



## Socioeconomic status of fishermen communities in Panchganga river basin in Kolhapur District, Maharashtra, India

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### Abstract

*Panchganga is main tributary of river Krishna in Kolhapur district. Krishna is the major river in peninsular India. Human beings are inseparable and the most dominant direct or indirect component of any riverine system. Sociological survey plays a significant role in understanding the vitality of a natural system and its relationship with dependent human society. The Social Impact Assessment (SIA) study was mainly focused on the traditional fishermen communities dependent for their livelihood on the five tributaries in Panchganga river basin. The social survey of 78 individuals from three traditional fishermen communities in 17 villages in Panchganga basin revealed the changing status of riparian biodiversity. Most the respondents opined that fish catch and fish diversity had decreased considerably over last two decades. Comparison of past and present status of fish species diversity revealed that out of the earlier 23 abundant species only one had retained its original status, whereas of the earlier abundant species status of 22 species had relegated to common. From the earlier 42 common species now 12 had become rare. Socioeconomic status of the traditional fishermen communities being entirely dependent on health of river, their occupation has declined and thus many had to shift over to other petty jobs for subsistence.*

**Keywords:** Socio-economic condition, Fishermen communities, Panchganga basin, Landuse change.

### Introduction

Rivers have served as crucial life support systems for generations to the great civilizations those emerged on river banks, and still continue to play the role where their ecology and biodiversity is protected and conserved. It needs to be remembered that healthy river systems have all along provided natural water regulating and supporting services that contribute directly and indirectly to socio-cultural needs and human well-being. This has been through potable water supply, maintenance of fisheries and agriculture, and also recreation besides several other values. Despite these vital values and services to humanity, today most river systems are neglected and are being severely damaged by anthropogenic activities under disguise of 'development'.

Changing landuse practices in the river catchments, near and far, have contributed to a steady decline, degradation, and fragmentation of the diverse macro and micro riparian habitat, leaving them valuable than ever before. The social survey, carried out in the present study as a vital part Social Impact Assessment (SIA), is an integrated part of Environmental Impact Assessment (EIA) methodology and was developed during the early 1970s as a tool of methodology to better understand the consequences of landuse change and environmental alterations and as an input to EIA<sup>1</sup>. Social assessments can be used in fishery to explore the historical,

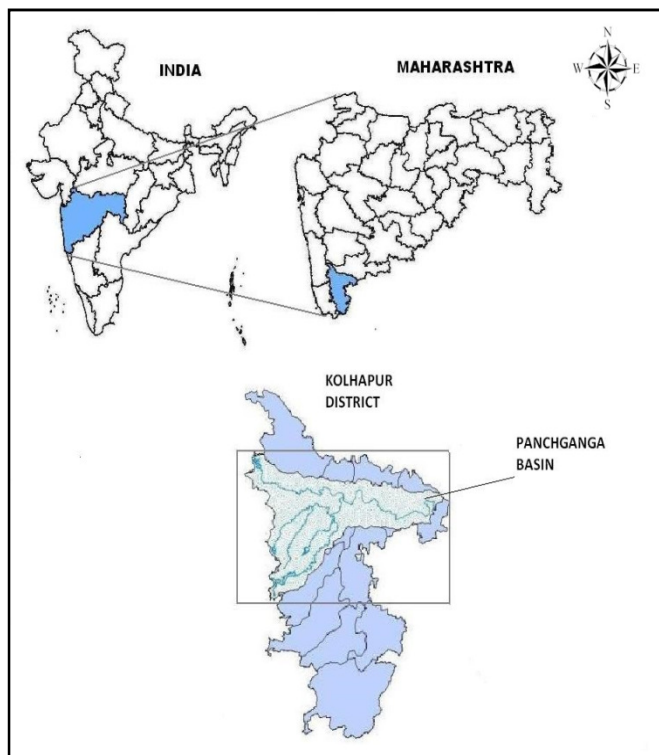
cultural, economic, ecological, and demographic impacts of management plans<sup>2</sup>.

The present study provides benchmark information on the status and trends of the socio economic conditions of the fishermen communities in Panchganga basin, which are directly linked to changing status of landuse practices and riparian habitats in the river ecosystem, and information on social vulnerability of the communities related with their livelihood activity.

### Materials and methods

Panchganga ('five rivers' in Marathi) is one of the important upper catchment tributary of River Krishna, in the Western Ghats in south Maharashtra. Panchganga basin (2730 sq km) lies between 16°19' 12'' and 16°55' 21'' N latitudes and 73° 44' 10'' and 74°42' 20'' E longitudes. Panchganga River basin is formed in the upper western part of the district by five tributaries namely Bhogawati (83km), Tulashi (34 km), Dhamni (41 km), Kumbhi (48 km) and Kasari (69 km).

The five tributaries unite to form Panchganga River at Prayag near Kolhapur city. After the confluence Panchganga flows for about 67 km before it meets river Krishna at Narsinghwadi near Maharashtra Karnataka border (Figure-1).



**Figure-1:** Location map of Panchganga Basin.

This SIA study is mainly focused on the traditional fishermen communities dependent on the local rivers for their livelihood, which is very much reliant on the health of the rivers in Panchganga basin. Therefore to study river ecology and socio-economic condition of fishermen community in Panchganga basin, a social survey of fishermen communities was undertaken. Random sampling survey method was used for this purpose<sup>3</sup>. The interview schedule comprising of 68 relevant questions was prepared for individual feedback of fisherman, which included personal biographical information, traditional fishing practices, past and present status of fish species, past and present status of riparian ecosystem, change in river catchment landuse etc. Initially pilot schedule was field tested and further improvements were made in the final schedule. Survey of traditional fishermen was conducted in the villages where they are actively engaged in traditional occupation.

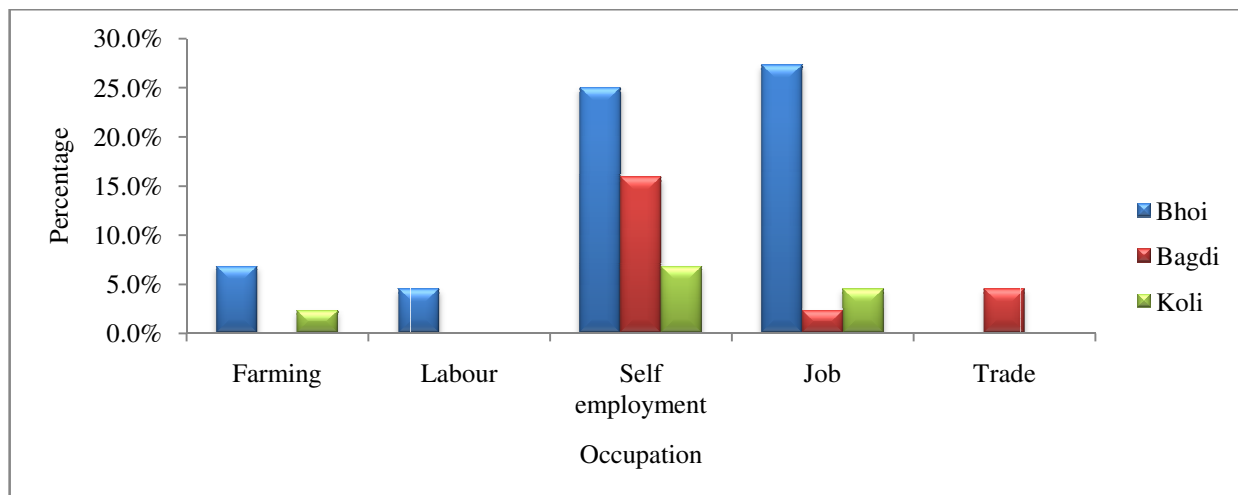
This sociological study provided a valid tool to understand life condition of fishermen communities better in the context of changing environmental and socio-economic aspects impacting their traditional livelihood. During the study interaction was made with several individuals. A total of 78 fishermen from 17 locations, along the entire Panchganga river course were conducted as per the division i.e. upper catchment (#30), middle catchment (#20) and lower catchment (#28) were interviewed. In addition, extensive personal observations were made during the field study. Statistical Package for the Social Sciences (SPSS) and Microsoft excel application was used to analyze the data generated through questionnaire survey.

## Results and discussion

In Panchganga river basin fishing activity is an age old livelihood activity and has been carried out by the three traditional fishermen communities namely Bhoi, Bagdi and Koli. Among these communities Bhoi community (65.4%) dominates in population size and are spread in the entire Panchganga basin. While Bagdi (17.9%) and Koli (16.7%) communities are smaller in size and restricted to upper and lower catchments, and strikingly absent in the middle catchment of Panchganga river basin. Traditionally fishing was done as subsistence in these communities, but later it was carried out as a major source of livelihood. In the recent years some poor people from other communities, who are not traditional fishermen, have also entered in fishing activity in the basin. However, they concentrate more on fishing in newly constructed dams, tanks and village ponds, as fishing in them is less skilled and profitable than traditional river fishing.

The literacy level of a population reveals its ability to develop and carry out the traditional livelihood with innovations or to opt for better occupational opportunities. The literacy levels of the respondents indicated that majority (84.6%) fishermen were literate. Whereas as expected most of the Illiterate fishermen (24.4%) belonged to senior age group. Most (42.6%) of the literate fishermen had education only up to secondary school level. The literacy level revealed that Bhoi community was more educated among the three fishing communities, and Graduates (4.4%) were observed only in the Bhoi community which indicated better job opportunity to them as compared to other two communities. For example in Gudalwadi village in upper catchment of Bhogawati river, most of the Bhois were educated and had good job exposure and potential. Hence they did not get engaged anymore in the less lucrative traditional fishing activity. Bagdi and Koli on the other hand were being not much exposed to social change and therefore were restricted to traditional livelihood activities with meager earnings. In general it is found that the literacy level in fishermen communities in India is very low<sup>4,5</sup>.

Today mainly due to degradation of riverine ecology many fishermen families in the study area could not be totally dependent on their traditional occupation for survival and thus had to shift to several petty jobs. For example Bhoi community only some (35.9%) still continued with fishing while others did supplementary jobs. Bhoi families from Sonurle village, in upper catchment of river Kasari, still depended only on fishing despite their economic status becoming poor. Some Bagdi (12.8%) families besides fishing are now engaged in other occupations. As compare to Bhoi community Bagdi and Koli communities are revealed to be more backward with reference to their literacy and economic status. Most members of these fishermen communities, who were no longer doing fishing as their main occupation, but were engaged in other activities like petty jobs, farming, trade, labourer and some were self employed (Figure-2).



**Figure-2:** Fishing Communities and their alternate occupations.

For example Bhoi community was engaged in, job (27.3%), self employed (25%), farming (6.8%) and as labourer (4.5%). While Bagdi community was involved in jobs and trading, and some (15.9%) of them were self-employed. However, in Koli community only some (6.8%) were self employed, and few were doing petty job (4.5%) and farming (2.3%). Most of the fishermen in Bhoi community depend on minor business, for example in Shirdhon village they were engaged in blanket weaving. While in Ghotawade village some members of Koli community were now involved in lime production.

Poor income status of fisherman families with fishing as livelihood, even when market price of fish is high, normally indicated poor fish catch in the associated riverine systems. The income from fishing to the traditional fishermen from Panchganga basin has now become relatively meager. About (56.4%) fishermen had monthly fishing income of only between Rs.1001 to 2500. It was observed that fishermen in mid age group of 36-45 yrs (30.8%) were mainly active in fishing. Only few (1.3%) fishermen from Bhoi community had more than Rs.4000 monthly income from fishing. However, the total family income did not necessarily reflect income only from the fishing activity, as most of the fishermen families could not be solely dependent on income from fishing, and had to opt for supplementary or alternative source of income. It was observed that many (33.3%) of the fishermen, particularly from Bhoi community, had their total monthly family income between Rs.4501 to 6000 and few (10.3%) fishermen had their total family income more than Rs.9000. In Bagadi community some (12.8%) had family income between Rs.4501-6000 and only few (3%) had family income between Rs. 7501-9000. Studies on fishermen communities in India have revealed that the economic conditions of fishermen communities are usually poor, when they were not fully engaged in a fishing business<sup>6,7</sup>.

In the recent years there are significant landuse changes in the river catchments and riparian habitats in Panchganga basin. This has resulted into river bed water level fluctuations, bank

reclamation, habitat fragmentation and pollution of the riparian micro ecosystems and fish habitats. The cumulative consequence of these environmental changes is reflected in decline in riverine fish diversity, density and distribution<sup>8</sup>. No wonder that most of the fishermen (57.7%) in the study area could not any longer dependent on rivers for their livelihood, but instead they had to do search for other water recourses in the vicinity for fishing. Whereas the remaining fishermen (42.3%) had no option but still solely depend on the same riverine habitats for fishing. It was observed that Bhoi and Koli communities were not solely dependent on any one source of aquatic habitat in the area, as they did fishing in other water resources such as Village ponds, percolation tanks, and minor irrigation dams. Interestingly Bagdi community is still solely dependent on rivers for fishing. Though about 21.8% fishermen did fishing individually, most (78.2%) fishermen were engaged in both fishing individually as well as collectively. Group fishing was mainly carried out in percolation tanks, dams and village ponds as drag nets, requiring team effort and many nets were used.

During summer fishing in upper catchment is negligible as most of the streams run dry being non perennial. But in middle and lower catchments fishermen get good fish catch from pools and depressions in river beds due to presence of water in Kolhapur Type (KT) weirs, temporary bunds, and sand pits in river beds. In these sites large numbers of fish get trapped in stagnant water pools. Incidentally during summer months these very sites often become areas of mass fish mortality due to concentration of pollution in water bodies, with high fish concentration, through industrial effluents or oxygen depletion due to increased nutrient load as result of sewage pollution.

Changing nature of riparian habitats has made fishermen uncertain about availability of traditional fish species they expected earlier. Therefore due to this uncertainty, in species diversity as well as in abundance, today the fishermen community is less dependent on any one specific type or

specific fishing gear to be used. It was observed that Bhoi community used all types of fishing gear i.e. Gill net (23.1%), fish trap (2.6%), hook and line; cast net (1.3%). When Bagdi and Koli communities mostly used cast net and gill net. It was noticed that younger generation since could not operate cast net skillfully, mostly depended on easier gill net. Which are relatively passive type, none tiring and involve less skilful operation. According to many fishermen respondents in some regions dynamites, chlorine powder, and electric shock techniques were used, particularly by locals outside fishing community, for mass fish killing in riparian and riverine habitats. The traditional fishermen opined that this indiscriminate and destructive method of fish catching has adversely affected fish stocks in many parts of the river system. It was claimed however, that such techniques were avoided by the traditional fishermen (Figure-3).

**In Panchganga Basin:** Depending on local geomorphology, hydrology, and climatic factors, a combination of fishing gear was used by the three traditional fishing communities. Most of them (76.67%) preferred cast and gill net. In the upper catchment (3.33%) fishermen used all types of gear. In middle catchment majority fishermen (75%) used cast and gill net, and others (21.4%) operated only gill net and hook and line, but in the lower catchment only two fishing nets were used. Most (70%) fishermen used gillnet and (30%) fishermen preferred both, cast and gill net. The drag net is not practiced in these rivers due to topography of river bed and water current, but it is mostly used in group fishing in minor dams and percolation tanks in the region.

Recently with knowledge of improved fishing techniques, and availability of improved material, some traditional fishing gear have either been modified or replaced by nylon rope and nets.

According to earlier study on fish and fisheries in Panchganga river, fishermen were using traditional cast net, gill net, bag net and drag net and only few, particularly members of fishermen cooperative, had started using government supplied nylon threads for hook and line and nets<sup>9</sup>. In another study on use of different fishing gear and its impact on Krishna river fishery in Telangana, it is reported that many gear were employed for short-time only when water level was suitable for their use, i.e. especially when the level increased with the beginning of monsoon or when flood starts receding<sup>10</sup>.

In the present study there was unanimity in the respondents on rapid decline, in last two decades, in fish catch and fish diversity in Panchganga river basin. In this, the middle age group's opinion (30.8%) was more important as this group was most actively engaged in fishing among all age groups. the experienced senior fishermen (24.4%) also revealed that there was decrease in the fish catch as compare to past few decades. It was further stressed that fish species, earlier common, are now rarely recorded from the river waters. The comments on changing status of fish diversity in rivers in Panchganga river basin are based on experience and knowledge of fishermen interviewed during the study. This survey was targeted to take note of any possible change in fish diversity and its status during last 20 years. But this status could not be very precise as most fishermen identified different species with same common local name. In general they were more concerned about marketable fish species, rather than taxonomy of small size minor fish species. The changes observed in fish diversity in Panchganga basin is summarized in Table 1. The fish list was used for the survey was from the original benchmark work done by state fisheries department's authorities<sup>11</sup>. According to studies on fish and fisheries of Panchganga river reported gradual decline in fish species diversity in Panchganga river<sup>9</sup>.

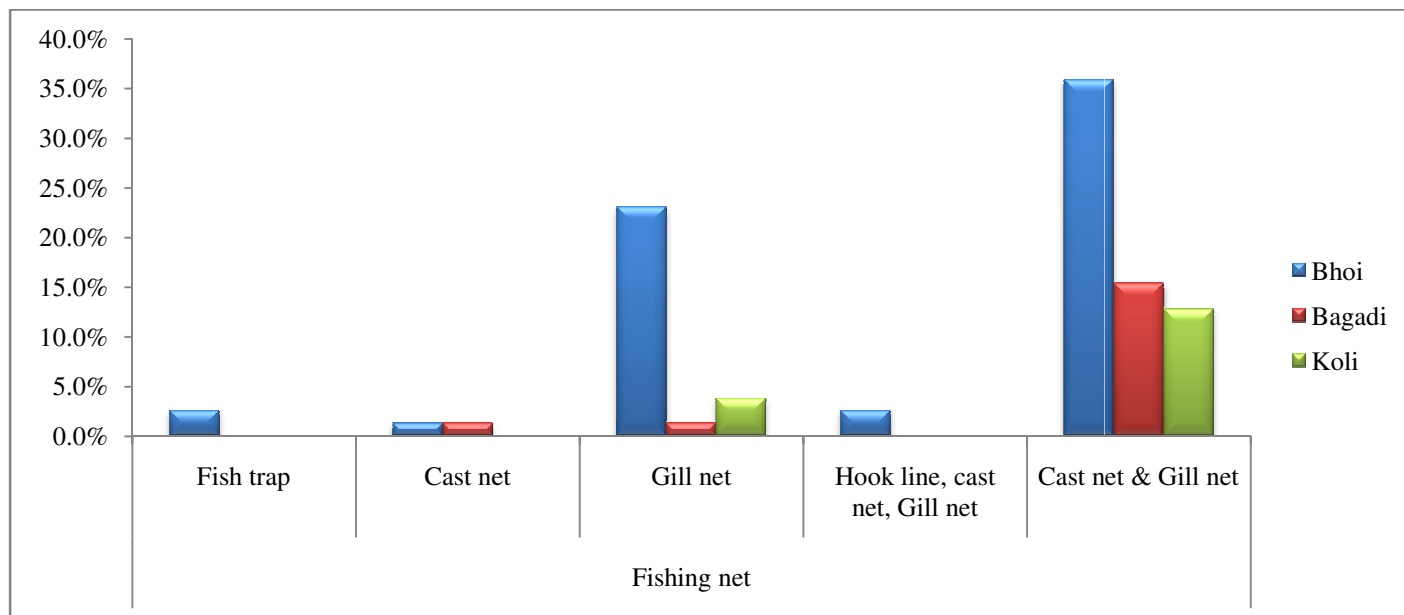


Figure-3: Fishing Gears used by the three traditional fishing communities.

**Table-1:** Past and present status of fish species diversity in Panchganga Basin

Past Status		Present status		
		Abundant	Common	Rare
Abundant	23	1	22	-
Common	46	-	34	12
Rare	3	-	2	1
Total	72	1	57	13

Comparing past and present status of fish species data generated during present field study revealed that out of the earlier 23 abundant species only one (*Rasbora daniconius*) had retained its status, whereas of the earlier abundant species status of 22 species had relegated to common. From the earlier 42 common species now 12 had become rare and remaining 20 have maintained their common status. From the earlier 3 rare species two species, both exotic, namely *Oreochromis mossambicus* and *Hypophthalmichthys molitrix* had becomes common and only species *Puntius deccanensis* had maintain its rare status. It was also observed in the adjoining Warna river basin that there too drastic reduction in the fish diversity has taken place from 71 species to 42 in the last couple of decades<sup>12</sup>.

The socio-economic condition of fishermen community in Panchganga basin was entirely dependent on local fish diversity, quality and availability. It was observed that due to habitat loss, construction of large number of KT weirs which stagnate river water flow during summer and effluent pollution there was decrease in fish diversity and yield in riverine fishery, a large number of fishermen families were shifting or already shifted to other occupations for livelihood. This clearly indicated gradual environmental degradation of the riparian and riverine habitats in Panchganga basin. Observations also indicate that economically important exotic fish species introduced in the village ponds and percolation and minor tanks fetched more benefits to fishermen as compared to the limited fish from degraded riverine habitats. As a result traditional fishermen communities are today diverted from riverine fishery to tank fishery, despite increasing competition from non fishermen communities.

Most fishermen (38.2%) opined that decline in fish diversity was a consequence of riverine pollution. This was mainly observed in middle and lower catchments of Panchganga basin. Almost same percentage fishermen (32.4%) believed that the reason was agriculture expansion and pollution. According to only few (4.4%) it was as result of construction of Dams and K.T Weirs in riparian habitats on different rivers in PRS. Only (1.5%) opined that it was because of frequent water level fluctuation in river due to construction of dams and K.T weirs.

About 61.5% fishermen opined that there are number of brick kilns along the riverbanks in the area where they fish and most

(61.0%) opined that this number is on increase all along the rivers. The investigator confirmed this activity where many farmers from river banks are selling their rich cropland soils along river banks to brick industries for making quick money. The number of brick kilns along river had increased exponentially in middle and lower catchments of Panchganga river basin, as demand for bricks in construction industry is continuously on increase in Kolhapur city and nearby towns in the district.

In some areas in Panchganga basin siltation in river bed is not uncommon; this is due to soil excavation in near catchment and along river banks. About (43.2%) fishermen confirmed that there is increase in siltation because of soil excavation along river, while many (40.5%) opined that widening of river bank was caused by soil excavation. Few (13.5%) respondents opined that soil excavation results into siltation and swallowing of the river bed. According to a study on environmental impact of brick industry in Kolhapur district, Panchganga and its tributary river Kumbhi basin riparian habitats is the major source of bank soil for brick production; where clay mining had led to the formation of deep trenches, which is responsible for soil erosion in the riparian habitats<sup>13</sup>.

Because of the low occupational income and general apathy of the government towards welfare of fishermen communities, young generation of traditional fishermen communities had shifted to other alternate livelihood. Most (87.2%) fishermen mentioned that their youth were engaged in other diverse occupations. In Bhoi community youth (60.3%) was being educated, was engaged in occupations such as petty jobs and business. In this community families were shifting focus of their new generation away from traditional fishing. The younger generation in Bhoi community was engaged in jobs (22.1%), businesses (22.1%) and a few (17.6%) were working as laborers; they are also exploring new income sources. While in Bagdi community few representatives (5.9%) of new generation were engaged in other job and trade. This scenario of change in traditional fishermen livelihood to other occupations was forces owing to insufficient income from fishing due to rapid degradation of riverine and riparian habitats making their traditional livelihood unsecured and non viable.

### Conclusion

During the interaction with the three traditional fishermen communities, namely Bhoi, Bagdi and Koli from Panchganga basin, on their status of social and economic conditions it was revealed that it is directly dependent on well being of Panchganga river and its tributaries in the basin. Social impact assessment, as a part of EIA revealed vital information and also how it is linked to changing status of the riverine ecosystems. This provided information on social vulnerability related with subsistence and livelihood activities of the three communities. From the study it is understood that due to recent decrease in fish diversity and yields from the traditional riverine fishery, as

visible degradation of the riparian habitats, a large number of fishermen families had shifted to other alternative occupations for livelihood purpose. Similarly most fishermen had diverted from traditional riverine capture fishery to culture fisheries in newly constructed tanks and dams, as it gave them more profit than riverine fishery. In general it was reported that there was decrease in fish diversity and fish catch in recent years from rivers in Panchganga basin. The reasons behind declining fish diversity and density varies with the changes in the riparian habitat conditions in the catchment and also with experience and knowledge of the fishermen. It was observed that changing landuse practices in the river basin in general and riparian habitats in particular, are detrimental to riverine ecology and biodiversity. The activities like agriculture expansion, riparian area encroachment and reclamation, bank soil excavation, industrial and urban pollution, soil erosion are some major threats to the riparian and riverine habitats in Panchganga basin.

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