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1	Evaluation of Physicochemical Parameters of Vena river water of Wardha District.	Pranita D. Ashtankar	Zoology	International Journal of Research and Analytical Reviews (IJRAR), Vol.10, Issue 1	Mar-23	E-ISSN: 2348-1269, P-ISSN: 2349-5138	https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4398598
2	Evaluation of Physicochemical Parameters of Vena river water of Wardha District.	Shital J. Karmore	Zoology	International Journal of Research and Analytical Reviews (IJRAR), Vol.10, Issue 1	Mar-23	E-ISSN: 2348-1269, P-ISSN: 2349-5138	https://papers.ssrn.com/sol3/papers.cfm?abstract_id=4398598
3	Butterfly Species Diversity in Chhatrapati	Dr. Umesh P. Tulaskar	History	International Journal of Current Science	Apr-23	ISSN : 2250-1770	https://rjpn.org/ijcspub/papers/IJCSP23B1093.pdf

	Shivaji Maharaj Park, Hinganghat (M.S.)			(IJCPUB), Volume 13, Issue 2 April 2023			
4	Butterfly Species Diversity in Chhatrapati Shivaji Maharaj Park, Hinganghat (M.S.)	Pranita D. Ashtankar	Zoology	International Journal of Current Science (IJCPUB), Volume 13, Issue 2 April 2023	Apr-23	ISSN : 2250-1770	https://rjpn.org/ijcpub/papers/IJCSP23B1093.pdf
5	Butterfly Species Diversity in Chhatrapati Shivaji Maharaj Park, Hinganghat (M.S.)	Shital P. Dharmik	Zoology	International Journal of Current Science (IJCPUB), Volume 13, Issue 2 April 2023	Apr-23	ISSN : 2250-1770	https://rjpn.org/ijcpub/papers/IJCSP23B1093.pdf




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EVALUATION OF PHYSICO-CHEMICAL PARAMETERS OF VENA RIVER WATER OF WARDHA DISTRICT (M.S.)

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Abstract: The current effort is a component of a survey to evaluate the physico-chemical characteristics of the Vena river water of Wardha district Maharashtra. The Physico-chemical variables including temperature, transparency, turbidity, TDS, Ph, dissolved oxygen, hardness, chloride, alkalinity, phosphate, and nitrate were investigated. January 2020 to December 2022 was the study period. Physico-chemical factors were found to vary seasonally, and the report's findings indicate that some of these shifts may have been caused by surrounding farms, industries, and sewage water.

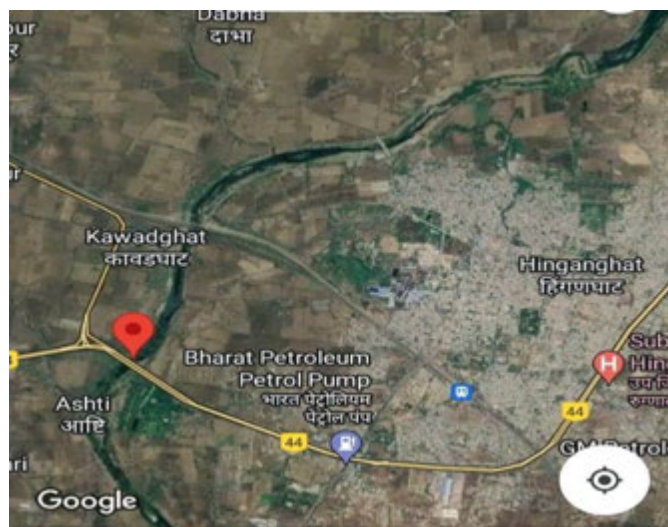
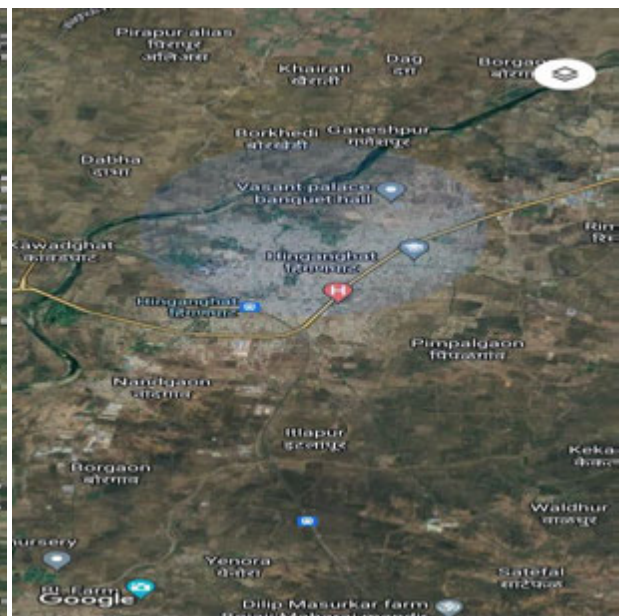
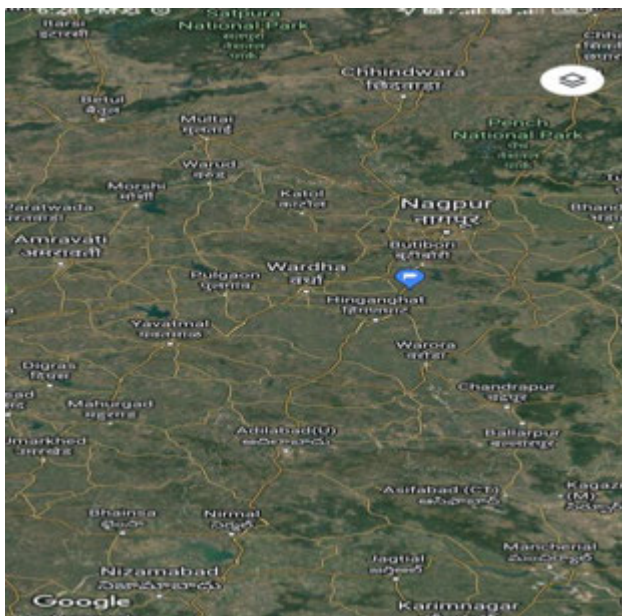
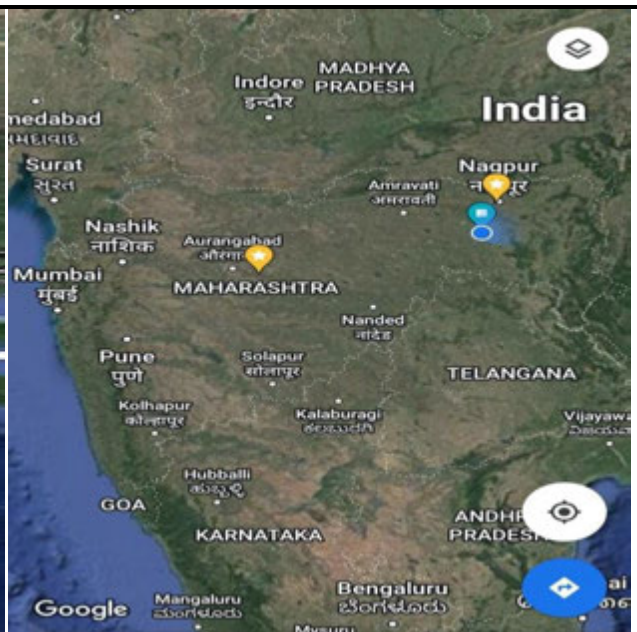
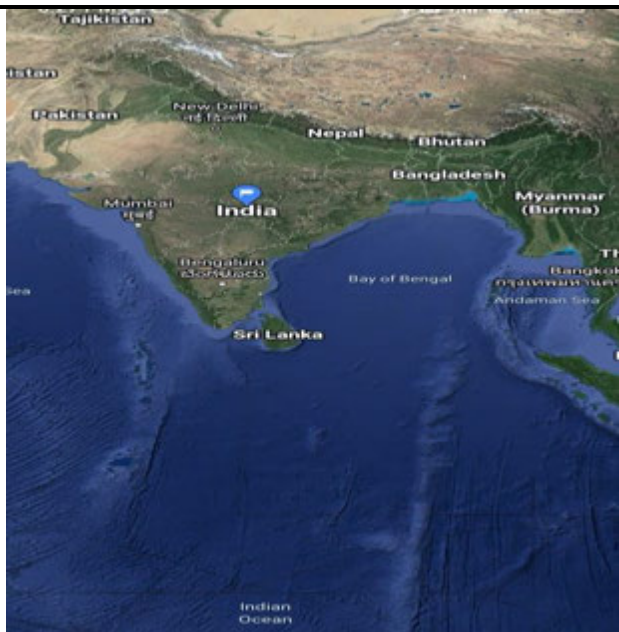
Keywords- Physico-Chemical characteristics, Ground water, Sewage, Effluents, Heavy metals, Pesticides.

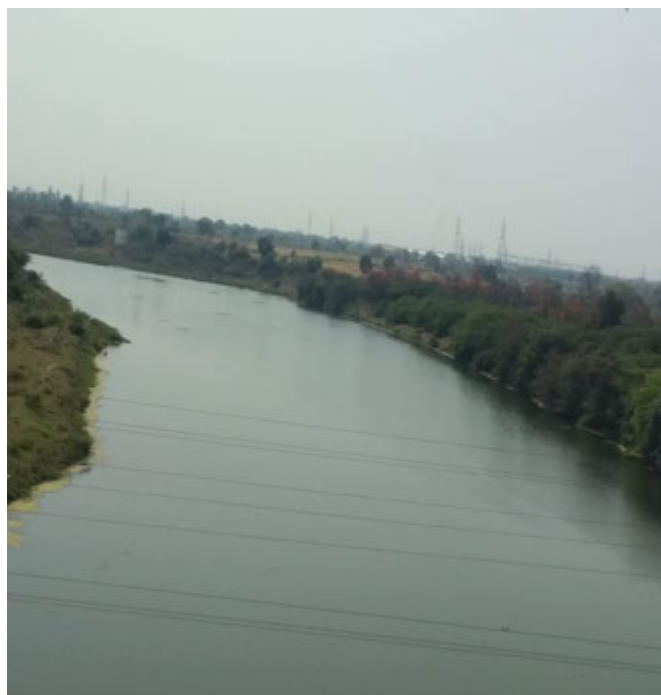
INTRODUCTION

Water is the most important factor for the ecosystem. Organisms that are present in the ecosystem depend mainly on water for their growth, development, and nourishment. Water is also important for human existence. The quality of water indicates the presence of good flora and fauna in that specific area. The physical, chemical and biological aspects of water are indicators of its quality [1].

Any changes in physio-chemical characteristics of water denote the contamination of water resources and destruction of aquatic habitat. Water resources could get polluted due to the use of pesticides in nearby farm, industries, domestic waste, etc. Most water resources get polluted due to the release of heavy metals from industries. These heavy metals and pesticides in the water resources get accumulated in the body of aquatic organisms and caused severe damage to them.

Hence the present study put forward to evaluate the physico-chemical parameters of the Vena river water of Wardha district in Maharashtra.





Four study sites of Vena river water of Wardha district (Maharashtra)

Materials and Methods:

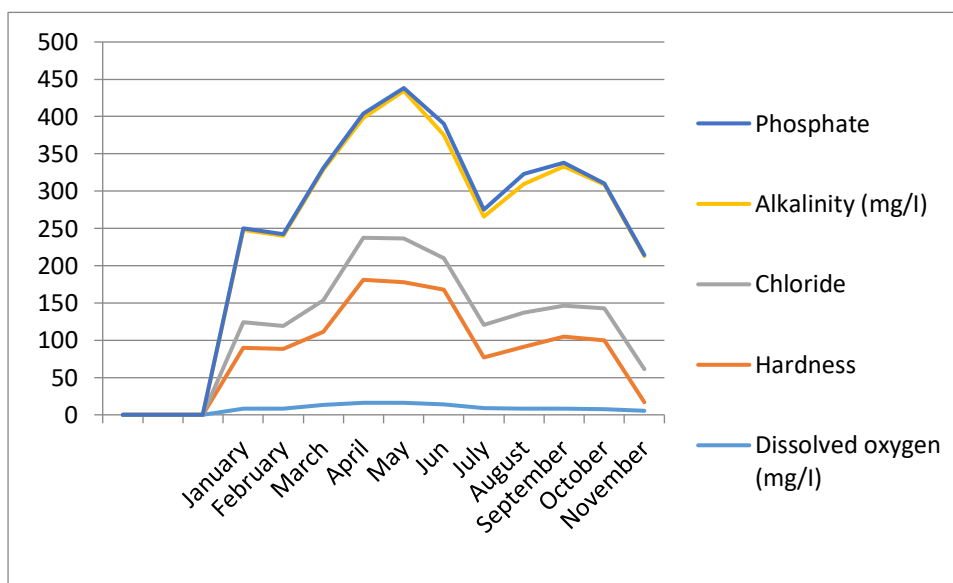
Water samples were collected from four different regions of the Vena River in a plastic bottles, in the evening hours between 5 pm to 6 p.m. in each week of every month of year 2022. A thermometer and a pH meter were used to record the pH and temperature of the water sample at the time of sample collection. Other variables, including DO, Alkalinity, Turbidity, TDS, Phosphate, Nitrate, Chloride, Total Hardness, and Waste Transparency, were estimated in the lab using conventional techniques as advised by APHA [2].

Observations:

It has been observed that there were fluctuations in physical as well as chemical parameters of Vena River water in every month. The given table shown below denotes the variations in physical and chemical characters of Vena river water.

Month	Temperature (°C)	Transparency (cm)	Turbidity (NTU)	TDS (gm/lit)	pH
January	20.6	15	8.70	0.34	7.56
February	22.7	12.6	11.49	0.37	7.54
March	25.8	11.7	13.42	0.5	7.40
April	25.4	6.6	13.11	0.2	7.64
May	36.4	6.1	8.4	0.4	7.15
June	31.7	8.5	10.3	0.6	7.43
July	25.5	45.51	2.4	2.1	7.61
August	25.7	41.60	2.1	2.2	8.51
September	26.6	39.75	2.1	0.4	8.20
October	28.7	72.12	0.5	0.6	7.32
November	22.8	76.15	1.34	1.3	8.4
December	21.9	69.28	1.4	0.6	7.80

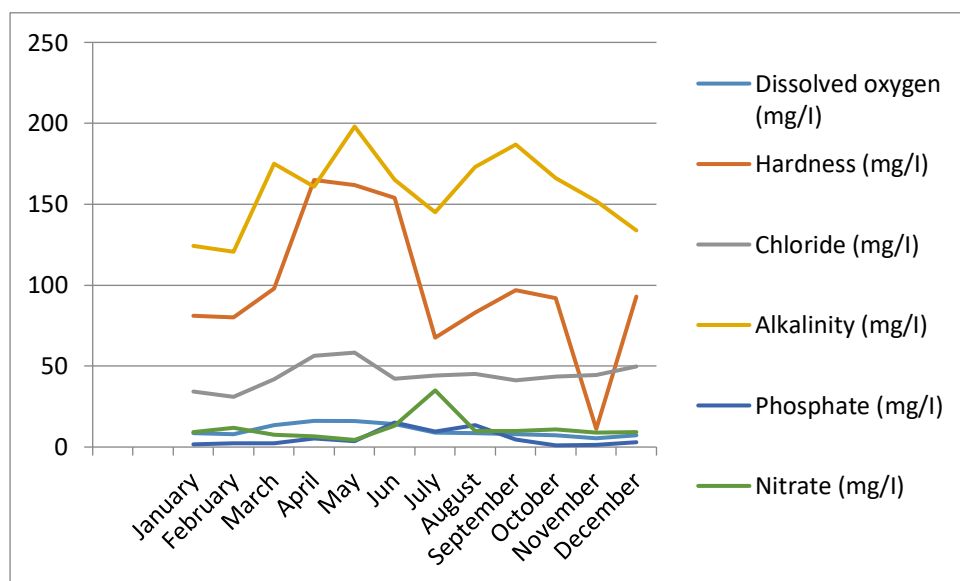
Table No. 1: Physical parameters of Vena River water of Wardha district



Graph 1: Showing changes in Physical parameters of Vena River water of Wardha district

Month	Dissolved oxygen (mg/l)	Hardness (mg/l)	Chloride (mg/l)	Alkalinity (mg/l)	Phosphate (mg/l)	Nitrate (mg/l)
January	8.58	81.04	34.24	124.24	1.81	9.15
February	8.03	80.27	31.02	120.67	2.35	11.83
March	13.57	98	42.01	175	2.31	7.59
April	16.04	165	56.37	161	5.15	6.54
May	16.07	162	58.35	198	3.8	4.40
Jun	14.08	154	42.11	165	15.14	13.27
July	9.03	67.6	44.03	145	9.70	35.02
August	8.56	83	45.12	173	13.41	10.05
September	8.07	97	41.07	187	4.71	10.02
October	7.41	92.13	43.51	166	1.05	11.04
November	5.42	11.2	44.56	152	1.41	9.07
December	7.23	93	49.71	134	3.15	9.12

Table 2: Chemical parameters of Vena River water of Wardha district



Graph 2: Showing changes in Chemical parameters of Vena River water of Wardha district

Results and Discussion:

Temperature:

From the present data analysis of water, temperature ranges from 20.6 °C to 36.4 °C. It was found that the maximum temperature is 36.4 °C and the minimum temperature 20.6 °C. It is shown that winter temperatures are generally lower and summer temperatures higher [3],[4].

Longer days and a rise in the intensity of solar radiation were blamed for the progressive rise in air and water temperatures from January to September. Similarly, the drop in temperature from September to December was brought on by shorter days and a reduction in the amount of solar energy [5]. It was noted that the summer time had a high temperature because the water level was low [6].

Transparency:

The transparency range of Vena River water was reported from 6.1 cm to 76.15 cm. The minimum transparency was recorded in May and the maximum in November. Transparency plays an important role in the penetration of light into the water layer. The transparency of water is mainly affected by various factors such as biological productivity, suspended particles, etc. Due to the absence of rain, runoff, and floodwater as well as the gradual setting of suspended particles, there was more transparency over the winter and summer [7].

Turbidity:

It was reported that the maximum value of 13.42 NTU was recorded in March month. From the observation and evaluation physico-chemical analysis of water, turbidity ranges from 0.5 NTU to 13.42 NTU. Possible causes include human activity, a drop in water level, and the presence of suspended particulates [6].

TDS:

From the present analysis of water, TDS ranges from 0.2 gm /l to 2.2 gm /l. The maximum value was 2.2 gm /l and the minimum value was 0.2 gm /l in August and April. In the August TDS of Vena river, water was maximum because of heavy rainfall and heavy flood.

Ph Range:

From observation, the Ph value ranges from 7.15 to 8.51. It was reported that the maximum value was 8.51 in August and the minimum value in May was 7.15. The range of Ph values indicated that the Vena river water is alkaline. The ph value is maximum in August. It might be due to monsoon, post-monsoon, and other effluents, heavy metals, domestic waste, and pesticides contributing to the basic rain.

Dissolved oxygen:

One of the most crucial parameters is DO. Its relationship to a water body provides both direct and indirect information, such as stratification, bacterial activity, photosynthesis, and nutrient availability [8]. As Summer progressed, dissolved oxygen levels dropped as a result of rising temperatures and increasing microbial activity [9][10][11][12]. From the observation, the dissolved oxygen values range from 7.23 mg/l to 16.7 mg/l. It was reported that the maximum value in May was 16.7 mg/l. Summer's long days and bright sunlight appear to hasten phytoplankton's photosynthesis, which uses CO₂ and emits oxygen. This may be the cause of the higher O₂ quality measurements made in the summer [13].

Hardness:

From the present study, the hardness range of Vena river water was reported from 67.6 to 165. Maximum hardness in April and minimum 67.6 in July. The high rate of water evaporation in the summer may be to blame for the uneven distribution of water volume. Heavy metals, domestic trash, industrial effluents, and other things were dumped into water bodies.

Chloride:

It was reported that the maximum value of Chloride was 58.35 mg/l and the minimum value was 31.02 mg/l in May and February. It concluded that in summer there is less water in the river and due to urbanization, Farm, and nearby industries heavy metals, pesticides, domestic waste, and effluents get into river water and that might be the reason for increasing the Chloride level.

Alkalinity:

The range of alkalinity values reported in the present analysis was from 120.67 in February to 198 mg/l in May. In summer temperature is high hence it affects the carbonic acid. Carbonic acid is present in water in combination with carbon dioxide. River water's dissociation of carbonic acid may aid to increase the level of alkalinity. Winter is characterized by a limited temperature range and a high oxygen dissolution rate [14]

Phosphate:

It was reported the range of phosphate started from 1.05 mg/l to 15.14 mg/l. It was found that the maximum range was in Jun and the minimum in October. The maximum value of phosphate in June is high due to industrial effluent, agriculture runoff, and domestic waste from different sources release into the river water. It is possibly due to rain.

Nitrate:

The maximum value of Nitrates was reported as 35.02 mg/l in July and the minimum value was reported as 6.54 mg/l in April. The maximum value of Nitrate was 35.02 mg/l mainly due to rain, and the release of agricultural runoff which contain pesticides, heavy metals, and effluents from industries.

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INTERNATIONAL JOURNAL OF CURRENT SCIENCE (IJCPUB)

An International Open Access, Peer-reviewed, Refereed Journal

BUTTERFLY SPECIES DIVERSITY IN CHHATRAPATI SHIVAJI MAHARAJ PARK, HINGANGHAT (M.S.)

¹Pranita D. Ashtankar, ²Shital P. Dharmik, ³Umesh P. Tulaskar¹Research Scholar, ²Assistant Professor, ³Principal, M.A.K. Women's College, Hinganghat. (M.S)¹Department of Zoology,¹An Autonomous Department of R.T.M. Nagpur University, Nagpur. (Maharashtra, India)

Abstract: The present study was put forward to find out the diversity in the species of Butterflies in Chhatrapati Shivaji Maharaj Park of Hinganghat City in Wardha District. (M.S) The good flora in the Park indicates that there must be diversity in the butterfly species which acts as pollinating agents for many flowering plants. In the corresponding study area, there were approximately 30 species of Butterflies found such as the Danaid egg fly, Blue pansy, Common evening brown, Dark evening brown, Common Sailor, Great egg fly, Common lemon pansy, Grey pansy, Dark blue tiger, Glassy tiger, Stripped tiger, Blue tiger, Plain tiger, Common Indian crow, Long-tailed blue, Tiny grass blue, Common pierrot, Common grass blue, Zebra blue, Small cupid, Pale sulfur butterfly, Common emigrant, Common wanderer, Common gull, Lime butterfly, Common jay, Common rose, Crimson rose butterfly, Common Mormon, etc. that belongs to Family Nymphalidae, Lycaenidae, Pieridae, Lycaenidae respectively.

Index Terms: Diversity, butterfly, species, photography, Family, Chhatrapati Shivaji Maharaj Park, Hinganghat.

Introduction

Since the beginning of time, people have revered butterflies as a representation of beauty and grace. They are well-known insects because of their diurnal habits. They are easily recognized by their vibrant hues, forms, and exquisite flying, which delights everyone [1]. Butterflies are among the most exquisite and colorful animals in the world and have high aesthetic value [2]. Because of their intricate life cycle and impact on the natural world, butterflies are unique among insects. As a result, studies and in-depth research have focused on butterflies. Throughout ecology, butterflies play a significant role, notably in the pollination process. More than 50 species of crops with substantial economic value can be pollinated by them [3]. One of the most noticeable creatures on Earth is the butterfly. These insects are regarded as valuable bio-indicators because they are very sensitive to changes in their environment such as variations in temperature, humidity, light, and rainfall patterns [4]. By serving as a pollinator, prey, and biological pest control, inducing genetic variation in plants, enhancing environmental attractiveness, and lowering air carbon dioxide levels, butterflies maintain the ecosystem. Children of all ages would unquestionably be worse off if butterflies suddenly vanished from the planet. Butterfly populations and flowering plant populations are often so interdependent that neither could exist without the other.

In the current study, an effort had been made to catalog the diversity of butterflies found in Chhatrapati Shivaji Maharaj Park, Hinganghat in Wardha District.

Material and Methods:

Study areas:

Hinganghat is one of the developing cities in the Wardha District. The average elevation of the city of Hinganghat is modest, at 215 (705ft) above sea level. The city's Vena River encircles the area on two sides [5]. The study or evaluation was conducted in Chhatrapati Shivaji Maharaj Park, Hinganghat. (20.54810N, 78.83820E).

Data collection method:

Data were collected using two methods, first directly by the Photographic method, during the daytime. The second method is by using good Binoculars. With good binoculars, we could bring to see butterflies close to us from afar and it helps in the identification of butterflies. The objective of the study was to collect information about the diversity of species of butterflies. As September month is celebrated as “Butterfly Month” worldwide and after the monsoon, flora starts to blossom. Hence most of the diversity in butterflies could be observed in that period. Therefore Study period was from September 2022 to April 2023.



Fig. 1 Showing Map of the Study area in the Hinganghat Region of Wardha District (M.S.)

Observations:

There are various species of butterflies observed that were from Nymphalidae, Lycaenidae, Pieridae, and Papilionidae Family. The details of each species that come under these families are given in the following tables:

Family-Nymphalidae

Sr.No.	Common name	Scientific name	Family	Marathi name
1	Danaid egg fly	Hypolimnas misippus	Nymphalidae	Chhota chandva
2	Blue pansy	Junonia lemonias	Nymphalidae	Nil bhirbhiri
3	Common evening brown	Melantitis leda	Nymphalidae	Sanjpari, chanchal
4	Dark evening brown	Melantitis phedim	Nymphalidae	Gadad sanjpari
5	Common sailor	Neptis hylas	Nymphalidae	Bhatke tandel
6	Great eggfly	Hypolimnas bolina	Nymphalidae	Motha chandva
7	Common lemon pansy	Junonia almana	Nymphalidae	Pitnetri bhirbhiri
8	Grey pansy	Junonia atlites	Nymphalidae	Rakhi bhirbhiri
9	Dark blue tiger	Tirumala septentrion	Nymphalidae	Gadad nil
10	Glassy tiger	Parantica aglea	Nymphalidae	Kancha ruikar
11	Stripped tiger	Danaus genutia	Nymphalidae	Patteri ruikar
12	Blue tiger	Tirumala limniace	Nymphalidae	Nil ruikar
13	Common Indian crow	Euploea core	Nymphalidae	Habshi
14	Plain tiger	Danaus chrysippus	Nymphalidae	Ruikar

Family-Lycaenidae

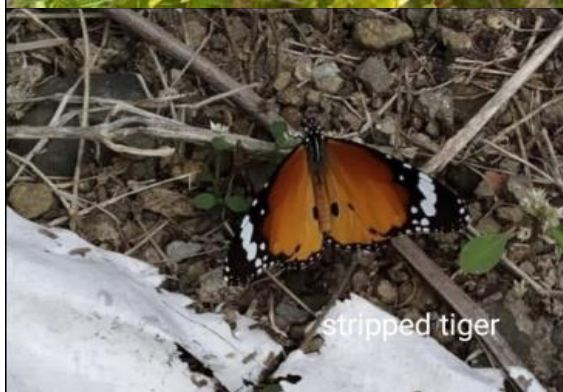
Sr.No.	Common name	Scientific name	Family	Marathi name
1	Common Pierrot	Castalius rosimon	Lycaenidae	Kavdi
2	Common grass blue	Zizina labralus	Lycaenidae	
3	Zebra Blue	Liptots plinius	Lycaenidae	Pattanil
4	Small cupid	Chilades parrhasius	Lycaenidae	Laghu pandav
5	Long-tailed blue	Lampides boeticus	Lycaenidae	
6	Tiny grass blue	Zizula hylax	Lycaenidae	chingi

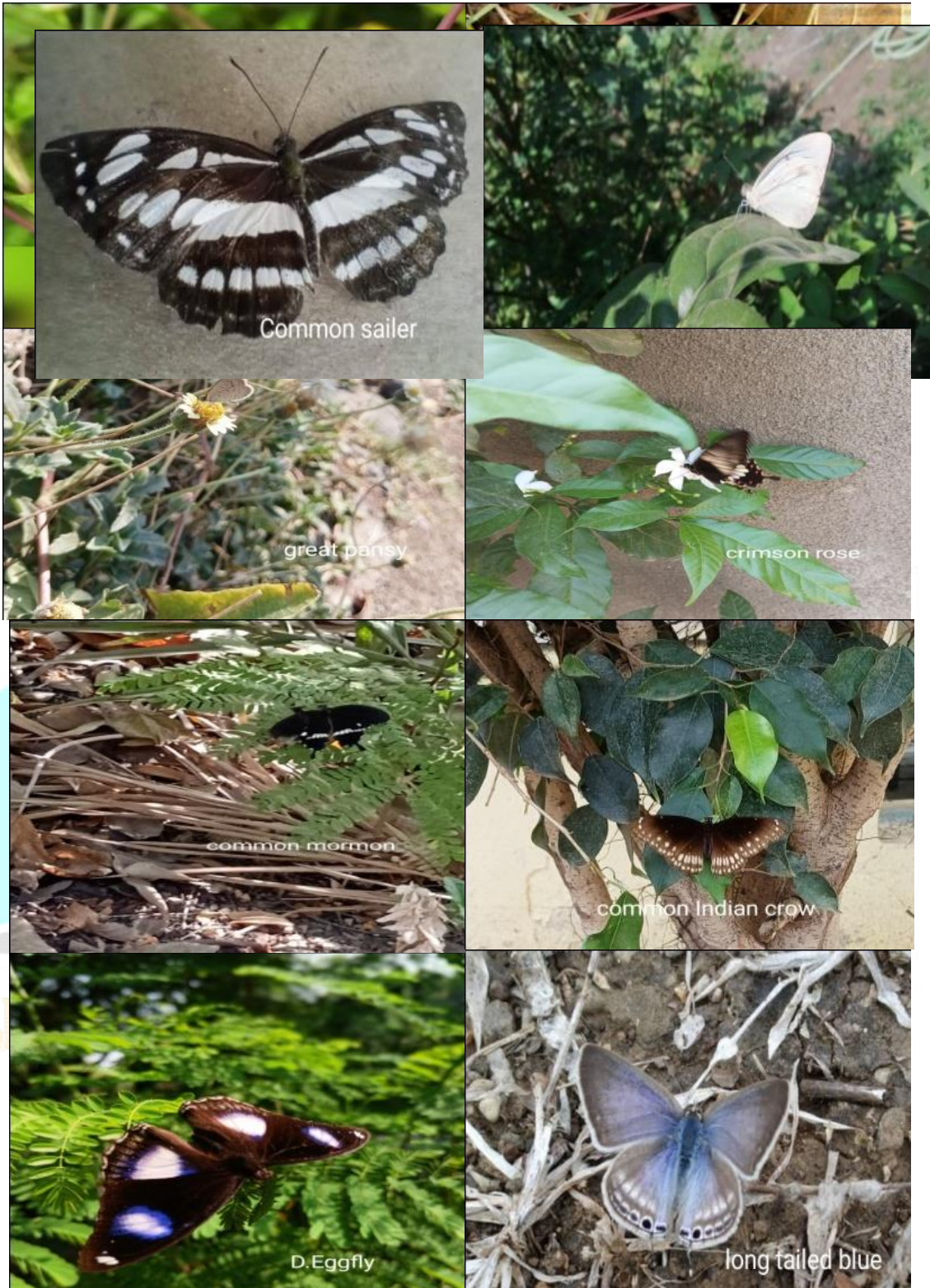
Family-Pieridae

Sr.No.	Common name	Scientific name	Family	Marathi name
1	Common wanderer	Pareronia Valeria	Pieridae	Bhatkya
2	Common emigrant	Coropsilia pomera	Pieridae	Pardeshi, Pravasi
3	Pale sulfur butterfly	Aphrissa statira	Pieridae	
4	Common gull	Cepora nerissa	Pieridae	Kavdshya
5	Common grass yellow	Eurema hecabe	Pieridae	Trun, pitambari

Family-Papilionidae

Sr.No.	Common name	Scientific name	Family	Marathi name
1	Lime butterfly	Papilio demoleus	Papilionidae	Limbhali
2	Crimson rose	Pachliopta hectar	Papilionidae	Kirmiji madhalsa
3	Common rose	Pachliopta aristolochiae	Papilionidae	Gulabi rani
4	Common jay	Graphium doson	Papilionidae	Shevali
5	Common Mormon	Papilio polytes	Papilionidae	bahurupi







lime butterfly



common grass blue



pale sulphur butterfly



great eggfly



lemon pansy



small cupid



common grass yellow



plain tiger



zebra blue



Fig. 2 Showing Photographs of Butterflies of various species observed in Chhatrapati Shivaji Park, Hinganghat region (M.S.)

Results and discussion

The goal of the current study was to comprehend the diversity of butterflies from Chhatrapati Shivaji Maharaj Park, Hinganghat. The city of Wardha district is located in Maharashtra. A total of 30 butterfly species belonging to 4 families were recorded. The highest number of butterflies belonging to the family Nymphalidae included 14 species, 6 species of Lycaenidae, 5 species of Pieridae, and 5 species were recorded from the Papilionidae by Photography and Binoculars method. Nymphalidae had the highest species and abundance as compared to Lycaenidae, Pieridae, and Papilionidae. This showed that Nymphalidae dominated with the highest species and abundances in the study area of Chhatrapati Shivaji Maharaj Park, Hinganghat. Records from observations indicate that the variety of species changes depending on the local ecosystem and weather.

The ecology is preserved by butterflies so adopting new conservation policies is urgently necessary. Creating a butterfly park, cultivating and protecting plants that serve as the specialized larva and nectar hosts for these butterflies, and protecting and maintaining the butterfly breeding grounds are all measures in the conservation of these species [6].

The results of this study highlight the importance of the city as the preferred habitat for butterflies. If the landscaping and guided maintenance are carefully planned, the diversity of butterflies in Hinganghat can increase variably. Adding a dimension to butterfly conservation and research will also enhance our future efforts to understand the complexity of the utilitarian interaction between butterflies and flowering plants, which is essential for the continuity of ecosystem services [7][8].

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