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Short Communication

Catch Composition of Set Net Fisheries during Normal Season in Sungai Sembilang Waters, Selangor, Malaysia

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Abstract

Set net fisheries are made according to traditional fishing gears method in the coastal waters of Sungai Sembilang, Selangor, Peninsular Malaysia. These fisheries system are the passive structure of gear used to catch fish that swim in shallow water with muddy substrate. This study focused on determining the species variety and the possible potential of set net fisheries in Sungai Sembilang. Catch composition of set net was investigated based on the catch data during July to December 2020 and continued from January to February 2021. The catch data was recorded by a research assistant on site during fishing season. The data consisted of species, length, and weight of all catches recorded. Total catch of 60 fish species belonging to 23 families were captured during this study period. Ariidae (31.73%), Clupeidae (11.56%), and Scatophagidae (7.96%) were determined as dominant families caught this set net, and the total dominant catch amount species, *Plicofollis argyropleuron* (18.71%), *Nemapteryx caelata* (9.96%), and *Anodontostoma chacunda* (8.92%), compromised 37.6% of the total catch. This type of fishing gear can be used by local fisherman to catch fishes and can prevent trawl net from come closer to the shore. This study would provide some general useful information about the status of set net fisheries as well as the species abundance caught from the set net.

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1. Introduction

Tropical, small scale coastal fisheries, which feed and provide income to millions of people around the world (Zeller *et al*., 2007; Pauly, 2006; McGoodwin, 1984; Berkes *et al*., 2001) are especially hard to manage in proper scientific manner based on optimum yield. The set net fishery industry is popular and well known to be one of the traditional fishing methods in the world. Nowadays, the set nets are used around the world, particularly in the Far East country (FAO, 2015). This fisheries system is well-known with different sizes and types at certain times of the year (Deveciyan, 2011). In general, they consist of gears that are inertly constructed for catching fish in shallow water with cloudy substrates. Setting up a set net in an appropriate location by looking at the flow is also significant in catching the fish that swim in these set nets (Bök, 1991).

In this world, mainly many regions in the Far East, there have been some studies about diversities, catch composition, and abundance to determine the possible catch of fixed fish stake trap fishing (Robertson and Duke, 1990; Liu *et al*., 1995; Chen *et al*., 1997; Jenq, 2004; 2010). Large set nets are used to catch large pelagic species such as tuna, yellowtail, and salmon as well as demersal species such as sea bream. About 100,000 tons of salmon are harvested annually in Japan of which 60% are from coastal waters (He and Inoue, 2010). Moreover, the amount of salmon produced by set net fishery increased to 230,000 tons in 1997, reaching 86% of the amount of domestic production (Shimizu, 2005).

On the other hand, the catch composition of Taiwan coastal and offshore fisheries contributed by set net in 2017 was only 7% among the other types of fishing gear (Liao *et al*., 2019). The study of set nets in Tung-Ao bay, Taiwan from 1990 to 2011 showed an increasing trend for both the total number of species and the diversity index while the cumulative percentages of the top 10 captured fish species decreased annually (Lu and Lee, 2014). Besides, there was also biology and ecology studies in northern Jinju bay, Korea that investigated the influence of fishing method (beam trawl and set net) on prey choice via stomach content analyses and the results obtained for set net samples was not optimal (Joo *et al*., 2020).

The set net technology also had been introduced in the Southeast Asian countries including Thailand, Indonesia, and Vietnam. The peak level of daily catch of Rayong set net in Thailand was 50-100 kg in the first year (2003) and gradually increased to about 200-250 kg for the next 6 years of the project (Manajit *et al*., 2011). In contrast, the daily average catch of set nets in Bone bay, Indonesia was only 61 kg per day for the same period of study (2008-2015) (Rosmaladewi, 2018). Another area of study such as in Nha Trang bay, Vietnam reported that the total landing of the main species, Spanish mackerel, dramatically decreased from approximately 23,457 kg in 2005 to only 6,998 kg in 2016. The moon phase, year, and sea surface temperature (SST) are found to be significant factors to the variation of Spanish mackerel catch of set net fishery (Nguyen and Nguyena, 2017).

All previous studies have shown that diversity, catch compositions, and abundance of set net fisheries are varied for different countries and waters. However, this method of fishing is dependent on the fundamental characteristics of passive fishing gear such as the migration of fish, environmental condition of waters, and the performance of fishing gear (Olii *et al*., 2014). Thus, various improvements have been made to ensure these fisheries are more stable and profitable.

To overcome the true essential challenges in fisheries, new techniques that can address current tension in the sector must be developed. The Southeast Asian Fisheries Development Center (SEAFDEC) promotes the transmission of community-based set net fishing technology as one technological method. Unlike round haul net or trawl fishing where fish are chased, set net fishing involves fisherman waiting for fish to congregate around the set net. Because fish can enter and escape the net, only around 20-30% of the fish that enter the net are eventually captured. It is an environmentally beneficial fishing method that avoids overfishing (SEAFDEC, 2011).

Only some people know about set net fisheries in Sungai Sembilang, Selangor Malaysia. This study focused on determining the species variety and the potential of set nets as fishing gears in Sungai Sembilang. Furthermore, the outcome of this study will provide some information about maintainable coastal fisheries management, species diversity, catch composition, and the status of set net fishing in this country.

2. Materials and Methods

2.1 Set Net Species Catch Sampling and Data Collection

Every set net was visited monthly around March 2020 – February 2021 in the coastal waters of Sungai Sembilang, Selangor (Malaysia).

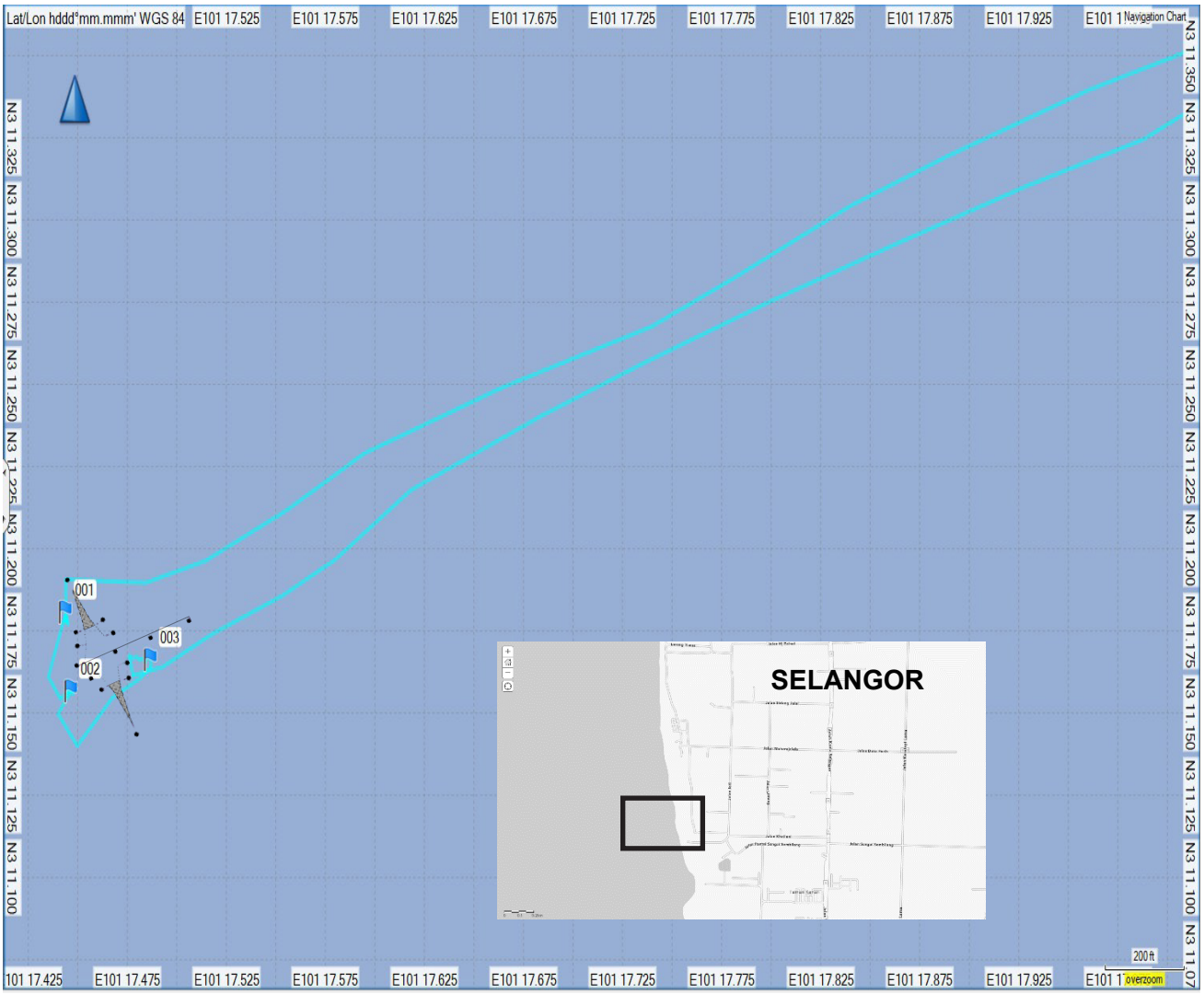

Figure 1. Sampling locations

Table 1. Set net location and mesh size used in this study

Location	Area	Coordinates	Depth (m)	Mesh size (mm)
Selangor	Sungai Sembilang	3° 11' 181"N – 101° 17' 444"E	3-5	76.2 mm

In general, fishing activity occurs monthly in Sungai Sembilang. In a month, the set net is being set up for two times during the week. The mesh size of the set net is 76.2 mm (Table 1). We recorded all the fish caught by these gears in one day, twice a month for the set net in the year 2020 – 2021. In addition, the set net catches were collected from fishermen logbook of catch data obtain by weight.

2.2 Gear Description

Each fishery system was constructed over a surface area of approximately 50 m length and 40-50 m width at depth of up to 5-6 m, perpendicular to the shore in Sungai Sembilang. The set net was located just above the average low tide level and consisted of a leader net, an entrance, a slope, a playground, a bag net and a final trap or cod end and all of them supported by galvanized pipe poles and pvc pipe (Figure 2) and top view (Figure 3). At every compartment, the mesh size is different for all parts of the set net. Five fishermen harvest the fish trapped in the set net by opening the zip in both final trap and cod end. The set net was checked once daily (in the morning) and usually being cleared only during low tide.

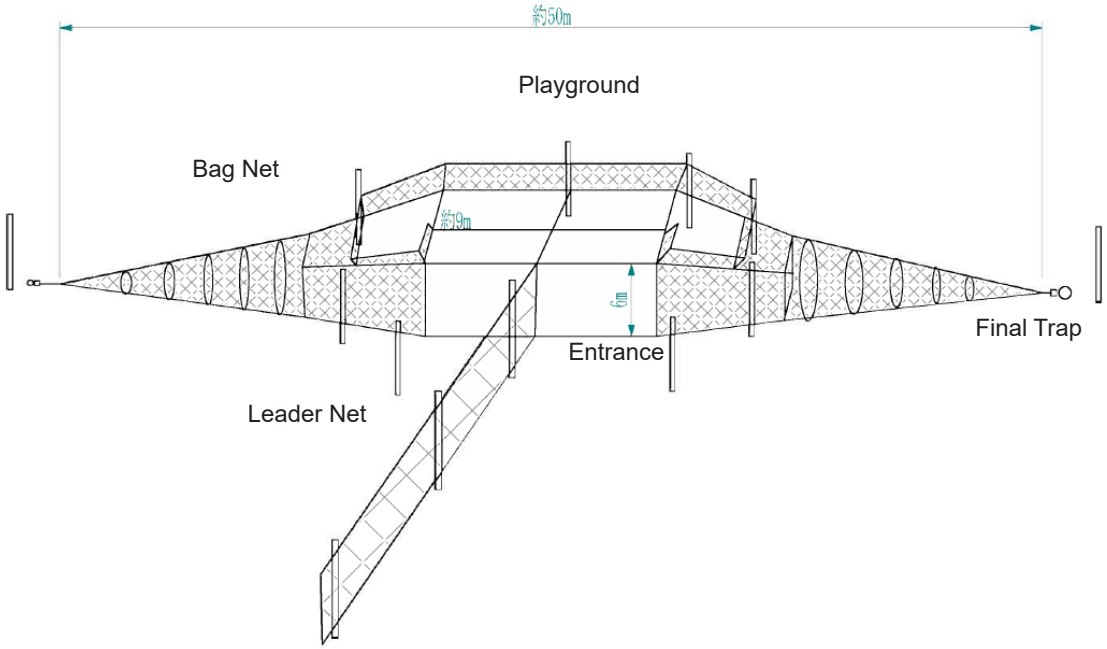

Figure 2. Drawing of a typical set net in Sungai Sembilang

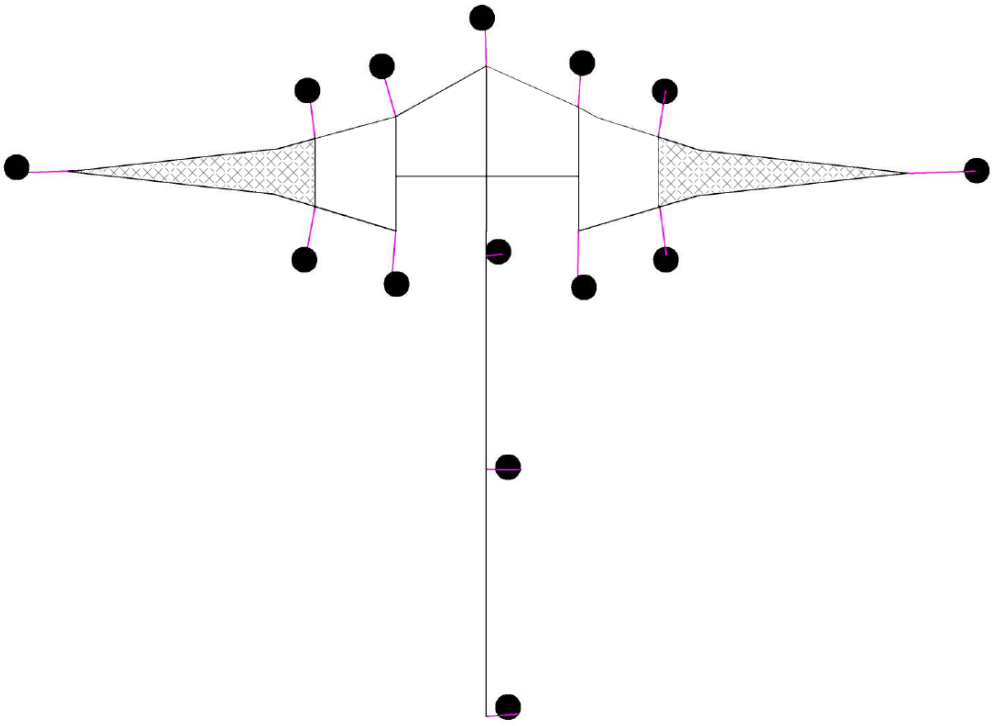

Figure 3. Top view drawing of a typical set net in Sungai Sembilang

2.3 Catch composition

To assess spatial difference in the output of the set net fishery, Catch Per Unit Effort (CPUE) of monthly dominant species was used in the study. The CPUE of a set net was calculated by dividing the total catch by the number of fishing days within the set net. CPUE values are given with standard error values.

$$CPUE_i = \frac{Catch_i}{Fishing\ days_i}$$

Description:

Catch: the sum of the catch within a set net and
Fishing days: the sum of the fishing days in the set net

The differences between the total catch composition and CPUE were identified using Student t tests (Zar, 1984). Significant differences were considered for $P < 0.05$.

3. Results and Discussion

3.1 Season Variation of Catch Composition of Set Net

to species migrating out of the system as they mature and the introduction of new species, which could also be related to temperature patterns, which change considerably over the year. Family Ariidae was the highest in total catch in both weight and number during the study period. The second highest was from Family Clupeidae in number. The other species had no regular trend like Family Ariidae and Family Clupeidae and their catch composition was not significant.

3.2 Variation of Catch Composition by the Weight Basis

The total weight of Family Ariidae was 413.64 kg (58.40%) which was the largest catch by weight during this study period. Family Ariidae catch composition was dominant in every month. The contribution of Family Sciaenidae 68.97 kg (9.74%), was second highest in total catch weight. A little amount of Family Sphyraenidae 0.38 kg (0.05%) and Family Menidae 0.26 kg (0.04%) were found during this study period.

3.3 Variation of Catch Composition by the Number of Fish Basis

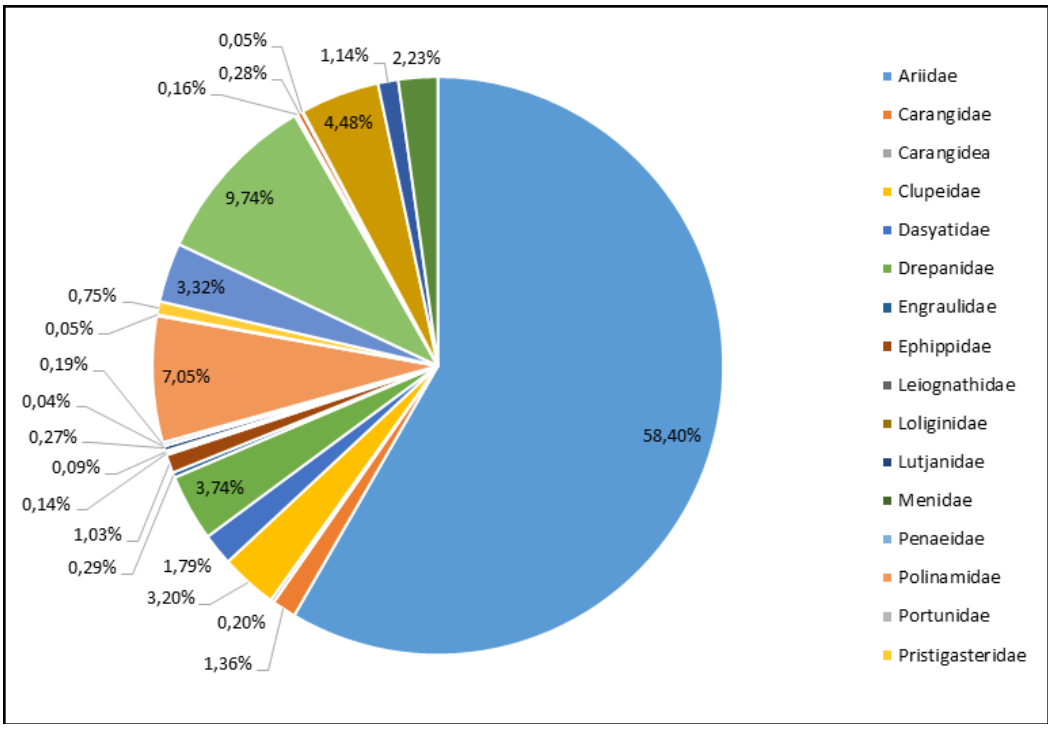

Figure 4. Variation of catch composition (by weight basis) during the study period.

Throughout the study period, catch composition of fish varies with seasonal variation. This study was conducted during the southwest monsoon (July to December 2020) and during northeast monsoon (January to February 2021). Seasonal variations might be attributed

The total number of Family Ariidae was 1403 (31.73%) which was the highest catch in number during this study period. Family Ariidae was dominant in every month. The contribution of Family Clupeidae 511 (11.56%) was the second highest in the total catch. A

small number of Family Sphyraenidae (2) and Family Portunidae (1) were found during this study period.

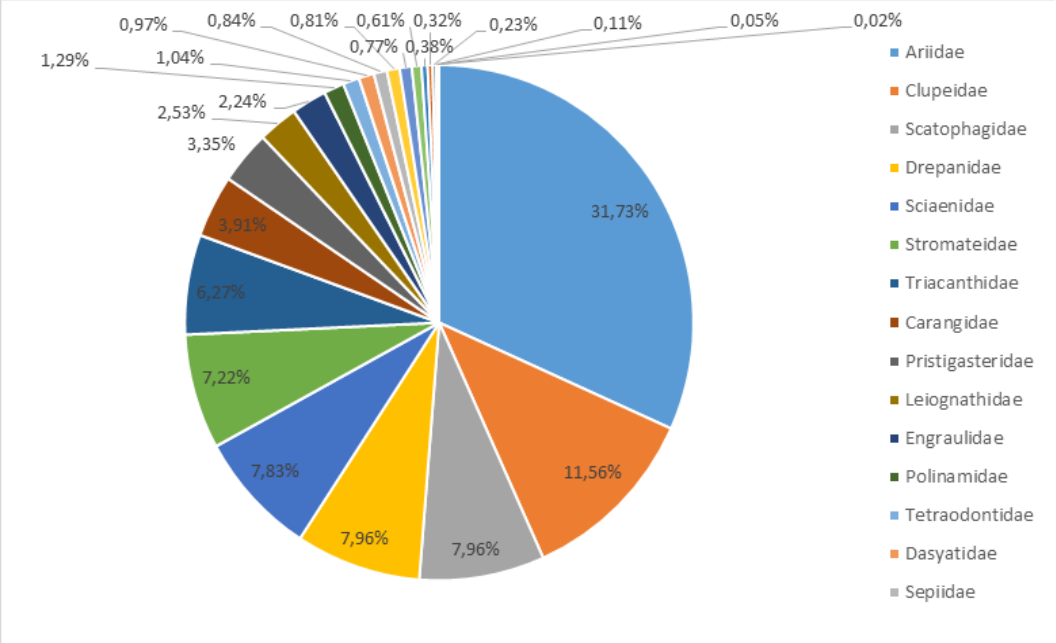

Figure 5. Variation of catch composition (by number basis) during the study period.

3.4 Catch Composition

The highest value of fish that was caught from the study location in July 2020 was 149.62 kg/day and the lowest was 13.47 kg/day in January 2021. The capture for each month shows variation.

4. Conclusion

Set net fisheries is one of the most significant fishing methods used in coastal fisheries of Sungai Sembilang to catch coastal fishes. Species that swims through the coastal areas of Sungai Sembilang to feed, for nursing and spawning ground are caught by the set net. In this study, 60 species representing 15 families were captured by the set net. The three dominant species that were caught during this study were from Family Ariidae, Clupeidae, and Scatophagidae. The other family was insignificant in quantity. From this study, we managed to display the species diversity that was found in Sungai Sembilang by using set nets as fishing gears. However, the usage of set nets was still uncommon in Malaysia. Only certain fishermen used this method. The recommendations that can be concluded from this study were: 1) We need more studies for this method as it is one of the most effective methods in fisheries. The lack of study on these fishing gears in Malaysia are the reasons why people still use the common method of fisheries which is using gill nets, trawl nets, and other traditional fishing gears 2) The set nets can be improved according to the sustainability of the method with our local fisheries and seasons, 3) Introducing set nets as a sustainable fishing gear can improve the quality of our fishing industry, especially for local fisherman. This is important as this method can prevent overfishing as it is one of the current issues in the fisheries industry. The important catch by these gears consist of red mullet, horse mackerel, sole, bocce, and shrimp being reported in this study.

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Authors' Contributions

All authors have contributed very well to the final manuscript. The contribution of each author as follows, Wan Muhammad Luqman Wan Rosdi; design study.

Abdul Wahab Abdullah; design study assistant. Mohd Nazir Taib; sample collection on site. Noor Hanis Abu Halim; sample collection for length weight analysis. Nur Habibah Abu Talib; sample collection and species identification. Hashim Suhaimi; lab work and species identification. Sharum Yusof; fishing gear expert. All authors discussed the result and contributed to the final manuscript

Conflict of Interest

The authors declare that they have no competing interests.

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