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## BIODIVERSITY OF CORAL FISH IN BONTANG WATERS, EAST KALIMANTAN, INDONESIA

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### Abstract

*Bontang sea waters is a part of Coral Triangle. Information and data on the coral fish community in that waters are still a few, therefore this study aimed to identify the species composition and structure of the coral fish community in the study area. Data collection performed using visual census method in the area of Kedindingan island, Melahing island, and Gusung Sapa Segajah. The fish were observed for species and abundance in the depth range from 4m-6m. In total, 1.162 of coral fish has been found in this study, consisted of 228 species from 21 families. Among them, there were 33 species of target fish (consumable), 80 species of Major fish (ornament), and 14 species of indicator fish from family Chaetodontidae. Biodiversity index ( $H'$ ) ranges from 2,29 to 3,02. Similarity index ( $E$ ) ranges between 0,60 to 0,84. Dominance index ( $C$ ) ranges between 0,08 to 0,25.*

**Keywords :** Fish, Coral, Melahing, Kedindingan, Sapa Segajah

### INTRODUCTION

The ecosystem of coral reef is one of the richest ecosystems. The coral reef is described as rain forest of the sea in which the function ecologically is very important, such as protecting the coast from erosion caused by current and waves.

Fish is an important component in the aquatic environment. The presence of fish in the ecosystem could provide a description of the actual condition of the coral reef. The fish use coral reef as their territory area (Robertson *et. al*, 1976), shelter (Hixon, 1991), feeding area (Reese, 1981), a place for reproduction and grow (Wootton, 1992). Resources providing the habitat probably can limit the abundance of a population and the habitat characteristic can be an important key in defining the community structure of a population (Klopfer, 1969; Gorman and Karr, 1978; Brown, 1984, Bell *et al*, 1991).

The complexity of Bontang coastal zone management still remains high this day. In fact, the volume of activity tends to increase considering the fact that the region has long been an operation area of several oil and gas companies.

In addition to the mineral resources that are abundant in the cluster of coral, Bontang waters also having a quite diverse marine biodiversity. The potential of marine biodiversity is scattered in small islands throughout the Coastal Bontang. Meanwhile, documentation about the biodiversity of marine organisms such as fish in Bontang waters still very little. The coral reefs in this region increasingly threatened by anthropogenic factors. The purpose of this study is to determine the biodiversity of marine species particularly reef fish in the waters of Bontang.

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## MATERIALS AND METHODS

### Study Site

The observation was conducted at 3 locations (Gusung Sapa Segajah, Melahing island, and Kedindingan island). Each location consisted of 2 observation stations (Figure 1). The study conducted in April 2015 (Table 1).

### Sampling Method

Observation stations were chosen based on the characteristics of each location (Figure 1). Sapa Segajah is a flat island (sandbars) where surrounding overgrown by coral reefs. Melahing is an island with a stretch of coral that grow around it and inhabited. Kedindingan is an island overgrown with coral reefs around it and uninhabited.

### Data Analysis

Data of reef fish is obtained by using visual census, that is Line Intercept Transect / LIT (English *et al.* 1997). The equipment used are a SCUBA, underwater camera, a transect of 50m length and data recorder board. The observers swim along the line transect of 50 m length and width 5 m (2.5 m to left and right). Transect laid at depths ranging from 5-8 meters. Recording of fish performed during day time in the reef slope.

Identification of fish species using manual identification book of Allen (2003) and supported by documentation (photos and videos) taken during the field survey. The censused Fish were classified taxonomically and analyzed for the condition of the community structure.

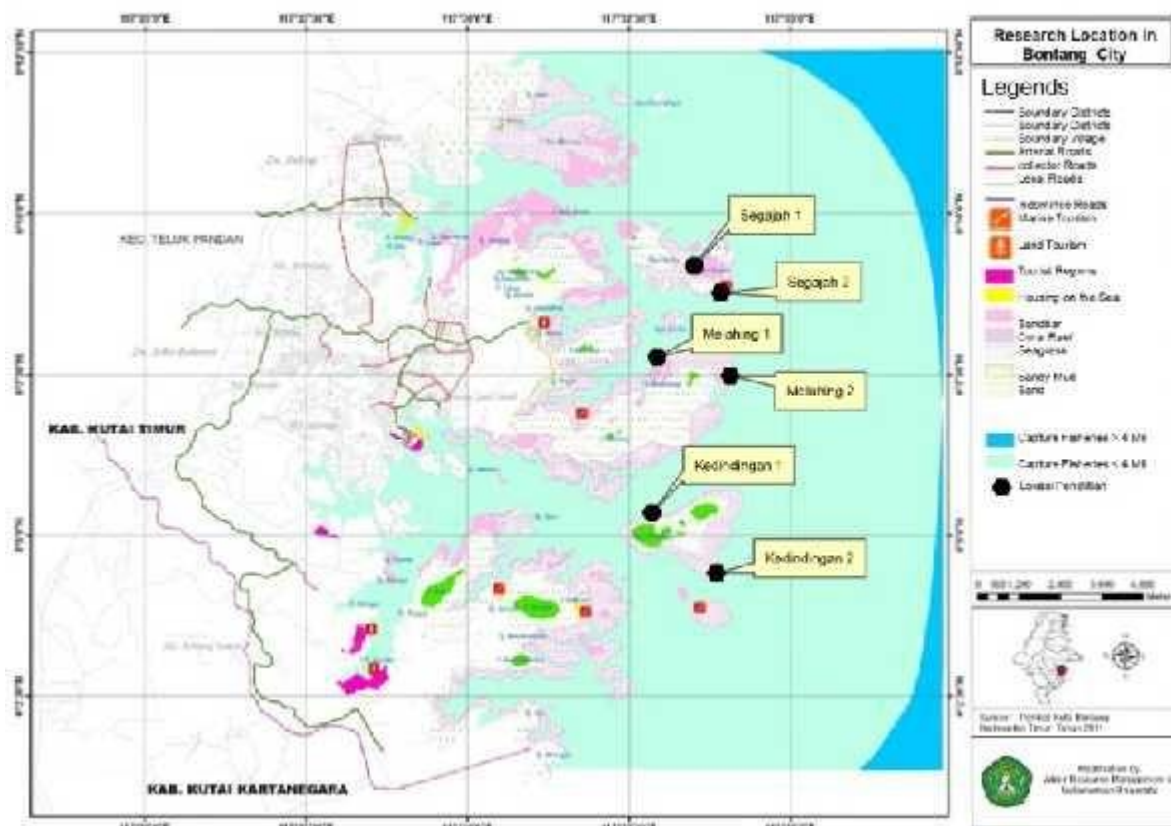


Figure 1. Research Location in Bontang City, Indonesia



## RESULT AND DISCUSSION

The existence of reef fish can not be separated by the presence of coral reef ecosystems in a region since coral reef resource is a habitat for a number of coral reef fish. The good or poor condition of the coral reefs will determine the abundance of reef fish that inhabit these waters.

The results of the observation of reef fish are presented in Table 1. In overall, 131 reef fish species found in Bontang waters that coming from 21 families and as many as 1.162 fish were identified (Table 1). The types of fish consisted of 80 major fish species, 14 species of indicator fish and 33 species of targets fish.

### Sapa Segajah

Sapa Segajah is part of the District of North Bontang. In the form of a flat island/gusung that is very gentle slope where the land area is only visible at low tide. The waters consist of an expanse of seagrass at the top of the island and coral reefs at the bottom. The water condition is not too clear, where the visibility is only about 6 m. The base substrate of the waters is dominated by a few massive coral colonies.

Observation points in Sapa Segajah station are divided into two, namely: point 1 is on the inner side of the island (leeward reef) and point 2 is on the outer side of the island (windward reef). At a point, 1 as many as 81 fish reef consisting of 11 families and 22 species were found, while at point 2 as many as 79 fish reef consisting of 12 families and 27 species were found.

Groups of indicator fish derived from group Chaetodontidae (Table 2). As many as 8 species found, namely *Chaetodon auriga* (2), *Chaetodon kleinii* (6), *Chaetodon octofasciatus* (1), *Chaetodon vagabundus* (2), *Chelmon rostratus* (2), *Heniochus pleurotaenia* (5) and *Parachaetodon ocellatus* (2).

The identified target fish derived from some families, namely: Caesionidae (1 species), Acanthuridae (4 species), Balistidae (1 species), Lutjanidae (1 species), Mullidae (1 species), Nemipteridae (1 species), Scaridae (2 species) and Serranidae (1 species).

The group of Major fish derived from families: Blennidae (1 species), Centriscidae (1 species), Gobiidae (1 species), Labridae (5 species), Pomacanthidae (1 species), Pomacentridae (14 species), Scorpaenidae (1 species), Tetraodontidae (1 species), Zanclidae (1 species).

The diversity of coral fish at Station Sapa Segajah categorized moderate ( $H' = 2,55$  and  $2,66$ ). Community stability relatively low with uniformity value of  $0,838$  and  $0,798$ . The dominance of particular fish species did not found as showed in  $C$  value =  $0,12$ .

### Melahing Island

Observation station in Melahing is an island inhabited by locals. The location included in the subdistrict of North Bontang. Most of the livelihood of the people is a fisherman. Marine waters of Melahing island consists of coral reefs that grew around the island. The visibility waters at the time of observation were about 5 m.

The coral fish community found in Point 1 was 431 fish, consisted of 13 families and 45 species. At Point 2, as many as 293 coral fish were found, consisted of 10 families and 39 species (Table 2).

Group of Target fish that was found in the locations consisted of family Acanthuridae (5 species), Caesionidae (6 species), Haemulidae (1 species), Lethrinidae (1 species), Lutjanidae (2 species), Mullidae (1 species), Nemipteridae (3 species), Scaridae (5 species), Serranidae (1 species).

Group of indicator fish that was found around Melahing island derived from family Chaetodontidae with an individual number of 19 fish. The species were: *Chaetodon auriga* (2 fish), *Chaetodon baronessa* (2 fish), *Chaetodon kleinii* (2 fish), *Chaetodon lunulatus* (2 fish), *Chaetodon octofasciatus* (

5 fish), *Chelmon rostratus* (2 fish), *Heniochus chrysostomus* (3 fish) dan *Heniochus varius* (1 fish).

A group of Major fish that was found in this location was consisted of 7 families, among them Centriscidae (1 species), Gobiidae (1 species), Labridae (15 species), Pomacanthidae (1 species), Pomacentridae (24 species) dan Sparidae (1 species).

The biodiversity of coral fish in Station Melahing island classified moderate ( $H^2=2,298$  and  $2,959$ ). Population stability in the community is relatively low with a similarity value of 0.6 and 0.797. The dominance of certain fish was not found in Melahing island, as shown by C values of 0,249 and 0,08 (Figure 2).

### Kedindingan Island

Kedindingan observation stations is a form of an island that are uninhabited. Included into District of South Bontang (Figure 1). Conditions of Kedindingan Island observation station consists of the mangrove ecosystem in the upper part of the island. The water around the island has seagrass ecosystems and coral reefs that grew around

the island. Visibility of the waters at the time of observation approximately 5 meters at points 1 and 8 meters at point 2.

The community of coral fish found at point 1 was as many as 130 fish, consisted of 8 families and 25 species. There were 148 fish found at point 2 that derived from 7 families and 40 species (Table2).

Groups of target fish found in this location belong to families: Acanthuridae (6 species), Haemulidae (1 species), Lutjanidae (1 species), Mullidae (1 species), Nemipteridae (2 species) dan Scaridae (3 species).

Groups of indicator fish found to belong to Chaetodontidae with an individual number of 10 fish, consisted of *Chaetodon kleinii* (1 fish), *Chaetodon lineolatus* (1 fish), *Chaetodon lunulatus* (1 fish), *Chaetodon octofasciatus* (5 fish), *Chaetodon selene* (1 fish), and *Chaetodon trifasciatus* (1 fish).

Groups of major fish in the location belong to 6 families, that are Gobiidae (3 species), Labridae (8 species), Pomacanthidae (1 species), and Pomacentridae (24 species).

Table 2. Composition of Coral Fish in Bontang Marine Waters

Taxa (Family/species)	Sapa Segajah		Melahing		Kedindingan	
	1	2	1	2	1	2
<b>1. Acanthuridae</b>						
<i>Acanthurus albipectoralis</i>	-	-	-	-	-	3
<i>Acanthurus reverses</i>	-	3	3	-	-	-
<i>Acanthurus nigrofuscus</i>	-	-	-	6	-	3
<i>Ctenochaetus binotatus</i>	1	18	3	-	-	6
<i>Ctenochaetus striatus</i>	-	-	-	4	-	5
<i>Prionurus scalprum</i>	1	-	-	-	-	-
<i>Zebrasoma rostratum</i>	-	-	-	-	-	3
<i>Zebrasoma scopas</i>	-	-	-	1	-	5
<b>2. Balistidae</b>						
<i>Sufflamen fraenatum</i>	-	1	-	-	-	-
<b>3. Blennidae</b>						
<i>Aspidontus taeniatus</i>	2	-	-	-	-	-
<b>4. Caesionidae</b>						
<i>Caesio cunning</i>	3	-	-	-	-	-
<i>Caesio caerulaurea</i>	-	-	27	-	-	-



<i>Caesio lunaris</i>	-	-	35	5	-	-
<i>Caesio striata</i>	-	-	5	-	-	-
<i>Caesio suevica</i>	-	-	5	-	-	-
<i>Caesio varilineata</i>	-	-	4	-	-	-
<i>Caesio xanthalytos</i>	-	-	34	-	-	-
<b>5. Centriscidae</b>						
<i>Aeoliscus strigatus</i>	-	-	206	-	-	-
<b>6. Chaetodontidae</b>						
<i>Chaetodon auriga</i>	2	-	2	-	-	-
<i>Chaetodon baronessa</i>	-	-	-	2	-	-
<i>Chaetodon kleinii</i>	6	1	2	-	1	-
<i>Chaetodon lineolatus</i>	-	-	-	-	-	1
<i>Chaetodon lunulatus</i>	-	-	1	1	-	1
<i>Chaetodon octofasciatus</i>	1	-	4	1	5	-
<i>Chaetodon selene</i>	-	-	-	-	-	1
<i>Chaetodon trifasciatus</i>	-	-	-	-	-	1
<i>Chaetodon vagabundus</i>	2	-	-	-	-	-
<i>Chelmon rostratus</i>	2	-	2	-	-	-
<i>Heniochus chrysostomus</i>	-	-	3	-	-	-
<i>Heniochus pleurotaenia</i>	5	-	-	-	-	-
<i>Heniochus varius</i>	-	-	1	-	-	-
<i>Parachaetodon ocellatus</i>	2	-	-	-	-	-
<b>7. Gobiidae</b>						
<i>Aspidontus taeniatus</i>	-	-	-	-	-	1
<i>Valenciennea longipinnis</i>	-	1	-	-	-	-
<i>Elacatinus evelynae</i>	-	-	-	2	-	1
<i>Elacatinus prochilos</i>	-	-	-	-	-	1
<b>8. Haemulidae</b>						
<i>Plectrohinchus chaetodontoides</i>	-	-	2	-	1	-
<b>9. Labridae</b>						
<i>Bodianus mesothorax</i>	-	-	1	-	-	2
<i>Choerodon anchorago</i>	-	-	10	-	-	-
<i>Diproctacanthus xanthurus</i>	-	-	-	1	-	-
<i>Gomphosus caeruleus</i>	-	-	-	1	-	1
<i>Gomphosus varius</i>	-	-	-	1	-	1
<i>Halichoeres hortulanus</i>	-	5	-	-	1	4
<i>Halichoeres melanurus</i>	-	-	-	2	-	-
<i>Halichoeres nigrescens</i>	-	1	-	-	-	-
<i>Halichoeres maculipinna</i>	-	-	1	-	-	-
<i>Halichoeres poeyi</i>	-	-	-	-	-	7
<i>Halichoeres prosopeion</i>	-	-	1	-	-	-
<i>Halichoeres richmondi</i>	-	-	-	-	-	1
<i>Hologymnosus annulatus</i>	-	-	-	5	4	-
<i>Hologymnosus penrosei</i>	-	-	-	10	6	-
<i>Labrichthys unilineatus</i>	-	-	-	1	-	-
<i>Labroides dimidiatus</i>	-	1	-	2	-	-

<i>Pseudocoris yamashirai</i>	-	-	-	1	-	-
<i>Thalassoma ascensionis</i>	-	-	-	-	-	1
<i>Thalassoma Hardwicke</i>	-	1	1	6	-	2
<i>Thalassoma janseni</i>	-	-	-	-	4	-
<i>Thalassoma lunare</i>	-	1	9	7	9	-
<i>Thalassoma noronhanum</i>	-	-	-	-	1	-
<i>Thalassoma quinquevittatum</i>	-	-	-	-	1	-
<b>10. Lethrinidae</b>						
<i>Lethrinus microdon</i>	-	-	-	1	-	-
<b>11. Lutjanidae</b>						
<i>Lutjanus adetii</i>	-	-	4	-	-	-
<i>Lutjanus biguttatus</i>	-	-	5	-	1	4
<i>Lutjanus decussates</i>	2	2	-	-	-	-
<b>12. Mullidae</b>						
<i>Parupeneus barberinus</i>	3	-	3	3	-	-
<b>13. Nemipteridae</b>						
<i>Scolopsis bilineata</i>	1	1	-	1	7	-
<i>Scolopsis trilineata</i>	-	-	-	1	-	-
<i>Pentapodus bifasciatus</i>	-	-	2	-	1	-
<b>14. Pomacanthidae</b>						
<i>Centropyge vlorikii</i>	-	-	-	1	-	-
<i>Chaetodontoplus mesoleucus</i>	1	-	-	-	-	-
<i>Chaetodontoplus personifer</i>	-	-	-	-	1	-
<b>15. Pomacentridae</b>						
<i>Abudefduf sexfasciatus</i>	-	2	-	-	-	-
<i>Acanthochromis polyacanthus</i>	-	-	1	-	-	-
<i>Altrichthys azurelineatus</i>	-	-	-	37	-	-
<i>Altrichthys curates</i>	1	-	-	-	-	-
<i>Amblyglyphidodon batunai</i>	-	-	-	6	-	1
<i>Amblyglyphidodon brachialis</i>	-	-	1	-	-	-
<i>Amblyglyphidodon coelestis</i>	-	-	2	-	-	-
<i>Amblyglyphidodon curacao</i>	-	-	9	15	-	6
<i>Amblyglyphidodon flavilatus</i>	-	-	2	-	-	1
<i>Amblyglyphidodon imitator</i>	-	-	1	-	-	-
<i>Amblyglyphidodon lepidogenys</i>	-	16	1	35	-	36
<i>Amblyglyphidodon orbicularis</i>	-	-	-	-	-	2
<i>Amblyglyphidodon ternatensis</i>	-	-	-	-	1	-
<i>Amphiprion sandaracinos</i>	-	-	-	4	-	-
<i>Chromis amboinensis</i>	-	-	-	-	-	2
<i>Chromis bami</i>	-	1	-	-	-	-
<i>Chromis caudalis</i>	-	1	-	-	-	-
<i>Chromis flavicauda</i>	-	1	-	-	5	-
<i>Chromis nitida</i>	-	-	-	-	-	1
<i>Chromis pembae</i>	-	-	-	2	-	-
<i>Chromis scotoerahiloptera</i>	-	-	-	20	-	-
<i>Chromis viridis</i>	-	-	-	24	15	-



<i>Chromis xanthopterygia</i>	-	-	-	49	-	-
<i>Chrysiptera rollandi</i>	1	-	1	-	-	1
<i>Dascyllus aruanus</i>	16	-	1	-	1	-
<i>Dascyllus carneus</i>	-	-	-	-	-	1
<i>Dascyllus melanurus</i>	20	-	-	-	-	-
<i>Dascyllus reticulatus</i>	-	-	-	-	44	1
<i>Dascyllus trimaculatus</i>	-	-	-	-	-	19
<i>Dischistodus melanotus</i>	-	-	3	-	-	-
<i>Neoglyphidodon melas</i>	-	-	-	-	-	2
<i>Neopomacentrus filamentosus</i>	-	-	-	-	-	6
<i>Pomacentrus armilatus</i>	-	-	-	2	-	-
<i>Pomacentrus aurifrons</i>	-	-	-	2	1	1
<i>Pomacentrus auriventris</i>	-	1	-	-	3	-
<i>Pomacentrus burroughi</i>	-	-	2	2	-	-
<i>Pomacentrus emarginatus</i>	-	-	-	-	1	-
<i>Pomacentrus littoralis</i>	-	2	-	-	-	-
<i>Pomacentrus leptus</i>	-	-	-	1	-	2
<i>Pomacentrus mollucensis</i>	3	7	17	15	11	8
<i>Pomacentrus trilineatus</i>	-	-	-	-	-	1
<i>Pomacentrus xanthosternus</i>	-	6	1	-	1	-
<i>Pomacentrus vaiuli</i>	-	1	-	-	-	-
<i>Pomachromis ricardsoni</i>	-	-	-	7	-	-
<b>16. Scaridae</b>						
<i>Chlorurus sordidus</i>	-	-	1	-	2	-
<i>Scarus dimidiatus</i>	-	-	6	-	-	-
<i>Scarus fuscocaudalis</i>	-	-	1	-	-	-
<i>Scarus niger</i>	-	1	1	3	-	-
<i>Scarus scaber</i>	-	1	-	-	-	-
<i>Scarus prasiognathos</i>	-	-	-	-	2	1
<i>Scarus quoyi</i>	-	-	-	2	-	-
<i>Scarus trispinosus</i>	-	-	-	-	-	1
<b>17. Scorpaenidae</b>						
<i>Dendrochirus zebra</i>	-	1	-	-	-	-
<b>18. Serranidae</b>						
<i>Diploprion bifasciatum</i>	1	-	3	-	-	-
<b>19. Sparidae</b>						
<i>Acanthopagrus latus</i>	-	-	1	1	-	-
<b>20. Tetraodontidae</b>						
<i>Canthigaster epilampra</i>	-	1	-	-	-	-
<b>21. Zanclidae</b>						
<i>Zanclus cornutus</i>	5	1	-	-	-	-
<b>Number of Individuals</b>	<b>81</b>	<b>79</b>	<b>431</b>	<b>293</b>	<b>130</b>	<b>148</b>
<b>Number of species</b>	<b>22</b>	<b>27</b>	<b>45</b>	<b>39</b>	<b>25</b>	<b>40</b>

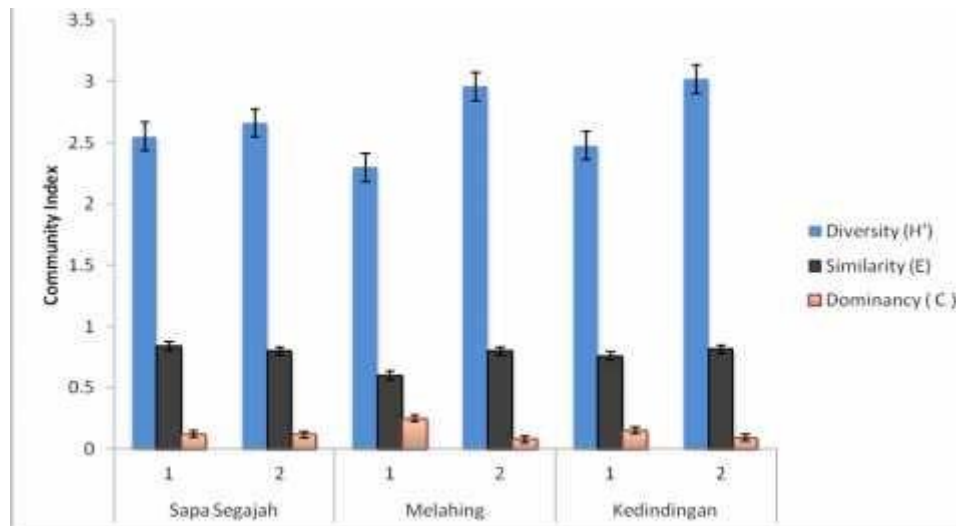


Figure 2. Histogram of Community Structure of Coral Fish in Bontang Marine Waters

## CONCLUSIONS

1. Total Coral fish found during study reached 1.162 fish, consisted of 228 species and belong to 21 family
2. Species of coral fish consisted of 33 species of target fish (consume/food), 80 species of major fish (ornament fish), and 14 species of indicator fish from family Chaetodontidae
3. Analysis of community structure showed biodiversity of coral fish categorized as Moderate to high, with similarity index relatively high and there was no dominant species found.

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