ACTA NATURA ET SCIENTIA PRENSİP

Traditional Weather Forecasting: Practices of Fishers, Sailors and Old Folks in Tawi-Tawi, Philippines

Albaris B. Tahiluddin[1] 🆔 • Abdulgajir H. Ullang Jr.[1] 🆔 • Alfayedie M. Jali[1] 🆔 • Jaro O. Ajik[1] 🆔 • Jamrun H. Ebbah[1] 🆔 • Wahaymin M. Jamil[1] 🆔

[1] Mindanao State University-Tawi-Tawi College of Technology and Oceanography, College of Fisheries, Sanga-Sanga, Bongao, 7500, Tawi-Tawi, Philippines, albarist20@gmail.com; ullangabdulgajirjr@gmail.com; alfayedisali@gmail.com; jaromar49@gmail.com; jamrunebbah@gmail.com; jayminjarackal@gmail.com

✉ Corresponding Author: albarist20@gmail.com

ARTICLE INFO

ABSTRACT

Weather forecasting using traditional methods in the province of Tawi-Tawi, Philippines, is an important indigenous knowledge and is heavily applied to predict the weather in preparation for fishing and sailing and also for disaster prevention. Here, we documented the practices of the local people of Tawi-Tawi, situated in the southern Philippines, in forecasting weather using traditional methods. The informants of the study were fishers/Badjaos (n=15), sailors/boat captains (n=15) and old folks (n=15), which were interviewed at the Chinese Pier, Bongao, located in Tawi-Tawi, Philippines. Results revealed that traditional knowledge/methods using atmospheric (clouds, wind, temperature, and visibility), astronomical (sun and moon) and biological (seagrasses/algae, ants, birds, bees, and earthworms) indicators were used to forecast weather, which generally predicts an incoming rainy season as well as adverse weather (typhoons and floods). This study indicates that traditional weather forecasting is still used by the local people of Tawi-Tawi crucial for fishing and sailing activities.

INTRODUCTION

Fishing is an important and major livelihood for coastal settlers in Tawi-Tawi, southern Philippines, owing to its favorable location in the heart of the coral triangle, which is deemed as the world center of coral reef biodiversity (Muallil et al., 2020; Mohammad et al., 2022; Tahiluddin & Sarri, 2022). Hence, fish and other fishery aquatic products are considered as a significant source of protein for Filipinos (Tahiluddin & Terzi, 2021; Tahiluddin & Kadak, 2022). In particular, small-scale fishing is a practice by fishers in Tawi-Tawi using various fishing gear with the help of motorized boats (Muallil & Hapid, 2020; Ajik & Tahiluddin, 2021; Mohammad et al., 2022). In fishing, the fishers have to be equipped with traditional knowledge of weather forecasting in order to plan incoming fishing activities safely. Moreover, sailors, mainly the boat captains of the "lansa"- a big wooden-hulled passenger and cargo vessel, are also adept at reading the different indicators as a clue or basis for the onset of rain or extreme

Tahiluddin et al. (2023) Acta Natura et Scientia 4(1), 10-16

ACTA NATURA ET SCIENTIA

weather conditions. Fishers and sailors in Tawi-Tawi are mostly depended highly on traditional weather forecasting passed on from generation to generation (Personal Communication).

Typhoons are considered as serious threats to human lives and urban development due to their huge destructive power and high frequency of occurrence (Liu et al., 2020). Of 20 tropical cyclones on average coming from the Western Pacific Ocean, eight or nine of them cross the Philippines, which typically develop from July to November (Santos, 2021). Among the most devastating typhoons that struck the Philippines was Typhoon Haiyan (Yolanda), which occurred on November 8, 2013 (Lum & Margesson, 2014). In Tawi-Tawi, Philippines, during typhoon seasons, rough seas usually occur. Occasionally, fishers who went fishing were reported to be missing, and sailing "lansa" went sinking. Hence, weather forecasting plays an important role in safe water transportation and activities.

Traditional weather forecasting is considered a belief designed to explain mysteries of nature that old folks could hardly explain in any other way (Galacgac & Balisacan, 2009). Traditional weather forecasting is a global practice by various indigenous communities and serves as a guide in order to cope with harsh incoming weather (Risiro et al., 2012; Enock, 2013; Zachary et al., 2021). Hence, preparing in advance for their livelihood-related activities to avoid extreme damages (Galacgac & Balisacan, 2009). In the Northern Philippines, like in Ilocos Sur province, traditional weather forecasting is one important piece of knowledge used by the local people to predict weather conditions for fishing and farming (Galacgac & Balisacan, 2001). Despite the existence of modern technology, such as the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA), locals claimed that PAGASA forecasts are not specific to local forecasts and are applicable in wider coverage (Galacgac & Balisacan, 2009). In Tawi-Tawi, PAGASA stations are lacking, and weather forecasting is only available via television and smartphones. However, since not all fishers and sailors own these technologies, relying on old folks' knowledge for forecasting weather remains useful. Hence, in this study, forecasting weather using traditional methods used by the fishers (Badjaos), sailors/boat captains, and old folks was determined through one-on-one interviews.

MATERIAL AND METHODS

Study Location

The study was conducted at a Chinese pier, Bongao, Tawi-Tawi, Philippines (Figure 1). The study location is the central pier of Tawi-Tawi, where all passenger boats (lansa), fishing boats, and other water transportation can be seen.
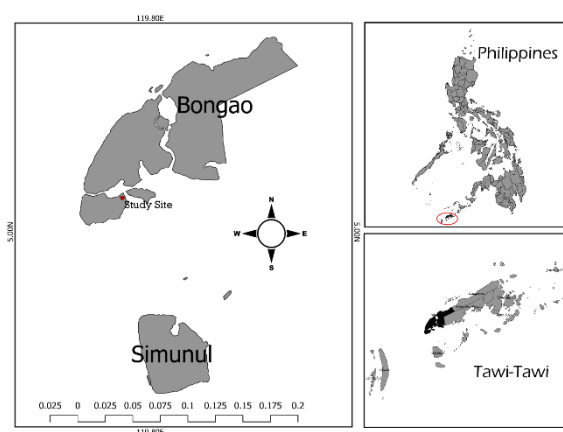

Figure 1. Study site

Data/Information Gathering

In this study, the respondents or traditional weather forecasters (n=45) were composed of fishers (Badjaos, n=15), sailors (boat captains, n=15) and old folks (n=15). Using the local dialect (Sama), the respondents were personally interviewed with the help of an unstructured questionnaire. Traditional weather forecasters were asked how they predict the weather, such as the upcoming rain or wet season, adverse weather factors (typhoons and floods) and others, using atmospheric, astronomical, and biological indicators.

Data Analysis

Descriptive statistics, i.e., frequency statistics, were used in analyzing the data with the help of Microsoft Excel 2021.

Tahiluddin et al. (2023) Acta Natura et Scientia 4(1), 10-16

ACTA NATURA ET SCIENTIA

RESULTS AND DISCUSSION

This study revealed that fishers (Badjaos), sailors (boat captains), and old folks used traditional knowledge to forecast the weather in the local area. These methods of forecasting include various indicators, such as atmospheric (clouds, wind, temperature and visibility), astronomic (moon and sun), and biological (seagrasses/algae, ants, birds, bees and earthworms) indicators. Globally, this form of indigenous knowledge has been practiced since immemorial (Muguti & Maposa, 2012; Enock, 2013).

In the present study, the widely used traditional knowledge for weather forecasting was the atmospheric indicators namely clouds, wind, temperature, and visibility. All of the respondents (100%) relied on clouds to predict the weather. The presence of cumulonimbus clouds would predict rain, while the appearance of hair-like clouds (cirrus clouds) would serve as an indicator of an incoming storm (Table 1). In Africa, old folks interpret the presence of clouds (cumulonimbus) as an approaching heavy storm with thunder and lightning (Enock, 2013),

similar to modern meteorology forecasts (Barry & Chorley, 1998; Ahrens & Henson, 2019). The wind is another atmospheric indicator used by the Tawi-Tawian people (80%) in the present study; when the wind blows from the south, adverse weather, like typhoons and floods, can be expected (Table 1). This claim is parallel to those reported by the old folks in Ilocos Sur, Philippines (Galacgac & Balisacan, 2001). Southwest monsoon is typically carried heavy rainfall, which could intensify when associated with tropical cyclones (Cayanan et al., 2011). Another meteorological indicator in the present study used by traditional weather forecasters (44.44%) is when a warm temperature is felt during nighttime, indicating that rain will occur within one or two days (Table 1). Galacgac & Balisacan (2001) reported that the old folks in Ilocos Norte, Philippines, also predict an incoming short-range rain once the temperature is warm at night. Moreover, Malaysian farmers used this human behavior, that is, feeling warmth associated with lethargy, irritability, and insomnia, as a rain indicator (Garay-Barayazarra & Puri, 2011).

Table 1. Atmospheric indicators utilized as traditional weather forecasting by the Tawi-Tawian people

Atmospheric Indicators	No. of Respondents				Forecast
	Boat captain	*Fishers (Badjaos)*	*Old folks*	*Total*	
A) Clouds	15	15	15	45	
The presence of cumulonimbus clouds					There is an incoming rain.
The appearance of hair-like clouds (cirrus clouds)					There will be a storm.
B) Wind Wind blows from the south	12	13	11	36	Adverse weather, like a typhoon, is coming.
C) Temperature Warm temperature is felt during nighttime.	8	5	7	20	Rain will occur within one or two days.
D) Visibility When the mountain or island is seen, or visibility is very high.	7	7	6	20	Adverse weather conditions will occur.

Tahiluddin et al. (2023) Acta Natura et Scientia 4(1), 10-16

ACTA NATURA ET SCIENTIA

When the visibility is low or dull/foggy.					The weather is good.

Table 2. Astronomic indicators utilized as traditional weather forecasting by the Tawi-Tawian people

Atmospheric Indicators	No. of Respondents				Forecast
	Boat captain	*Fishers (Badjaos)*	*Old folks*	*Total*	
Moon and sun A luminous ring around the moon and sun	10	11	10	31	Rain will occur after one or two days.

Table 3. Biological indicators utilized as traditional weather forecasting by the Tawi-Tawian people

Atmospheric Indicators	No. of Respondents				Forecast
	Boat captain	*Fishers (Badjaos)*	*Old folks*	*Total*	
A. Plant/Algae The appearance of seagrass and algae floating in the sea	4	1	6	11	A typhoon is coming.
B. Animal Migration of armies of ants (Formicidae) typically carrying stored food Migration of birds, such as frigate birds, waders or shorebirds, and bees. Earthworms walking on land.	15	2	15	32	Wet/rainy season is about to start.

The moon and sun are typical astronomical indicators to predict weather conditions. In this study, a rain will occur within one or two days when a luminous ring around the moon and sun is observed (Table 2). According to Galacgac & Balisacan (2001), the appearance of a luminous ring around the moon (lunar corona) indicates extreme weather conditions, i.e., floods or typhoons. Enock (2013) also found out that astronomical indicators, such as the moon, are used in Africa to predict the approaching rainfall but in different ways, while the sun is typically used to signal temperature changes. Ahrens & Henson (2019) mentioned that a halo (a light ring that encircles the moon or the sun) is produced when the light passes through the crystals of ice in cirrostratus clouds. In addition, the formation of thick cirrostratus clouds often occurs ahead of a proceeding cyclonic storm; therefore, they are usually used to predict rain within 12-24 hours. Other astronomical indicators used by traditional weather forecasters are the stars, as reported by some study (Muallil et al., 2020). For instance, the agricultural farmers in Sibutu, Tawi-Tawi, used the presence of seven stars, being positioned directly overhead at sunset, to signal the farming season. In addition, rain would be expected when the three stars are noticed roughly 100 degrees

Tahiluddin et al. (2023) Acta Natura et Scientia 4(1), 10-16

ACTA NATURA ET SCIENTIA

westward from the east (Muallil et al., 2020). Fishers also used the aggregation of stars observed 45 degrees from the east as a sign of a fishing season, especially, capturing *Megalaspis cordyla, Sphyraena barracuda*, and *Rastrelliger kanagurta* (Muallil et al., 2020).

Biological indicators for traditional weather forecasting were not commonly used by the Tawi-Tawian people since they typically live near coastal belt. Only one indicator was used: the appearance of seagrasses and algae floating in the sea, indicating that a typhoon is coming (Table 3 A). According to Navarrete-Fernández et al. (2022), the litter of seagrasses on the beach is three-fold higher after heavy rainfall. Other studies indicated that the most commonly used biological indicators in forecasting weather conditions, especially by agricultural farmers, are the terrestrial plants. Terrestrial plants are good rainfall predictors due to their high affinity to water, which respond easily to significant changes in atmospheric moisture content (Zachary et al., 2021). Plant indicators such as early rotting and ripening of some fruits, development of flower/buds/shoots, and flowering of plants predict the onset of the rainy season (Galacgac & Balisacan, 2009). Animals are also key indicators of premature and late rainfall onset, especially migratory birds, amphibians, and insects (black ants and spiders) (Zachary et al., 2021). The presence of plenty of spider webs is also used to indicate an upcoming extreme wet season (Enock, 2013). The appearance of a local African type of kingfisher has been linked to heavy falls, which may occur within days (Enock, 2013). In the present study, animal indicators, like the migration of armies of ants (Formicidae) typically carrying stored food, migration of birds (frigate bird and waders or shorebirds) and bees, as well as earthworms walking on land, are all indicators of incoming wet/rainy season (Table 3B). The ant exodus from their caves and the low-flying behavior of dragonflies are used by traditional weather forecasters as a clue for the upcoming rainfall (Galacgac & Balisacan, 2009). Galacgac & Balisacan (2001) also reported that the migration of honeybees predicts the onset of the rainy season. Insects are proficient at monitoring the conditions of the atmosphere since their survival is dependent on it (Galacgac & Balisacan, 2009).

CONCLUSION

Weather forecasting using traditional methods is an important indigenous knowledge that has been used by the local Tawi-Tawian people in the southern Philippines since ancient ages, handed to them by their ancestors. Atmospheric, astronomical, and biological (plants and animals) indicators were all used for traditional weather forecasting, which generally predicts the onset of the rainy season and incoming adverse weather conditions, such as typhoons and floods. The locals apply this indigenous knowledge for safe trips during fishing and sailing.

Compliance with Ethical Standards

Authors' Contributions

ABT: Manuscript design, Drafting, Revising

AHU & AMJ: Conducted the survey, Data analysis, Drafting

JOA, JHE & WMJ: Reviewing, Editing

All authors read and approved the final manuscript.

Conflict of Interest

The authors declare that there is no conflict of interest.

Ethical Approval

For this type of study, formal consent is not required.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author, [ABT], upon reasonable request.

REFERENCES

Ahrens, C. D., & Henson, R. (2019). *Meteorology today: an introduction to weather, climate, and the environment*. 12th Edition. Cengage Learning Canada Inc.

Tahiluddin et al. (2023) Acta Natura et Scientia 4(1), 10-16

ACTA NATURA ET SCIENTIA

Ajik, J. O., & Tahiluddin, A. B. (2021). Size distribution, length-weight relationship, and catch per unit effort of frigate tuna, *Auxis thazard* (Lacepède, 1800) in Tawi-Tawi waters, southern Philippines, caught using multiple handline. *Marine Science and Technology Bulletin*, *10*(4), 370-375. https://doi.org/10.33714/masteb.974182

Barry, R., & Chorley, J. (1998) *Atmosphere, Weather and Climate*. Seventh Edition. Routledge.

Cayanan, O. E., Chen, T. C., Argete, J. C., Yen, M. C., & Nilo, P. D. (2011). The effect of tropical cyclones on southwest monsoon rainfall in the Philippines. *Journal of the Meteorological Society of Japan*, *89A*, 123-139. https://doi.org/10.2151/jmsj.2011-a08

Enock, C. M. (2013). Indigenous knowledge systems and modern weather forecasting: exploring the linkages. *Journal of Agriculture and Sustainability*, *2*(1), 98-141.

Galacgac, E. S., & Balisacan, C. M. (2001). Traditional weather forecasting methods in Ilocos Norte. *Philippine Journal of Crop Science*, *26*, 5-14.

Galacgac, E. S., & Balisacan, C. M. (2009). Traditional weather forecasting for sustainable agroforestry practices in Ilocos Norte Province, Philippines. *Forest Ecology and Management*, *257*(10), 2044-2053. https://doi.org/10.1016/j.foreco.2009.01.002

Garay-Barayazarra, G., & Puri, R. K. (2011). Smelling the monsoon: Senses and traditional weather forecasting knowledge among the Kenyah Badeng farmers of Sarawak, Malaysia. *Indian Journal of Traditional Knowledge*, *10*(1), 21-30.

Liu, G., Li, X., Wang, J., Kou, Y., & Wang, X. (2020). Research on the statistical characteristics of typhoon frequency. *Ocean Engineering*, *209*, 107489. https://doi.org/10.1016/j.oceaneng.2020.107489

Lum, T., & Margesson, R. (2014). Typhoon Haiyan (Yolanda): U.S. and international response to Philippines disaster. Report, September 30, 2022; Washington D.C.. (https://digital.library.unt.edu/ark:/67531/metadc282292/: accessed September 30, 2022), University of North Texas Libraries, UNT Digital Library.

Mohammad, H. S., Ebbah, J. H., Sahiyal, K. M., & Tahiluddin, A. B. (2022). An assessment of small-scale fisheries in Tandubas, Tawi-Tawi, Southern Philippines. *Menba Journal of Fisheries Faculty*, *8*(1), 10-22.

Muallil, M. Y., Adam, K., Muallil, R., & de Guzman, L. E. (2020). From fishing to farming in Sibutu Island, Tawi-Tawi. In O. B. Zamora, L.E.P. de Guzman & R. V. Tatlonghari (Eds.), *Stories of adaptation to climate change* (pp. 108-122). Department of Agriculture-Bureau of Agricultural Research (DA-BAR) and University of the Philippines Los Banos-College of Agriculture and Food Science (UPLB-CAFS).

Muallil, R. N., & Hapid, M. G. N. (2020). Preliminary report on an artisanal fishery for thresher sharks (*Alopias spp*) in Tawi-Tawi, Southern Philippines. *Marine Policy*, *117*, 103894. https://doi.org/10.1016/j.marpol.2020.103894

Muguti, T., & Maposa, R. S. (2012). Indigenous weather forecasting: A phenomenological study engaging the Shona of Zimbabwe. *The Journal of Pan African Studies*, *4*(9), 102-112.

Navarrete-Fernández, T., Bermejo, R., Hernández, I., Deidun, A., Andreu-Cazenave, M., & Cózar, A. (2022). The role of seagrass meadows in the coastal trapping of litter. *Marine Pollution Bulletin*, *174*, 113299. https://doi.org/10.1016/j.marpolbul.2021.113299

Risiro, J., Mashoko, D., Tshuma, Doreen, T., & Rurinda, E. (2012). Weather forecasting and indigenous knowledge systems in Chimanimani District of Manicaland, Zimbabwe. *Journal of Emerging Trends in Educational Research and Policy Studies*, *3*(4), 561-566.

Tahiluddin et al. (2023) Acta Natura et Scientia 4(1), 10-16

ACTA NATURA ET SCIENTIA

Santos, G. D. C. (2021). 2020 tropical cyclones in the Philippines: A review. *Tropical Cyclone Research and Review*, *10*(3), 191-199. https://doi.org/10.1016/j.tcrr.2021.09.003

Tahiluddin, A. B., & Kadak, A. E. (2022). Traditional fish processing techniques applied in the Philippines and Turkey *Menba Journal of Fisheries Faculty*, *8*(1), 50-58.

Tahiluddin, A. B., & Sarri, J. H. (2022). An overview of destructive fishing in the Philippines. *Acta Natura et Scientia*, *3*(2), 116-125. https://doi.org/10.29329/actanatsci.2022.352.04

Tahiluddin, A. B., & Terzi, E. (2021). An overview of fisheries and aquaculture in the Philippines. *Journal of Anatolian Environmental and Animal Sciences*, *6*(4), 475-486. https://doi.org/10.35229/jaes.944292

Zachary, M., Yin, L., Zacharia, M., Sakwa, A., Zhang, X., Zheng, Y., & Mukolwe, B. (2021). The use of traditional knowledge in weather forecasting by Nganyi community. *SCIREA Journal of Environment*, *5*(2), 27-45.