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Influence of seasonal variation on the utilization and catch composition of fishing gears in Palanan, Isabela seashore, Philippines

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Abstract
The study determined and documented the influence of seasonal variation on the utilization and catch composition of fishing gears along the coastal area of Palanan, Isabela. Ocular inspection of fishing gears and personal interviews were conducted at the stations namely: Dicotcotan San Isidro, Sabang Maligaya, Culasi, and Dimolid. Results showed a diversity of fishing gears and fish species documented along the study area at two seasons. The most commonly used fishing gears during the onset of summer and rainy seasons are: troll line, bottom set gill net, troll with bait fish (*lonoy*), bottom hook and line (*pasayad*), multiple hook and line *(ug-og)*, multiple hook troll line (*saliw-siw tuna*), and spear. On the other hand, the most documented fish species caught by fishing gears are skipjack tuna, frigate tuna, scads, indo pacific sail fish, sardines and flying fish in summer and surgeon fish, siganids, and snapper for the rainy season.

Keywords: Seasonal variation, fishing gears, catch composition, Palanan, Isabela

1. Introduction
Marine fisheries are very important to the economy and well-being of coastal communities, providing food security, job opportunities, income and livelihoods as well as traditional cultural identity. They produced 80 million tonnes of fish in 2009 and directly employed 34 million people in fishing operations in 2008 [2]. Fish and fishery products are a vital and affordable source of high-quality protein, especially in the world's poorest nations – in 2008, fish supplied more than 3 billion people with at least 15 percent of their average animal protein intake [2]. Therefore, maintaining the long-term prosperity and sustainability of marine fisheries is not only of political and social significance but also of economic and ecological importance. Fishing gears are an intrinsic part of the fishing process. Without these tools we would be very ineffective predators in the marine environment. Therefore, any assessment of the impacts of fishing on marine environment requires, at a minimum, a time series of fisheries catch related to the gear that caught them. Global statistics are generally poor when it comes to identifying the species taken and the actual location where they are taken. Worse yet, are records of how much fishing 'effort' was expended, and even these seldom describe which types of fishing gear were used [11].

There are databases available on the internet providing details of fish species composition captured per country, but does not currently provide details of which gear was used to take the catch [12]. Several researches focused on understanding the patterns, on the seasonal variation of fish abundance, biomass and ecological indices such as species richness and diversity [3-5]. The study was conducted to document the influence of seasonal variation on the utilization and catch composition of fishing gears at Palanan, Isabela, Philippines.

2. Materials and Methods
2.1 Description of the study area: The Province of Isabela lies at the Northeastern Luzon of the Philippine archipelago. It is one of the five Provinces of Region II, which comprises 35 municipalities, two cities, and four coastal towns. Palanan is the oldest coastal town of Isabela. It lies with the geographical coordinates of 7° 3' 32" North latitude, and 122° 25' 47" East longitude (Fig. 1).

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Fig 1: Location of Palanan, Isabela, Philippines.

2.2 Ocular inspection and interviews: Data were gathered by ocular inspection and personal interview. Questions about the fishing gears used by fishermen, the catch composition during summer and rainy seasons were asked during the interview. Validation was done through ocular inspection of fishing gears used on the catch composition per fishing gears

2.3 Assessment method: Interviews and ocular inspections were conducted at the onset of summer and rainy season. Samplings were randomly selected at four fish landing areas namely: Dicotcotan San Isidro, Sitio Sabang Maligaya, Culasi, and Sitio Dimolid for three (3) days per week in every station during the months of April and October, 2015, respectively.

2.4 Calculation of fishing effort: This study used a modified measure for fishing effort of fisherman, the time spent per fishing operation and catch composition by boat were determined. The catch per unit effort (CPUE) is the most commonly accepted measure of fishing effort [9]

Formula:
$$cpue_I = \frac{\sum \frac{C_i}{f_i}}{n} = \overline{\left(\frac{C}{f}\right)}$$

3. Results
3.1 Identified and classified fishing gears: A total of thirty one (31) fishing gears were identified along the coastal area of Palanan, Isabela The category, classification, English name, local name (tagalog and paranan) names, and catch composition of fishing gears were included. The identified fishing gears includes the following: bottom set gill net, drift gill net, seine net, beach seine, encircling gillnet (*pangulung*), large set bottom net (*panting kalabao*), cast net, crab lift net, scoop net, push net, troll line, multiple hook troll line *(saliw-siw tuna),* hook and line (*paulad*), troll with bait fish (*lonoy*), multiple hook and line (*saliw-siw with miniature boat*), fishing lure (*alpaca*), multiple hook and line (*kasikas*), multiple hook and line (*bira-bira*), multiple hook and line (*ug-og*), set hook and line (*kanaway*), bottom hook and line (*pasayad*), hook and line (*tapun-tapun*), hook and line (*bakul-kul*), hook and line (*aya-aya*), bottom set long line (*kitang*), floater (*parubao*), fishing lure (*rapala*), jigger or attracting device (*light-light*), harpoon (*tarapang*), spear (*pana*), and fish pot (*bubo*) (Fig. 2). Majority of the fishing gears were classified as lines (18), followed by nets (10) (Fig. 3).
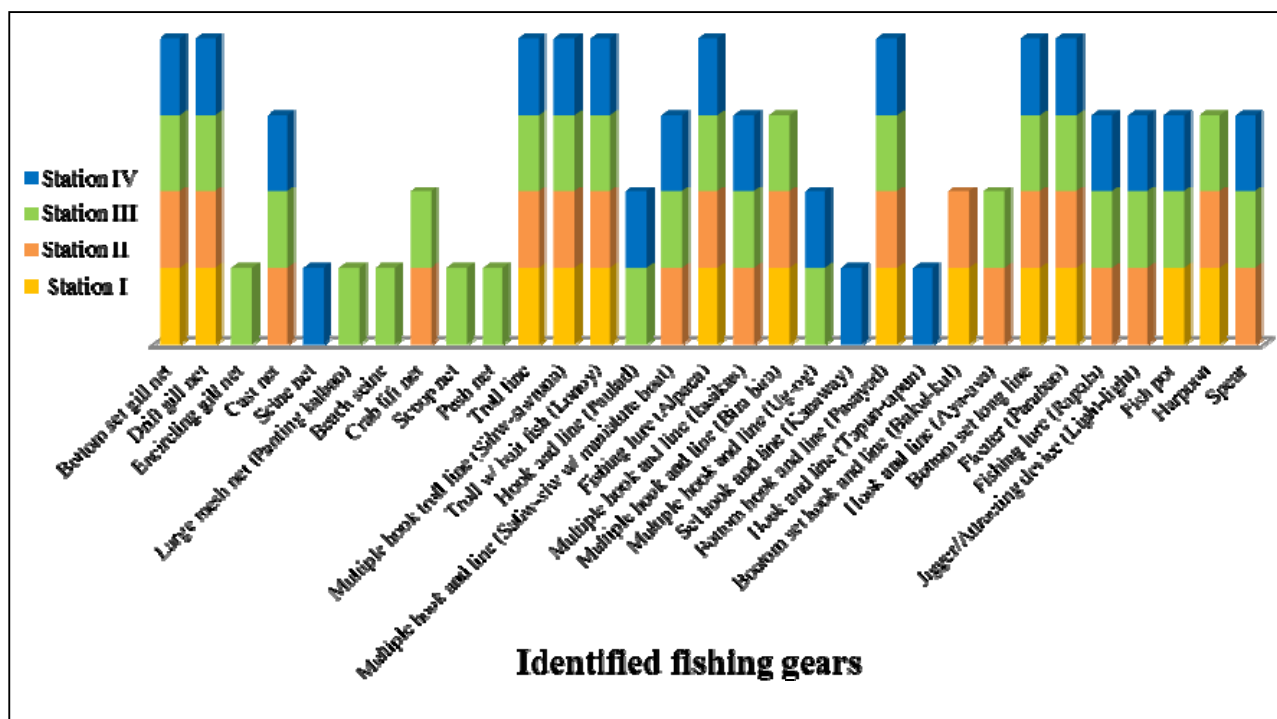

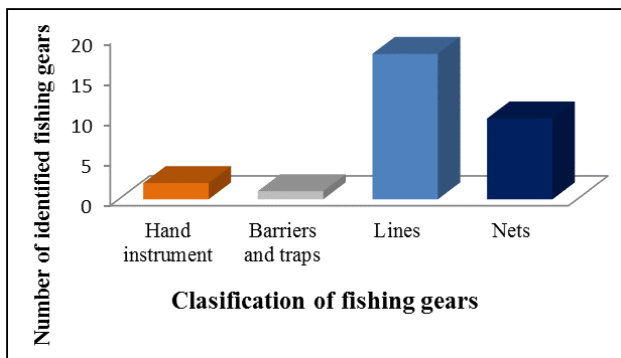**Fig 2:** Fishing gears compositions used at the four landing site in Palanan, Isabela

Fig 3: Classification of fishing gears used at Palanan, Isabela during the onset of summer and rainy seasons

3.2 Catch composition of fishing gears: The catch composition of fishing gears used during the summer and rainy season belongs to the following family of fishes: Acanthuridae, Ariidae, Caesionidae, Carangidae, Clupiedae, Congridae, Coryphaenidae, Cynoglossidae, Engraulidae, Ephippidae, Exocoetidae, Gerreidae, Haemulidae, Hemiramphidae, Holocentridae, Istiophoridae, Kyphosidae, Labridae, Leiognathidae, Lutjanidae, Lethrinidae, Menidae, Mugilidae, Mullidae, Nemipteridae, Pempheridae, Polynemidae, Priancantidae, Scaridae, Sciaenidae, Scombridae, Serranidae, Siganidae, Sphyraenidae, Synodontidae, Trichiuridae, Dasyatididae and Palaemonidae.

3.3 Influence of seasonal variations on the utilization of fishing gears: The composition in the number of fishing gears used along the four stations between the two seasons is shown in Fig. 4. This study shows that there are more fishing gears used at any stations during the onset of summer, rather than rainy season. A total of thirty one (31) fishing gears are used during onset of summer, while only fifteen (15) fishing gears for the rainy season. Majority of the fishing gears used during onset of summer are lines (54.84%) followed by nets (32.36%). On the other hand, lines (40%) of fishing gears used during onset of rainy season and followed by nets (33.33%).

This study revealed that seasons influence the utilization of fishing gears used at the coastal area of Palanan, Isabela. There is a great variation on the utilization of fishing gears between summer and rainy season. All the fishing gears identified are used at the onset of summer season. However, only a few are used during the onset of rainy season (Fig. 5). The distribution of fishing gears used along the fish landing stations of Palanan, Isabela (Fig. 6).
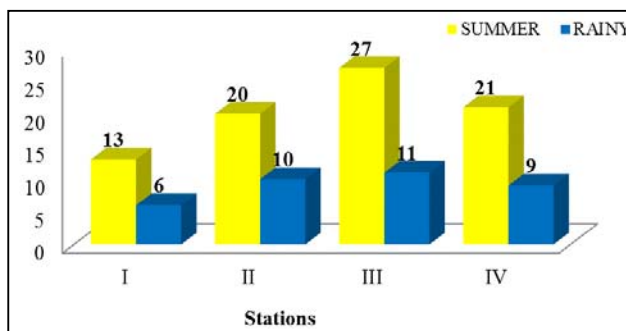

Fig 4: Composition in the number of fishing gears used along the four stations between the summer and rainy seasons
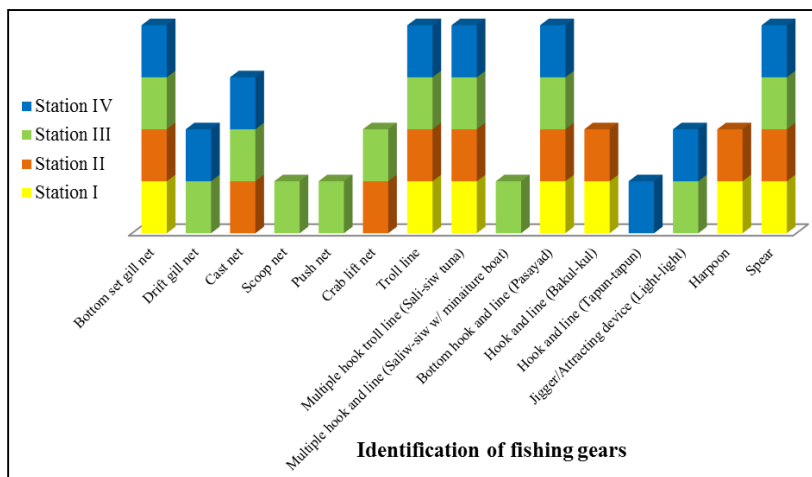

Fig 5: Identified of fishing gears used at the fish landing sites of Palanan, Isabela at the onset rainy season
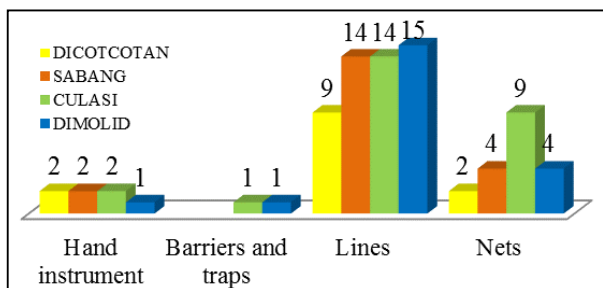

Fig 6: Composition of fishing gears used at the four station of Palanan, Isabela

3.4 Catch per unit effort of fishing gears

The estimated volume of catch of the fishing gears used per day of fishing operations at the onset of summer and rainy seasons. During onset of summer season, Station 3 obtained the highest volume of catch with a total of 5,160 kg fishes during one day of fishing operation and this is due to the various type of fishing gears used at the stations (Fig. 7). While during the onset of rainy season, Station 2, obtained the highest volume of catch with total of 1,130 kg fishes during one day of fishing operation (Fig. 8).
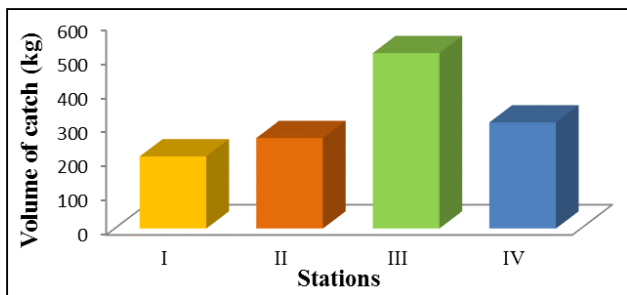
Fig 7: Estimated volume of catch per day of fishing operations at the onset of summer season.
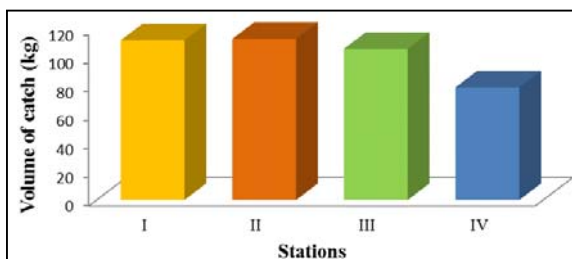

Fig 8: Estimated volume of catch during one day fishing operations during onset of rainy season

4. Discussion
The variation on the use of fishing gear used during summer and rainy seasons is due to effect of seasonal variations. Some popular problems in fishing practices include insufficient information on fishing equipment, groups and size of fishes. The gear types may select catch by size or species, therefore, gear use may affect the catch per unit effort of targeted fishes as reflected in the study of [1]. These fishing gears are mostly operated through the shallow water areas and sandy part of the sea floor. Generally, the catch rate trends among the fishing ground were associated with the reproduction periods of the species as reflected in the study of [10].

In summer, it is worthy to mention here that primary productivity and phytoplankton abundances were high in the region due to the favorable environmental zone and sea surface temperature as reflected in the study of [8]. Regarding the fishing gears identified and documented during summer months, the station that use various types of fishing gears is station 3 with 27 fishing gears identified by followed by station 2 and 4 with 27 and 21 fishing gears.

Associated with the recent study during the rainy season, it is considered that some natural resources are affected due to Northeast monsoon wind. As observed, the situations of the landing site that remained are very difficult during this month and the declining use of fishing gears is also affected. Conversely impact of seasonal variations remained that a large adjustment of the fishermen on fishing practices. Some fishing gears are not often use during rainy season due to some problems on fishing activities, compared during the summer months where the use of fishing gear is almost free and favorable from any disturbances on fishing operations.

The most diverse group of fishes that were caught during the onset of summer season includes the following: Flying fish, Sardines, Indo-pacific sail fish, Big eye scads, Round scads, Mackerels, Squids, Anchovies, Tuna, Cutlass fish, Common pony fish, Moon fish, goat fish, and Croaker fish. Those fishes were caught almost all the time during summer season, because this is the time for their spawning and breeding as reflected to the study of [8]. Fishes use to spawn throughout the year in the region, however, summer months (April to May) could be considered as peak spawning season and also rich abundance of phytoplankton and zooplankton. Therefore, favorable hydrographical and biological conditions are vital for the successful recruitment of larvae fish [13, 7]. Fishes caught during the rainy season includes Surgeon fish, Siganids, and Snapper fishes.

The fisherman had to make effort to go fishing operation early in the morning and afternoon and sometimes at night time. They use motorized boats and none motorized boat to their fishing operation. Every fisherman dreams of a bigger catch. Weather condition and moon phases may affect the fishing practices of fishermen

The catch per unit effort (CPUE) is especially useful if the relationship between catch and effort is linear through the origin (strict proportionality) as reflected in the study of [6]. It is very important relationship between catch and effort on fishing activities. The catch per unit effort reflects the effort and inputs that the fisherman must give in order to catch fish. Higher CPUE are expected in fishing grounds with abundant fishes. You can catch fish with a very little investment in times, fuel and other consumptions.

At the onset of summer season, station 3 obtained the highest volume of catch and this is due to the diversity of fishing gears used at the station. On the other hand, station 2 had the highest volume of catch during the onset of summer season. It was obtained that these is a large decrease in the volume of catch during the onset of rainy season as compared to summer season. Possible reasons for this include the weather disturbances and the change in the monsoon which also corresponds to the frequent formation of typhoons in the pacific region. The coastal area of Isabela serves as a major path of typhoons. Every year specially during the months of September-December. These seasonal variations greatly influence the volume, density and abundance of the catch of fishing gears across the four major landing sites of Palanan, Isabela.

5. Conclusion
The findings of the present study revealed a diversity of fishing gears used along the coastal areas of Palanan, Iabela at the onset of summer and rainy seasons. Majority of the fishing gears identified belongs to the line category. Catch composition of the fishing gears used in Palanan, Isabela belong to a diverse family of fishes which includes flying fishes, sardines, tuna and tuna-like fishes, scads, surgeon fishes, siganids and anchovies. All of the documented fishing gears are used during the summer season while only 15 are used at the onset of rainy season. The catch per unit effort (CPUE) of fishing gears is relatively higher during the summer (13,160 kg) as compared to the rainy (4,105 kg) season.

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