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Weather Observation at Tigbauan, Iloilo, Philippines From 1977 to 1980

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INTRODUCTION

The Philippines lies in the tropic region from approximately 5 to 19^oN latitude. The weather condition is relatively constant compared with countries in the temperate zone such as Japan.

However, through careful observations, there is a slight difference in such weather parameter as air temperature during the monsoon season. When establishing and operating fishponds for bangos and sugpo culture, it is very important to know the weather conditions particularly wind direction, water temperature and the amount of rainfall, because these factors directly affect yields.

Weather observation was initiated aiming at the following purposes:

- i) Train technical staff of Aquaculture Department (AQD) of the SEAFDEC in terms of knowing the method and practice of weather observations based on the daily activity.
- ii) Provide the basic data of weather as well as sea conditions which are necessary for the proper operation of various hatcheries, pond and cage design-construction and operation, and for the ecological study of commercially important marine species.
- iii) Gather meteorological data through actual daily observations for the basic study such as those needed by students in the university.

MATERIAL AND METHOD

Daily weather observation was preliminarily initiated on the middle of June 1977 to familiarize the staff members who were scheduled to conduct the daily observations. On July 1, 1977, the daily observation was regularly done by the staff members (mostly the present authors) of the ecology project of SEAFDEC. The observation was usually done twice daily, viz. at 0900 and 1500 hrs.

The items observed daily were as follows:

- i) Air and seawater temperatures under the shade and at the shore waters, respectively, measured by an ordinary mercury thermometer in degrees centigrade ($^{\circ}\text{C}$).
- ii) Cloud mass through visual observations, the sky is divided into 10 divisions and the number of divisions occupied by cloud is counted.
- iii) Rainfall measured in mm using an ordinary rain gauge which has an opening of 20 cm in diameter.
- iv) Wind direction is expressed in figure by means of a wind vane (FV-101, Koshin-Denki, Kogyo Co., Ltd) as a normal way.
- v) Wind speed, read with the aforementioned instrument and expressed in meters per second (m/sec.).
- vi) Salinity of seawater, measured with a refractometer (A.O. Goldberg).
- vii) Wave and swell are through visual observation, expressed with the code number which is commonly used as shown in Tables 1 and 2.

Table 1. Sea wave condition.

Code	Approximate height (feet)	Description
0	—	Calm
1	Less than 1	Smooth
2	1 to 3	Slight
3	3 to 5	Moderate
4	5 to 8	Rough
5	8 to 12	Very rough
6	12 to 20	High
7	20 to 40	Very high
8	40 and over	Mountainous
9	—	Very rough confused sea

Table 2. Sea swell condition.

Code	Approximate height (feet)	Approximate length (feet)	Description
0	None	None	No swelling
1	Less than 6	300 to 600	Quite weak
2	Less than 6	More than 600	Weak
3	6 to 13	Less than 300	Moderate
4	6 to 13	300 to 600	Moderate
5	6 to 13	More than 300	Moderate
6	More than 13	Less than 300	High swelling
7	More than 13	300 to 600	High swelling
8	More than 13	More than 600	High swelling
9	—	—	Confused sea

viii) The color of the seawater, observed visually.

ix) Number of fry collectors engaged in collection of bangos (milkfish, *Chanos chanos*) and/or sugpo (giant tiger prawn, *Penaeus monodon*) along the shore waters, counted were those operating their devices at the back of the AQD area, around 500 m in distance along the shore line. This activity is subject to the occurrence of fry which are stocked for pond culture.

OBSERVATION AND DISCUSSION

It is generally accepted that the types of climate in the Philippines are categorized into four as follows:

Type I. Two pronounced season: Dry from November to April, wet the rest of the year.

Type II. Very pronounced maximum rain period from November to January having no dry season.

Type III. Seasonal fluctuation is somewhat meager, being relatively dry from November to April and wet during the rest of the year, without pronounced maximum rain periods.

Type IV. Rainfall is evenly distributed throughout the year.

The amount of annual rainfall observed varied from 1,889 to 2,785 mm, with an average of 2,191 mm. According to the data of the present observation, the rainy period is from June to October, the dry season from November to May

(Table 3, Fig. 1). One rainy season consists of two peaks: July-August and October, which is almost identical with the observations recorded in Iloilo City. This type, with two peaks of rainfall in one rainy season appears to characterize the season in Iloilo province or Panay Island such as that in Roxas City, north-east Panay Island (Villanueva, personal communication). This type of rainfall might be one of the variations of Type I.

During the daily observations, it was found that the raining occurred and stopped suddenly and often locally. For instance, while it is raining at the SEAFDEC area, it is clear at a place only 5 km away. This phenomenon might be characteristic to Tigbauan area, although similar cases may occur in the whole Philippines.

Table 3. Mean monthly record of rainfall at Tigbauan during the period from 1977 to 1980.

Month/Year	1977	1978	1979	1980	Mean
January	—	45.20	3.90	8.28	19.13
February	—	5.70	27.40	27.00	20.03
March	—	0.30	1.80	77.15	26.42
April	—	116.10	109.90	4.45	76.82
May	—	99.40	221.65	92.00	137.68
June	—	258.30	235.80	526.50	340.20
July	—	207.70	648.80	332.04	396.18
August	—	465.10	497.80	277.08	413.33
September	469.16	195.20	150.65	11.90	206.73
October	171.83	372.90	821.60	200.95	391.82
November	58.02	92.50	38.95	248.81	109.57
December	12.72	92.10	26.45	82.40	53.42
Total	711.73	1,950.50	2,784.70	1,888.56	2,191.33

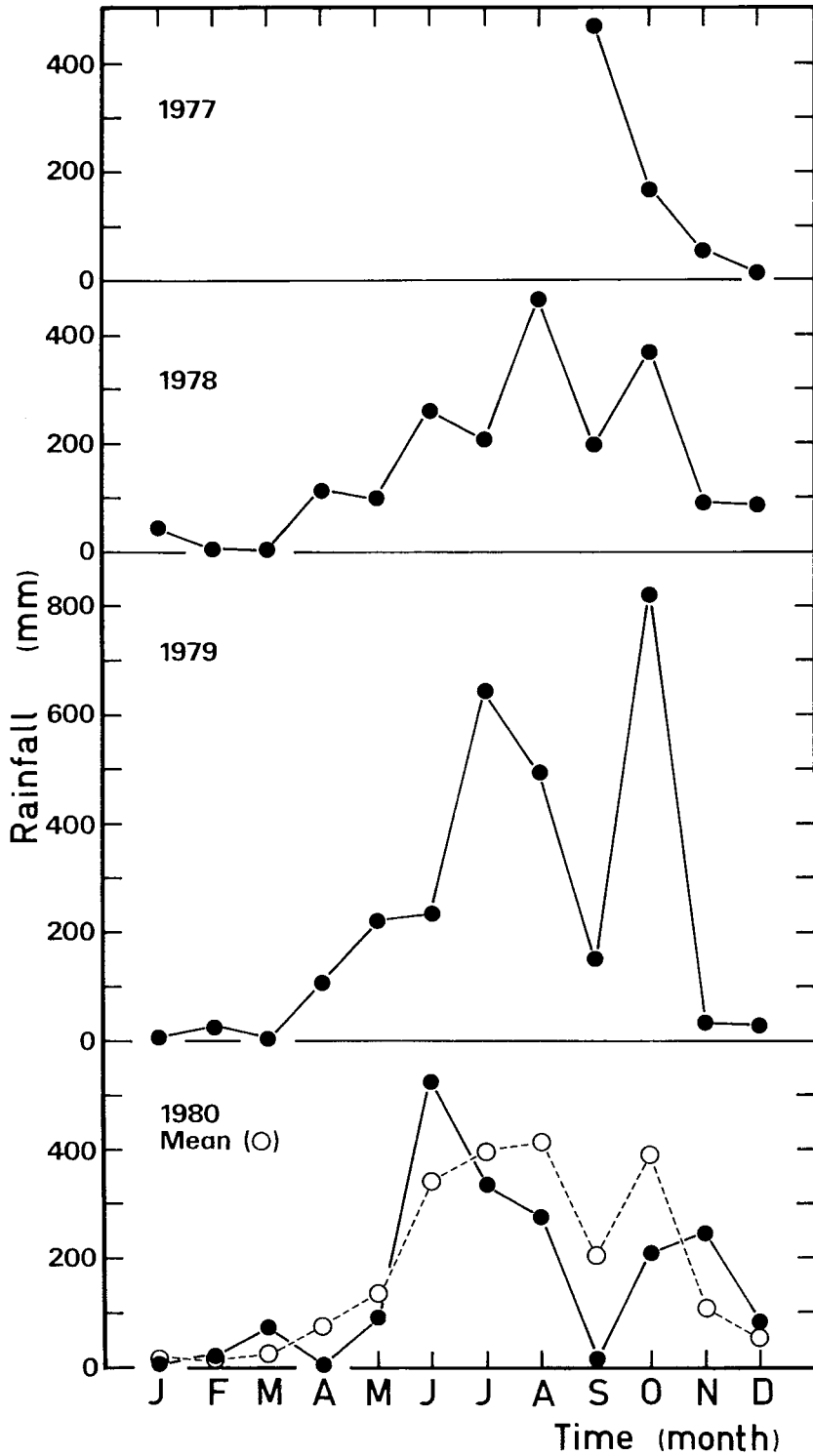


Fig. 1. Monthly fluctuations of rainfall based on daily record at Tigbauan. Open circle indicate mean of 4-year data.

The temperature of the sea water varied from 25.5 to 30.4 °C (Table 4, Fig. 2), while air temperature ranged from 25.5 to 30.9 °C (Table 5, Fig. 3), both showing a similar range. However, air temperature was generally noted to be quite low in the early morning and very high at about noon time but not so with sea water temperature.

Sea water temperature observed at shore seems to be easily affected by the air temperature, showing the fluctuation range of about 5 °C because of the shallow sampling site. Offshore water may show lesser fluctuation than the present result.

Table 4. Mean monthly record of sea water temperature (°C) at Tigbauan Main Station during the period from 1977 to 1980.

Month/Year	1977	1978	1979	1980	Mean
January	—	26.5	26.9	27.2	26.87
February	—	25.5	27.6	27.1	26.73
March	—	27.2	27.7	27.8	27.57
April	—	29.0	28.8	28.7	28.83
May	—	29.6	29.5	30.0	29.70
June	—	30.0	30.5	30.1	30.20
July	29.8	29.8	29.4	29.3	29.58
August	29.4	28.6	29.0	29.7	29.18
September	28.3	29.0	30.3	29.5	29.28
October	30.1	28.5	28.6	30.4	29.40
November	28.0	28.5	29.6	29.6	28.93
December	27.6	27.7	28.4	28.5	28.05

The air temperature shows two peaks each, viz. hot season during April-June and October-November (the former being more pronounced) and cold season, viz. January-February and August-September (the former being lower) (Table 5, Fig. 3). This phenomenon seems to indicate that the air temperature is directly affected by the lack of rainfall and cold northeast monsoon in addition to the weak intensity of sunlight during the corresponding period.

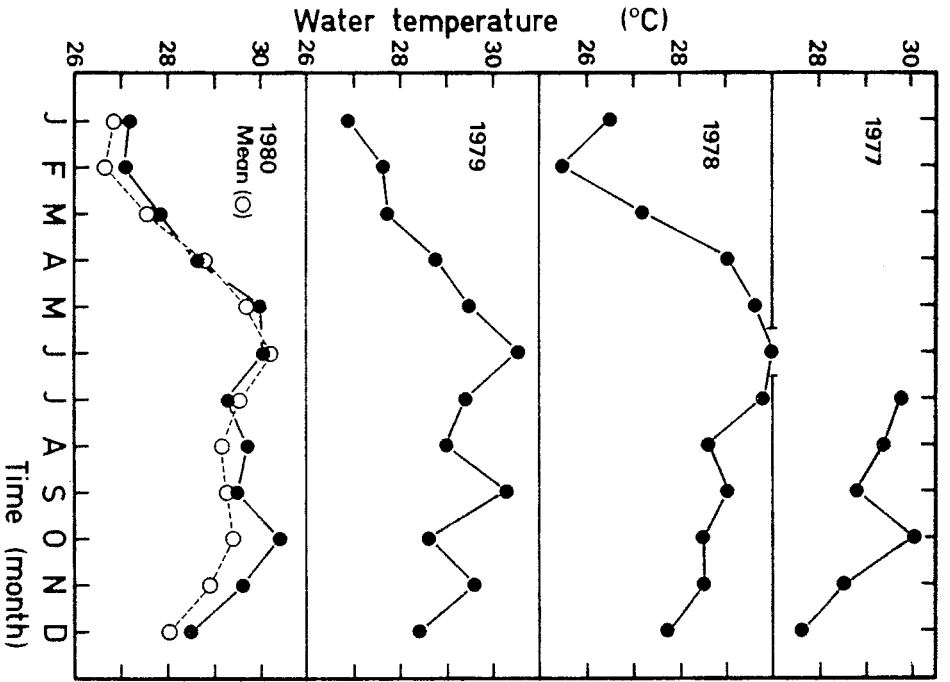


Fig. 2. Monthly fluctuations of sea water temperature based on daily record at Tigbauan. Open circle indicate mean of 4-year data.

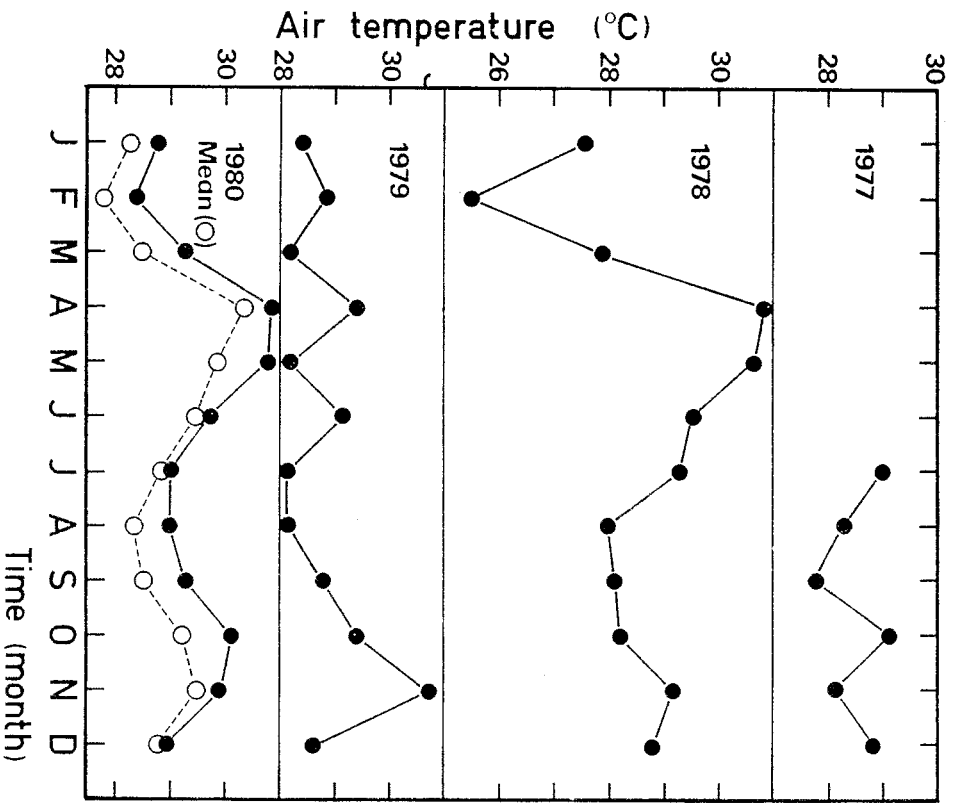


Fig. 3. Monthly fluctuations of air temperature based on daily record at Tigbauan. Open circle indicate mean of 4-year data.

Table 5. Mean monthly record of air temperature at Tigbauan during the period from 1977 to 1980.

Month/Year	1977	1978	1979	1980	Mean
January	—	27.6	28.4	28.8	28.27
February	—	25.5	28.9	28.4	27.60
March	—	27.9	28.2	29.3	28.47
April	—	30.8	29.4	30.9	30.37
May	—	30.6	28.2	30.8	29.87
June	—	29.5	29.2	29.7	29.47
July	29.0	29.3	28.1	29.0	28.85
August	28.3	28.0	28.1	29.0	28.35
September	27.8	28.1	28.8	29.3	28.50
October	29.1	28.2	29.4	30.1	29.20
November	28.1	29.2	30.7	29.9	29.48
December	28.8	28.8	28.6	28.9	28.78

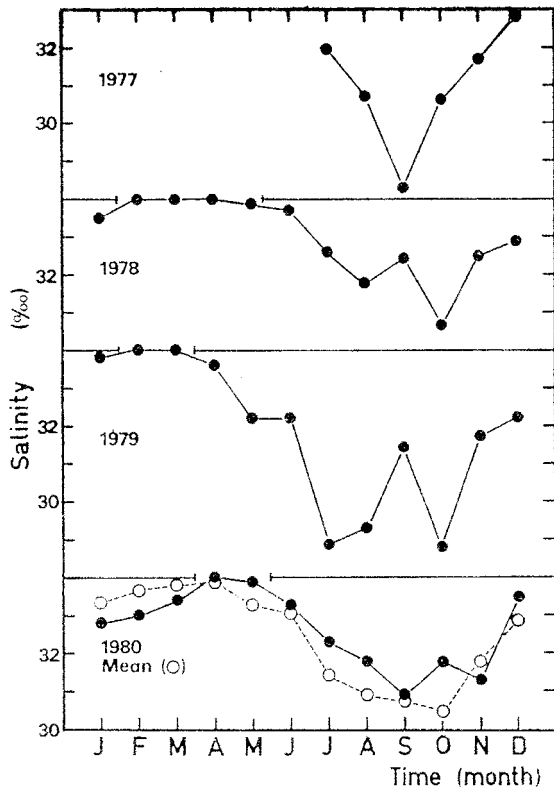


Fig. 4. Monthly fluctuations of salinity based on daily record at Tigbauan. Open circle indicates mean of 4-year data.

It was observed that the salinity is directly lowered by the amount of rainfall. The highest salinity of 34 ‰ was recorded on March-April corresponding to the lowest amount of rainfall, while the lowest salinity was about 30 ‰ which was registered September-October corresponding to the highest amount of rainfall (Table 6, Fig. 4).

Table 6. Monthly record of salinity at Tigbauan Main Station during the period from 1977 to 1980.

Month/Year	1977	1978	1979	1980	Mean
January	—	33.5	33.8	32.8	33.37
February	—	34.0	34.0	33.0	33.67
March	—	34.0	34.0	33.4	33.80
April	—	34.0	33.6	34.0	33.87
May	—	33.9	32.2	33.9	33.33
June	—	33.7	32.2	33.3	33.07
July	31.9	32.6	28.9	32.3	31.43
August	30.7	31.8	29.3	31.8	30.90
September	28.3	32.4	31.4	30.9	30.75
October	30.6	30.7	38.8	31.8	30.48
November	31.7	32.5	31.7	31.3	31.80
December	32.9	32.9	32.2	33.5	32.88

The cloud mass varied from 3 to 8; lowest from January to April and highest from June to October (Table 7, Fig. 5) showing a direct relationship with rainfall.

Fine weather was mostly observed during the period from December to April or May reasonably equivalent to dry season (Table 7, Fig. 5).

Wave and swell, as indicators of sea conditions were relatively constant with some fluctuations showing high code figure during July-August and calm condition during December-April (Table 8).

Table 7. Mean monthly record of cloud mass at Tigbauan during the period from 1977 to 1980.

Month/Year	1977	1978	1979	1980	Mean
January	—	5.0	3.4	4.3	4.23
February	—	4.1	2.9	4.6	3.87
March	—	4.9	4.4	4.0	4.43
April	—	5.2	4.6	4.0	4.60
May	—	5.7	4.2	5.0	4.97
June	—	5.5	7.1	6.9	6.50
July	7.3	6.1	7.1	6.4	6.73
August	6.4	8.0	7.0	6.5	6.98
September	7.5	5.2	5.8	7.2	6.43
October	3.8	6.5	6.8	5.4	5.63
November	5.4	4.1	4.1	4.6	4.55
December	3.6	3.9	3.6	6.2	4.33

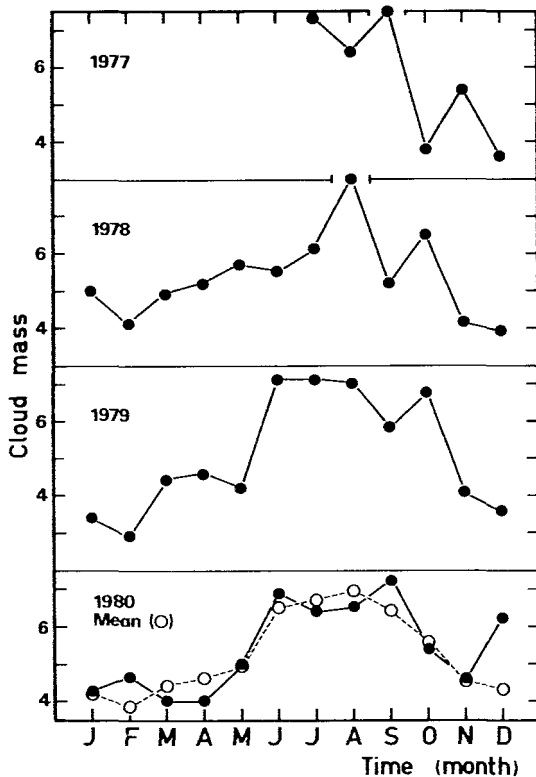


Fig. 5. Monthly fluctuations of cloud mass based on daily record at Tigbauan. Open circle indicate mean of 4-year data.

Table 8. Mean monthly record of sea condition at Tigbauan during the period from 1977 to 1980.

Month	SEA CONDITION															
	Sea wave							Sea swell								
	1977	1978		1979		1980		1977	1978		1979		1980			
am	am	pm	am	pm	am	pm	Mean	am	pm	am	pm	am	pm	Mean		
January	—	1.3	—	1.4	1.5	1.3	1.3	1.36	—	0.8	—	0.9	1.1	1.2	1.1	1.02
February	—	1.1	—	1.2	1.7	1.1	1.4	1.30	—	0.4	—	0.5	1.1	1.0	1.2	0.84
March	—	1.1	—	1.2	2.0	1.1	1.5	1.38	—	0.5	—	0.7	1.3	0.9	1.3	0.94
April	—	0.8	—	1.3	1.7	1.2	1.5	1.30	—	0.4	—	1.2	1.3	1.1	1.3	1.06
May	—	1.4	4.2	1.5	2.1	1.5	2.9	2.27	—	1.1	2.9	1.2	1.7	1.5	2.3	1.78
June	—	1.0	1.4	1.2	1.9	1.5	2.1	1.52	—	0.8	1.0	1.0	1.6	1.4	1.8	1.27
July	2.4	1.3	2.0	2.7	3.3	3.1	3.3	2.59	1.7	1.0	1.6	2.2	3.0	2.6	3.0	2.16
August	2.0	2.9	2.9	2.9	3.1	2.6	3.3	2.81	1.4	1.5	1.8	2.5	2.7	2.6	3.2	2.24
September	2.3	1.3	1.5	1.3	1.8	2.3	2.9	1.91	1.3	0.9	1.0	1.2	1.7	2.2	2.6	1.56
October	0.2	1.7	1.8	2.7	2.6	1.5	2.4	1.84	0.1	1.3	1.3	2.8	2.7	1.5	2.3	1.71
November	1.0	0.4	0.3	0.9	1.1	2.2	2.1	1.14	0.6	0.2	0.2	1.0	1.1	2.1	2.1	1.04
December	1.4	1.2	1.2	1.0	1.0	1.0	1.4	1.17	0.7	1.0	0.9	1.1	0.9	1.0	1.3	0.99

As a result it can be said that the Tigbauan area is sheltered from the northeast monsoon but is affected by the southeast monsoon. On the other hand, according to the data on wind direction and intensity, the prevailing northeast monsoon period is from December to March, while the prevailing southeast monsoon period falls in August only (Fig. 6). It seems that the Tigbauan area is not as severely affected by the northeast monsoon as by the southeast monsoon based on the result of the sea conditions.

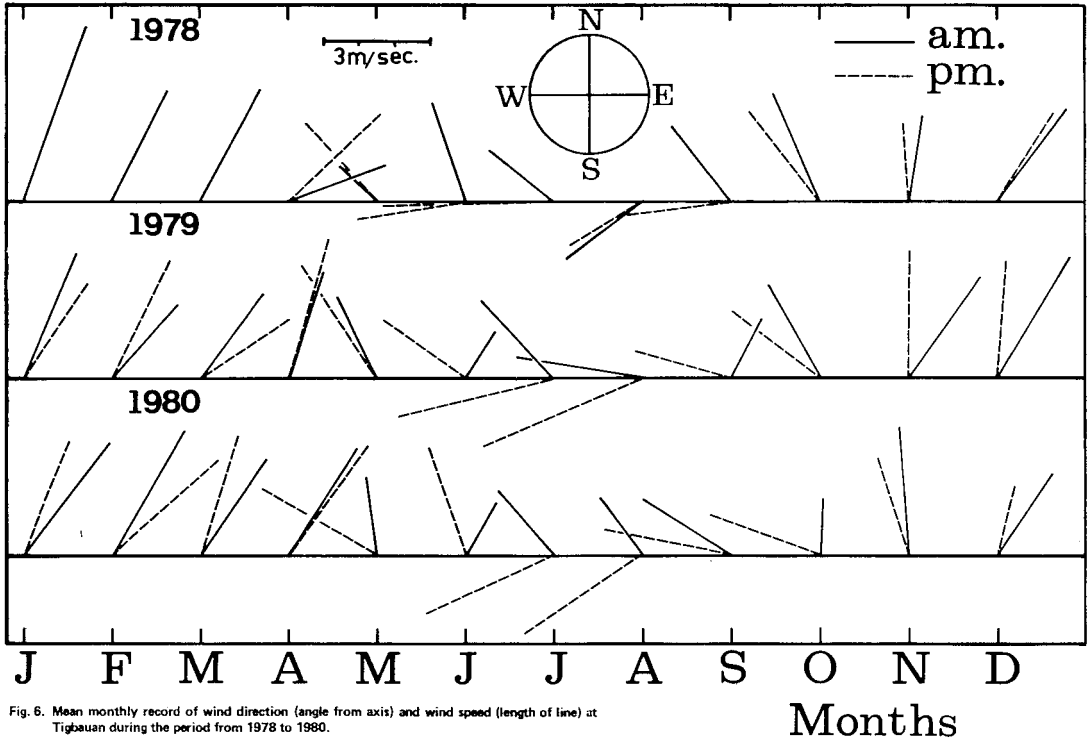


Fig. 6. Mean monthly record of wind direction (angle from axis) and wind speed (length of line) at Tigbauan during the period from 1978 to 1980.

The wind vane is located at a one storey research building of the SEAFDEC Aquaculture Department and is surrounded by several coconut trees which are almost as tall as the wind vane. This situation may have affected the wind data so that they tended to show a lesser effect of the southwest monsoon. It was observed that the wind intensity generally grew stronger in the afternoon, although the direction was practically the same.

The color of sea water was mostly light blue, greenish blue or bluish green. However, during and for two or three days after stormy weather, the color was light brown or yellowish brown owing to the turbulence, and river run-off. Storms caused by tropical depressions, tropical storms or typhoons mostly hit the Tigbauan area during the period from September to November.

Table 9 shows the mean of the four-year data of weather observed at

Table 9. Mean yearly record of weather observation at Tigbauan Main Station during the period from 1977 to 1980.

	Air Temp. (°C)	Cloud mass	Rainfall (mm)	Water Temp. (°C)	Salinity (‰)
1977	*28.52	*5.67	* 711.73	*28.87	*31.02
1978	28.63	5.35	1,950.50	28.33	33.00
1979	28.83	5.08	2,784.70	28.86	31.84
1980	29.51	5.43	1,888.46	28.99	32.67
Mean	28.87	5.38	1,833.85	28.76	32.13

* since July; ** since September.

Tigbauan. Rainfall and salinity varied between years, except for air temperature which slightly but consistently increased. Amount of rainfall was highest in 1979 with corresponding low salinity.

The fry collection was mostly observed during the period from April to December with a peak on May-June. After accumulating more data on quality and quantity covering preferably 10 to 20 years, a more detailed and definitive analysis could be done.

It should be mentioned that during the four-year period, many and different technicians took part in the daily observations; consequently, slight inconsistencies in the observations and measurements could not be avoided. In future studies, observations, would be ideally made by a staff who is well trained to gather more accurate and more detailed data. Finally the reader, who may be interested in the daily records, may refer to the data bank or the library of the Aquaculture Department of SEAFDEC both of which have the raw data.

RECOMMENDATION

Needless to say, this kind of weather observation should be continued as long as possible. In fact, this daily observation is presently going on conducted by the staff of the ecology project of the SEAFDEC.

The wind vane presently used should be transferred to a better place where there are no tall buildings, trees or other obstacles which hinder the normal condition of wind velocity and direction. The present location is also surrounded by the tall buildings and a high cliff, aside from the tall coconut trees.

It might be interesting to record daily maximum and minimum air temperatures, particularly the latter, since during the cold months the larval rearing water sometimes drops to 23-24 °C in the early morning, which used to cause their heavy mortality. Thus, an automatic recorder or maximum-minimum thermometer should be used. Presently the tidal fluctuations either at Tigbauan or Iloilo City (some 20 km away from Tigbauan) are unknown. The tidal data used mostly by the fishermen or pond caretakers are based on those at Cebu Port. For the above mentioned purposes, it is recommended to set up a tide observatory well ashore so that it is easy to read the tidal fluctuations as well as to get sea water samples particularly during stormy weather.

A sunshine recorder on a roof is also recommendable to know the seasonal intensity of the sunshine. The data obtained would be helpful for the diatom culture which is necessary for both prawn and finfish larval rearing.

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