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Diversity of some fauna in National Chambal Sanctuary in Madhya Pradesh, India

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ABSTRACT

Meshram PM (2010) Diversity of some fauna in National Chambal Sanctuary in Madhya Pradesh, India. Biodiversitas 11: 211-215. National Chambal Sanctuary (NCS) gives very good account of avifauna. It over emphasizes significant and important birds species available which are of National and International importance. Crocodiles use sand banks for nesting and basking. Fauna in the NCS is very much influenced by various factors like habitat suitability and protection of their habitats. Their distribution is depending on availability of deep water pools. Another important factors on which distribution of animals depends long stretches of long sand banks. Sloppy to steep sand bank with loose soil were good habitats for nesting of crocodiles, turtles and birds. NCS areas were considerably altered and there were disturbance by the sand miners, poachers, fishermen and farmers. Consequently the poor survival is recommended to greater protection by management practices. Effective co-operations between the Forest Department of Madhya Pradesh and neighbouring states were needed as sand mining and poaching becomes an interstate problem. Thus, strategic location of this site in the migratory route of water birds enhances its importance as a significant water bird habitat. In the present study diversity of some fauna in NCS is discussed.

Key words: National Chambal Sanctuary, fauna, diversity.

INTRODUCTION

In India, National Chambal Sanctuary is lying in three states of Madhya Pradesh, Uttar Pradesh and Rajasthan. The interstate boundary of Madhya Pradesh and Rajasthan along the Parvati river up to the point where Chambal right main canal crosses the Parvati river and the interstate boundary of Madhya Pradesh, Rajasthan and Uttar Pradesh running parallel at a distance of one km either side of Chambal river has been declared National Chambal Sanctuary for Crocodile (*Crocodylus palustris*), Gharial (*Gavialis gangeticus*) and other wild animals. During 1978 the Chambal river was declared as a Crocodile Sanctuary under Crocodile Project with an aim to provide fully protected habitat for conservation and propagation of *gharial, crocodilian* and other wild animals. The river Chambal is one of the country's most beautiful and least polluted river systems. The National Chambal Sanctuary extends over the Chambal River from Jawahar Sagar Dam to Kota barrage and after a gap of 18 km free zone, from Keshoraipatan (Rajasthan) through Pali to Pachanada Uttar Pradesh where it forms a common confluence with the Yamuna along with the Kunwari, Pahuj and Sindh rivers. The total length of the river inside the sanctuary is about 600 kms. The width of the river that is included inside the Sanctuary is 1000 m from midstream on either side of the bank in Rajasthan and Madhya Pradesh. Uttar Pradesh has a greater width to an area 635 sq. km geographically. The sanctuary lies between the latitudes 25^o 35' N and 26^o 52' N and longitudes 76^o 28' E and 79^o 01' E.

In Madhya Pradesh the Sanctuary runs for a length 435 km. The National Chambal Sanctuary was established to protect this pristine river ecosystem, complete with its varied flora, aquatic life and avifauna. The river harbors a variety of aquatic life like the elusive Ganges River Dolphin (*Platanista gangetica*), Gharial (*Gavialis gangeticus*), Crocodile (*Crocodylus palustris*), seven species of fresh water turtles (*Aspideretes gangeticus, Lissemys punctata, Chitra indica, Batagur kachuga, Kachuga dhongoka, Pangshura tentoria* and *Hardella thurjii*), the otter (*Lutra perspicillata*) and a variety of fishes. The rare Ganges river Dolphin *P. gangetica*, the sole member of the cetaceans group is one of the main attractions of the sanctuary. So called the queen of Chambal, the Dolphin inspire of being blind can be seen perusing their playful antics in the water while coming out to breathe for air. The Chambal Sanctuary is one of their safest breeding areas. As per the management plan of National Chambal Sanctuary, around 170 species of birds have been identified in the Sanctuary. Among the different species of birds found in the sanctuary are: bare headed goose, brahmini duck, teals, cormorants, egrets, black and white ibises, brown headed gulls, pointed stork, common crane, sarus crane, herons, spoon bills, pelicans, etc. One can have an easy sighting of the Indian Skimmer- the highest population of which in the world is found in the

NCS. The other important terrestrial animals present in the ravines of the sanctuary are land monitor lizard, variety of other lizards and snakes, sambhar, porcupine, hares, desert cat, blue bull, wild boars etc. (Anon. 2003). In the present study diversity of some aquatic, terrestrial fauna and their probable impact in National Chambal Sanctuary are discussed.

MATERIAL AND METHODS

The information of general habitat of animals was collected. Habitat analysis was carried out on the basis of river bank types located in different zones both aquatic and terrestrial and the water depth during different seasons. Habitats used by the various animals were observed. Data sheets were prepared to record field observations, interview results, past records etc. A detailed survey was carried out by motorboat and also walking along the river bank. During 5th May, 2010 a stretch of 1.0 km on National Chambal Gharial Sanctuary (Figure 1) was surveyed for recording the fauna. The fauna is divided into terrestrial and aquatic and exhibits a wide diversity in faunal composition. The aquatic birds were observed with the help of field binoculars. The fauna were identified with the help of Dr. R.K. Sharma, Range Officer, National Chambal Sanctuary, Deori, Morena, M.P. (India) and using management plan of National Chambal Sanctuary (2003).

As a measure of α- diversity (diversity within habitat), the most popular and widely used the following Shannon's diversity index (H') was calculated since it is well accepted that all species at a site, within and across systematic groups contribute equally to its biodiversity (Ganeshaiah et al. 1997).

$$\text{Shannon's index} \quad H' = \sum_{i=1} (pilnpi)$$

p= is the proportional abundance of the i th species
s =total number of species
ln = is the log with base'e' (Natural log)

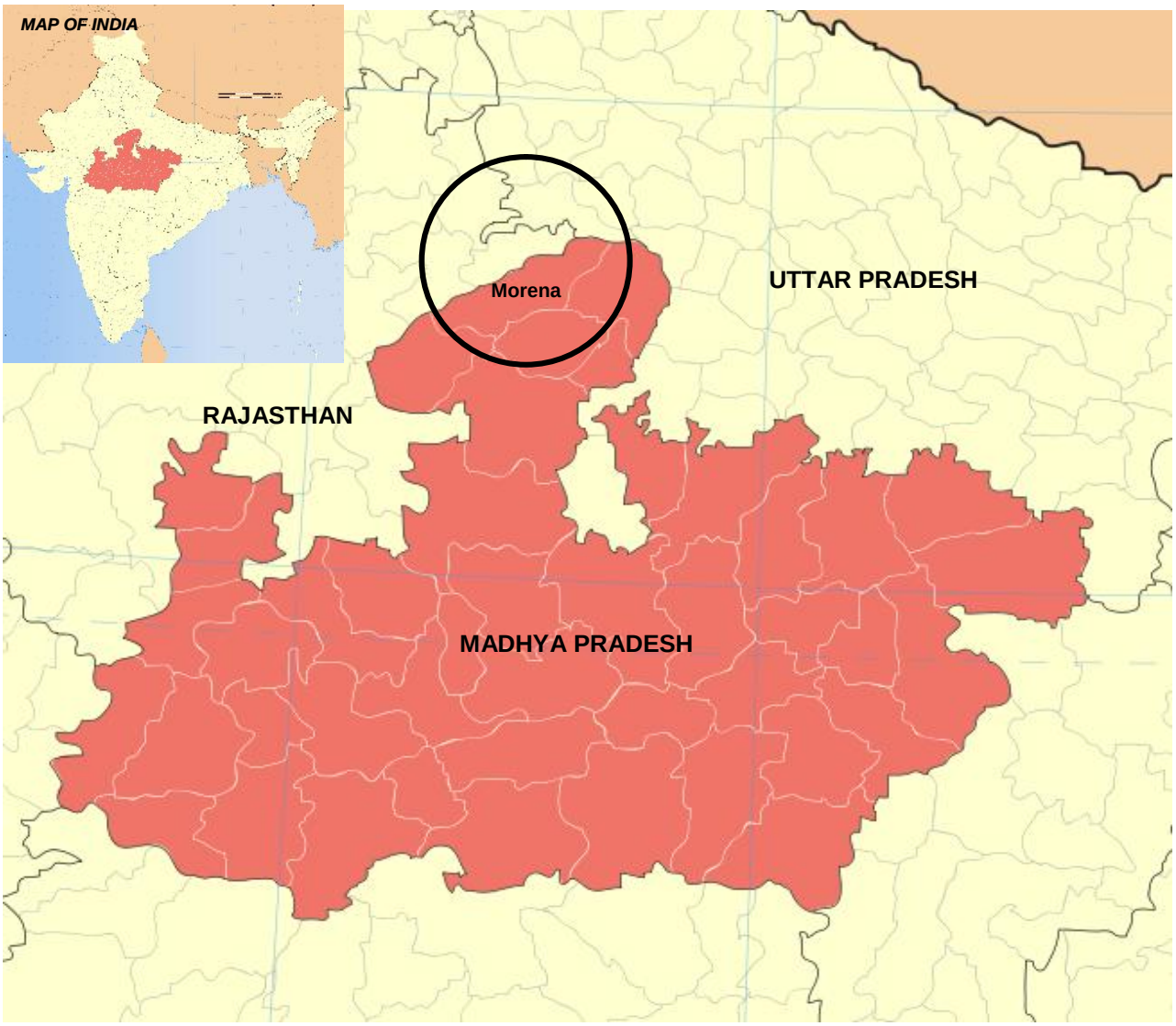

Figure 1. National Chambral Sanctuary in three states of Madhya Pradesh, Uttar Pradesh and Rajasthan, India (circle).

Table 1. Census of some aquatic and terrestrial fauna in NCS during 2010.

Scientific name	Common name	Family	No. of fauna sighted	Remark
Birds				
Acridotheres gingianus	Bank myna	Sturnidae	4	
Burhinus oedicnemus	Stone curlew	Burhinidae	1	
Columba livia	Blue rock pigeon	Columbidae	1	
Dendrocygna javanica	Whistling teals	Anatidae	28	
Dicrurus adsimilis	Black drongo	Dicruridae	2	
Egretta garzetta	Little Egret	Ardeidae	1	
Hirundo rustica	Common swallow	Hirundinidae	26	
Lanius excubitor	Grey shrike	Laniidae	120	
Merops orientalis	Green bea eater	Meropidae	2	
Neophron percnopterus	Scavenger vulture	Accipitridae	1	
Pavo cristatus	Common peafowl	Phasianidae	2	
Phalacrocorax niger	Little cormorant	Phalacrocoracidae	2	
Rynchops albicollis	Indian skimmer *	Laridae	2	
Sterna aurantia	River tern	Laridae	2	
Streptopelia tranquebarica	Red Tuttle Dove	Columbidae	3	
Streptopelia decaocto	Ring dove	Columbidae	2	
Vanellus indicus	Redwattled lapwing	Charadriidae	15	
Vanellus spinosus	Spurwinged plover	Charadriidae	5	
Entomofauna				
I. Lepidoptera				
Catopsilia crocale	Common emigrant	Pieridae	2	
Danaus chrysippus	Plain Tiger	Danaidae	3	
Terias (Eurema) blanda	Grass Yellow	Pieridae	2	
II. Odonata				
Orthetrum pruinosum neglectum	Dragonfly	Libellulidae	5	
Orthetrum taeniolatum	Dragonfly	Libellulidae	3	
Crocodiles				
Gavialis gangeticus	Gharial	Crocodylidae	5	5 nests
Crocodylus palustris	Mugger	Crocodylidae	1	
Turtles				
Kachuga kachuga	Hard shell tuttle	Emydidae	2	2 nests
Fish				Seasonal
Labeo rohita	Rohu	Cyprinidae	5	R/Y
Catla catla	Catla	Cyprinidae	2	R/Y
Heteropneustes fossilis	Cat fish	Saccobranchidae	12	R/Y

Note: *Globally Threatened, R/Y Round the year

Table 2. Density percentage and Shannon diversity index of some aquatic and terrestrial fauna in NCS during 2010.

Scientific name	Common name	% Density
Dicrurus adsimilis	Black drongo	0.766284
Vanellus indicus	Redwattled lapwing	5.747126
Phalacrocorax niger	Little cormorant	0.766284
Vanellus spinosus	Spurwinged plover	1.915709
Rynchops albicollis	Indian skimmer *	0.766284
Hirundo rustica	Common swallow	9.961686
Merops orientalis	Green bea eater	0.766284
Dendrocygna javanica	Whistling teals	10.72797
Egretta garzetta	Little egret	0.383142
Columba livia	Blue rock pigeon	0.383142
Acridotheres gingianus	Bank myna	1.532567
Streptopelia tranquebarica	Red tuttle dove	1.149425
Burhinus oedicnemus	Stone curlew	0.383142
Lanius excubitor	Grey shrike	45.97701
Sterna aurantia	River tern	0.766284
Streptopelia decaocto	Ring dove	0.766284
Pavo cristatus	Common peafowl	0.766284
Neophron percnopterus	Scavenger vulture	0.383142
Danaus chrysippus	Plain tiger	1.149425
Terias (Eurema) blanda	Grass yellow	0.766284
Catopsilia crocale	Common emigrant	0.766284
Orthetrum pruinosum neglectum	Dragonfly	1.915709
O. taeniolatum	Dragonfly	1.149425
Gavialis gangeticus	Gharial	1.915709
Crocodylus palustris	Mugger	0.383142
Kachuga kachuga	Hard shell tuttle	0.766284
Labeo rohita	Rohu	1.915709
Catla catla	Catla	0.766284
Heteropneustes fossilis	Cat fish	4.597701
		100
Shannon Diversity Index		2.17057

RESULTS AND DISCUSSION

The numbers of fauna sighted, density percentage and Shannon diversity index of some fauna in National Chambal Sanctuary (NCS) during the present study are shown in Table 1 and 2. During the survey the wetland avifauna was observed in higher numbers as compared to other fauna. The surveyed stretch of the site is mainly sandy banks. The sandy banks of river are used by the gharial, mugger and turtle for basking and nesting. Fishes constitute secondary level of food chain. Availability of avifauna in their numbers and available species is another important significant biodiversity criteria that requires immediate attention in this site. World famous Keoladeo Ghana Bird Sanctuary at Bharatpur is only 95 kms away from this site and it is very natural to expect richness species, numbers and offering an extensive habitat for resident as well as migratory birds. Chambal River lies on the migratory route of aquatic fauna providing an approximate stretch of 300 km of perennial wetland habitat for wintering aquatic bird fauna. Most of the entire avifauna recorded in this site are either residents or migrants.

On the basis of data of avifauna clearly indicates that major congregator birds are fish feeders exemplifying the richness of fishes in the river system. This also signifies high levels of primary production in the site. It was also observed that bird population fluctuate in Chambal river which has some direct relation with the habitat condition with Bharatpur which is one of the major habitat for water bird situated 95 km away from this site. It is presumed that during the drought period in Bharatpur more birds take refuse in Chambal River which perhaps includes endangered Siberian Crane which is also reported from Madhya Pradesh. Wetlands are highly productive systems. They are rated third among the highly productive systems of the world. The food chain and food pyramid of NCS is depicted in the following diagram (Figure 2).

In NCS, cattails, *Typha* spp. is the main aquatic plant. *Typha* accounts for high level annual net primary production levels (tons/h), which is 10-94 tons/ha. Like primary production the secondary production is also fairly high in wetlands. The secondary production depends upon the pathway and efficiency of utilization of energy in primary production. In wetlands a relatively small portion of primary production of algae and higher plants is directly utilized by herbivores. Large part of plant production is used only after it is dead and partly decomposed. Various benthic organisms, some fishes and dolphins feed on detritus in different stages of decay. Other carnivores

including amphibians, fish, certain turtles, gharial, mugger, dolphin and waterfowl consume the Benthos and fish. Gharial, mugger and dolphin are important tertiary players in the food chain but almost all of them are basically sympatric with each other in their feeding habits. Thus, they generally avoid each other for food and habitat or to say there is least competition among the various carnivores for food and space. Gharials hunt surface fishes, dolphins mostly depend on deep water fishes, otters may have habitat overlapping with dolphins, but muggers are totally different with respect to size and quantity of the prey. They generally feed on bigger prey. Birds to some extent certainly compete with muggers and gharials of lower age group for the small catch fish.

Pre- predatory and intra –predatory relationships are the least studied aspect in the NCS almost all the key stone species viz. gharial, gangetic dolphin and mugger are pisivorous species. Illegal fishing on commercial scales has reduce in the availability of chief prey in the NCS which may have a direct bearing on the reduced numbers of the above species especially that of gharials. Birds prey, some of the migratory birds, jackles, monitor lizards, carnivores and omnivore turtles prey upon eggs and hatchlings of gharial and mugger. This intra-predatory relationship controls the natural recruitment of gharial and muggers. Thus, it becomes very important to study pre-predator and intra-predatory relationships to maintain dynamic and viable populations of keystone species in the site.

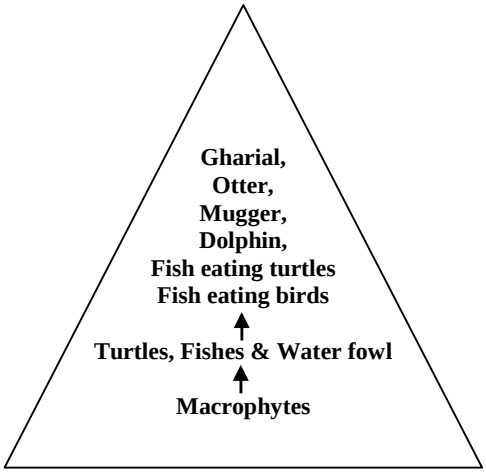

Figure 2. Food pyramid diagram of National Chambal Sanctuary (NCS), India.

Population directly dependent upon wetland resources and cultural-indigenous practices of wetland resource utilization

As detailed elsewhere more than four lakes population is directly dependent on the river ecosystem. They invariably cultivate the land up to the brim, pump out the water for irrigation purposes. Agricultural practices up to the brim of the river to some extent certainly adversely affect the nesting behavior of gharials, muggers and turtles. Fishing is almost through the length of the sanctuary. Fishing on commercial scales is most prevalent in NCS. There are many fake owners who auction the fishing permits every year to small traders. The fishing activity in recent times is gravely affected actual numbers of gharial and mugger population. Once caught in to the fishing nets these creatures get entangled and then beaten to death to relieve the fishing nets. Simultaneously fishing activity also reduces the food availability for tertiary components of the biological pyramid (keystone species). Sand mining is the major detrimental activity that is destructing the habitat in a highly dangerous way. Recent survey of NCS and the court commissioner's report has brought out some disturbing picture of habitat destruction and highly mortality of wild animals (Anon. 2003).

Existing conservation measures

National Chambal Sanctuary is one of the rare protected areas where good levels of conservation measures were successfully taken up and implemented. Gharial rehabilitation project was started in the year 1979 when all time low gharials were recorded (50 gharials as per report of science today report in 1979). Deori has been designated as Gharial Rehabilitation Centre (DGRC) where artificial hatching and rearing of gharials was carried out. In all 1287 gharials were released into the sanctuary. Initially there was no much pressure with respect to resource and utilization on to the Chambal Ecosystem. Then people were law obedient and had fear for administration. There was a spirit of team work that resulted in better conservation measures as reflected in above table. But, as a result of gradual political and muscle power getting into lucrative sand mining business over a period of 10-15 years, people have become more daring and destructive. Unabated illegal sand extraction in many stretches of the NCS resulted in severe habitat destruction and reduction in number of gharials. Even the migratory avifauna is being hunted mercilessly in the NCS. Around 37 animals were found dead during the survey of the year 2003. The casualties included 8 gharials, 2 muggers, 1 dolphin, 7 turtles and several birds. The high rate of mortality of wild animals caused by illegal fishing and mining is a matter of serious concern. Additional boon for NCS is simultaneous conservation of one of the rarest and highly endangered aquatic mammal i.e. fresh water river dolphin (Gangetic Dolphin) during implementation of gharial project. Results of the recent survey indicated that the number of gharials dwindled almost less than 50% in comparison to 1997 estimated population. Regular monitoring could have saved the NCS. NCS on the river Chambal is a refuge for the rare and endangered gharial (*Gavialis gangeticus)* and ganges river dolphin (*Platanista gangetica*). The Chambal river is holding the best population of dolphins among the southern tributaries of Ganges. The 400 km stretch of crystal clear water also supports marsh crocodiles, smooth coated otters, 7 species of turtles (*Aspideretes gangeticus, Lissemys punctata, Chitra indica, Kachuga kachuga, K. dhongoka, Pangshura tentoria* and *Hardella thurjii*) and 250 species of birds. The Chambal river also supports more than 40 species of fish species, which include Deccan mahseer *Tor khudree* and the giant fresh water ray *Himantura chaophraya*, which occur only in the Chambal river

(Taigor and Rao 2010). A good population of Indian Skimmers is the strongest birding attraction here. Black Bellied Terns, Red Crested and Ferruginous Poachards, Bar-Headed Goose, Sarus Crane, Great Thick-Knee, Indian Courser, Pallas's Fish Eagle, Pallid Harrier, Greater and Lesser Flamingos, Darters, and the resident Brown Hawk Owl, all add up to an impressive list of birds of Chambal. The habitat of aquatic animals in the Chambal river is characterized by expanses of open sand which is sparsely covered with the variety of herbs, the most common in the open sand being *Tamarix dioica.* Some Turtle species frequently dig nest adjacent to the *T. dioica* on some occasions soft shell turtles also dig nests near this vegetation. The *T. dioica* on the open sand help prevent the wind from eroding the sand and exposing nests. Aquatic and semi-aquatic vegetation are similar along the entire Chambal river. Herbivorous Turtles feed and take shelter on *T. dioica*, *Potamogeton demersum*, and *Zannichellia* spp. vegetation. During summer the aquatic vegetation dries up due to low water level, however, during wet season the vegetation is completely submerged in the flood waters and it is difficult to collect the plant material during this period. Major tree species are *Prosopis* spp., *Acacia* spp., *Ziziphus mauritiana*, etc. Turtle, *Aspideretes gangeticus* travel more than 500 m and lay eggs under the shade of *Acacia* spp. (Taigor and Rao 2010).

The habitat of the fauna in NCS is mostly aquatic with terrestrial habitat within 1 km from the mid river bank. The micro habitats are: deep water pools, shallow riffle areas, sand peninsulas, muddy banks, sand banks (steep and sand banks), rocky banks, xerophytes vegetation on the banks etc. The habitat as the key to organizing knowledge about fauna and maintenance of appropriate habitat is the foundation of all wildlife management (Thomas 1979). Species richness can be affected by habitat loss, fragmentation and modification. Habitat studies provide crucial information about the ecological requirements of a species or community. Increasing habitat loss causes a significant increase in extinction risk among many species. The management criteria in the NCS are cessation of commercial fishing, anti-poaching measures, extending protection to habitat and rehabilitation of Gharial under 'grow and release program' and monitoring of the population of fauna and research (Singh 1985).

CONCLUSIONS

Observations of NCS were considerably altered and there are disturbances by the sand miners, poachers, fishermen and farmers. Considering the poor survival, it is recommended to provide greater protection by management practices. Effective co-operations between the Forest Department of Madhya Pradesh and bordering states are needed as sand mining and poaching becomes an interstate problem. Thus, strategic location of this site in the migratory route of water birds enhances its importance as a significant water bird habitat. NCS Management Plan 2003 gives very good account of avifauna of the NCS. It over-emphasizes significant and important birds species available in the NCS which are of National and International importance. Crocodiles use sand banks for nesting and basking. Fauna in the NCS is very much influenced by various factors like habitat suitability and protection of their habitats. Their distribution is depending on availability of deep water pools. Another important factor on which distribution of animals depends is long stretches of long sand banks. Sloppy and steep sand bank with loose soil are essential for good habitats for nesting of crocodiles, turtles and birds. NCS will have negative impact mainly on the Gharial, Turtle breeding programs and other avifauna.

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