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## Diversity and Species Richness of Avifaunal Species in Undisturbed Areas of Madhav National Park, Shivpuri, Madhya Pradesh, India

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### ABSTRACT

Avian species play a crucial ecological role by contributing to nutrient cycling, seed dispersal, and maintaining ecosystem balance in forest habitats. This study was conducted in Madhav National Park, located on the outskirts of Shivpuri in Madhya Pradesh, India, over a one-year period from November 2018 to October 2019. The primary objective was to assess the diversity and distribution of birds in undisturbed zones of the park. Surveys were carried out at two selected sites using the point transect method, which allowed researchers to systematically record bird species. A total of 100 different bird species were observed during the study period. These species were classified based on how frequently they were sighted—categorized into common, frequently seen, occasionally observed, and rare. Notably, the Tree Pipit was the only species listed as rare. The research also identified species with conservation concern, including four listed as Near Threatened, two as Critically Endangered, and one as Vulnerable according to IUCN criteria. The study provides important baseline data on avifaunal diversity in this protected area, highlighting its ecological richness and the need for long-term conservation planning.

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## **Introduction–**

Birds are among the most vibrant and sonorous elements of nature, known not only for their visual appeal but also for their diverse and melodic calls. Their behavior, abundance, and distribution offer valuable insights into the health of an ecosystem. As bioindicators, bird species help in evaluating environmental changes and degradation. A rich bird population in any area typically reflects the ecological stability and the richness of flora and fauna in that region.

India is globally recognized for its vast and varied biodiversity. As of 2022, the country is home to an estimated 1,369 species of birds, which accounts for more than 12% of the global bird population. This includes a significant number of endemic species, found only within the Indian subcontinent, and a large proportion of migratory birds that arrive seasonally from different parts of the world. These statistics underscore India's importance in global avifaunal conservation. Madhav National Park, situated in the Shivpuri district of Madhya Pradesh, represents a unique combination of ecosystems that include lakes, dry deciduous forests, grasslands, and wetlands. Established in 1956, the park has since served as a sanctuary for numerous bird species and other wildlife. The two major water bodies within the park—Madhav Lake and Sakhya Sagar Lake—support a diverse array of birdlife, particularly aquatic and semi-aquatic species.

In recent years, undisturbed and protected areas within national parks have become increasingly important for ecological research due to growing anthropogenic pressures in surrounding landscapes. This study aims to document and assess the avifaunal diversity within relatively undisturbed regions of Madhav National Park. By identifying species richness, abundance, and conservation status, this research intends to contribute toward understanding the ecological significance of the park and to aid in the development of targeted conservation strategies. The findings from such studies are vital for maintaining ecological balance and guiding sustainable management of biodiversity-rich habitats like Madhav National Park.

## **Materials and Methods–**

### **Study Area:**

The fieldwork was conducted in two ecologically distinct zones of Madhav National Park, Madhya Pradesh. These included Site 1 – Madhav Lake and Site 2 – Baradari. Both locations were selected based on minimal human interference and high habitat quality. Madhav Lake, an artificial



reservoir developed between 1915 and 1918 on the Manier River, lies at coordinates 25.426638°N and 77.713513°E. The lake covers an area of 1.29 square kilometers and is bounded on the eastern side by a masonry wall. The site harbors rich aquatic flora and supports a tranquil, pollution-free environment ideal for bird habitation. Baradari, the second observation site, is positioned at 25.434089°N and 77.707246°E. It is a terrestrial location characterized by a historic marble pavilion constructed in 1915 by the then Gwalior ruler, Madhav Rao Scindia. This architectural structure sits atop a hill near Sakhya Sagar Lake and is surrounded by natural vegetation. Baradari, due to its elevated position and lack of regular public access, offers a serene habitat suitable for both terrestrial and avian wildlife.

### **Methodology:**

Bird diversity was documented using the Point Count technique, which allows for the systematic recording of bird species within a fixed radius. This method was implemented during peak activity periods—morning (6:00 AM) and mid-day (12:00 PM). Field equipment included Olympus binoculars and a Nikon D3400 DSLR camera fitted with zoom lenses (70–300 mm and 80–105 mm). Species identification was conducted with the help of widely accepted ornithological guides authored by Grimmett et al. (1999) and Ali (2006), ensuring accurate classification and nomenclature.

### **Results and Discussion–**

During the course of this study, a total of 100 distinct bird species were recorded from the two selected observation sites within Madhav National Park. These species were distributed across 17 different avian orders and 41 families. Detailed listings of the species, along with their IUCN status and site-wise occurrence, are provided in **Table 1**, while visual representations of conservation status and abundance are shown in **Figures 1 and 2**. Madhav Lake, being a freshwater body rich in aquatic vegetation, supported a higher diversity of birds compared to Baradari. Specifically, 76 species representing 15 orders and 35 families were observed at Madhav Lake. In contrast, Baradari, a terrestrial habitat, recorded 50 species from 10 orders and 25 families. The disparity in species richness between the two sites highlights the role of water availability and habitat complexity in influencing bird diversity.

Among the avian orders, Passeriformes emerged as the most dominant, accounting for 37 species, making it the largest single order recorded in this study. This was followed by Pelecaniformes with 11 species. Similar dominance of Passeriformes was previously noted in the studies conducted by Bagde (2015) in the West Chhindwara region and Mewada (2017) along the Narmada River, indicating

a recurring ecological trend in central India. The variety of birds at Madhav Lake can be attributed to its ecological features that support not only aquatic species but also terrestrial and migratory birds. Such environments offer feeding grounds, nesting areas, and roosting opportunities. These observations align with the findings of Puppalwar and Telkhade (2017), who also reported higher avifaunal richness in and around aquatic bodies such as Moharli Lake in Maharashtra.

The survey further identified several species of conservation concern. Four of the species observed are classified as Near Threatened by the IUCN: the Great Thick-knee (*Esacus recurvirostris*), Painted Stork (*Mycteria leucocephala*), Oriental Darter (*Anhinga melanogaster*), and Black-headed Ibis (*Threskiornis melanocephalus*). Additionally, the Woolly-necked Stork (*Ciconia episcopus*) was categorized as Vulnerable. Three Critically Endangered vultures—Indian Vulture (*Gyps indicus*), White-rumped Vulture (*Gyps bengalensis*), and Red-headed Vulture (*Sarcogyps calvus*)—were also observed during the study. These sightings are consistent with records from similar ecological zones, such as those reported by Talat and Orus (2019) in the Pench Tiger Reserve.

**Table – 1: List of avian species recorded at both study sites of Madhav National Park, Shivpuri (M.P.) during 2018–2019**

| S<br>N<br>. | ORDER           | FAMILIES         | ENGLISH NAME                 | SCIENTIFIC NAME               | SITE |    | IUCN S. | P. T. | Abundance |
|-------------|-----------------|------------------|------------------------------|-------------------------------|------|----|---------|-------|-----------|
|             |                 |                  |                              |                               | S1   | S2 |         |       |           |
| 1.          | ANSERIFORMES    | ANATIDAE         | Bar-headed Goose             | <i>Anser indicus</i>          | Y    | N  | LC      | D     | C         |
| 2.          |                 |                  | Indian Spot-billed Duck      | <i>Anas poecilorhyncha</i>    | Y    | N  | LC      | D     | C         |
| 3.          |                 |                  | Lesser Whistling-duck        | <i>Dendrocygna javanica</i>   | Y    | N  | LC      | D     | C         |
| 4.          |                 |                  | African comb Duck            | <i>Sarkidiornis melanotos</i> | Y    | N  | LC      | D     | C         |
| 5.          |                 |                  | Ruddy Shelduck               | <i>Tadorna ferruginea</i>     | Y    | N  | LC      | U     | C         |
| 6.          |                 |                  | Northern Shoveler            | <i>Spatula chrypeata</i>      | Y    | N  | LC      | D     | O         |
| 7.          | GRUIFORMES      | RALLIDAE         | Common Moorhen               | <i>Gallinula chloropus</i>    | Y    | N  | LC      | S     | C         |
| 8.          |                 |                  | Eurasian Coot                | <i>Fulica atra</i>            | Y    | N  | LC      | I     | C         |
| 9.          | CHARADRIIFORMES | JACANIDAE        | Bronze-winged Jacana         | <i>Metopidius indicus</i>     | Y    | N  | LC      | U     | F         |
| 10.         |                 | RECURVIROSTRIDAE | Black-winged Stilt           | <i>Himantopus himantopus</i>  | Y    | N  | LC      | I     | C         |
| 11.         |                 | CHARADRIIDAE     | Red-wattled Lapwing          | <i>Vanellus indicus</i>       | Y    | N  | LC      | U     | C         |
| 12.         |                 |                  | Little Ringed Plover         | <i>Charadrius dubius</i>      | Y    | N  | LC      | S     | F         |
| 13.         | BURHINIDAE      | Great Thick-knee | <i>Esacus recurvirostris</i> | Y                             | N    | NT | D       | F     |           |
| 14.         | CICONIIFORMES   | SCOLOPACIDAE     | Wood Sandpiper               | <i>Tringa glareola</i>        | Y    | N  | LC      | S     | F         |
| 15.         |                 |                  | Green Sandpiper              | <i>Tringa ochropus</i>        | Y    | N  | LC      | I     | F         |



|     |                  |                   |                             |                                    |   |   |    |   |   |
|-----|------------------|-------------------|-----------------------------|------------------------------------|---|---|----|---|---|
| 16. |                  |                   | Common Greenshank           | <i>Tringa nebularia</i>            | Y | N | LC | S | F |
| 17. |                  |                   | Painted Stork               | <i>Mycteria leucocephala</i>       | Y | N | NT | D | C |
| 18. |                  |                   | Asian Openbill              | <i>Anastomus oscitans</i>          | Y | N | LC | U | C |
| 19. |                  | CICONIIDAE        | Woolly-necked Stork         | <i>Ciconia episcopus</i>           | Y | N | VU | D | F |
| 20. |                  |                   | Eurasian Spoonbill          | <i>Platalea leucorodia</i>         | Y | N | LC | U | C |
| 21. |                  |                   | Little Cormorant            | <i>Microcarbo niger</i>            | Y | N | LC | U | F |
| 22. |                  | PHALACROCORACIDAE | Indian Cormorant            | <i>Phalacrocorax fuscicollis</i>   | Y | N | LC | U | C |
| 23. | SULIFORMES       |                   | Great Cormorant             | <i>Phalacrocorax carbo</i>         | Y | N | LC | U | C |
| 24. |                  | ANHINGIDAE        | Oriental Darter/ Snake bird | <i>Anhinga melanogaster</i>        | Y | N | NT | D | C |
| 25. |                  |                   | Indian Pond Heron           | <i>Ardeola grayii</i>              | Y | N | LC | U | C |
| 26. |                  |                   | Grey Heron                  | <i>Ardea cinerea</i>               | Y | N | LC | U | F |
| 27. |                  |                   | Purple Heron                | <i>Ardea purpurea</i>              | Y | N | LC | D | O |
| 28. |                  |                   | Black-crowned Night Heron   | <i>Nycticorax nycticorax</i>       | Y | N | LC | D | F |
| 29. |                  | ARDEIDAE          | Striated Heron              | <i>Butorides striata</i>           | Y | N | LC | D | O |
| 30. | PELECANIFORMES   |                   | Little Egret                | <i>Egretta garzetta</i>            | Y | N | LC | I | C |
| 31. |                  |                   | Cattle Egret                | <i>Bululcus ibis</i>               | Y | N | LC | I | F |
| 32. |                  |                   | Intermediate Egret          | <i>Ardea intermedia</i>            | Y | N | LC | D | F |
| 33. |                  |                   | Great White Egret           | <i>Ardea alba</i>                  | Y | N | LC | U | C |
| 34. |                  |                   | Red-naped Ibis              | <i>Pseudibis papillosa</i>         | Y | N | LC | D | O |
| 35. |                  | THRESKIORNITHIDAE | Black-headed Ibis           | <i>Threskiornis melanocephalus</i> | Y | N | NT | D | C |
| 36. | STRIGIFORMES     | STRIGIDAE         | Spotted Owlet               | <i>Anthene brama</i>               | Y | N | LC | S | O |
| 37. |                  |                   | Rock Dove                   | <i>Columba livia</i>               | N | Y | LC | D | C |
| 38. |                  |                   | Yellow footed Green Pigeon  | <i>Treron phoenicopterus</i>       | Y | Y | LC | I | F |
| 39. | COLUMBIFORMES    | COLUMBIDAE        | Western Spotted Dove        | <i>Spilopelia suratensis</i>       | N | Y | LC | I | F |
| 40. |                  |                   | Laughing Dove               | <i>Spilopelia senegalensis</i>     | Y | Y | LC | S | C |
| 41. |                  |                   | Red Turtle Dove             | <i>Stigmatopelia tranquebarica</i> | N | Y | LC | D | O |
| 42. |                  |                   | Rose-ringed Parakeet        | <i>Psittacula krameri</i>          | Y | Y | LC | I | C |
| 43. | PSITTACIFORMES   | PSITTACIDAE       | Plum-headed Parakeet        | <i>Psittacula cyanocephala</i>     | Y | Y | LC | D | F |
| 44. | CUCULIFORMES     | CUCULIDAE         | Greater Coucal              | <i>Centropus sinensis</i>          | Y | Y | LC | S | F |
| 45. |                  |                   | Little Swift                | <i>Apus affinis</i>                | Y | Y | LC | I | F |
| 46. | CAPRIMULGIFORMES | APODIDAE          | House Swift                 | <i>Apus nipalensis</i>             | N | Y | LC | I | C |
| 47. |                  |                   | Lesser Kingfisher           | <i>Ceryle rudis</i>                | Y | Y | LC | U | C |
| 48. | CORACIIFORMES    | ALCEDINIDAE       | Common Kingfisher           | <i>Alcedo atthis</i>               | Y | Y | LC | U | C |



|     |                |              |                               |                                  |   |   |    |   |    |
|-----|----------------|--------------|-------------------------------|----------------------------------|---|---|----|---|----|
| 49. |                |              | White-breasted Kingfisher     | <i>Halcyon smyrnensis</i>        | Y | N | LC | I | C  |
| 50. |                | MEROPIDAE    | Asian Green bee-eater         | <i>Meropus orientalis</i>        | Y | Y | LC | I | C  |
| 51. |                | CORACIIDAE   | Indian Roller                 | <i>Coracias benghalensis</i>     | Y | Y | LC | I | F  |
| 52. | BUCEROTIFORMES | BUCEROTIDAE  | Indian Grey Hornbill          | <i>Ocyrceros birostris</i>       | N | Y | LC | S | F  |
| 53. |                | MEGALAIMIDAE | Coppersmith Barbet            | <i>Megalaima haemacephala</i>    | N | Y | LC | I | F  |
| 54. | PICIFORMES     |              | Yellow-crowned Woodpecker     | <i>Leiopicus mahrattensis</i>    | Y | Y | LC | S | F  |
| 55. |                | PICIDAE      | Black-rumped Flame back       | <i>Dinopium benghalense</i>      | Y | Y | LC | S | O  |
| 56. |                |              | Bay-backed Shrike             | <i>Lanius vittatus</i>           | N | Y | LC | S | C  |
| 57. |                | LANIIDAE     | Long-tailed Shrike            | <i>Lanius schach</i>             | N | Y | LC | U | F  |
| 58. |                | DICRURIDAE   | Black Drongo                  | <i>Dicrurus macrocerus</i>       | Y | Y | LC | U | C  |
| 59. |                |              | Brahminy Starling             | <i>Sturnia pagodarum</i>         | Y | Y | LC | U | F  |
| 60. |                | STURNIDAE    | Common Myna                   | <i>Acridotheres tristis</i>      | Y | Y | LC | I | C  |
| 61. |                |              | Rufous Treepie                | <i>Dendrocitta vagabunda</i>     | N | Y | LC | D | C  |
| 62. |                | CORVIDAE     | Large-billed Crow             | <i>Corvus macrorhynchos</i>      | N | Y | LC | S | C  |
| 63. |                |              | House Crow                    | <i>Corvus splendens</i>          | Y | N | LC | S | F  |
| 64. |                |              | Oriental Magpie Robin         | <i>Copsychus saularis</i>        | Y | Y | LC | S | C  |
| 65. |                |              | Indian Robin                  | <i>Saxicoloides fulicatus</i>    | Y | Y | LC | S | C  |
| 66. |                | MUSCICAPIDAE | Black Redstart                | <i>Phoenicurus ochruros</i>      | Y | Y | LC | I | O  |
| 67. |                |              | Grey-headed Canary Flycatcher | <i>Culicicapa ceylonensis</i>    | Y | N | LC | S | F  |
| 68. |                |              | Tickell's Blue Flycatcher     | <i>Cyornis tickelliae</i>        | Y | N | LC | S | O  |
| 69. | PASSERIFORMES  |              | Pied Bush Chat                | <i>Saxicola caprata</i>          | Y | N | LC | S | F  |
| 70. |                | MONARCHIDAE  | Indian Paradise-flycatcher    | <i>Terpsiphone paradise</i>      | N | Y | LC | S | O  |
| 71. |                |              | White Wagtail                 | <i>Motacilla alba</i>            | Y | N | LC | U | F  |
| 72. |                | MOTACILLIDAE | White-browed Wagtail          | <i>Motacilla maderaspatensis</i> | Y | N | LC | S | C  |
| 73. |                |              | Grey Wagtail                  | <i>Motacilla cinerea</i>         | Y | N | LC | S | F  |
| 74. |                |              | Citrine Wagtail               | <i>Motacilla citreola</i>        | N | Y | LC | I | O  |
| 75. |                |              | Western Yellow Wagtail        | <i>Motacilla flava</i>           | Y | N | LC | D | O  |
| 76. |                |              | Tree Pipit                    | <i>Anthus trivialis</i>          | Y | N | LC | D | Ra |
| 77. |                | ESTRILDIDAE  | Red Avadavat                  | <i>Amandava amandava</i>         | Y | Y | LC | S | O  |
| 78. |                | PYCNONOTIDAE | Red-vented Bulbul             | <i>Pycnonotus cafer</i>          | Y | Y | LC | I | C  |
| 79. |                | PLOCEIDAE    | Baya Weaver                   | <i>Ploceus philippinus</i>       | N | Y | LC | S | F  |
| 80. |                | PARIDAE      | Great Tit                     | <i>Parus major</i>               | Y | N | LC | I | C  |
| 81. |                | CISTICOLIDAE | Common Tailorbird             | <i>Orthotomus sutorius</i>       | Y | N | LC | S | O  |

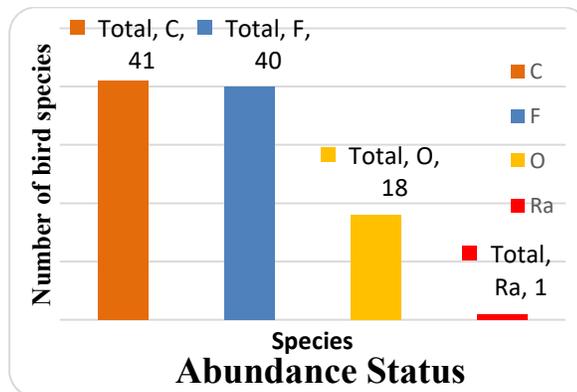
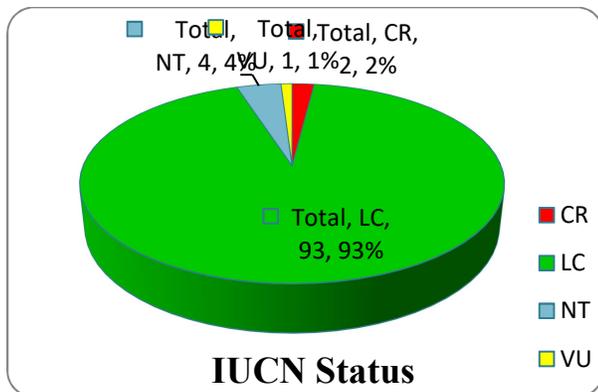


|      |                 |                |                                  |                                   |                           |   |    |    |   |   |
|------|-----------------|----------------|----------------------------------|-----------------------------------|---------------------------|---|----|----|---|---|
| 82.  |                 |                | Ashy Prinia                      | <i>Prinia socialis</i>            | Y                         | Y | LC | S  | C |   |
| 83.  |                 |                | Grey-breasted Prinia             | <i>Prinia hodgsonii</i>           | Y                         | Y | LC | S  | F |   |
| 84.  |                 |                | Jungle Prinia                    | <i>Prinia sylvatica</i>           | N                         | Y | LC | D  | F |   |
| 85.  |                 |                | Plain Prinia                     | <i>Prinia inornata</i>            | N                         | Y | LC | S  | O |   |
| 86.  |                 | LEIOTHRICHIDAE | Common Babbler                   | <i>Argya caudate</i>              | Y                         | Y | LC | S  | C |   |
| 87.  |                 |                | Large Grey Babbler               | <i>Argya malcolmi</i>             | Y                         | Y | LC | S  | C |   |
| 88.  |                 |                | Jungle Babbler                   | <i>Turdoides striata</i>          | N                         | Y | LC | S  | F |   |
| 89.  |                 | PASSERIDAE     | Chestnut-shouldered Bush-sparrow | <i>Gymnoris xanthocollis</i>      | Y                         | Y | LC | S  | F |   |
| 90.  |                 |                | House sparrow                    | <i>Passer domesticus</i>          | N                         | Y | LC | D  | F |   |
| 91.  |                 | ZOSTEROPIDAE   | Indian White-eye                 | <i>Zosterops palpebrosus</i>      | Y                         | Y | LC | D  | F |   |
| 92.  |                 | VANGIDAE       | Common Woodshrike                | <i>Tephrodornis pondicerianus</i> | Y                         | N | LC | S  | F |   |
| 93.  | ACCIPITRIFORMES | ACCIPITRIDAE   | Shikra                           | <i>Accipiter badius</i>           | Y                         | Y | LC | S  | F |   |
| 94.  |                 |                |                                  | Indian Vulture                    | <i>Gyps indicus</i>       | N | Y  | CR | D | O |
| 95.  |                 |                |                                  | Griffon Vulture                   | <i>Gyps fulvus</i>        | N | Y  | LC | I | O |
| 96.  |                 |                |                                  | Red-headed Vulture                | <i>Sarcogyps calvus</i>   | N | Y  | CR | D | F |
| 97.  |                 |                |                                  | Short-toed Snake Eagle            | <i>Circaetus gallicus</i> | N | Y  | LC | S | O |
| 98.  | GALLIFORMES     | PHASINIDAE     | Grey Francolin                   | <i>Francolinus pondicerianus</i>  | N                         | Y | LC | S  | F |   |
| 99.  |                 |                |                                  | Jungle Bush Quail                 | <i>Perdica asiatica</i>   | Y | N  | LC | S | F |
| 100. |                 |                |                                  | Indian Peafowl                    | <i>Pavo cristatus</i>     | Y | Y  | LC | S | C |

**IUCN Status**– LC – Least Concern, NT – Near Threatened, VU – Vulnerable, CR – Critically Endangered, EN – Endangered.

**IUCN population trend**: D – Decreasing, I – Increasing, S – Stable, U – Unknown.

**Abundance Status**: C – Common, FC – Frequently Common, O – Occasional, Ra – Rare.



**Fig. 1:** IUCN status of Avifaunal species

**Fig. 2:** Abundance status of Avifaunal species



Overall, the study underscores the ecological significance of Madhav National Park as a habitat supporting both common and threatened bird species.

### Conclusion and Future Prospects

This study highlights the significant variation in bird species richness and abundance between the two habitats within Madhav National Park. The aquatic environment of Madhav Lake supports a higher diversity of bird species compared to the terrestrial zone of Baradari, underscoring the vital role of water bodies in maintaining avifaunal diversity. The presence of numerous common, rare, and threatened species, including several classified under IUCN conservation categories, emphasizes the park's critical ecological value as a refuge for both resident and migratory birds. The findings reinforce the necessity of preserving varied habitats within the park to sustain bird populations and maintain ecosystem balance. Regular monitoring and comprehensive biodiversity assessments are essential to detect changes in avian communities that may indicate environmental disturbances or degradation.

Future research should expand to include more sites and seasons, employing advanced methods such as bioacoustics and satellite tracking to gain deeper insights into bird behavior and habitat use. Conservation efforts must focus on habitat protection, mitigating human disturbances, and raising public awareness about the importance of avian species. By doing so, Madhav National Park can continue to serve as a sanctuary for avifaunal diversity, contributing to regional and global biodiversity conservation goals

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