



RESEARCH ARTICLE

ICHTHYOFAUNAL DIVERSITY IN THE RIVER DAUK, A TRIBUTARY OF MAHANANDA RIVER AT UTTAR DINAJPUR DISTRICT OF WEST BENGAL, INDIA

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ABSTRACT

Ichthyofaunal diversity of the River Dauk at Uttar Dinajpur District of West Bengal in India was investigated during the year 2009 and 2010. Three different stations of the river namely Bholagachh (Station I, S₁), Chopra (Station II, S₂) and Dalua (Station III, S₃) were selected for sampling of the fishes. Overall eighteen species belonging to three orders and seven families were recorded in the sampling stations of the river. Cyprinidae was the most dominating family (80.10%) with ten species. Cobitidae was the next dominant family having three species (11.33%). Balitoridae (1.45%), Nandidae (2.31%), Ambassidae (1.95%), Gobiidae (0.43%) and Sisoridae (2.43%) families represented only single species of each. *Barilius bendelisis* (26.37%), *Aspidoparia morar* (26.29%) and *Puntius chola* (15.11%) of the family Cyprinidae were the most abundant among the available species during the study period at all the three stations. Distribution of the fish among the different stations was not uniform during the study period. It was concluded that fish assemblage in the river Dauk was poor as compared to previous records. Habitat degradation, over exploitation and effluents discharge from Teesta Hydroelectric Power Project could influence the distribution of fish in this river.

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INTRODUCTION

Northern part of West Bengal, popularly called North Bengal, is endowed with eight river basins. About 63% of the freshwater resource (98,679 million cubic meter of surface and 9,130 million cubic meter of ground water) of the entire West Bengal is carried out by these basins annually. The River Mahananda is one of them. The main stream of this river is connected by different tributaries; one of them is River Dauk. Dauk enters into Uttar Dinajpur district, West Bengal through Indo-Bangladesh border at Balabari and traverses a long distance through Chopra block of this district before it joins with Mahananda at Odraghat, Bihar. The basin of this river sustains livelihoods of fisherman, agricultural farmers and rural people inhabiting near the bank of the river. The fisherman utilizes this river through random fish capture. The spatial and temporal variability of rain of this region causes twin menace of flood and drought during monsoon and summer respectively which also affects the ichthyofaunal diversity of the river. Kottelat and Whitten (1996) considered the biological change brought about by environmental degradation and enumerated pollution, increased sedimentation, flow alteration, water diversion and introduced species as the main causes of decreased ichthyofaunal diversity of Asian countries. Although several ichthyologists have contributed significantly to make an inventory of freshwater fish inhabiting rivers of India (Sen, 1985; Madhyastha and Murugan, 1996; Arunachalam and Sankaranarayanan, 1999; Sarkar and Banerjee, 2000; Mishra *et al.*, 2003; Karmakar *et al.*, 2008), it is still inadequate and requires continuous updating in the light of habitat degradation, declining species diversity and conservation of the declining stock. Records of ichthyofaunal diversity of the rivers of North Bengal dates back to forties when Shaw and Shebbeare (1937) reported 131 species from the river, streams and ponds in the hills and plains of the Darjeeling District and the adjoining Duars. This was followed by Hora and

Gupta (1940) who reported 58 species of fishes from Kalimpong, Duars and Siliguri Terai. Jayaram and Singh (1977) reported 96 species of fishes from the confluence of river Tengan with Mahananda, Atrai river, Purnabhasa river, river Dharla at Changrabandha, river Kalindri, river Mahananda at Malda Town, Jamuna at Hilli village of Balurghat, Teesta, Karotayar, Panga, Balasan, Jaldhaka etc of North Bengal. While Patra and Datta (2010) reported only 31 species of the fish belonging to 18 genera and 4 families of Cypriniformes in Karala river, a tributary of Teesta River at Jalpaiguri district of West Bengal. Patra *et al.* (2011) also reported only 55 species of fish belonging to eight orders and twenty families in Karala River. Information on the distribution of fish catches over time and space provides basic idea to assess a fisheries resource (Mondal and Kaviraj, 2009). However, there is no scientific record of ichthyofaunal diversity of river Dauk. The present study is, therefore, aimed to investigate the diversity of ichthyofauna of this river and to detect their status on the basis of the percentage of catch frequency which may be useful for better management and conservation.

MATERIALS AND METHODS

Sampling Stations

Three different stations were selected for sampling of fish (Fig 1):

(a) **Station I (S₁):** This station is situated at Bholagachh (26°11' N to 26°49' N, 88°49' E to 89°7' E) of Uttar Dinajpur district, 17 km from Balabari, the Indo-Bangladesh border. A canal from Teesta Hydroelectric Power Project joins with the River Dauk at this point.

(b) **Station II (S₂):** This station is situated at Chopra (26°11' N to 26°49' N, 88°49' E to 89°7' E) of Uttar Dinajpur district, 12 km apart from Bholagachh (S₁).

(c) **Station III (S₃):** This station is situated at Dalua (26°11' N to 26°49' N, 88°49' E to 89°7' E) of Uttar Dinajpur district, 8 km from

Chopra (S₂). Beyond this point the River Dauk enters into Bihar and joins with the river Mahananda.

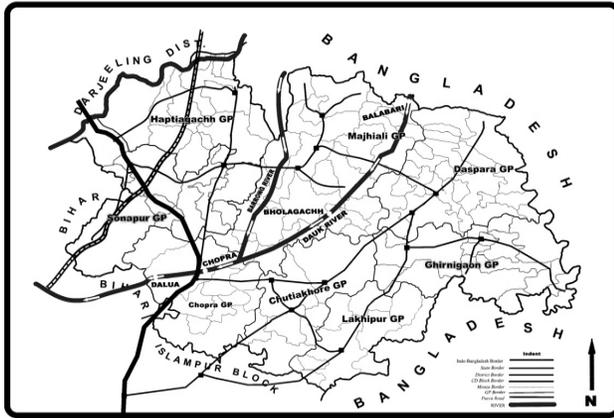


Figure 1. Location map of the selected sampling stations of the River Dauk

Sampling and Analysis

Samples of fish were collected at random from the above mentioned three stations from January, 2009 to December, 2010. Fishes were captured by vessel net or khara jal (local contrivance, mesh size 6 mm x 6 mm), gill net (variable mesh size) and cast net (5 mm x 5 mm mesh size). The collected samples were preserved in 4-10% formalin as per the size and brought to the laboratory for identification following standard taxonomic procedure (Talwar and Jhingran, 1991; Jayaram, 1981) and assorted according to their families and order. Identification was made up to species level. Specimens with doubtful identifying characters were sent to Zoological Survey of India (ZSI), Kolkata for identification. Biomass and number of each species were recorded after every sampling at every station. The frequency of occurrence (FO) of each species was calculated based on the ratio between the number of occasions the species was collected in a year and total number of sampling on that year. Percentage of mean abundance, mean biomass and mean frequency of occurrence were calculated of each species considering their abundance, biomass and frequency of occurrence at all stations during 2009 and 2010.

RESULTS AND DISCUSSION

At Bholagachh (S₁) ten species of fish were recorded during 2009 (Table-1) in which seven species were from the order Cypriniformes (89.64% by number and 88.64% by biomass), two species from the order Perciformes (7.61% by number and 6.17% by biomass) and one species from the order Siluriformes (2.75% by number and 5.19% by biomass). Among seven species of Cypriniformes, six species (*Barilius bendelisis*, *Aspidoparia morar*, *Puntius chola*, *Osteobrama cotio cotio*, *Salmostoma phulo*, *Garra gotyla gotyla*) belonged to the family Cyprinidae (97.70% by number and 96.82% by biomass) and only one species (*Botia rostrata*) belonged to the family Cobitidae (2.30% by number and 3.18% by biomass). In Perciformes, one species *Chanda nama* (53.19% by number and 63.16% by biomass) belonged to the family Ambassidae and another species *Badis badis* (46.81% by number and 36.84% by biomass) belonged to the family Nandidae. Only one species *Gagata cenia* belonging to the family Sisoridae of Siluriformes were recorded. On that year of that station maximum frequency of occurrence (FO) observed in *Barilius bendelisis* (FO=1.00) followed by *Aspidoparia morar* and *Puntius chola* (FO=0.63), *Botia rostrata* (FO=0.38) and rest of the species (FO=0.25). While twelve species of fish were recorded at the same station (S₁) during 2010 (Table-1) in which, nine species from the order Cypriniformes (83.77% by number and 89.78% by biomass), two species from the order Perciformes (12.28% by number and 5.33% by biomass) and one species from the order Siluriformes

(3.95% by number and 4.89% by biomass) were recorded. Among nine species of Cypriniformes, seven species (earlier six species and *Cirrhinus reba*) of the family Cyprinidae (87.96% by number and 93.07% by biomass), one species (*Acanthocobitis botia*) of the family Balitoridae (9.42% by number and 4.95% by biomass) and one species as earlier of the family Cobitidae (2.62% by number and 1.98% by biomass) were observed. In Perciformes, as earlier *Chanda nama* (35.71% by number and 41.67% by biomass) and *Badis badis* (64.29% by number and 58.33% by biomass) were recorded. As earlier only one species of Siluriformes was recorded. During 2010 maximum frequency of occurrence was observed for *Puntius chola* (FO=1.00) followed by *Barilius bendelisis* (FO=0.80) and other species (FO=0.40 for all other species except *Botia rostrata* and *Acanthocobitis botia*, which showed FO=0.20).

At Chopra (S₂) fourteen species of fish were recorded during 2009 (Table-2) in which twelve species were from the order Cypriniformes (95.57% by number and 90.72% by biomass), one species from the order Perciformes (2.15% by number and 6.19% by biomass) and another one species from the order Siluriformes (2.28% by number and 3.09% by biomass). Among twelve species of Cypriniformes, eight species (earlier five species namely *Barilius bendelisis*, *Aspidoparia morar*, *Puntius chola*, *Garra gotyla gotyla* and three new species *Crossocheilus latis latis*, *Chagunius chagunio* and *Danio devario*) belonged to the family Cyprinidae (85.55% by number and 82.40% by biomass), three species (earlier *Botia rostrata* and two new species *Somileptes gongota* and *Lepidocephalus guntea*) belonged to the family Cobitidae (12.95% by number and 16.58% by biomass) and only one species (*Acanthocobitis botia*) belonged to the family Balitoridae (1.50% by number and 1.04% by biomass). Only one species *Glossogobius giuris* belonging to the family Gobiidae of Perciformes and another one species *Gagata cenia* belonging to the family Sisoridae of Siluriformes were recorded. On that year of that station maximum frequency of occurrence observed in *Barilius bendelisis* and *Puntius chola* (FO=0.90) followed by *Aspidoparia morar* and *Somileptes gongota* (FO=0.60), *Garra gotyla gotyla*, *Cirrhinus reba*, *Lepidocephalus guntea* and *Gagata cenia* (FO=0.30), *Crossocheilus latis latis*, *Chagunius chagunio* and *Botia rostrata* (FO=0.20) and rest of the species (FO=0.10). While only nine species of fish were recorded at the same station (S₂) during 2010 (Table-2) in which, eight species were from the order Cypriniformes (92.77% by number and 9.70% by biomass) and one species from the order Siluriformes (7.23% by number and 8.30% by biomass). Among nine species of Cypriniformes, six species (except *Crossocheilus latis latis* and *Danio devario* of the earlier) belonged to the family Cyprinidae (68.81% by number and 81.90% by biomass) and two species (except *Botia rostrata* of earlier) belonged to the family Cobitidae (31.19% by number and 18.10% by biomass). Only one species *Gagata cenia* of Siluriformes as earlier were recorded. On that year of that station maximum frequency of occurrence observed in *Puntius chola* (FO=1.00) followed by *Barilius bendelisis* (FO=0.75) and all other species (F=0.50) except *Chagunius chagunio* and *Somileptes gongota* (FO=0.25).

At Dalua (S₃) only nine species of fish were recorded during 2009 (Table-3) which was all belonging to the order Cypriniformes. Among nine species of Cypriniformes, seven species as earlier (*Barilius bendelisis*, *Aspidoparia morar*, *Puntius chola*, *Cirrhinus reba*, *Crossocheilus latis latis*, *Chagunius chagunio* and *Danio devario*) of the family Cyprinidae (83.64% by number and 86.77% by biomass) and two species (*Somileptes gongota* and *Lepidocephalus guntea*) of the family Cobitidae (16.36% by number and 13.23% by biomass) were recorded. On that year of that station maximum frequency of occurrence observed in *Barilius bendelisis* and *Puntius chola* (FO=1.00) followed by *Aspidoparia morar* (FO=0.91), *Somileptes gongota* (FO=0.73), *Lepidocephalus guntea* (FO=0.45), *Cirrhinus reba* (FO=0.36), *Chagunius chagunio* (0.27) and rest of the species (FO=0.09). While during 2010 at the same station (S₃) only seven species of fish of the order Cypriniformes were recorded (Table-3).

Table 1. Indigenous fish species collected from the River Dauk at Bholagachh (S₁, catching point) during 2009 and 2010

Fish species	2009					2010				
	Biomass (g)	Biomass (%)	Number	Abundance (%)	FO	Biomass (g)	Biomass (%)	Number	Abundance (%)	FO
Family: Cyprinidae (Cypriniformes)										
<i>Barilius bendelisis</i>	2838	36.86	742	30.04	1.00	2280	40.51	262	22.98	0.80
<i>Aspidoparia morar</i>	2060	26.75	1023	41.42	0.63	770	13.68	214	18.77	0.40
<i>Puntius chola</i>	860	11.17	132	5.34	0.63	678	12.05	105	9.21	1.00
<i>Osteobrama cotio cotio</i>	375	4.87	128	5.18	0.25	350	6.22	125	10.96	0.40
<i>Salmostoma phulo</i>	250	3.25	86	3.48	0.25	150	2.67	53	4.65	0.40
<i>Garra gotyla gotyla</i>	225	2.92	52	2.11	0.25	275	4.89	65	5.70	0.40
<i>Cirrhinus reba</i>	0	0	0	0	0.00	200	3.55	16	1.40	0.20
Family: Cobitidae (Cypriniformes)										
<i>Botia rostrata</i>	217	2.82	51	2.06	0.38	100	1.78	25	2.19	0.20
Family: Balitoridae (Cypriniformes)										
<i>Acanthocobitis botia</i>	0	0	0	0	0.00	250	4.44	90	7.89	0.20
Family: Ambassidae (Perciformes)										
<i>Chanda nama</i>	300	3.90	100	4.05	0.25	125	2.22	50	4.39	0.40
Family: Nandidae (Perciformes)										
<i>Badis badis</i>	175	2.27	88	3.56	0.25	175	3.11	90	7.89	0.40
Family: Sisoridae (Siluriformes)										
<i>Gagata cenia</i>	400	5.19	68	2.75	0.25	275	4.89	45	3.95	0.40

Table 2. Indigenous fish species collected from the River Dauk at Chopra (S₂, catching point) during 2009 and 2010

Fish species	2009					2010				
	Biomass (g)	Biomass (%)	Number	Abundance (%)	FO	Biomass (g)	Biomass (%)	Number	Abundance (%)	FO
Family: Cyprinidae (Cypriniformes)										
<i>Barilius bendelisis</i>	1028	15.90	393	25.60	0.90	650	19.62	112	20.25	0.75
<i>Aspidoparia morar</i>	1070	16.55	473	30.81	0.60	400	12.07	34	6.15	0.50
<i>Puntius chola</i>	1611	24.92	245	15.96	0.90	613	18.50	94	17.00	1.00
<i>Garra gotyla gotyla</i>	280	4.33	65	4.23	0.30	225	6.79	55	9.95	0.50
<i>Cirrhinus reba</i>	233	3.60	20	1.30	0.30	450	13.58	38	6.87	0.50
<i>Crossocheilus latis latis</i>	380	5.88	26	1.69	0.20	0	0	0	0	0.00
<i>Chagunius chagunio</i>	170	2.63	22	1.43	0.20	150	4.53	20	3.62	0.25
<i>Danio devario</i>	60	0.93	11	0.72	0.10	0	0	0	0	0.00
Family: Cobitidae (Cypriniformes)										
<i>Botia rostrata</i>	275	4.25	33	2.15	0.20	0	0	0	0	0.00
<i>Somileptes gongota</i>	377	5.83	32	2.08	0.60	200	6.04	20	3.62	0.25
<i>Lepidocephalus guntea</i>	320	4.95	125	8.14	0.30	350	10.56	140	25.32	0.50
Family: Balitoridae (Cypriniformes)										
<i>Acanthocobitis botia</i>	60	0.93	22	1.43	0.10	0	0	0	0	0
Family: Gobiidae (Perciformes)										
<i>Glossogobius giuris</i>	400	6.19	33	2.15	0.10	0	0	0	0	0
Family: Sisoridae (Siluriformes)										
<i>Gagata cenia</i>	200	3.09	35	2.28	0.30	275	8.30	40	7.23	0.50

Table 3. Indigenous fish species collected from the River Dauk at Dalua (S₃, catching point) during 2009 and 2010

Fish species	2009					2010				
	Biomass (g)	Biomass (%)	Number	Abundance (%)	FO	Biomass (g)	Biomass (%)	Number	Abundance (%)	FO
Family: Cyprinidae (Cypriniformes)										
<i>Barilius bendelisis</i>	1487	17.98	410	28.67	1.00	1050	26.65	114	19.59	0.60
<i>Aspidoparia morar</i>	1264	15.28	233	16.29	0.91	650	16.50	50	8.59	0.80
<i>Puntius chola</i>	2707	32.73	420	29.37	1.00	1110	28.17	169	29.04	0.80
<i>Cirrhinus reba</i>	738	8.92	36	2.52	0.36	370	9.39	30	5.15	0.60
<i>Crossocheilus latis latis</i>	300	3.63	20	1.40	0.09	0	0	0	0	0.00
<i>Chagunius chagunio</i>	550	6.65	67	4.69	0.27	175	4.44	5	0.86	0.40
<i>Danio devario</i>	130	1.57	10	0.70	0.09	0	0	0	0	0.00
Family: Cobitidae (Cypriniformes)										
<i>Somileptes gongota</i>	654	7.91	58	4.06	0.73	50	1.27	4	0.69	0.20
<i>Lepidocephalus guntea</i>	440	5.32	176	12.31	0.45	535	13.58	210	36.08	0.60

Among seven species of Cypriniformes, five species (except *Crossocheilus latis latis* and *Danio devario* of earlier) of the family Cyprinidae (63.23% by number and 85.15% by biomass) and two earlier same species of the family Cobitidae (36.77% by number and 14.85% by biomass) were observed. On that year of that station maximum frequency of occurrence obtained in *Aspidoparia morar* and *Puntius chola* (FO=0.80) followed by *Barilius bendelisis*, *Cirrhinus reba* and *Lepidocephalus guntea* (FO=0.60), *Chagunius chagunio* (0.40) and *Somileptes gongota* (FO=0.20).

Overall eighteen species of fish were recorded from the River Dauk during 2009 and 2010 in which fourteen species were from Cypriniformes (92.87%), three species from Perciformes (4.69%) and only one species from Siluriformes (2.45%). The data showed a very poor fish assemblage in the River Dauk as compared to the report of the rivers of North Bengal (Patra *et al.*, 2011; Patra and Datta, 2010; Shaw and Shebbeare, 1937; Jayaram and Singh, 1977). Among all the species *Barilius bendelisis* (26.37% by number and 32.21% by biomass), *Aspidoparia morar* (26.29% by number and 21.44% by biomass) and *Puntius chola* (15.11% by number and 26.15% by

Table 4: Status of the indigenous fish species of the River Dauk during 2009 and 2010

Fish species	Abundance (%)	Biomass (%)	FO	Distribution
I. Family: Cyprinidae (Cypriniformes)				
1. <i>Barilius bendelisis</i>	26.37	32.21	0.84	S ₁ , S ₂ & S ₃
2. <i>Aspidoparia morar</i>	26.29	21.44	0.64	S ₁ , S ₂ & S ₃
3. <i>Puntius chola</i>	15.11	26.15	0.89	S ₁ , S ₂ & S ₃
4. <i>Osteobrama cotio cotio</i>	3.28	2.50	0.11	S ₁
5. <i>Garra gotyla gotyla</i>	3.07	3.47	0.24	S ₁ & S ₂
6. <i>Cirrhinus reba</i>	1.82	6.87	0.33	S ₁ in 2010, S ₂ & S ₃
7. <i>Salmostoma phulo</i>	1.80	1.38	0.11	S ₁
8. <i>Chagunius chagunio</i>	1.48	3.61	0.19	S ₂ & S ₃
9. <i>Crossocheilus latis latis</i>	0.60	2.35	0.05	S ₂ & S ₃ in 2009
10. <i>Danio devario</i>	0.27	0.66	0.03	S ₂ & S ₃ in 2009
II. Family: Cobitidae (Cypriniformes)				
1. <i>Lepidocephalus guntea</i>	8.44	5.68	0.31	S ₂ & S ₃
2. <i>Somileptes gongota</i>	1.48	4.42	0.30	S ₂ & S ₃
3. <i>Botia rostrata</i>	1.41	2.04	0.13	S ₁ & S ₂ in 2009
III. Family: Balitoridae (Cypriniformes)				
1. <i>Acanthocobitis botia</i>	1.45	1.07	0.05	S ₁ in 2010 & S ₂ in 2009
IV. Family: Nandidae (Perciformes)				
1. <i>Badis badis</i>	2.31	1.21	0.11	S ₁
V. Family: Ambassidae (Perciformes)				
1. <i>Chanda nama</i>	1.95	1.47	0.11	S ₁
VI. Family: Gobiidae (Perciformes)				
1. <i>Glossogobius giuris</i>	0.43	1.38	0.02	S ₂ in 2009
VII. Family: Sisoridae (Siluriformes)				
1. <i>Gagata cenia</i>	2.43	3.80	0.24	S ₁ & S ₂

biomass) were the most dominating species both by number, biomass as well as frequency of occurrence (FO=0.84, 0.64 and 0.89 respectively). They were also distributed in all study stations of the river during both the year 2009 and 2010. *Osteobrama cotio cotio* (3.28%), *Salmostoma phulo* (1.80%), *Badis badis* (2.31%) and *Chanda nama* (1.95%) were recorded only at Bholagachh (S₁) area during 2009 and 2010 with very less number, biomass and frequency of occurrence (FO=0.11). *Chagunius chagunio* (1.48%), *Lepidocephalus guntea* (8.44%) and *Somileptes gongota* (1.48%) were poorly distributed (FO=0.19, 0.31 and 0.30 respectively) at Chopra (S₂) and Dalua (S₃) during both the year of study, but totally absent in Bholagachh (S₁). In Cobitidae, the abundance of *Lepidocephalus guntea* was slightly better than that of other species of that family. The abundance and frequency of occurrence of *Crossocheilus latis latis* (0.60%; FO=0.05) and *Danio devario* (0.27%; FO=0.03) were very poor. They were available only during 2009 at S₂ and S₃ stations. Similarly, *Botia rostrata* were available only during 2009 at S₁ and S₂ stations with very poor abundance (1.41%) and frequency of occurrence (FO=0.13). They were totally absent at both stations in 2010. A very few number of *Garra gotyla gotyla* (3.07%) and *Gagata cenia* (2.43%) were occurred (FO=0.24) at Bholagachh (S₁) and Chopra (S₂) in both the year of study but were totally absent at Dalua (S₃). *Acanthocobitis botia* (1.45%) recorded (FO=0.05) at S₁ in 2010 and at S₂ in 2009 but totally absent at Dalua (S₃). *Glossogobius giuris* (0.43%) recorded (FO=0.02) at S₂ in 2009 only but totally absent in 2010 and at S₁ and S₃.

Among the eighteen species of fish *Puntius chola* is a vulnerable species and *Chagunius chagunio* is an endangered species as per the list of threatened freshwater fishes of India, National Bureau of Fish Genetics Resources (NBFGR), Lucknow (Lakra *et al.*, 2010). The fish species were not evenly distributed at different stations. The maximum fish species were recorded at the middle stretches of the river (S₂) and the lowest fish species were recorded in the lower stretches of the river (S₃). A canal from Teesta Hydro-electric Power Project joins with the river Dauk at Bholagachh (S₁). Effluents of this power plant might be influencing the distribution of fish fauna in this river. From the foregoing study it is clear that the ichthyofaunal abundance and diversity of the River Dauk are very poor. This is due to over exploitation, habitat loss and other anthropogenic causes. Therefore, comprehensive strategies should be adopted to conserve the fish of the River Dauk immediately. Otherwise, the most valuable species will be disappeared near future.

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