, performed a very valuable experiment for our new Science.

I have as usual given the authorities as closely abridged as possible, and finally omitting, for brevity's sake, the comparative table, the various considerations from which the track of the storm has been laid down. The documents begin with the log of the ship *Caledonia*, which had the storm farthest to the Eastward.

* Horn Book of Storms, p. 7, 2nd Edition.

Ship CALEDONIA, Captain BURN.

I have fortunately two abstracts of this ship's Log: fortunately, because in the one there is evidently some grave oversight as to the ship's place, which on the 29th, is made 49', and on the 30th, when she was becalmed at the centre of the hurricane, 68' miles! to the Eastward of the one now printed; which being in Capt. Burn's hand writing, I take to be the correct one. It has also the advantage of having the barometrical observations.

Extract from Ship CALEDONIA'S Log Book; Bay of Bengal. Reduced to civil time. Forwarded by the Chamber of Commerce, Bombay.

Saturday, 29th November, 1845.—Throughout a moderate breeze, from Southward and SE. with passing squalls, and constant rain. Latitude by account 6° 50' North, longitude 88° 30' East; barometer 29.70; ship under double-reefed top-sails, and reefed courses, as the weather looked threatening. The two previous days we had much rain, and vivid lightning from the Northward and NW., and a heavy swell the last day from SW.

From noon till midnight, a fresh breeze from South and SSE., with heavy rain at times, swell increasing. Barometer 29.70. Distance run from noon to midnight ninety miles. Course West.

30th Nov.—1 A. M. Increasing breeze. Barometer 29.65.

„ 4 A. M. Heavy gale, wind shifting from South to SE. Barometer 29.50.

„ 6 A. M. Increasing gale, wind continually shifting from South to SE., and back again; a very heavy swell from SW. Barometer 29.50.

„ 7 A. M. Wind suddenly shifted to East, and increased to a very heavy gale, which obliged us to cut away the sails we had set, and lay the ship to, with her head to the Southward. Barometer 29.50.

„ 8-30 A. M. Gale at its height. Barometer 29.50.

„ 10 A. M. Gale decreasing, but found the barometer had fallen to 29.40.

30th Nov.—11 A. M. Suddenly fell calm.

„ Noon. Light airs from SW. cloudy appearance all round.
Barometer (still falling) 29.35, a very heavy swell.
Latitude by account 7° 0' North, longitude by account
85° 50' East.

„ From noon till 6 P. M. Light airs from the SW. and SSW.,
with cloudy weather and a heavy swell. Barometer
gradually falling.

„ 6-30 P. M. Increasing breeze from the South. Barometer
29.25.

„ 7-30 P. M. Gale returned with all its former violence, a very
heavy swell from SW. Barometer 29.20.

„ 10-30 P. M. Barometer commenced rising. Wind South.

1st Dec.—1 A. M. Gale decreasing. Barometer 29.40.

„ 4 A. M. Gale moderating fast, and swell going down, wind
drawing round from South to SE. Barometer 29.45.

„ 8 A. M. Fresh breeze, a SE. Barometer 29.60.

„ Noon moderate, breeze ESE., with cloudy weather. No
observation.

The following day we got observations, and found the longitude
by account correct to a few miles, but the latitude by account was
fifty miles to the Southward of observation, shewing we had experi-
enced a strong set to the Northward.

JOHN F. BURN,

Bombay ; 9th February, 1846.

Commander, Ship Caledonia.



*Abridged Log of the Ship ALIBI, Captain RHODES, from the Mauritius,
bound to Vizagapatam. Log reduced to civil time.*

On the 27th November.—The *Alibi* was at noon in latitude 3° 6'
North, longitude 90° 34' East, with a five knot breeze from the South.

Throughout the 28th.—To noon on that day ; when she was in latitude
6° 9' North, longitude 90° 57' East. She had strong steady South to
SSE., winds, latterly the weather rather unsettled, but at noon she had
a lower studding-sail set. P. M. the wind hauling gradually to the

Eastward, and at 6 P. M. it was due East to midnight. Ship running eight knots to the Northward.

29th November.—Wind EbN., and ship running to the North, seven and a half knots, to noon; when latitude by observation $9^{\circ} 8'$ North, longitude $91^{\circ} 0'$ East, frequent squalls, and the weather very unsettled. Barometer at 29.45. P. M. hard squalls and sea rising. 6 P. M. wind ENE., at 9, South, and decreasing, but the squalls heavier. Ship always running seven and eight knots to the NNW.

30th.—Midnight and to noon, wind marked NE., increasing again with tremendous heavy squalls, and weather very threatening. At daylight more moderate, and at noon latitude $11^{\circ} 50'$ North, longitude $89^{\circ} 32'$ East. Barometer rising a little, and weather clear to the East, but dark and heavy to the Westward. P. M. and to noon on the 1st, strong NE. breezes.

It will be clearly seen on reference to the chart, that this ship ran up between the 28th and 29th to the Eastward of the Caledonia's Storm Circle, which was probably then forming.

Abridged Log of the Ship JULIANA, Captain W. T. WOODHOUSE, from the Mauritius to Madras. Reduced to civil time. Forwarded by Capt. BIDEN.

The *Juliana* at noon on the 27th November, was in latitude $5^{\circ} 9'$ North, longitude $87^{\circ} 50'$ East, with fresh breezes N. Westerly, threatening weather and thick misty rain, with a high confused sea from ENE. P. M. to midnight, wind N. Westerly to West, with the same weather, and a broken swell from the NE. At 10, wind varying from NNW. to West. Heavy rain all night.

28th November.—Daylight wind had veered to SW., noon moderate with passing showers. Latitude $7^{\circ} 12'$ North, longitude $89^{\circ} 3'$ East. P. M. to midnight, gradually increasing to fresh gales; and rain and wind veering from SW. to SSE. at 8 P. M.; at 9 SE., at 10, East; at 12, ENE.

29th.—At 1 A. M. wind NEbE. At daylight "increasing gales." At 8 A. M. NNE. and increasing to noon, when strong gales NNE. and a heavy sea, latitude $8^{\circ} 54'$ North, longitude $87^{\circ} 28'$ E.* At 11 A. M. hove to. P. M. to midnight, gale from NE. with some very heavy gusts, the strongest at 4 P. M. Sea very heavy.

* *Hawks*, Petrels and other birds alighting, is noted in the log at noon this day.

30th November.—2 A. M. wind ENE. 8 A. M. ESE. Noon latitude $9^{\circ} 34'$ North, longitude $86^{\circ} 5'$ East. P. M. moderating. 3 P. M. wind East, at 9 ENE. to midnight, when gale breaking to windward with dark appearance to the SW. and vivid lightning.

1st December.—Moderating. Noon latitude $10^{\circ} 53'$ North, longitude $84^{\circ} 53'$ East.

This Ship's barometer was deranged.

Abridged Note from the Log of the Ship FRANCES, Captain SHARP, from England (?) to Madras. Reduced to civil time. Forwarded by Captain BIDEN.

30th November, 1845.—Strong gale with heavy squalls and a high head sea, ship under three double-reefed top-sails, and fore-topmast stay-sail. Wind from WNW. to SW. Latitude by account $7^{\circ} 42'$ North, longitude by account $86^{\circ} 9'$ East. P. M. a heavy gale, and a dangerous head sea from North-eastward. P. M. carried away the fore and main-topgallant masts.

1st December.—Strong breeze and cloudy, latitude by account $9^{\circ} 13'$ North, longitude by account $85^{\circ} 41'$ East. P. M. more moderate throughout, with rain.

2nd.—Latitude by observation $11^{\circ} 39'$ North, longitude by observation $85^{\circ} 50' 15''$ East.

Extract from the Log Book of the Ship MORLEY. Forwarded by Captain BIDEN,

At noon 30th November, then in latitude $9^{\circ} 50'$ North, longitude $87^{\circ} 10'$ East, with brisk gales from SSW. The glass commenced to fall, a wild appearance, down royal-yards and all the gear. At 8 P. M. a sudden shift in a tremendous squall from East. At midnight, a severe storm attended with strong gusts, the sea making up in heaps, causing the ship to lurch heavily and endangering the masts. At 8 A. M. 1st December, a heavy storm, wind veering from NNE. to East with heavy rain, ship now lying to under close-reefed main-topsail. Noon a heavy

gale EbN. at midnight, the gale veered to ESE. and became more moderate. Glass down in the height of the gale to 28.90.

The following Memorandum of the MORLEY'S Barometer, was obtained and forwarded to me, by Captain BIDEN.

Morley's Barometer at commencement of gale,	..	29.85
Ditto midnight, 30th November,	.. ..	29.30
Ditto ditto, 1st and 2d December, 3 A. M.		28.90
Soon after the strength of the gale, Barometer rose to,		29.40
and suddenly to,	.. .. .	29.80

Ship MYARAM DYARAM.

Capt. Biden, notes in a letter, that the ship *Myaram Dyaram*, from Manilla to Bombay, put into Galle, having lost boats, cut away anchors, and thrown part of her cargo overboard, in a gale from the Eastward in 9° North and 86° East, and this appears, by a letter from Capt. Faucon of the *Frolic*, to the Secretary of the Bombay Chamber, to have occurred on the 1st December. This vessel is also noticed in a letter from Capt. Twynham, at Point de Galle, as having had the gale *at the same time* as the *Caledonia*, and five feet water in her hold.* We are thus uncertain as to the date of the worst part of the storm with her. Capt. Faucon states it to have begun on the 28th; the two ships, the *Caledonia* and *Myaram* having left the Straits together.

Abridged Log of the Ship JOHN WICKLIFFE, from London to Madras.
Reduced to civil time. Forwarded by Capt. BIDEN.

On the 29th November.—From noon to midnight, the *John Wickliffe* was running up to the NbE. with a fresh WNW. to Westerly breeze, going from five to eight knots, *with a heavy head sea.*

* The Captain promised a copy of the log to Capt. Twynham, but left without giving it. Had we not a hundred instances of the kind, we could not believe that, after passing through such peril and loss, men will not take the trouble of desiring any boy or junior officer on board, to copy three days' logs! for those who are trying to teach them how to avoid such misfortunes in future.

On the 30th November.—Midnight to noon, the wind is marked between West and NW. and gradually decreasing to two and a half knots. Noon latitude 5° 43' North, longitude 86° 15' East, with a heavy head sea. P. M. wind West to WSW., at 5, NW., at 7, NEbN., and at 8, calms and variable, till at 9, a light breeze sprung up from the South, veering a little to the West. At midnight, ship going four knots.

On the 1st December.—Fine Southerly and SS. Easterly breeze to noon, when barometer marked 29.80, latitude 7° 9' North, longitude 85° 42' East. The same breeze with cloudy weather to midnight.

Ship WILLIAM ABRAM's Note from Capt. BIDEN.

The Ship *William Abram*, on the 30th November in latitude 4° 36' North, and longitude 90° 10' East, thermometer at 80°, and sympiesometer at 29.65, had the wind from noon on the 29th, in light squalls from the NW. and at midnight and towards noon on the 30th, variable from the South, with squalls and heavy rain.

Peninsular and Oriental Steam Navigation Company's Ship HINDOOSTAN, Capt. MORESBY. From Point de Galle, bound to Madras.

I am indebted to Capt. Moresby for this very interesting log, which as it details a new experiment of high interest to us, that of a fine, well appointed and ably commanded Steam Ship, steaming through the centre of a hurricane, I have printed at length.

Log of the Peninsular and Oriental Steam Navigation Company's Steam Ship HINDOOSTAN. From Point de Galle towards Madras.

H.	Courses.	K.	F.	Winds, &c.	Bar.	Remarks, Monday, Dec. 1st, 1845.
1	NE.	7	4	NNW.	..	A. M. Fresh breeze and cloudy.
2	..	7	4	..	..	At 2, Sounded, 6 fathoms. At 2, latitude by Canopus 6° 27' North. At 4, sounded in 60 fathoms, no ground.
3	NNE.	7	4			At 5-30, saw the land to the NW.
4	NbW.	7	4			At 6, saw the Basses right a head, distant about 2 miles, hauled out to ENE. At 6-20, sounded, no bottom at 70 fathoms when Saddle hill bore NNW., Chimney hill NW½W. and the middle of the Basses NbW. At 8, cloudy weather; visited ship—squally appearances. At 11, hard rain; noon hard squall of wind and rain, with thick uncomfortable weather. Found we have experienced a current of 46 miles against us.
5	..	7	4			
6	ENE.	7	4			
7	NNE.	7	4			
8	..	7	4			
9	..	7	4			
10	..	7	4			
11	NbE.	7	4	} Ther.	29.71	
12	..	7	4		76°	

Distance Steamed. Longitude Chronometer. Latitude Observation.

Various courses, 140 miles.				82° 10' East.	6° 50' North.	
1	NbE.	7	..	North.	Bar.	
2	..	7	..	..	29.69	P. M. Hard squalls from Northward
3	North.	7	..	..		with heavy rain. At 3, passed a small
4	..	7	..	..		Brig standing to the Southward. At
5	NbE.	7	..	..		5, hands employed lashing and se-
6	..	6	..	..	29.64	curing every thing on deck and be-
7	..	6	..	..	29.60	low. Carpenters screwing the ports and
8	..	5	..	..	29.50	gangways in. At 8, fresh gale and
9	NNE.	5	..	North.	29.00	heavy constant rain. Well, 2½ inches.
10	NE.	5	..	..	29.00	11-30, strong gale with a heavy swell
11	..	3	..	..	28.90	from NE. shipping a great quantity
12	NNE.	3	..	{ N. E. } { mid- } { night. }	28.90	of water, put fresh gaskets on all the
						sails. Midnight, shipped a sea in the
						saloon through the stern ports.

H.	Courses.	K.	F.	Winds, &c.	Bar.	Remarks, Tuesday, Dec. 2nd, 1845.
1	East.	3	..	East.	28.90	A. M. Wind lulled suddenly and
2	North.	5	..	SW. to S.	28.90	shifted round to the Southward, and
3	East.	2	..	{ SW. to } { SSE. }	29.00	blew a perfect hurricane, veering gra-
4	North.	5	..	..	29.25	dually to the S. Eastward. At 1, run-
5	NbW.	6	..	SE.	29.40	ning before the wind and sea, the star-
6	..	6	..	..	29.54	board jolly boat's davit broke, the
7	..	6	4	..	29.61	boat hanging only by the port tackle
8	..	6	4	..	29.62	and stopper, cut it a drift as it was
9	..	7	..	..	29.62	beating heavy against the stern. At
10	NNW.	7	..	ESE.	29.62	1-20, the starboard cutter was lifted by
11	..	7	4	..	29.64	the wind and thrown up on the top of
12	..	7	4	..	29.64	the awning stanchions, and its own da-
						vits, secured it as well as possible.

Distance Steamed. Longitude. Well at 2 A. M. 3 inches. Lat. Observation.

Various 140 miles. Long. by act. 82° 20' East. No observation Lat. by act. 8° 41' N.

1	{ NNW. } { ½ W. }	8	..	SE.	29.74	At 2, the chocks of the fore yard
2	..	8	..	..		carried away, secured the yard with
3	..	8	4	..		fresh lashing. At 4, strong gale with a
4	..	8	4	..		heavy following sea, wind veering from
5	..	8	4	East.		South to SE. Carpenters with seamen
6	..	8	4	..	29.80	securing and nailing the skylights, &c.
7	NNW.	8	4	..		At daylight got the starboard cutter in
8	..	8	4	..		board and secured, she is almost knock-
9	..	8	4	..		ed to pieces. At 8, moderating. At 9,
10	..	8	4	..		squally, noon squally with rain. Car-
11	..	8	4	..		penters fitting dead-lights, opening
12	..	8	4	SE.	29.80	ports, &c. At 4, strong breeze and
						cloudy rain. At 8, squally from NE.
						visited ship and found all right. Mid-
						night, wind variable from the SE.

H.	Courses.	K.	F.	Winds, &c.		Remarks, <i>Wednesday, Dec. 3rd, 1845.</i>
1	NNW.	8	4	NE. to SE.	Well.	A. M. Moderate, wind with a heavy SE. swell.
2	..	8	4			
3	..	8	4	..	..	At 2, lat. by Canopus 10° 25' North.
4	..	8	4	..	Dry.	At 2, ditto, Sirins, 10° 24' North.
5	..	8	4	East.	..	Daylight thick hazy weather. At
6	..	8	4			8, moderate weather.
7	..	8	4			
8	..	8	4	..	Dry.	
9	..	8	4			
10	..	8	4	ESE.		
11	..	8	4			
12	..	8	4			

Captain Moresby remarks in a letter to me, that "during the first part of the hurricane, the atmosphere felt very close and warm."

Ship FRANCES.

Captain Biden has furnished me with an extract from the log of the ship *Frances*, from Colombo to Madras, which vessel was on the 29th November, in 6° 4' North, and on the 2nd December in 11° 39', but has no intervening observations or latitude by account given. She was probably, Capt. Biden says, about sixty miles from the Ceylon shore. She evidently ran up just before the storm reached that meridian, having had strong SE. and Easterly gales on the 1st and 2nd.

Ship CARNATIC, bound to Bombay. From the Bombay Chamber of Commerce.

This ship was standing in to sight Cape Comorin, and at noon on the 1st December was in latitude 4° 25' North, longitude by chronometer 78° 43' East, her barometer 29.70, sympiesometer 29.50, and thermometer 84°, with a moderate breeze from the North, cloudy, light rain, and a heavy head swell. By midnight the wind had veered to the Westward, (I suppose about NW.?)

2nd December.—Daylight increasing North Westerly breeze, latitude at noon 5° 21' North, longitude 79° 33' East, barometer 29.66, sympiesometer 29.16, thermometer 81°. P. M. Fresh breeze from the Westward, and unsettled weather with a confused sea. At 8 P. M. to midnight. The same wind at SW.

At noon on the 3d.—Latitude $6^{\circ} 46'$ North, longitude $78^{\circ} 29'$ East, barometer 29.80, sympiesometer 29.20, thermometer 84° .

Ship BOLTON, Capt. T. DAVIDSON. From the Bombay Chamber of Commerce.

This ship was also like the *Carnatic*, standing in to sight Cape Comorin, and the abstract from her log is given in a tabular form, which I print below. It appears that like the *Carnatic*, she just felt the South-western quadrant of the storm, which was wrecking the *Florist* at Tuticoreen in its passage over the Peninsula.

Extract from the Log of the Ship BOLTON.

Dates.	Latitude.	Longitude.	Barometer.	Thermometer.	Wind.	Remarks.
1st Dec.	4 40 N.	77 37 E.	29.90	83	NNE.	{ Fresh winds and cloudy. Ship 43 miles West of account.
2nd „	5 50	77 24	29.80	84	W. to NW.	{ First part light airs, latter part heavy squalls of wind and rain, weather very unsettled.
3rd „	7 17	77 10	29.60	83	W. to N.	{ First severe squalls with torrents of rain, latter part calm.
4th „	7 8	77 42	29.80	82	Calms.	{ Found the current to have set these last 24 hours S. 50° E., 42 miles.

Ceylon and the Southern part of the Peninsula of India.

We now take the data which relate to the passage of the storm over Ceylon and the Southern extremity of India. These are mostly but detached notes, but will enable us to trace the vortex pretty accurately; as to time at least, to the Malabar Coast. It will be recollected that we had the log of the *Hindoostan* Steamer off the Eastern Coast of Ceylon, steaming through the Eastern verge of the centre, a little after midnight of the 1st and 2nd, being then about thirty miles from the shore, and to the ESE. of Baticolo.

Captain BIDEN, Master Attendant of Madras, says:—

“The Master of the War Steamer *Spiteful* says, it blew hard at Trincomallee on the 1st, from East and SE. Several trees were blown

down, but the fury of the gale was to the Southward, and what is very remarkable, is, that although the strength of the hurricane was about the *Hindoostan's* position, yet a vessel arrived at Trincomallee that was off the Basses on the 1st, and she was perfectly becalmed, yet the Ceylon paper states, that it blew hard at Point de Galle. The Master could not tell me the range of the *Spiteful's* barometer. However, the reports I send you, shew that this gale extended from several degrees East of Ceylon, across that Island to Tuticoreen, Tinevelly, and Ootacamund on the Neilgherries, and to Quilon on the Malabar Coast, where I suspect it was confined within a narrow compass, in a North and South direction. It was squally off Calicut, but was scarcely felt at Tellicherry. The H. C. Sloop of War *Coote*, struck on the reef off Calicut on the 1st, and the foul weather on the 3rd broke her up.

“We were apprehensive of bad weather here, as the surf was high with a turbulent sea, heavy clouds all gathering in the SE. and as a ship came in from the Northward on the 2nd and experienced very fine weather, and our Steamer the *Hindoostan* had not arrived, I was clearly of opinion, that she had encountered a gale to the Southward, and so it proved to be the case. We had very threatening weather on the 16th, I prepared the shipping by signal to “prepare to slip and put to sea.” Barometer fell from 30° to $29^{\circ} 88'$, however, although the clouds portended wind and rain, we had but little of either. On the 25th and 26th, barometer ranging from $30^{\circ} 10'$ to $30^{\circ} 18'$, we had the heaviest fall of rain we have experienced this year, and serious alarms are happily relieved by that providential downfall, but how are we to account for such a dense atmosphere, and so much rain, without the mercury indicating so great a change? The sympiesometer also rose a day or two before, and continued steady—there was but little wind throughout, the weather was close and the thermometer higher than usual at this season, viz. from 78° to 82° .

“A large ship under jury masts was seen off Trincomalee on the 19th instant. Capt. Maitland steamed out of the harbour at daylight, on the following day intending to offer assistance, but the stranger was out of sight, and the *Spiteful* having but few coals, and *none in store at Trincomallee!* Capt. Maitland was reluctantly compelled to put back. The ship *Robert Small*, homeward bound, sailed from these roads on Saturday evening the 29th, and must I think, have run right into the

heart of the gale, as she started with a fresh NE. wind. However, she is ably commanded and well managed."

Capt. BIDEN in an additional note adds—"Capt. Maitland, H. M. Steam Vessel *Spiteful*, reports that the gale was severe at Trincomallee on the 1st instant, and that a complete hurricane raged at Baticolo and to the Southward. Ceylon papers of the 13th instant, report, that the gale though brief, was very severe at Point de Galle on the night of the 1st, and during the 2nd instant.

"The ship *Caledonia* from Singapore to Bombay, has also put in at Galle, having lost top-gallant masts, top-sails and fore-sail, and quarter boats, and thrown part of her cargo overboard, in a heavy gale from South, SE. and East, on the 30th ultimo, in latitude 7° North, and longitude 88° East.

"At Tuticoreen the ship *Florist*, loading for China, was wrecked on the night of the 2nd instant, on a reef off Tuticoreen.

"The gale was violent at Quilon on the night of the 2nd instant, and at A. M. of the 3rd instant several *Dhonies* were driven on shore, and beat to pieces. The *Charles Forbes* encountered the gale off Anjengo, and the time verified by her log may be considered as more correct than that which is reported from Quilon.

"The hurricane raged with great violence at Tinevelly and at Ootacamund, but I have not been able to obtain the ranges of the barometer."

C. BIDEN.

From Mr. HIGGS, Master Attendant of Trincomallee.

I have the following register of the weather from the 30th November to the 3rd December, but have altered the letters which designate the weather to words, as the former are not generally understood.

Mr. Higgs, says in his letter to me, "during the night of the 1st and morning of the 2nd instant from Trincomallee on the road to Kandy in a SE. direction, a vast number of large trees were blown down so as to obstruct the road, and at Habboneme, fifty miles distant, the travellers' bungalow was blown down; there has not been a settled gale of wind at Trincomallee for the last eleven years, but we have frequently had in the months of November and December, a heavy swell rolling in from the NE, when there have been gales in the Bay of Bengal.

H.	Barometer in Inches and Decimals.	Thermometer.	Winds.		Weather.	Rain. Inches.	30th November, 1845. Remarks.
			Quarter.	Strength.			
2							
4							
6	29.79	78	NE.	5	..	..	Cloudy and blue sky.
8	29.80	81	..	5			
10	29.82	79	NNE.	5	..	..	Overcast and squally.
12	29.82	82	NE.	5	..	..	Cloudy and blue sky.
2	29.76	82	..	5	..	..	A high sea from the Eastward.
4	29.76	81	..	5			
6	29.76	80	..	5	..	..	Overcast.
8							
10							
12							

H.	Barometer in Inches and Decimals.	Thermometer.	Winds.		Weather.	Rain. Inches.	1st December, 1845. Remarks.
			Quarter.	Strength.			
2	..	..	NE.	6	..	..	Overcast and squally.
4	..	..	..	6			
6	29.76	76	..	7	..	..	A very high sea in the offing (from East.)
8	29.76	77	..	5	..	..	Rain in showers.
10	29.78	77	..	5			
12	29.74	79	..	5	..		Blue sky and cloudy.
2	29.70	78	NEbN.	6			
3	29.68	76	..	7	..	..	Violent gusts with rain.
4	29.68	76	NE.	6	..	..	Rain.
6	29.68	76	..	6			
8	29.68	76	..	6			
10	29.68	76	ENE.	6			
12							

H.	Barometer in Inches and Decimals.	Thermometer.	Winds.		Weather.	Rain. Inches.	2nd December, 1845. Remarks.
			Quarter.	Strength.			
2	East.	9	Most violent gusts with rain. Many trees blown down and large branches strewed around. The beach covered with fish at daylight. A very high sea from the East rolling in. Gloomy weather. Hazy.
4	..	..	..	8	..	..
6	29.66	76	ESE.	7	..	..
8	29.68	78	..	7	..	..
9	29.70	79	..	0	..	..
10	29.71	79	SE.	6	..	..
12	29.71	77	..	6	..	..
2	29.68	78	East.	6	..	..
4	29.68	78	..	6	..	..
6	29.70	77	..	4	..	..
8	29.72	76	SE.	3	..	..
10							
12							

H.	Barometer in Inches and Decimals.	Thermometer.	Winds.		Weather.	Rain. Inches.	3rd December, 1845. Remarks.
			Quarter.	Strength.			
2							Clearer. Smooth Sea. Overcast and squally. Up to the 10th we had light variable winds, on that day at noon, a steady NE. wind set in, which continues. Trincomallee 15th Dec. 1845.
4							
6	29.77	75	SW.	1	..	..
8	29.82	77	..	0	..	..
10	29.86	79	NNE.	1	..	Be.	
12	29.84	81	..	2	..	..
2	29.80	82	..	3	..	..
4	29.79	81	NE.	3	..	..
6	29.79	80	..	0	..	..
8	..	..	SE.	4	..	..
10	..	..	..	3	..	..
12							

Baticolo and Tuticoreen.

From the *Colombo Observer* of the 15th and 18th, I collect the following notices of the storm at the above named places, the notice of the 18th is a well written letter, evidently by a careful observer at Baticolo, and I have used the other notices only to supply a few words.

Batticaloa.*—This place was visited by a most fearful hurricane on the night of the 1st instant. The day had been very wet and stormy with squalls from the NE., but this was considered as no more than the usual monsoon. However, about midnight, it began to blow with great fury from the NW., or along the coast, with heavy rain. About half-past 2 A. M. of the 2nd, the wind shifted round to the opposite quarter, and after a short but ominous lull, blew with truly terrific violence from the South and SE., occasioning wide spread, and almost universal, destruction of trees and native houses, and even of bungalows. The roaring and hollow *moaning*† (as noticed by many) of the hurricane, the incessant dash of the rain, and a complication of other noises, were most dismal, but in fact even the crash of thousands of falling trees could not be distinctly *heard*, though it must have added to the general uproar. No body could say if it thundered, *but a great light* was observed at one period of the storm, which probably was caused by some electric explosion. The hurricane did not extend to the country at the most Southern extremity of the lake of Batticaloa.

Tuticoreen.—The effects of the gale are thus described in a letter dated the 4th instant (December.) The gale commenced about 8 P. M. (the date is not given, but in the paper of the 15th, the *Florist* is said to have been lost on the night of the 2nd,) and raged with unremitting fury till 3 A. M., after which it abated, and about sunrise there was a comparative calm. The wind was from SE. accompanied with torrents of rain. During the night the ship *Florist*, of 538 tons, was driven on shore.

For the following observations from Palamcottah, Cochin, Trevandrum, Quilon and Alleppy, I am indebted to Major General Cullen.

* This is no doubt the correct spelling, but Horsburgh, and all the charts use Baticolo, which I have therefore preferred.

† I have noticed this before (VIIth and XIth Memoirs, and Horn Book of Storms,) there is no doubt that it does occur in hurricanes very frequently. Is it an electric phenomenon, analogous to the remarkable rumbling which proceeds a hail storm in India, and often in Europe?

Meteorological Observations at Palamcottah. By Conductor THOMAS DARLING of the Ordnance.

1845.	Hour.	Barometer.	Thermometer.			Hour.	Barometer.	Thermometer.			Fall of Rain.	Remarks.
			Attached.	Maximum.	Wet Bulb.			Attached.	Maximum.	Wet Bulb.		
December, 1	9 A. M.	29.916	79½	78½	71	4 P. M.	29.796	85½	85	73	..	Clear and dry: gentle Northerly breeze.
"	"	.880	78	79	71	"	..	..	..	72	..	Dark haze with a slight drizzling rain now and then during the day. Wind blowing fresh from N.E., at 4 P. M., with heavy rain. At 11 P. M. A violent gale from the East, by which all the oldest and largest trees were uprooted and laid prostrate. At Midnight. Very violent, the wind veering to the S.E. accompanied with heavy rain until about 1½ A. M., when the hurricane abated. 6 A. M. Clear and fair, with a fresh breeze from the S.E.
"	"	.866	79½	78	75	"	.800	85	84½	78	..	Northwards clear: fresh breeze from S.E.
"	"	.954	80	79	75	"	.842	85	84	76	..	Clear: wind fresh from Southward, evening.
"	"	.874	80½	78	75	"	.764	85¾	85	76	..	Clear, light, cool N. wind: evening fresh from S.E.

Register of the Barometer at Cochin, during the Gale of the 3rd December, 1845.

Date.	Time.	Bar.	Ther.	Dew point by Daniell.	Remarks.	
1845.			o			
Nov. 29	9 $\frac{1}{2}$ A. M.	30.232	81	64	Generally dry Easterly winds, as shewn by the dew point.	
„ 30	9 $\frac{1}{2}$ „	.190	81 $\frac{1}{2}$	65		
Dec. 1	9 $\frac{1}{2}$ „	.200	80 $\frac{1}{2}$	64		
„ 2	9 $\frac{1}{2}$ „	.144	81	67		
„ „	4 $\frac{1}{2}$ „	.050	81 $\frac{1}{2}$	67		
„ 3	6 $\frac{1}{2}$ „	29.980	77	×		Violent gale from NE.
„ „	6 $\frac{3}{4}$ „	.964	76	72		Ditto ditto, increasing.
„ „	7 „	.980	76	×		Slightly moderated and more Easterly.
„ „	7 $\frac{1}{4}$ „	30.000	77	×		Moderating, EbS.
„ „	7 $\frac{1}{2}$ „	.012	77	×		Strong gale with occasional violent gusts East and SE.
„ „	7 $\frac{3}{4}$ „	.026	77	×	Wind moderate ditto ditto E. & SE.	
„ „	8 „	.050	77	×	Breeze moderate ditto ditto SE. & S.	
„ „	8 $\frac{1}{4}$ „	.058	77	×	Strong wind again ditto ditto SE.	
„ „	8 $\frac{1}{2}$ „	.070	77	×	Ditto ditto with heavy rain from SE.	
„ „	8 $\frac{3}{4}$ „	.114	77	×	Moderate breeze ditto ditto SE.	
„ „	9 „	.130	77	74	Rather strong ditto ditto SE. & S.	
„ „	9 $\frac{1}{4}$ „	.142	77	×		
„ „	10 „	.154	77	×		
„ „	10 $\frac{1}{2}$ „	.158	77	×	Moderate breeze SSE.	
„ „	11 „	.160	78	×	Ditto ditto Southerly and SWesterly.	
„ „	12 „	.160	79	×	Ditto ditto Southerly and SWesterly.	
„ „	1 P. M.	30.164	79	×		
„ „	2 $\frac{1}{2}$ „	.130	79	×		
„ „	4 „	.130	79	74	Breeze Southerly.	
„ 4	9 $\frac{1}{2}$ A. M.	.286	81	68		
„ 5	„ „	.218	82	70		
„ 6	9 $\frac{1}{2}$ A. M.	.170	80	73		
„ 7	„ „	.224	82	76		

About one inch of rain fell from midnight on the 2nd to noon on the 3rd.

Barometer at Trevandrum.

Date.	Time.	Bar.	Ther.	Remarks.
1845.			o	
November, 29	9 $\frac{1}{2}$ A. M.	29.930	82	
„ 30	„	.864	82	
December, 1	„	.844	81 $\frac{1}{2}$	Three inches of rain.
„ 2	„	.960	82	
„ 3	„	.990	80	
„ 4	„	.928	83	
„ 5	„	.854	81	
„ 6	„	.822	81 $\frac{1}{2}$	
„ 7	„	.874	82	

At Trevandrum.—It appears to have blown very strong, at 1 A. M. of the 3rd a violent gale from 2 $\frac{1}{2}$ to 3: abated from 3 to 3 $\frac{1}{2}$: when it recommenced with greater violence, than ever, and continued till about day-break.

At Quilon.—The Master Attendant writes that—“The gale commenced at 10 P. M. of the 2nd, and continued till 7 A. M. of the 3rd.”

At Alleppy.—The Master Attendant writes—“A gale of wind with some rain commenced at this place about midnight on the 2nd, which continued till daylight on the 3rd, when it blew a perfect hurricane.

At Cannanore.—A correspondent writes—“The gale on the 3rd commenced here as far as I can remember, about 8 A. M., and lasted till about 1 P. M. At first from NE. and East, and latterly from SE. and SSW. Hardly any rain fell.”

Remarks on board the Ship FAIZE ROHABANNY, THOMAS STEWART, Commander. From the Bombay Chamber of Commerce. Reduced to civil time.

December 2nd.—Light SE. breezes and cloudy.—Midnight. Squally; wind veered to the Eastward, in twenty-six fathoms off Cadiapatam Point. Barometer 29·95.—P. M. Wind WNW., a fresh breeze, and cloudy, with constant rain.—Sunset. Barometer 29·80: dark cloudy weather: wind increasing to a gale.—At 9 P. M. Barometer 29·70: strong gale from the SW.: a high confused sea: lying to under close-reefed main-topsail: thirty-three to thirty-five fathoms.—Midnight. Violent squalls from the Westward with heavy rain, lightning from the Eastward. Barometer 29·50.

3rd.—At 3 A. M. Barometer 29·45: the wind veered round to the Southward.—Noon. Calm and sultry weather: off Cape Comorin: twenty-nine fathoms. Barometer 30·5.—P. M. Wind NNE.: light breeze and clear weather.

4th.—Noon. Cape Comorin NE.: after which fine weather.

Abstract of the Log of the Ship CHARLES FORBES, Captain WILLS; from China bound to Bombay. Civil time. From the Bombay Chamber of Commerce.

December 1st 1845.—A. M. Light Northerly and NNEasterly airs and hazy weather.—Noon. Winds ENEasterly: Latitude 7° 52' North:

forty-six fathoms water.—P. M. Winds light and veering to the Southward and South-westward.—Midnight. Light NWesterly winds and fine weather.

2nd.—A. M. Light Northerly and NEasterly winds and fine weather.—Noon. Winds variable and light; Latitude $8^{\circ} 48'$ North: twenty-six fathoms.—P. M. Calms with occasional light variable airs.—Sunset. Wind NW. and increasing; the weather very unsettled; heavy clouds hanging over the land with lightning.—At 8. Light breeze and cloudy, with rain; tacked off shore.—At 9. Increasing breeze with squalls: Barometer 29.80: Sympiesometer 29.20.—At 10. Hard squalls with a heavy swell: Barometer 29.75: Sympiesometer 29.12.—At 11. Wind NNW. and increasing, and sea rising.—Midnight. Blowing a perfect gale NW., and high sea. Barometer 29.62: Sympiesometer 28.90.

3rd.—A. M. Hard gale with severe squalls, and high sea.—At 2. Hard weather with thick heavy rain: Barometer 29.56: Sympiesometer 28.86.—At 4. Wind veering to WNW. and Westward: the topsails blown from the bolt ropes, leaving the ship under bare poles, the sea running very high: Barometer 29.50: Sympiesometer 28.78.—Daylight. The wind veering to the South-westward. Wore ship and set the mainsail; ship labouring much in the high confused sea, the rain ceasing.—At 7. The wind lulling at times, and weather clearing over the land, but a very high confused sea; the ship pitching and labouring much, in which we carried away flying-jib-boom, spritsail yard and dolphin-striker, and stove in the jolly boat, hanging at our stern: Barometer 29.70: Sympiesometer 29.0.—At 8. Wind decreasing at SSW.: enabled to bend new sails, and to set the fore-topmast staysail, and storm mizen, to steady the ship: Barometer 29.86: Sympiesometer 29.16.—At Noon. Weather much more moderate with less sea. Latitude $8^{\circ} 58'$ North; in forty-one fathoms water.—P. M. Decreasing SWesterly, and Southerly breeze, and fine weather.—Sunset. Light Southerly breeze and fine: Barometer 29.86: Sympiesometer 28.20.*—Midnight. Land breeze, light and variable.

Ships along the Malabar Coast, and Magnetic Storm at Bombay.

By the zealous care of Mr. Scott, Secretary to the Bombay Chamber of Commerce, I have been furnished with several logs of ships along the

* The Sympiesometer is always 0.50 to 0.60, below the Barometer.

coast, shewing how they were just on the Northern range of the storm on the 2nd, 3rd, and 4th December: the 2nd and 3rd being, it will be recollected as above, the day of the *Charles Forbes'* storm, and the 3rd of that of *Cananore*, in latitude $11^{\circ} 52\frac{1}{2}'$ North. I note these for brevity's sake, in separate paragraphs.

The *Recovery*, Capt. Johnson, on the 2nd at noon, was in latitude $12^{\circ} 29'$ North; in forty-one fathoms water. Her barometer, a French one, at twenty-seven inches eleven lines, (equal to $29\cdot76$ English) having fallen to this, from twenty-eight inches one line, French ($29\cdot94$ English.) From the 1st, during the day, had the land and sea breezes, but at midnight it was dark and cloudy.

December 3rd.—Dark cloudy and variable.—Noon. Strong wind with heavy head sea from the NW. Latitude $12^{\circ} 57'$ North; in forty-one fathoms water, wind NE. Barometer twenty-seven inches ten lines French ($29\cdot67$ English) and in a note from Capt. Johnson says, “ usually on the coast at this season, twenty-eight inches two lines, French ($30\cdot03$ English).—At 3 P. M. A sudden squall with change of wind to the SSE. and very threatening appearance; by midnight, clear again.

4th.—1 A. M. Fresh breezes, cloudy, and heavy following sea from the SW. which continued to noon, when in latitude $14^{\circ} 53'$, North; and forty-five fathoms water; strong SSW. sea. No barometer marked this day.

5th.—Dark cloudy and unsettled, but light winds with strong swell from the SW. and a cloudy wild appearance. Latitude $16^{\circ} 40'$; in forty-one fathoms. Barometer twenty-seven inches ten lines, ($29\cdot66$ English.)

Ship Charlotte.—Her Commander says in his note. From the 1st to the 4th instant. Land and sea breezes prevailed with hot sultry weather during the day, and cloudy with heavy dews during the night. On the morning of the 4th, the wind freshened up at North and continued freshening till noon, when it veered round to the NE. Sacrifice Rock then bearing NbE $\frac{1}{2}$ East; distant about six miles (latitude about $11^{\circ} 24'$ North) in soundings of from sixteen to seventeen fathoms.—At 3 P. M. The wind increased to a fresh gale at East, running before it under our topsails; the clouds dark and disordered, going from East to SE.—At 6 P. M.—The wind moderated to a fresh steady breeze,

made all sail, running along the land in soundings of nineteen to twenty-two fathoms. At 10 at night, the wind wore to the SE. and continued a steady breeze at South to SE. all next day. The 5th when at noon St. George's Island, bore $\text{NNE}\frac{1}{2}\text{East}$. Latitude observation $15^{\circ} 11'$ North; distance off shore about ten miles; the weather moderating, but very hazy: the barometer and thermometer showed no symptoms of any change during the strength of the breezes: the latter part of the 5th decreasing winds with cloudy weather, with a cross turbulent sea.

Barque MARCHIONESS OF DOUGLAS.

Had fine weather from the 2nd instant; latitude $14^{\circ} 14'$ North, longitude $73^{\circ} 34'$ East, to the 4th instant in latitude $15^{\circ} 43'$ North, longitude $73^{\circ} 27'$ East. The winds moderate and light from NE. to NNW. and latterly SE.

Ship EARL OF CLARE.

Fine, land and sea breezes, from the 2nd instant; latitude $14^{\circ} 38'$, to the 4th instant, $16^{\circ} 17'$ North, while passing the Coast.

BOMBAY.

The recent Magnetic Disturbance.

The *Hurkaru*, in copying the letter we received sometime ago from Professor Orlebar, describing this phenomenon, makes the following observations, which we commend to the notice of the learned Professor himself, and all others interested in Meteorology.

“ We extract from the *Bombay Courier* a letter from Professor Orlebar, in charge of the Observatory at Bombay, descriptive of a remarkable magnetic disturbance,—‘ a magnetic storm,’ which was indicated by the apparatus under his care, on the morning of the 3rd instant. The Professor remarks that “ it will probably appear that this week has been accompanied with remarkable phenomena on every quarter of the earth.” May not this unusual disturbance of the magnetic fluid have been in some way connected with the rotatory hurricane which was experienced by the *Hindoostan* off Ceylon, on the 1st and 2nd instant, and which, travelling to the NW. might have been sufficiently near Bombay on the 3rd to produce the phenomena observed by Professor Orlebar ?” — *Bombay Courier*; December 30th.

Ship JOHN BROWN, R. BROWN, Commander. From the Bombay Chamber of Commerce.

From the log of this vessel, of which the track will be seen on the chart, it appears that on the 3rd and 4th December, she was running in to the ENE. ; towards, and in the passage between, the head of the Maldives and the Southern Laccadives, and that on the 4th at noon when with the *Charles Forbes*, the weather had quite moderated to fine, the *John Brown* was within a few miles on the same parallel of latitude as the *Forbes* on the 3rd, but about 170 miles West of her position, in longitude $73^{\circ} 29'$ East with steady breezes and gloomy weather, the wind about SW. and a heavy sea, which they supposed to be caused by a current setting to the ENE. Her barometer (probably too low) was at 28.80 ; the thermometer 87° .

Abridged Log of the Ship MARY ANNE, Captain ALLEN, from London to Bombay. Reduced to civil time. From the Bombay Chamber of Commerce.

At Noon 5th December, 1845.—Increasing breezes NNW. with a heavy head sea : Latitude $8^{\circ} 7'$ North : Longitude $71^{\circ} 15'$ East : Barometer 29.45 : Sympiesometer 29.30 : Thermometer $83\frac{1}{2}^{\circ}$.—Towards midnight decreasing and cloudy.

6th.—A. M. WSW., increasing to noon, when Latitude $9^{\circ} 54'$ North : Longitude $71^{\circ} 16'$ East : Barometer 29.40 : Sympiesometer 29.26 : Thermometer 82° : heavy confused sea from the Northward.—P. M. Wind West.—At 7, Southerly, rapid scud, much lightning and sea.—At 5 P. M. barometer fell to 29.35, and sympiesometer to 26.24.

7th.—Noon fine weather : Latitude $12^{\circ} 54'$ North : Longitude $11^{\circ} 0'$ East : Barometer 29.50 : Sympiesometer 29.36 : Thermometer $83\frac{1}{2}^{\circ}$. After which fine weather and calms.

Abstract of the Log of the Ship RAJASTHAN, Captain STEWART, from London bound to Bombay. Reduced to civil time. From the Bombay Chamber of Commerce.

On the 4th December, 1845.—*Rajasthan* was at noon in Latitude $9^{\circ} 55'$ North : Longitude $69^{\circ} 0'$, East : Barometer 29.85 : Sympiesometer 29.42 : Thermometer $83^{\circ} 3'$.—A. M. Freshening to steady ; fresh wind from the

NN. Westward with a head swell, studding sails set, noon increasing and heavy head sea from NNE. and clear weather. 4 P. M. Observed the Barometer to fall suddenly to 29·70: Sympiesometer 29·32: wind increasing; in small sails. At Midnight. Fresh gales and cloudy.

5th December.—6 A. M. Split fore and main-topsails: wind rapidly increasing to a hard gale NW., and sea much agitated, rising in pyramids* and breaking frequently on the ship, hove to on the larboard tack, under mizen and fore-topmast staysails. Noon. Latitude 11° 42' North: Longitude 71° 5' East. Barometer, noon 29·85, 4 P. M. 29·70. Sympiesometer, noon 29·42, 4 P. M. 29·32. At 0·30. P. M. Wind shifted to WSW. tremendous sea running, and ship labouring violently. At 4 P. M. A heavy gust with rain, when the violence of the wind abated during the night, the wind rising in heavy gusts, with intervals of calm, a dark cloudy sky and drizzling rain.

6th.—4 A. M. Wind shifted to SE. and barometer “on the turn.”† At 6. Fresh gales with passing squalls: made sail and bore away NNE., weather clearing up and sea rapidly going down. At 8. Single-reefed topsails. Noon. Latitude 12° 32' North: Longitude 71° 43'. Barometer, noon 29·70, 4 P. M. 29·60. Sympiesometer, noon 29·32, 4 P. M. 29·22. P. M. Steady breezes and showery, after which fine weather.

Captain STEWART has further obliged me with the following very instructive Remarks.

“1. On the evening of the 4th December, I observed a remarkable kind of lightning to N. Westward, shooting up perpendicularly from the horizon in stalks, or columns, of two and three, at short distances; it was not at all bright, but rather of a dullish glare.‡

“2. My barometer fell lowest on Saturday, after the greatest violence of the wind from NW. and SW. was past, which led me to expect that

* A remarkable instance, but which doubtless often occurs without being noted, of the pyramidal sea beginning very early in a gale: I account for it by supposing the NN. Easterly sea crossed and broken by the N. Westerly gale.

† It appears by this expression to have been lower than 29·70, between 4 P. M. of the 5th and 4 A. M. of the 6th, but is not, unfortunately, registered.

‡ This is almost, word for word, Capt. Rundle's description of this remarkable kind of lightning. See 11th Memoir, Journal Asiatic Society, Vol. XIV, p. 71, where I have also quoted another instance of it. We might almost term it “Typhoon lightning!”

when it shifted to South or SE., I should have the height of the gale ; on the contrary, there was both less wind and sea.

“ 3. I consider that when I hove to at 6 A. M. of the 5th, with the wind at NW. or NWbW., the centre of the storm was NE. of my position, and passing to WN. Westward, so that by running on, I should have got into worse weather ; and this is confirmed by the fact, that the ship *Monarch* a day’s sail ahead, experienced the extreme violence of the hurricane.

“ 4. With the exception of the singular lightning already mentioned, there was not a single flash, and the sky had more the appearance of a gale in the higher latitudes than a tropical storm, the scud passing swiftly in the direction of the wind with clear patches between, excepting the night of the 6th, when it was dark and lowering, with drizzling rain.

“ 5. The position of the vessel was correctly ascertained by observation, and the dates are all nautical time.”*

RATH. STEWART,

Com. Ship Rajasthan.

Abstract from the Journal of Captain McFARLANE, of the American Barque STAR. Reduced to civil time. From the Bombay Chamber of Commerce.

“ *Thursday 4th December, 1845.*—A fresh breeze at NWbN. and cloudy. Latitude observation $8^{\circ} 41'$: Longitude by chronometer $66^{\circ} 43'$ E. : Thermometer 81° : fresh breezes at NWbN., and passing clouds. Through the night, a strong breeze at N. Westward.

“ *5th.*—Noon, A. M. Strong gales at NWbN. and hazy. All this day we have had a heavy swell from NW., the vessel pitching violently. At 10 A. M. took in the top-gallant sails. Current setting to Southward and Eastward fifteen miles in twenty-four hours. Latitude observation $10^{\circ} 41'$: Longitude by chronometer $68^{\circ} 39'$: Thermometer 81° . First part of this day had strong breezes at NW., and quick passing clouds. At 6 P. M. Double-reefed the topsails ; a heavy sea from NNW. : through the night strong gales from NW. to North, with heavy squalls and thick, cloudy, rainy weather.

* Altered by me to correspond with the other logs.—H. P.

"6th.—At 8 A. M. Wind NNE., more moderate; wore ship to Northward and Westward and made sail. Latitude observation $12^{\circ} 6'$: Longitude by chronometer $71^{\circ} 24'$: Thermometer 76° . At meridian the NW. point of Cherbaniani Bank or Reef, bore $ENE\frac{1}{4}N.$, fifty-five miles distant. The course and distance for this day's run was $NEbE\frac{1}{2}E.$ 180 miles distance, whereas the course and distance by dead reckoning was North 33° East, 135 miles, which would make the current setting $EbS\frac{1}{2}S.$ ninety-five miles! I was prepared to find a good deal of Easterly current here, but did not expect any thing like this. The very heavy swell we have had, which has caused the vessel to pitch and strain very much, has arisen no doubt from this cause. Since we have got into the vicinity of these (Laccadive) Islands, we have had a very thick heavy mist, it being a mere chance that I was enabled to get observations, the sun appearing but a very short time. P. M. Strong breezes at EbN. and thick hazy weather: a large irregular swell. Through the night fresh gales and cloudy.

"7th.—Fresh breezes at ENE. and a confused irregular swell. From my observations this day, it would appear that there was some mistake in yesterday's work, otherwise we have had as much Westerly current this day, as we experienced yesterday in the opposite direction. Latitude observation $14^{\circ} 55'$: Longitude by chronometer $69^{\circ} 52'$: Thermometer 79° ."

WILLIAM MCFARLANE,

Master of American Barque Star.

Memorandum and Notes from Capt. DUNCANSON, Ship MONARCH. From the Bombay Chamber of Commerce.

1845.	Lat. N.	Long. E.	Adie's Symp.	Remarks.
<i>Dec. 1st</i>	$11^{\circ} 56'$	$68^{\circ} 14'$	29.58	Fine clear weather.
<i>„ 2nd</i>	$11^{\circ} 55'$	$69^{\circ} 5'$	29.50	} Strong monsoon with a very cross sea.
<i>„ 3rd</i>	$12^{\circ} 16'$	$70^{\circ} 29'$	29.42	

At 10 P. M. Squally, and wind variable from the Northward, a dark cloud rose to the Eastward, which rapidly spread overhead, with vivid lightning and loud thunder, with a very threatening appearance. Sym-piesometer fell to 29.30, and now beginning to blow hard; proceeded to get the ship under bare poles as fast as possible.

4th Dec.—Gale continued increasing till 1 A. M., on the 4th, when it blew a complete hurricane. Sympiesometer down to 28·90. The star-board cutter (a twenty-five feet boat) was blown from the davits, and the ship laid with her lee rail under water. At 8 A. M. A little more moderate, but a tremendous sea running; the wind gradually veering round from NNE., where it began, to Southward. At noon it commenced with redoubled violence, being then in latitude by account 13° 40' North and longitude 69° 6' East, and veered to WSW., then backed round to NE., blowing furiously all the time till 8 A. M., on the 5th, when we set some sail, having been lying to with a tarpaulin in the mizen rigging, for thirty-two hours previous. The sympiesometer began to rise about 5 A. M., and at noon was at 29·31, then in latitude 13° 20' North, and longitude 70° 20' East by account.

6th.—Strong breezes from NE. with hard squalls, veering to SE. with much rain, and a most cross, heavy sea. Latitude 13° 50' North: longitude 70° 3' East: Sympiesometer 29·47. Experienced a current of forty miles to the Westward.

JOHN DUNCANSON,

Commander of Ship Monarch.

Ship EUPHRATES.

The ship *Euphrates* Capt. Gifford, was on the 3rd December at noon in latitude 14° 35' North: longitude 69° 58' East, with a strong breeze NNE. and clear weather, becoming cloudy with lightning to the Southward: at midnight, she was standing in towards the Coast.

4th Dec.—At 3 A. M. The wind *shifted* suddenly in a hard squall to East with a threatening appearance. Barometer 29·85; the winds variable from the Eastward till noon, when a heavy head sea, (from the NE. to North.) Latitude at noon 15° 16': longitude 71° 28' East. After this time the weather was fine, the barometer gradually rising as the ship stood to the Northward.

SUMMARY.

We have now to consider the data we have for laying down the track of the storms as I have marked them on the chart.

Our first log to the Eastward is that of the *Caledonia*, which at noon on the 29th, was in latitude $6^{\circ} 50'$ North : longitude $88^{\circ} 30'$ East.* By midnight the weather was decidedly threatening, and the swell from the SW. increasing, the barometer having fallen to 29.70, with a fresh breeze from South to SSE., going about seven and seven and a half knots. We may fairly then assume, that she was now on the Eastern border of the vortex, and taking the average wind at SbE., that it bore WbS. of her. It will be noted that the *Alibi* was running up between the 28th and 29th to the Northward across the *Caledonia's* track, and experienced no bad weather, though traces of the stormy action may be found in her remarks.

The *Juliana* on the 27th, seems evidently running up into the South-western quadrant of a Storm Circle, (or into a *segment* of the forming vortex?) which by daylight of the 28th, had passed onwards, and was veering and hauling gradually, like the broken *streams* of wind, of which I have, in former Memoirs, supposed the existence, to SW. and to SSE., SE. and Easterly, when it became another, and a different storm, from the *Caledonia's*, as we shall presently shew.

To estimate the centre on this day, the 29th, we have but its bearing from the *Caledonia*. Its distance from her to the Westward I estimate as follows :—

We find that on the 30th, the *Caledonia* was at the true calm centre of her hurricane in latitude $7^{\circ} 0'$, longitude $85^{\circ} 50'$; and that a little after midnight between the 1st and 2nd, say at 1 P. M. of the 2nd, the *Hindoostan* Steamer also, doubtless steaming through the centre of her hurricane. Taking the *Caledonia's* hurricane and the *Hindoostan's* to be the same; this is from noon 30th to 1 A. M. of the 2nd, thirty-seven hours, and the distance between the positions is 218 miles, which gives 5.9 miles an hour for the rate of travelling of the vortex, or 141.5 miles per day. Now we find that the *Caledonia* in the twenty-four hours from noon of the 29th, to noon of the 30th, had made 160 miles of run, of which ninety miles were run from noon to midnight, and by 7 A. M. she was obliged to lie to, and at 10, was on the verge of the calm centre, in which at 11, she was fairly involved; or say she had made the

* Her position on the 28th, is marked from the memorandum before alluded to. Nothing being said of the weather from noon 28th, to noon 29th, I presume it was fine, and the track shews how the ship was running towards the hurricane.

remaining seventy miles in ten hours, allowing a little for the storm wave? the total rate of her run would then be 160 miles in twenty-two hours, or say, 7.3 miles per hour, or 1.4 miles faster than the vortex was moving before her.

If we assume the hurricane to have moved at this rate above mentioned, 5.9 miles per hour, it follows that the ship in the twenty-two hours that she was chasing it, only gained upon it at this rate of 1.4 miles per hour, which would give her distance at noon on the 29th, to have been really only thirty miles from the centre! and yet with only a double-reefed topsail breeze.

This would give but sixty miles of diameter, but though we have had, it is true, instances of hurricanes which like this have not much exceeded, as far as we could judge, sixty miles in diameter, yet I am inclined to allow it somewhat more than this, and we must therefore suppose, either that it was not completely formed at noon of the 29th, though the *Caledonia's* barometer (29.70) would indicate that it was enough so to produce the usual barometric depression, or that it was at a greater distance and moving at a slower rate.

We have no sort of indication to guide us in this estimate, so that I have, as a mere matter of choice and probability, placed the centre this day at fifty miles WbS. from the *Caledonia's* position, which gives it 100 miles of diameter. It could not have been much more, for we shall see that on the 30th, when she was *within* the calm centre, the *John Wickliffe*, at eighty-two miles to the SbE. of her, was barely experiencing the remote effects of the swell, in pitching away her flying jib-boom, while her wind, though Westerly, was declining to calm. The *John Wickliffe*, as she ran up, must have crossed, at about 8 A. M., on the 1st, the place of the centre a little before noon of the 30th. We find that the heavy head sea is again noted, P. M., but not at midnight, perhaps this is an omission in copying, or of a careless officer? It would have been of interest to have found traces of the confused sea of the centre at the very place of it, as we have done in other instances.

The storm had not formed and moved onward at the same rate on the 28th, for then, as will be seen by measuring backwards on the chart, the *Alibi* would have had very different weather. We shall find in our examination of the *Hindoostan's* log for the day in which she steamed through the hurricane, that its diameter then (on the 1st and

2nd,) close to the coast of Ceylon, did not certainly much exceed 120 or 130 miles.

On the 30th, we have the *Caledonia* in the centre, which we must therefore place at her position for this day. It is curious to remark that though the vortex was certainly moving on at the rate of 5.9 miles per hour, as we know from the time when it was crossed by the *Hindoostan*, yet the *Caledonia* seems to have lain from 11 A. M. to 6 P. M. in the calm! so that either she was carried along with the centre? or the calm space was from thirty to forty miles in diameter, and she was by the baffling SW. and Southerly winds carried round and round in it?*

It will be seen that while the longitude was found to agree with the account, it was the latitude which differed fifty miles from the observations when obtained. If the ship had been carried along by the vortex for the seven hours, this must have been detected by the error in longitude. It would be a curious fact to find a storm of not more than 100 miles in diameter with a calm space of thirty miles! so as to make the zone of hurricane surrounding it only thirty-five miles in breadth. There is some countenance given to the idea that there really was a state of things approaching to this, from the fact that during the-calm interval Capt. Burn, though evidently most attentive to his barometer, &c. only calls the sea "a very heavy swell." If the calm centre had been of the usual limited extent he would certainly have had somewhat of the dangerous confused pyramidal sea so often adverted to, and so well known to every sailor who has been through a China Sea Tyfoon,† that he never afterwards forgets to name it. The extent of the calm also accounts for the little sea found by the *John Wickliffe*. If these conjectures be correct, we have here a new class of circular storms which we might call Zonal, or Annulars, storms. And I venture to propose a name for them so early, merely for the purpose of calling attention to this singular peculiarity. The note in my Thirteenth Memoir, at p. 716, where Mr. Rechendorf describes the dust whirlwinds as a mere wall or zone of dust, will readily occur to those who have followed the subject. Mr. Thom speaking of the great storms of the

* Though these ought simply to have carried her to the Northern side of the calm centre: Northerly and even variable winds are not spoken of; perhaps an omission? for the log is seldom correctly kept in such weather.

† The *Caledonia* is a Bombay and China trader of 1000 tons, and Captain Burn, I have no doubt, has been in more than one Tyfoon.

Southern Indian Ocean, p. 201, says that "in the early stages it is probable the *calm* is very extensive and embraces several vortexes, which gradually merge into one," but it will be noted that we have here a "calm" of one-third of the whole space of the storm.

The centre for the 1st of December, we can only place by calculation, as to its probable position, between noon 30th, with the *Caledonia*, and 1 A. M., on the 2nd with the *Hindoostan* as calculated at p. 907, and assuming it to have travelled in a straight line. It would seem that the vortex expanded about this time, since it reached the *Hindoostan*, and being deflected or flattened, no doubt, by the high mountains of Ceylon, was with her not a NN. Westerly wind, which a true circle would require, but a Northerly wind which the coast hills would naturally produce. The warmth noted by Capt. Moresby, was probably the effect of the heated shores. At 1 A. M. on the 2nd, the *Hindoostan* was at the centre and *steaming* through the Eastern side of it! This ship's experiment, and I do not recollect that such a one has been performed before, gives us tolerable data for one important determination, which is the whole diameter of the vortex. The diameter of the calm space we cannot deduce from it, because she evidently steamed not through the middle, but through the Eastern edge of the calm centre.

If she had been far enough from the Ceylon shore for us to consider the Storm Circle as quite uninfluenced by the high land, our deductions would no doubt be more accurate. I have already noted that I make the storm arrows on the chart to form an oval and wavy, to represent this effect of the mountains, and that I consider the warm winds as coming from the heated shore, and that it is owing to this deflection that the *Hindoostan* had the wind North instead of N. Westerly, as she should, and probably would, have had it in the open sea.

We may consider her as entering upon the verge of the storm, at noon of the 1st when her barometer is at 29.71, and the gale seems fairly to have begun. From this time to noon the next day the log marks 135 miles of run, but the true distance is 110, which proportion we must use to calculate the distance run to 1 A. M. on the 2nd, when the wind "lulled suddenly, and shifted round to the Southward, and blew a perfect hurricane from the SE." Her run up to this time, then, is by log, seventy-one miles, but the correction above noted being the proportion of 135 : 110 :: 71 : 58, reduces it to fifty-eight miles, which

we must take as the nearest approximation to the semi-diameter of the (somewhat flattened?) vortex, or 116 miles for the diameter; which agrees well with what we estimated it to be from the *Caledonia's* log. We further see by Capt. Biden's note, the extract from the *Colombo Observer*, and Mr. Higgs' valuable register, that while the centre was passing over Baticolo at about half-past two in the morning, (the calm focus there seems to have been quite small in extent,) it was blowing from the East in "most violent gusts," at Trincomalee, which is about sixty miles in a NNW. direction from Baticolo, which gives 120 miles of diameter for it on shore.

The Baticolo description remarks, indeed, that "*the hurricane*" did not extend to the country about the South extremity of the lake, which extends about twenty miles from the flag-staff; but by this phrase, the writer probably means that, although there was a gale, yet it was not as at Baticolo, a *hurricane*, levelling every thing before it. Places situated towards the Southern half of a Storm Circle, where it infringes upon high land, and comes straight in from the sea, *should* also be partially sheltered; while those on the Northern side (Trincomalee in this case), should feel its full force; because, if we follow the wind in its circuit, we shall see that the outer zones of it to the North-west, must be impeded by the high land. A centre at Baticolo giving a strong gale at Trincomalee, would extend sixty miles inland to the Westward, over a perfectly flat country; but the first mountain ranges of considerable elevation, certainly approach within twenty-five or thirty miles of the coast. I have endeavoured to mark this effect on the chart by the Baticolo circle of wind-arrows, making them wavy and broken as they skirt and turn off from the mountain ranges; noting, however, that this is merely to express my views of the *probability* of what took place.

The calm at the Basses is also accounted for by their being so completely sheltered and by their distance from the centre. The gales at Colombo are described as being, "brief though severe." They were possibly streams of wind forcing their way through defiles of the mountains? for the vortex if it continued entire above, must have been much divided and broken up below, and probably indeed "lifted up" by the very high land in the interior of Ceylon.

The Trincomalee report from Mr. Higgs requires some farther notice, its barometrical register giving it especially a high value. We find that

it had increased to "violent gusts" from NEbN,* the barometer being at 29·68, the strength of the wind being as 7.; and that at 2 P. M. there were "most violent gusts," the strength of the wind being 9., and the barometer still between 29·68 and 29·66, at which it stood at 6 A. M. It might no doubt have been found lower in this interval if observed, and it was at half-past two that the centre was passing over Baticolo.

Centre of the 2nd December.—We have now to follow the storm and assign a place for the centre on the 2nd December, bearing in mind that from Baticolo to Tuticoreen Roads is, in a straight line, 222 miles, with the high land of Ceylon between them. The centre passed Baticolo on the 2nd, at 2½ A. M., and the *Florist* seems to have been wrecked in Tuticoreen Roads only about ten, or at most twelve hours later, that is in the night between the 2nd and 3rd. Hence this could scarcely be the same storm which had passed Baticolo, for if so, it must have, all at once, travelled at the rate of nearly eighteen miles an hour; and this notwithstanding the obstacles which the chain of Ceylon mountains must have presented. I am inclined then rather to suppose that this storm, which at or about midnight, 2nd and 3rd, was SE. at Tuticoreen; Westerly with the *Faize Rubahny*, between Cadiapatam Point and Cape Comorin; NW. with the *Charles Forbes*; a gale at Trevandrum, Quilon, Alleppy, Tinnevelly, and Ootacamund (no direction of the wind is given in the notes from these places); a "very violent gale" at East and SE. at Palamcottah; a "violent gale" at NE. on the morning of the 3rd at Cochin; and NE. and East, veering to SE. and SSW. at Cananore, at 8 A. M. to 1 P. M. on the 3rd. I am inclined to think then, that this storm was a new one, generated very possibly by the atmospheric disturbance to the East of Ceylon. The circle which I have marked on the chart then between Palamcotta and the *Faize Rubahny*, may be supposed to be the *average* position of the centre of a new storm, at midnight between the 2nd and 3rd, as far as any place can be assigned to it with uncertain data, and in a mountainous country.†

By noon of the 3rd, we find the *Charles Forbes* with the wind, which had rapidly veered with her since midnight, S. Westerly with nearly fine weather. At Cochin at noon it was Southerly and S. Westerly, and

* Advancing to the North beyond Baticolo, the high land trends farther inland to the West, so that the coast being lower, less interruption was given to the vortex.

† See postscript.

it was moderating from SE. and SSW.; so that we may take it at this time to have been clear of the coast, and assuming that it extended from the *Forbes'* position at midnight, to near Cananore, it was now a storm of 240 miles in diameter; but this could not be the case, for whatever the Cananore gale* was owing to the wind was S.Westerly, at daylight on the 3rd with the *Charles Forbes*, and N.Easterly at Cochin, and had left the *Faize Rubahny*; shewing that this vortex was of small extent, and that its centre lay between the *Forbes* and Cochin. I shall afterwards shew that the Cananore storm was probably that of the *Juliana*, *Frances*, and *Morley*.

The logs of the ships *John Brown* and *Mary Anne*, which were to the Westward of, and between the Maldives and Laccadives, give us no traces of the *Charles Forbes'* storm on the 4th and 5th, except in a heavy swell felt by the *John Brown*; so that it may have broken up or exhausted itself in the tract between the coast and these Islands, or have travelled on to the positions of the *Rajasthan* and *Monarch*, on the 5th and 6th, which we shall afterwards consider.

We must now return to the Bay of Bengal again, to take up the storm experienced by the *Juliana*, *Morley*, *Myaram Dyaram*, and *Frances*, as having precedence in order of time.

We noted p. 905 that the *Alibi* in running up across the *Caledonia's* track, and nearly due North, between the meridians of 89 and 90°, experienced no bad weather, though some traces of the stormy action might be found in her log. It would appear that she had on the 29th in latitude 9° 8' North, heavy squalls and sea from EbN. and ENE. to South, and again to NE. after midnight, but nothing that could be called a severe gale, though her barometer was low, and she saw that the weather was threatening to the Westward on the 30th, when she was in about 12° North.

The *Juliana* clearly ran into a circular storm, having the winds first varying from NNW. to West, then to SW. and moderating for a time (which so frequently occurs) towards noon on the 28th, when she was always running on to the NW. She crossed the track of her storm behind or to the Eastward of its centre, and had a gale from the NE. obliging her to lie to, at 11 A. M. on the 29th.

* The account it will be noted is a very loose one.

We have no data for assigning any centre to this storm on the 28th, if indeed it was formed at this time, but we can only conjecture it to have been, if formed, to the North and NE. of her on that day. On the 29th, however, we may fairly say that her NNE. and NE. gale was part of a true vortex, and that the centre bore about SEbE. from her. We can only estimate, or suppose, a distance for it, and this a very limited one, for if a vortex of large extent it would interfere with the Storm Circle of the *Caledonia*. That it was not a part of the *Caledonia's* storm, I infer from the fact that the distance between the two ships (both their positions being well ascertained) is upwards of two degrees, and their difference of longitude very small; so that the NE. gale of the *Juliana* cannot be made part of the *Caledonia's* circle, without carrying this last to reach the *John Wickliffe's* track, and include her on the 30th, when she had fine weather and calms.

On this account then I have marked the *Juliana's* storm for this day, as a separate one, also of small extent.

On the 30th we have the *Juliana* with an Easterly gale moderating at noon, while the *Morley*, to the ENE. of her, has hers just beginning at SSW. and was undoubtedly running on to the WNW., being bound to Madras, so as to overtake the more central parts of the storm which gave her the shift of wind to the Eastward, and the half an inch fall in her barometer. We have unfortunately here again but a meagre memorandum, in which the position of the ship for the 29th and 1st are wanting, when these would have been of the greatest importance to our research.

Of the *Myaram Dyaram's* hurricane, all we know is, that she had the wind more Easterly than the *Caledonia*, and occasionally to the North of East.* We know so little as to date and her position, that we are compelled, merely to *suppose* that it was on this day she had it most severely, and was in distress; one account (Captain Faucon) saying it was on the 1st, and another (Captain Twynham) on "the same day as the *Caledonia*," which would be the 30th, and her position gives the greatest probability to its having been on the 30th.† I have therefore placed the

* Letter from Captain Twynham.

† Captain Twynham, and Captain Faucon both mention that the *Myaram Dyaram*, "a short time" or "a few days" before the gale fell in with a vessel from Moulmein.

centre of this storm for this day close to the Southward of the *Myaram Dyaram*, and have just included in it the position of the *Frances*, which ship was evidently on the Southern and S. Eastern verge of a storm, and as far as we can judge by her meagre note, ran up on its Eastern side. It will be noted also that her position on this day with a Westerly and S. Westerly gale reduces greatly the Storm Circle of the *Caledonia*, proving that it could not even have been of 100 miles in diameter.* The fact of two small vortices so nearly parallel to each other is very remarkable, but the evidence for it appears to me, on this day especially, to be unquestionable, and if the *Myaram Dyaram's* storm commenced on the 28th, the two storms may have been also both formed on that date.

We have no farther trace of this storm after the 30th, and thus are uncertain if it broke up or amalgamated with the *Caledonia's*, *Hindustan's*, and Ceylon storm, or if it continued its track farther as a small independent storm to the Coromandel coast, and crossing the Peninsula, forced its way through the Palgatcherry Pass, and produced the Cananore, *Rajasthan's*, or *Monarch's* storms in the Arabian sea?

We can only intimate, or consider that this might be possible, and the heavy storm at Ootacamund, which is twenty-seven miles North of the Palgatcherry Pass, and nearly three degrees North of the centre of the storm we have traced near Cape Comorin, lends some countenance to this view; for a small storm might easily have landed about Porto Novo, between Pondicherry and Point Calymere without any reports or accounts of it being taken or obtained. The threatening weather seen to the SE. from Madras *might* have been the outskirts of it.

We now return to the Arabian Sea. I have shown at p. 911 that the *Charles Forbes'* storm may have been broken up amongst the Laccadives, or it may have joined its force to that of the Cananore storm, and both together have formed that which the *Rajasthan* experienced from the 4th to the 6th. We have seen that at noon the *Charles*

in distress, having no one to navigate her on board, and that she assisted her with an Officer and two Lascars. On her arrival at Point de Galle, two days after the *Myaram Dyaram*, it was found that she had fallen astern, and to the Northward of the *Myaram*, and though she felt the sea, had no violent winds. Her position being quite uncertain, we can only notice this.

* The *Caledonia* might even on this day have been further to the Northward, as she found on the 2nd that she was 50' North of account.

Forbes' storm was clear of the coast, and that at Cananore it was a gale on the 3rd, from 8 A. M. to 1 P. M. from NE., East, and SE., and that the ship *Charlotte* had no bad weather on the coast, being between Cochin and Cananore till the 4th; showing that this Cananore storm was of very small extent, and that the Cochin storm also did not reach much beyond that latitude. It is therefore *more* probable if the *Rajasthan's* storm came from the coast, that it was the *Charles Forbes'* travelling up in a NW. direction. Of the probability of this as to time and distance, we shall be better able to judge, when we have fixed the position of the *Rajasthan's* storm. That of the *Monarch*, which Captain Stewart supposes to have been the same, was evidently a different one, *preceding* that of the *Rajasthan* by fully eighteen hours.

It appears that on the 4th at 4 P. M., Captain Stewart observed a sudden fall of the barometer and sympiesometer, and that by noon of the 5th, the wind had increased to such a degree from the NW. that he judged it prudent to heave to, considering himself, as he observes in his note, in the South-western quadrant of a circular storm, which he no doubt was, and, from the sudden shifts, not far from the centre. I have therefore assigned it a circle of eighty miles in diameter only, which will allow her to have been twenty-five miles from the centre at noon, and in so small a vortex this seems quite a sufficient allowance. I am indeed inclined to consider this storm as one which was of much greater extent above, than at the earth's surface, thus affecting the barometer from 4 P. M. of the 4th; but not of any great violence, since the ship was running on, though her Captain clearly understood his position, till 6 A. M. The circumstance of the barometer remaining so low, with gusts at times though the force of the wind had, as it proved, passed over, is an additional motive for our supposing that the vortex may have been of much greater extent above.

The *Monarch's* hurricane as I have remarked, was evidently earlier in time, though this ship was considerably to the N. Westward of the *Rajasthan*.

It is remarkable that the *Monarch* seems to have seen the vortex spreading overhead at 10 P. M. on the 3rd, when her sympiesometer began to fall, and in three hours by 1 A. M. on the 4th, she had it blowing a complete hurricane, and at noon on that day she was at the centre of it. She laid to till 8 A. M. of the morning of the 5th, (the day of the *Rajasthan's*

or Cananore storm it will be remembered,) and then gradually made sail with the returning fine weather.

We can by no means positively connect these storms with those of the coast, though there is nothing impossible in their being connected, for taking the *Monarch's* to have been the Cananore storm, it must have travelled about 380 miles, or sixteen miles an hour, in the twenty-four hours between the 3rd and 4th, a rate at which no doubt our storms frequently *do* travel, and its rapid approach to the ship shews that it really was moving fast. It did not quit her so soon as it might be expected it would do, because she was for a time apparently blown round the circle, and thus drifting with the storm.

The *Rajasthan's* storm may be supposed to have been that of the *Charles Forbes*, without assuming any high rate of motion, for, as we have shewn, that vortex was just clearing, or clear of, the land by noon on the 3rd, when it would require only to travel about 300 miles in two days, or 150 miles per day, or a little more than six miles per hour to reach the *Rajasthan*.

Conclusion.

We are much struck when considering these remarkable small storms with their close analogy to what we see of water-spouts at sea, and with dust-whirlwinds on shore, which so frequently seem to move on in pairs or threes along the same paths: and yet withal, diminutive as we may comparatively term them, they seem to have been, for the *Myaram Dyaram*, *Caledonia*, *Hindoostan*, and the unfortunate station of Baticolo on the East side of the Peninsula, as well as with the *Monarch*, and nearly with the *Rajasthan*, of true hurricane, or rather considering them as to size, *Tornado* violence. They thus become, from the short warning which they afford, even more dangerous than storms of greater extent, which allow of twelve to twenty-four hours for preparation; and while they add a new page* to our

* Though not wholly an unexpected one. See X. Memoir. The *Coringa Packet's* and H. M. S. *Centurion's* storms off Ceylon; Journal Asiatic Society, Vol. XIII p. 113.

knowledge of Indian hurricanes, they give, as every successive investigation seems to give, a new lesson to the seaman which he has only to profit by.

The regularity with which, in spite of the mountains of Ceylon and of Southern India, they seem to move on, in about the average track is also remarkable.

POSTSCRIPT.—While this paper is going through the press, I obtain the log of the Barque *Victoria*, Captain Hyde, which ship on her voyage from Calcutta to Bombay, had from 11 P. M. of the 2nd, and morning of the 3rd December, a heavy gale from the North to NW. and SW., but which abated by 9 A. M. At 6 P. M. of the 2nd Quilon Flag-Staff bore $N\frac{1}{2}W.$; and at noon on the 3rd, the latitude was $8^{\circ} 31'$ North, by observation. This ship was therefore a little to the north of the *Charles Forbes'* position, and proves our estimation of that storm as marked by the outer arrow to be correct.—H. P.



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Piddington, Henry. 1845. "A Fourteents Memoir on the Law of Storms in India; being the Bay of Bengal. Ceylon, Malabar Coast, and Arabian Sea Storms of 29th November to 5th December, 1845." *The journal of the Asiatic Society of Bengal* 14(168), 878–916.

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