

# FURTHER INFORMATION ON BRYDE'S WHALE FROM THE COAST OF JAPAN

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Very little has been reported on ecological matters of Bryde's whale (*Balaenoptera edeni*) from the coast of Japan. In 1960, however, material was collected from about 120 whales from various landstations at Sanriku and Oshima. The present paper is based on this material as well as on that collected before, together with catch informations.

## EXTERNAL CHARACTER

One striking feature in external character of Bryde's whale is the ridges on each side of the head which run just posterior to the tip of the snout to the level of blow-holes, on the mid line between median line and margin of the snout. Since there present another ridge on the median line of the head, from tip of snout to blow-holes, there are 3 similar ridges, which run antero-posteriorly, on the head of the Bryde's whale. The side-ridges, however, sink abruptly at a level of or a little in front of the anterior part of the blow-holes and end with grooves (Fig. 1). Several hairs are present on each side-ridge.

In sei whale (*Balaenoptera borealis*) median ridge is present, but prominent side-ridges are not present (Figs. 2 and 3). This character is, therefore, very useful for identification of the two species at a glance. Such side-ridges are also present on the head of the Bryde's whale from the coast of Brazil as reported by Omura (1962). This character was already reported by Omura (1959) in a Japanese journal.

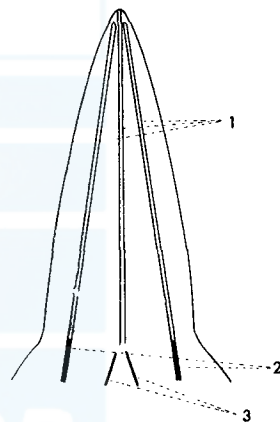


Fig. 1. Schematic drawing of head of *B. edeni* showing ridges.

- 1. Ridge
- 2. Groove
- 3. Blow-holes

## MOVEMENTS

Bryde's whale does not follow long distance migration, being only one exceptional species among balaenopterid whales. It is believed that Bryde's whale tends to remain in the same locality throughout the year. Recently Best (1960) reports that the Bryde's whales on the coast of

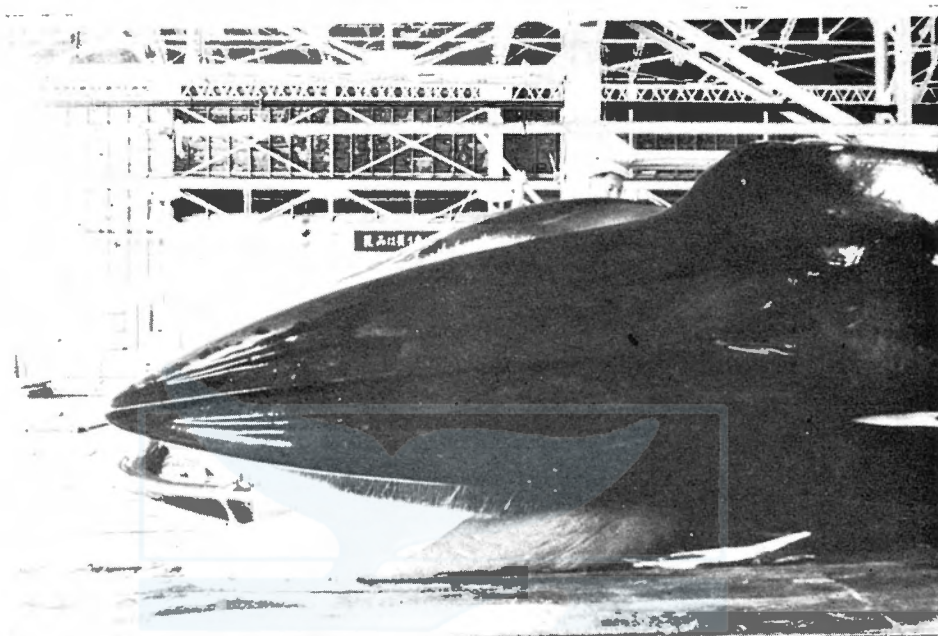


Fig. 2. Dorsal view of head. *B. edeni*. (Onagawa landstation, 1960)

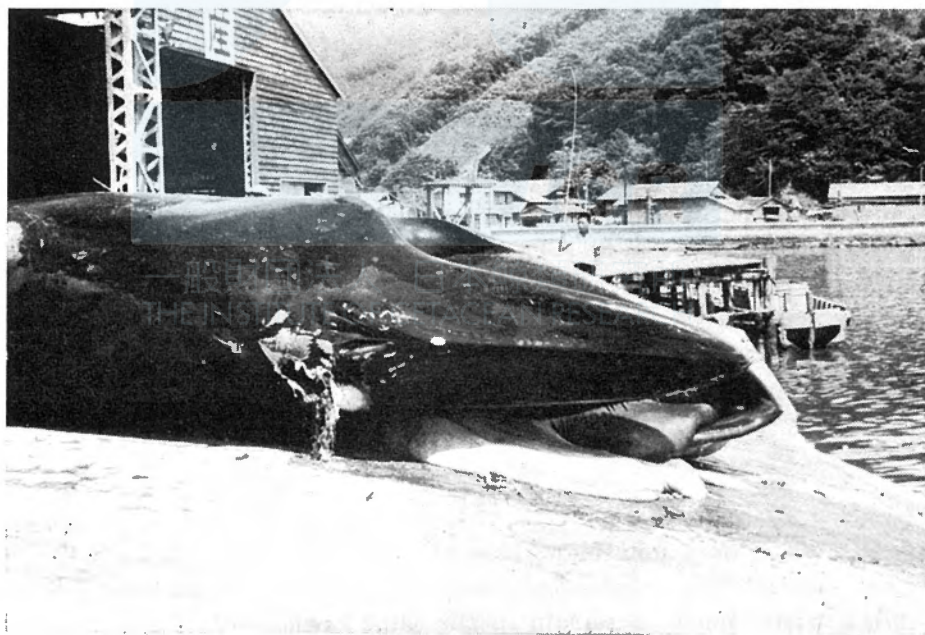


Fig. 3. Dorsal view of head. *B. borealis*. (Onagawa landstation, 1960)

South Africa are participating in either an onshore-offshore or a limited North-South migration and it is possible that they tend to follow the shoals of fish (South African pilchard) on which they feed for most of the year.

On the coast of Japan there are four localities on which Bryde's whales concentrate. These are the seas around Bonin Island, off Sanriku, off Oshima (Wakayama prefecture), and west coast of Kyushu (Fig. 4).

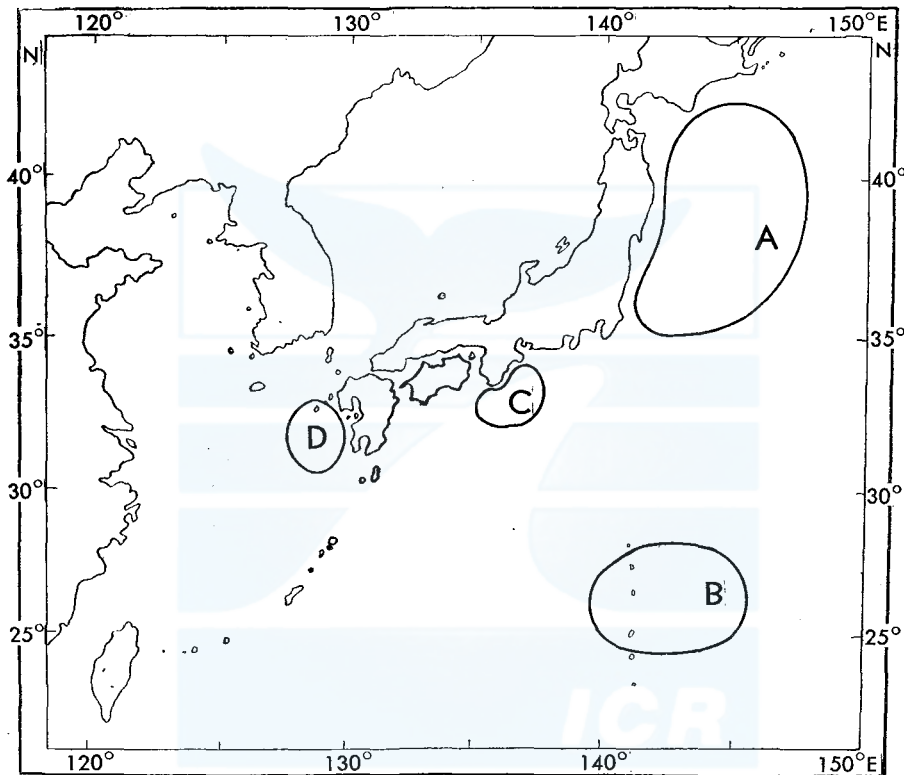


Fig. 4. Main concentrations of Bryde's whales on the coast of Japan.

A. Sanriku    B. Bonin Island  
C. Oshima    D. West coast of Kyushu

It was proved by whale marking that the Bryde's whales in the seas around Bonin Island move to the coast of Sanriku as already reported by Nemoto (1959). Fujino (unpublished) found that there is no practical difference in the frequency occurrence of blood group types between whales from the coast of Sanriku and off Oshima, using the material collected in 1960. It is possible, therefore, that the Bryde's whales in these three localities belong to single group or population. I have no material, except catch information, of the Bryde's whale on the coast

of west Kyushu. It is probable, however, that they belong to another group or population of Bryde's whales than those occurring on the former three localities, judged from the size distribution of the catches and from the point of view of the geographical separation. They are shorter than the other by about 3-4 feet (Fig. 5).

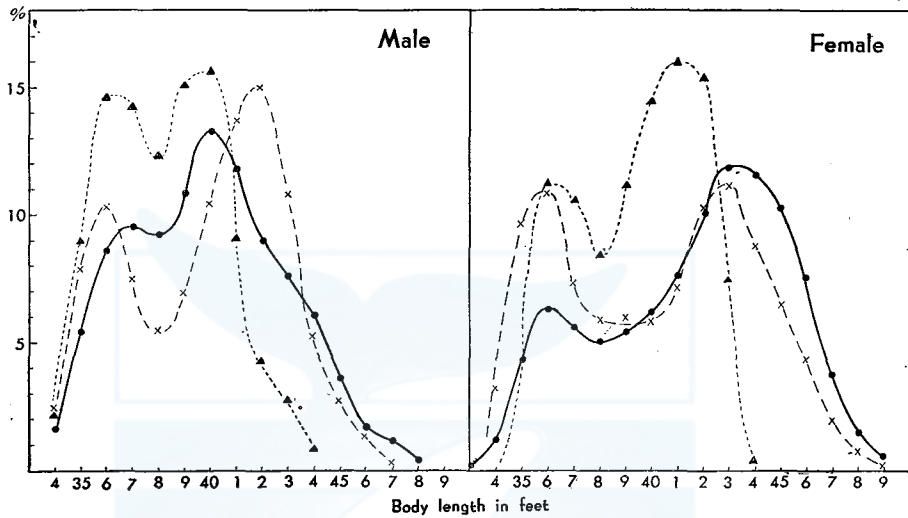


Fig. 5. Size distribution of Bryde's whales. (1955-1960, Smoothed)

●—● Sanriku      ×---× Oshima  
 ▲---▲ West coast of Kyushu

At Saldanha Bay, South Africa, Bryde's whales are taken during a period of 6 months from May to end of October (Best, 1960). On the coast of Japan, however, season is shorter than 6 months. On the coast of Sanriku baleen whales are taken from the beginning of May to the end of October yearly, and taking of Bryde's whales last usually about 4 months during this period. At Oshima, Wakayama prefecture, season does not last longer than 3 months. Usually season at Sanriku begins one month later than Oshima. The month when season begins differs yearly, possibly due to the oceanographic condition in that year. In Fig. 6 monthly catches of Bryde's whales are shown according to localities and by months for each year from 1955 to 1960 inclusive. As shown in this figure, at Oshima the peak of the catch is seen in May in 1955 and 1960, while in 1958 and 1959 the peak shifted to June. On the coast of Sanriku the largest catch was attained in June in the years 1955 and 1960 (and also in 1956), but in 1958 and 1959 (and also in 1957) the peak of the catch is observed in August. Fig. 7 shows the percentage of females among the monthly catches in these years. It is clear that at Oshima there is a difference of sex ratio and its tendency

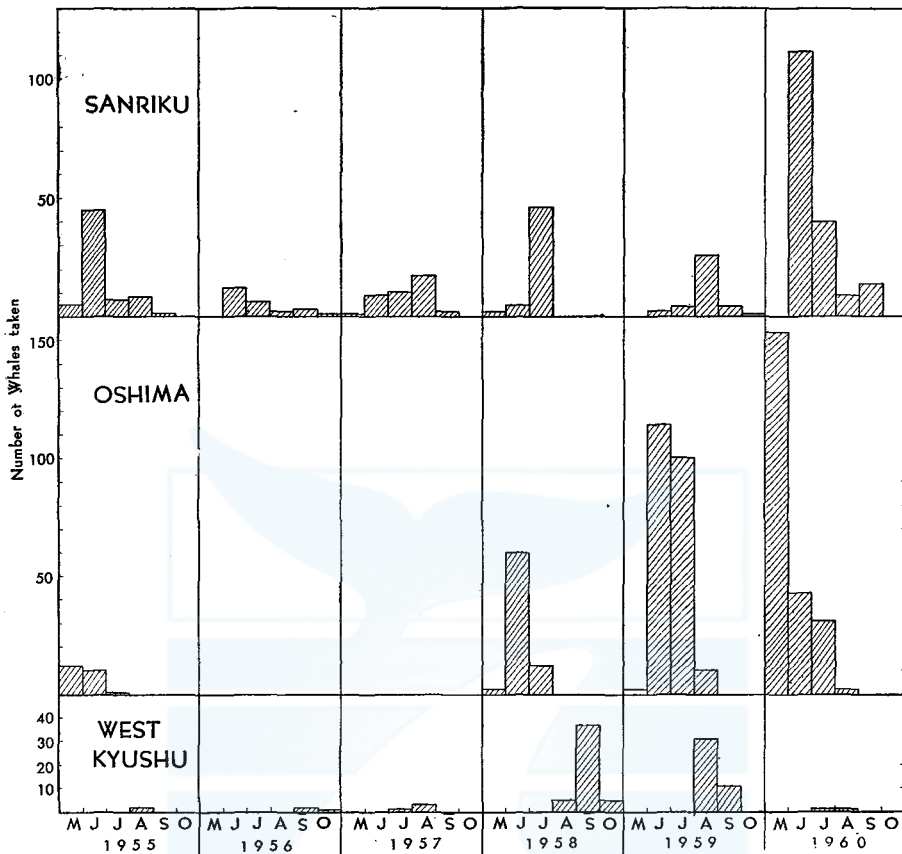


Fig. 6. Monthly catch of Bryde's whales on the coast of Japan. (1955-1960)

according to these groups of years. In 1955 and 1960, when the season started earlier, female is dominant in the catch and increases its ratio with the shifting of the season. In 1958 and 1959, when whaling begun later, a quite different tendency is clearly demonstrated in the figure. Also on the coast of Sanriku a similar tendency is observed, but in this locality female is always dominant than male and towards the end of the season such tendency is changed abruptly.

I have no corresponding figure of the Bryde's whales around the Bonin Island, since whaling in this region has been ceased since 1953. It is probable, however, from the above that the Bryde's whales on the coast of Japan move from the seas around Bonin Island to the coast of Honshu, the main island of Japan, seasonally and back again to the former region, hence migrating, and a segregation between males and females taken place during this migration.

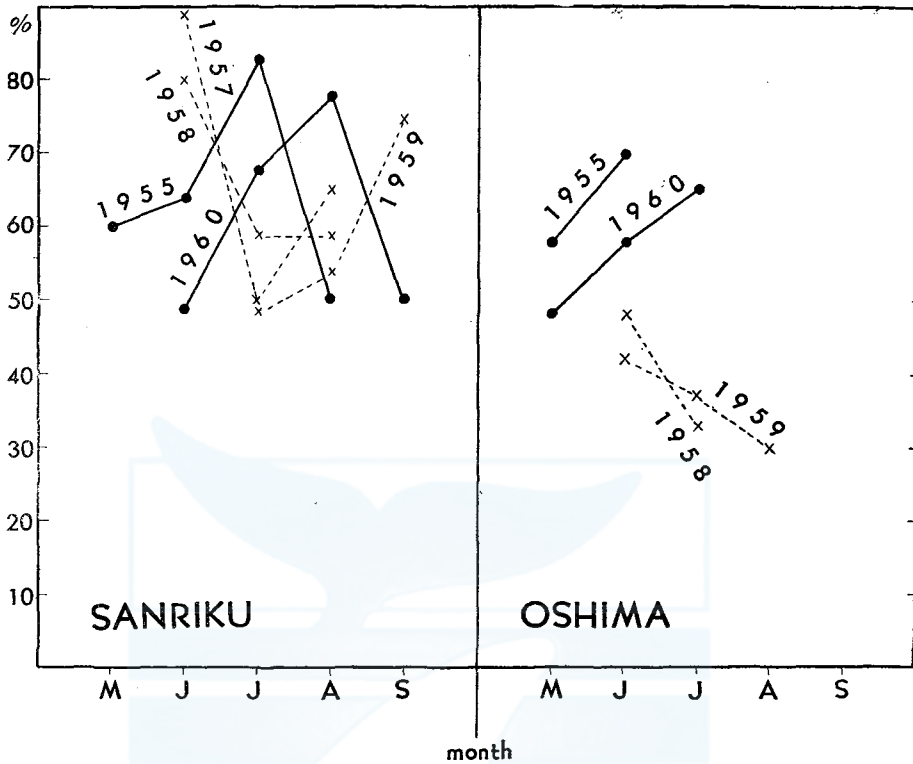


Fig. 7. Monthly change of sex ratio. (% females)

#### GROWTH OF FETUS

Laws (1959) found that foetal growth in three species of toothed whales can be described by a linear plot of length and larger neonatal sizes are attained by increased rates of growth and by extension of the gestation period, and in the baleen whales the first half of pregnancy follows this law, but thereafter growth can best be described by a logarithmic plot of length or of the cube root of weight. The reason is not known, but he suggests the fact that the baleen whales subject to very discontinuous feeding cycle as compared with the toothed whales. Bryde's whale is presumably different from other species of balaenopterid whales in this habit. According to Best (1960) it seems that there is no restricted breeding season in the Bryde's whales from South Africa and no fetal growth curve can be drawn from his material.

I have no recent record of fetus of the Bryde's whales from the coast of Japan, except one which was obtained at Oshima in June 1960 and measured 1.78 m in length. This is because almost all fetuses are lost during the time of towing whales by catcher to landstation. It is

an usual practice on catcher to cut open the belly of a whale, just after taking, and let the internal organs be washed and cooled by sea water in order to keep freshness of whale meat which is consumed as human food. The fetal records from Bonin Island, however, suggests that also in the Bryde's whales from the coast of Japan exist a breeding season, similar to that of other species of balaenopterid whales (Table 1). But these records are limited within two months of May and June and this is not conclusive.

TABLE 1. RECORDS OF FETAL LENGTHS OF BRYDE'S WHALES FROM THE COAST OF BONIN ISLAND, 1950-52

Length (m)	May	June	Total
0.0~0.2	10	—	10
0.2~0.4	6	1	7
0.4~0.6	14	6	20
0.6~0.8	16	2	18
0.8~1.0	19	5	24
1.0~1.2	12	3	15
1.2~1.4	14	4	18
1.4~1.6	7	7	14
1.6~1.8	11	9	20
1.8~2.0	8	6	14
2.0~2.2	6	1	7
2.2~2.4	2	1	3
2.4~2.6	1	1	2
2.6~2.8	—	2	2
2.8~3.0	—	—	—
3.0~3.2	—	—	—
3.2~3.4	—	—	—
3.4~3.6	—	—	—
3.6~3.8	—	1	1
Total	126	49	175
Mean length (m)	1.060	1.447	
2 S. E.	0.105	0.191	

#### SEXUAL CONDITION OF WHALES TAKEN

In 1960 at landstations at Oshima and Sanriku 81 whales were observed of their reproductive organs during a period from June to middle of September. The material obtained are tabulated in Table 2. Males with a combined testis weight of 1.5 kg. or over were deemed as sexual mature and less immature. In females the criterion for mature is the presence of any corpus luteum or albicans. As stated above only one fetus was obtained at Oshima, but great majority of females with a functional corpus luteum were deemed as pregnant, judged from the condition of their uterine cornua. Sometimes one or both testes or ovaries were lost before dismembering. There were two cases of pregnant

TABLE 2. OBSERVATION OF REPRODUCTIVE ORGANS (1960)

Sexual condition	Females	Males
Immature	16	25
Mature	28	17
Pregnant or ovulating	12	
Resting	6	
Lactating	4	
Unknown <sup>1)</sup>	6	

1) Because of one ovary lost

TABLE 3. OCCURRENCE OF NUMBERS OF OVULATIONS  
IN EACH BODY LENGTH GROUP (Female 1960)

Body length (m)	Numbers of ovulations												Total		
	0	1	2	3	4	5	6	7	8	9	10	11		12	
10.6~10.8	7														7
10.9~11.1	5			1*											6
11.2~11.4	2														2
11.5~11.7															—
11.8~12.0	1	1													2
12.1~12.3		1	1		1										3
12.4~12.6			2		1										3
12.7~12.9		1							1						2
13.0~13.2											1		1		2
13.3~13.5	1					1		1							3
13.6~13.8								1							1
13.9~14.1										1					1
14.2~14.4											1				1
Total	16	3	3	1	2	1	—	2	1	1	2	—	1		33

\* One ovary lost

(or ovulating) and concurrently recorded as lactating. Table 3 shows the frequency occurrence of each corpora number group against body length. From this table it seems probable that sexual maturity may be attained in average at a body length of around 11.8–12.0 m (39 feet).

#### AGE

Ear plugs were collected in 1960 from 64 whales, but among them 19 plugs were damaged at the time of taking or in the course of preparation and could not be used for determination of age. Thus remaining 45 ear plugs, 13 from males and 32 from females, were used in the present study. The results of ear plug examination are tabulated in Table 4 (males) and Table 5 (females). In Table 4 it is noted that males with up to 9 laminations are all sexually immature and with 13 laminations and more are all mature, except one whose testes had not been examined but apparently mature. In Table 5 it is shown that in females







sexual maturity will probably be attained when 9 or 10 laminations are accumulated in the ear plug. If we assume that two laminations are laid down each year, as in the case of other balaenopterid whales, it is probable that Bryde's whales attain their sexual maturity after five years from birth.

TABLE 6. CORRELATION BETWEEN NUMBERS OF OVULATIONS AND LAMINATIONS (Female 1960)

Numbers of ovulations	Numbers of laminations in ear plug																	Total
	5	6	7	8	9	10	11	12	13	14	15	16	17	18	...	24		
0		1		1	1	1												4
1	1				1		1											3
2							1											1
3																		—
4								1			1							2
5																		—
6																		—
7																		—
8														1				1
9																		—
10													1			1		2
Total	1	1	—	1	2	1	2	1	—	—	1	—	1	1	...	1	1	13

In Table 6 is shown the correlation between ovulation numbers and number of laminations. The material is very small, but it is probable that the increment of ovulation can be described by a linear plot of number of laminations in the ear plug.

#### FOOD

As already stated whales are cut open of their belly just after taking in order to keep freshness of meat. Concurrently stomachs are also cut very often and their contents are washed away during the course of towing, especially in cases stomachs were full of food. Even in these cases, however, it is possible to ascertain the kind of food eaten, by inspection of the second stomach and others. In this way 27 whales were observed of their stomach contents at landstations in Sanriku and 55 whales at Oshima in 1960. The results of observation are shown in Table 7. At Sanriku it is noted that most of the food were consisted of

TABLE 7. STOMACH CONTENTS OF BRYDE'S WHALE (1960)

Locality	Empty	Krill	Anchovy	Anchovy & Mackerel	Sand lance	Saury pike	Small fish	Total
Sanriku	6	2	11	2	1	1	4	27
Oshima	25	17	11	1	—	—	1	55

fish and among them anchovy is very dominant, while at Oshima higher percentage of krill than anchovy is observed.

#### OTHER INFORMATION

Nearly all Bryde's whales taken on the coast of Japan bear marks caused by the healing of the open pits in the skin, of unknown origin, which are acquired by whales in warmer waters. In addition to these white scars whales treated at Oshima bear very frequently fresh open pits on their skin, which numbers from one to 17 on one side of the body. These open pits were also observed at Bonin Island, but never at Sanriku. If we assume that the whales in the waters off Oshima move to the offing of Sanriku, these open pits are healed during this period of movement, which is supposed as about one month as already stated.

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