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Comparative Analysis of Aquatic Insect Diversity in a Warati Doha and Heti Lake Near Dhanora, District Gadchiroli

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ABSTRACT: The study was conducted during November 2022 to March 2023. Aquatic insects are best studied during the post monsoon period. The Aquatic insects were collected with the help of insect collecting net made up of nylon cloth for the collecting of aquatic insects different types of net are also used. Aquatic insects are collected with the help of fisherman aquatic insects sample were placed in white tray for sorting and screening of the Aquatic insects and non aquatic insects caught were immediately returned to the ghat.

Aquatic insects were collected during study period Warati doha near Dhanora, found different species of aquatic insects Nepa, cinerea, Ranatra, Giant water bug, Mayfly, Dragonfly, water beetle, culex, cimex, Belostomatid and these insects belong to different order hemiptera, Ephemeroptera, Mantodea, Odonata, Diptera, Plecoptera, Coleoptera, Tricoptera. Present the study in aquatic insects order hemiptera was found in most diverse and relatively abundant at Warati Doha.

KEYWORDS- Warati doha, Aquatic Insect, Dhanora, Gadchiroli

I. INTRODUCTION

Insects are very important as primary or secondary decomposers without insects to help break down and dispose of wastes dead animals and plants would accumulate in our environment and it would be messy indeed. Insects are under appreciated for their role in the food web. Aquatic ecosystem shows close interaction between biotic and abiotic components. Physico-chemical status has great influence on the well beings of aquatic species.

Aquatic insect is an important invertebrate organism both economically and ecologically. Inland water covers less than 1% on earth surface yet harbour 10% of all known animal species of this diversity over 60% is found in the aquatic insects, which today number cross to 100,000. Insects are generally the most conspicuous form of life in the aquatic ecosystem, which in view of their extremely varied habits, wide distribution and countless adaptations have occupied a dominant position as a largest group in the animal kingdom. No other group of animal has invaded the land, air and water to the same proportional degree as insects.

Therefore, such a multiple of species has enabled the group of insects to evolve a great diversity of habit and to colonize a wide range of ecological niches. The aquatic insects are taxonomically diverse and fascinating in structure and biology and some of them have great importance to public health and aquaculture of the inland waters. Aquatic insects or water insects live some portion of their life cycle in the water. They feed in the same ways as other insects.

Some diving insects, such as predatory diving beetle, can hunt for food under water where land-living insects cannot compete. One problem that aquatic insects must overcome is how to get oxygen while they are under water. All animals require a source of oxygen to live. Insects draw air into their bodies through spiracles, holes found along the sides of the abdomen. These spiracles are connected to tracheal tubes where oxygen can be absorbed. Other aquatic insects can remain under water for long periods due to high concentrations of hemoglobin in their haemolymph circulating freely within their body. Hemoglobin binds strongly to oxygen molecules.

A few insects such as water scorpions and mosquito larvae have breathing tubes ("siphons") with the opening surrounded by hydrofuge hairs, allowing them to breathe without having to leave the water.

**II. MATERIALS AND METHOD**

The study was conducted during the November 2022 to March 2023. The Aquatic insects were collected with the help of insect collecting net made up of nylon cloth for the collecting of aquatic insects' different types of net are also used.

Aquatic insects are collected with the help of fisherman aquatic insects sample were placed in white tray for sorting and screening of the Aquatic insects and non aquatic insects caught were immediately returned to the ghat. The content of each sample was transferred in to properly labelled plastic containers, preserved in 95% ethanol and taken back to the laboratory for analysis. In the laboratory aquatic insects well sorted on a petridish and identified in binocular and using to the family level taxonomic keys by several authors.

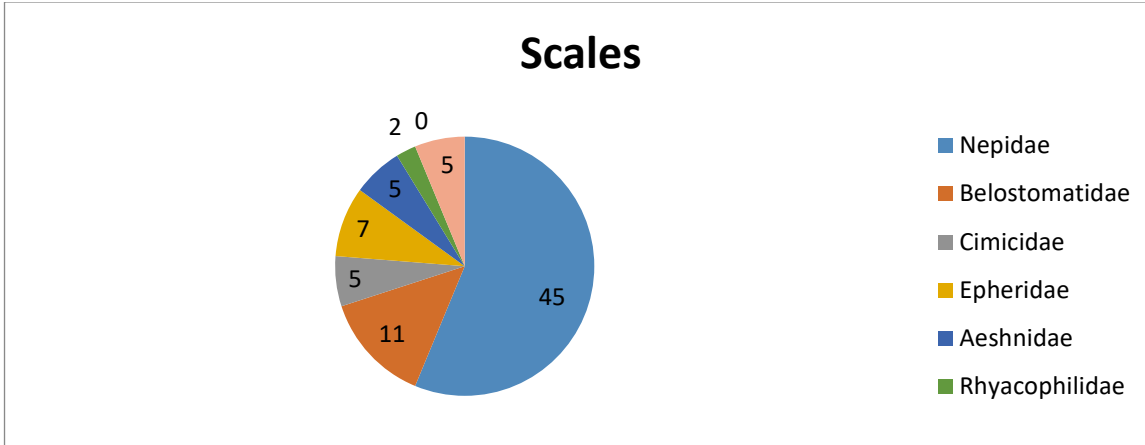
Pennak (1978) , subramanian (2005) , Wiggins (1996) , and the help of expert at the department large aquatic insects were sorted by the Naked eye whereas the sorting of the smaller ones was done under a dissecting microscope.all labelled vials containing 95% ethanol.

III. OBSERVATION AND RESULTS

Study survey of Aquatic Insect in Warati Doha on November -2022

Sr. No	Order	Family	Scientific Name	Common Name	Quantity
1)	1)Hemiptera	1) Nepidae	1)Nepa cinerea	Water scorpion	25
			2)Ranatra linearis	Water stick insect	20
		2)Belostomatidae	1)Lethocerus indicus	Giant water bug	11
		3)cimicidae	1)cimex linnaeus	Bed bug	5
2)	1)Diptera	1)Culcidae	1)culex linnaeus	Culex	5
3)	1)Ephemeroptera	1)Epheridae	1)Mayfly larvae	Mayfly larvae	7
4)	1)Odonata	1)Aeshnidae	1)Dragonfly larvae	Dragonfly larvae	5
5)	1)Trichoptera	1)Rhyacophilidae	1)Caddisfly larvae	Caddisfly larvae	2
6)	1)Coleoptera	1)Hydrophilidae	1)Hydrophilus	Water scavenger	8

November 2022 Study survey of aquatic insects collection in Warati Doha family wise recorded species Nepa cinerea (Nepidae) , are collect in higher quantity and caddisfly larvae (Rhyacophilidae) collect in lower quantity.

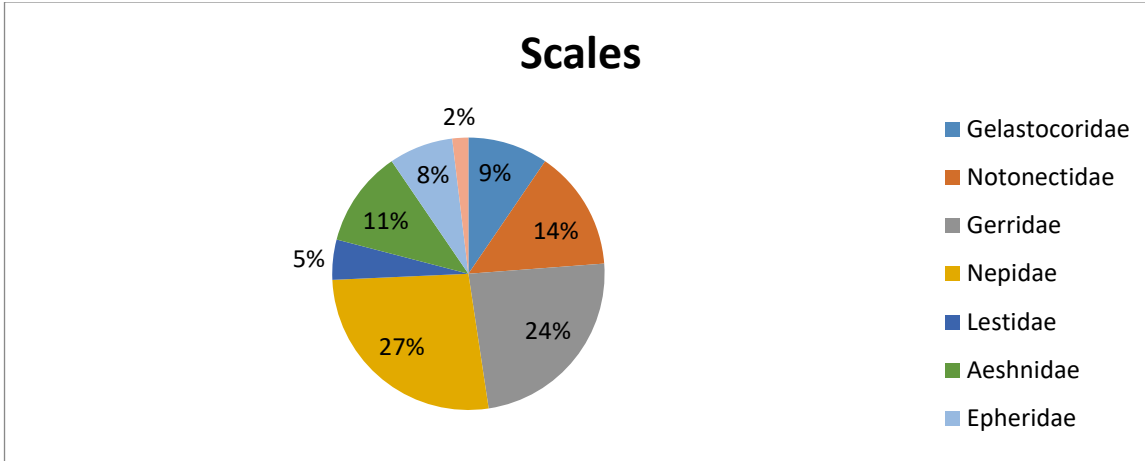


November 2022 Study survey of aquatic insects collection in Warati Doha family wise recorded species Nepa cinerea (Nepidae), are collect in higher quantity and caddisfly larvae (Rhyacophilidae) collect in lower quantity.

STUDY SURVEY OF AQUATIC INSECT IN HETI LAKE GHAT ON NOVEMBER -2022

Sr. No		Family	Scientific Name	Common Name	Quantity
1)	Hemiptera	1)Gelastocoridae	1)Gelastocoris oculatus	Toad bug	10
		2)Notonectidae	1)Notonecta linnaeus	Back swimmer	15
		3)Gerridae	1)Gerris	Water scorpion	25
		4)Nepidae	1)Nepa cinerea 2)Ranatra linearis	Water scorpion Water stick insect	8 20
2)	Odonata	1)Lestidae	1)Damselfly larvae	Damselfly larvae	5
		2)Aeshnidae	1)Dragonfly larvae	Dragonfly larvae	12
3)	Ephemeroptera	1) Epheridae	1)Mayfly larvae	Mayfly larvae	8
4)	Coleoptera	1)Hydrophilidae	1)Hydrophilus	Water beetel	2
5)	Diptera	1)Chironomidae	1)Chironomus plumosus	Chironomus larvae	17

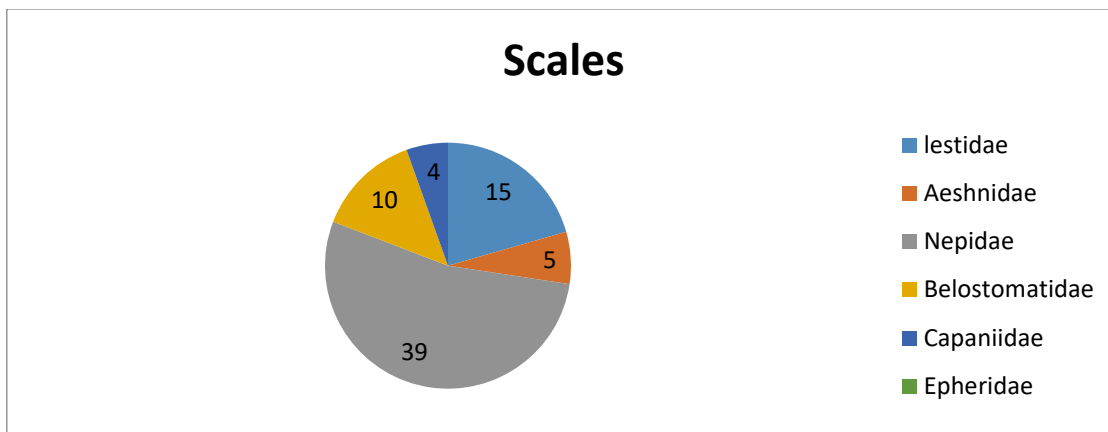
November 2022 Heti Lake Study survey of aquatic insects collection in Heti Lake family wise recorded species Gerris (Gerridae), are collect in higher quantity and Hydrophilous (Hydrophilidae) collect in lower quantity.



STUDY SURVEY OF AQUATIC INSECT IN WARATI DOHA ON DECEMBER -2022

Sr. No	Order	Family	Scientific Name	Common Name	Quantity
1)	Odonata	1)Lestidae	1)Damselfly larvae	Damselfly larvae	15
		2)Aeshnidae	1)Dragonfly larvae	Dragonfly larvae	5
2)	Hemiptera	1)Nepidae	1)Nepa cinerea	Water scorpion	17
			2)Ranatra linearis 1) Lithocerus indicus	Water stick insect 1)Giant water bug	22
		2)Belostomatidae			10
3)	Plecoptera	1)Capaniidae	1)stonefly nymph	Stonefly nymph	4
4)	Ephemeroptera	1) Epheridae	1)Mayfly larvae	Mayfly larvae	7

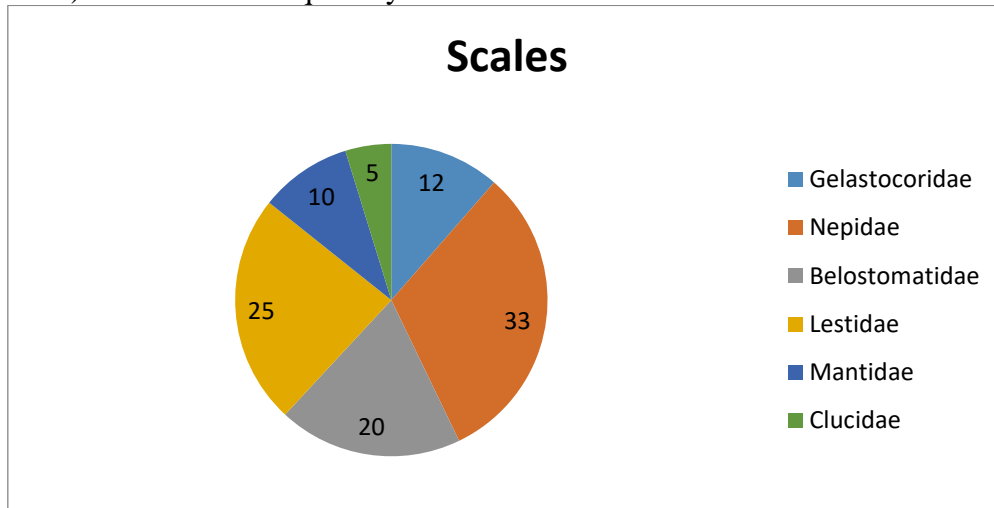
December 2022 Warati Doha Study survey of aquatic insects collection in Warati Doha family wise recorded species Ranatra linearis (Nepidae), are collect in higher quantity and stoneflies nymph (capniidae) collect in lower quantity.



STUDY SURVEY OF AQUATIC INSECT IN HETI LAKE ON DECEMBER -2022

Sr. No	Order	Family	Scientific Name	Common Name	Quantity
1)	1)Hemiptera	1)Gelastocoridae	1)Gelastocorisoculatus	Toad bug	12
		2)Nepidae	1)Nepa cinerea	Water scorpion	10
			2)Ranatra linearis	Water stick insect	23
		2)Belostomatidae	1)Lethocerus indicus	Giant water bug	20
2)	Odonata	1)Lestidae	1)Damselfly larvae	Damselfly larvae	25
3)	Mantodea	1)Mantidae	1)Statilia maculata	Asian Jumping mantis	10
4)	1)Diptera	1)Culcidae	1)culex linnaeus	culex	5
5)	coleoptera	1)Hydrophilidae	1)Hydrophilus	Water beetel	2
6)	1)Trichoptera	1)Rhyacophilidae	1)Caddisfly larvae	Caddisfly larvae	4
7)	Plecoptera	1)Capaniidae	1)stonefly nymph	Stonefly nymph	3

December 2022 Heti Lake Study survey of aquatic insects collection in Heti Lake family wise recorded species Dragonfly nymph (Aeshnidae) , are collect in higher quantity and Hydrophilus (Hydrophilidae) collect in lower quantity.



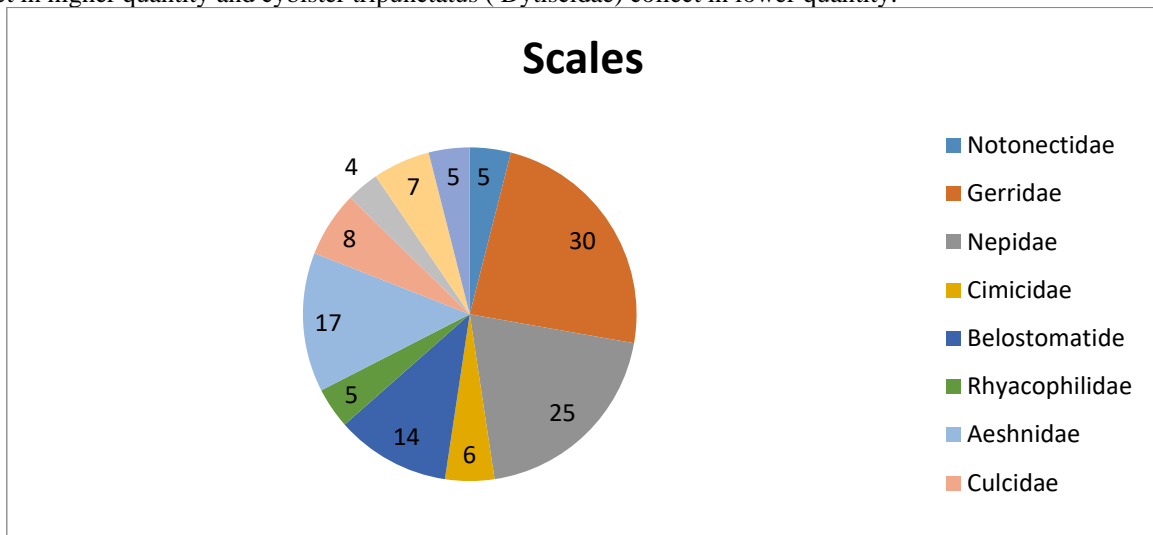
STUDY SURVEY OF AQUATIC INSECT IN WARATI DOHA ON JANUARY -2023

10	Order	Family	Scientific Name	Common Name	Quantity
1)	1) Hemiptera	1)Notonectidae	1)Notonecta glauca	Common black swimmer	5
		2)Gerridae	1)Gerris	Water scorpion	30
		3)Nepidae	1)Nepa cinerea	Water scorpion	10
			2)Ranatra linearis	Water stick insect	15
			1)Cimex	Bed bug	6
		4)Cimicidae	1)Lithocerus indicus	Giant water bug	14
		5)Belostomatide			
2)	1)Trichoptera	1)Rhyacophilidae	1)Caddisfly larvae	Caddisfly larvae	5
3)	1)Odonata	2)Aeshnidae	1)Dragonfly larvae	Dragonfly larvae	17
4)	1)Diptera	1)Culcidae	1)culex linnaeus	culex	8



5)	Coleoptera	1)Dytiscidae	1)cybister tripunctatus	Diving beetle	4
6)	Mantodea	1)Mantidae	1)Statilia maculata	Asian Jumping mantis	7
7)	Ephemeroptera	1) Epheridae	1)Mayfly larvae	Mayfly larvae	5

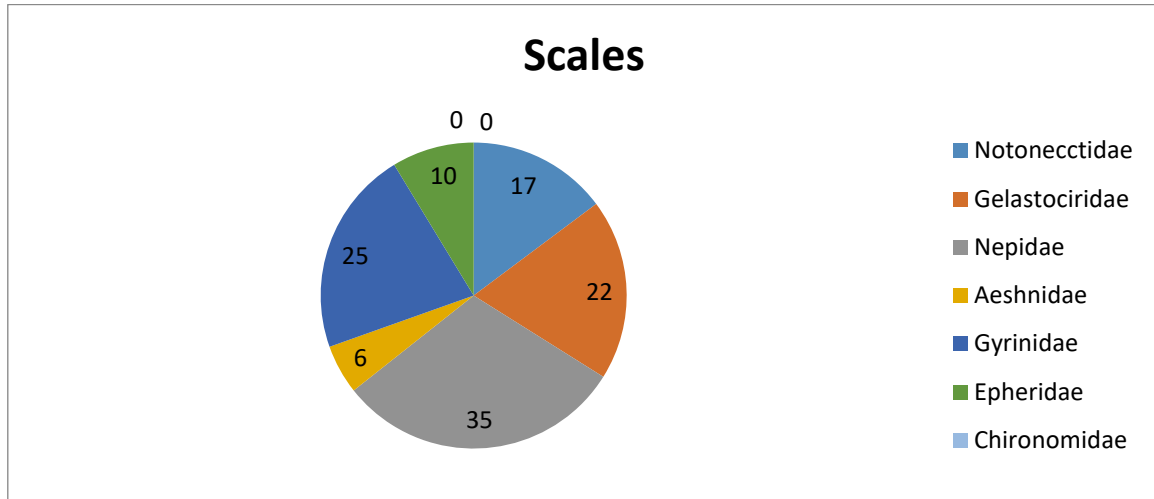
January 2023 Study survey of aquatic insects collection in Warati Doha family wise recorded species Gerries(Gerridae) collect in higher quantity and cybister tripunctatus (Dytiscidae) collect in lower quantity.



STUDY SURVEY OF AQUATIC INSECT IN HETI LAKE ON JANUARY -2023

Sr. No	Order	Family	Scientific Name	Common Name	Quantity
1)	1)Hemiptera	1)Notonectidae	1)Notonecta glauca	Common black swimmer	17
		2)Gelastocoridae	1)Gelastocoris oculatus	Toad bug	22
		2)Nepidae	1)Nepa cinerea	Water scorpion	20
			2)Ranatra linearis	Water stick insect	15
2)	1)Odonata	2)Aeshnidae	1)Dragonfly larvae	Dragonfly larvae	6
3)	coleoptera	1)Gyrinidae	1)Gyrinus natater	Common whirligig beetle	25
4)	Ephemeroptera	1) Epheridae	1)Mayfly larvae	Mayfly larvae	10
5)	Diptera	1)Chironomidae	1)Chironomus plumosus	Chironomus larvae	5

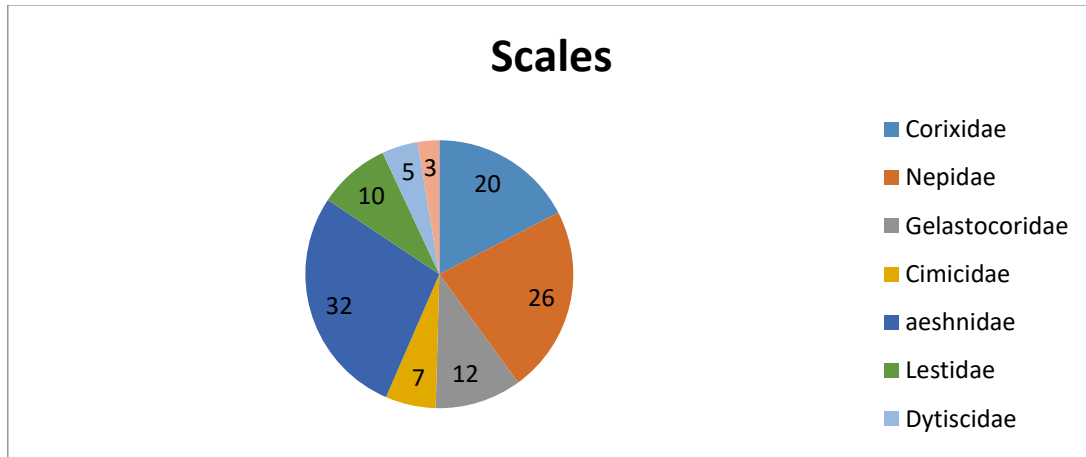
January 2023 Study survey of aquatic insects collection in Heti Lake family wise recorded species Gyrinus natater (Gyrinidae) collect in higher quantity and chironomus plumosus (chironomidae) collect in lower quantity.



STUDY SURVEY OF AQUATIC INSECT IN WARATI DOHA ON FEBRAUARY -2023

Sr. No	Order	Family	Scientific Name	Common Name	Quantity
1)	Hemiptera	1)Corixidae	1)Corixa punctata	Water boatmen	20
		2)Nepidae	1)Nepa cinerea	Water scorpion	15
			2)Ranatra linearis	Water stick insect	11
		3)Gelastocoridae	1)Gelastocoris oculatus	Toad bug	12
		4)cimicidae	1)Cimex linnaeus	Bed bug	7
2)	1)Odonata	1)Aeshnidae	1)Dragonfly larvae	Dragonfly larvae	32
		2)Lestidae	2)Damselfly larvae	Damselfly larvae	10
3)	Coleoptera	1)Dytiscidae	1)Dytiscus linnaeus	Little diver	5
4)	Ephemeroptera	1) Epheridae	1)Mayfly larvae	Mayfly larvae	3

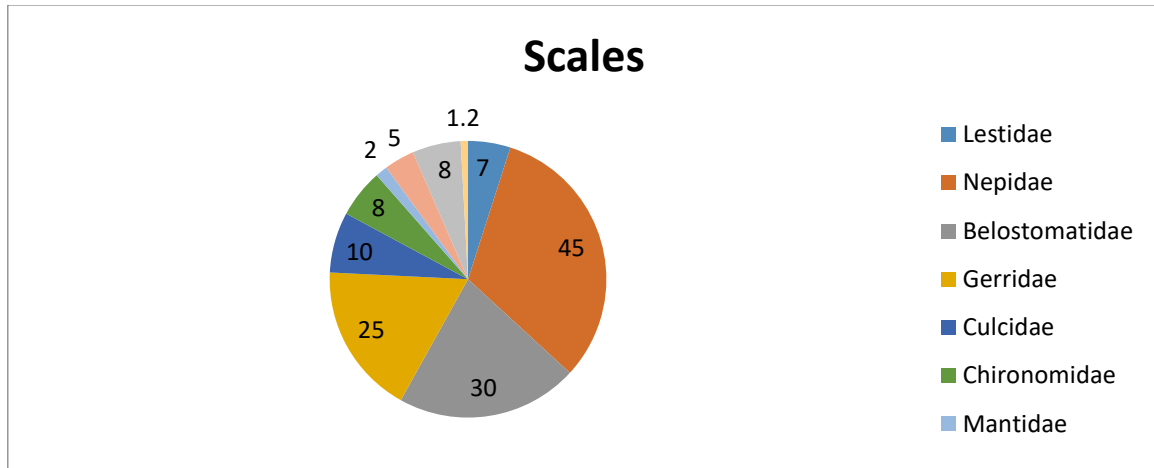
February 2023 study survey of aquatic insects collection in Warati Doha family wise recorded species Dragonfly larvae (Aeshnidae) collect in higher quantity and Mayfly larvae (Epheridae) collect in lower quantity.



STUDY SURVEY OF AQUATIC INSECT IN HETI LAKE ON FEBRUARY -2023

Sr. No	Order	Family	Scientific Name	Common Name	Quantity
1)	1)Odonata	1)Lestidae	2)Damsselfy larvae	Damsselfy larvae	7
2)	1)Hemiptera	2)Nepidae	1)Nepa cinerea	Water scorpion	13
			2)Ranatra linearis	Water stick insect	32
		2)Belostomatidae	1)Lithocerus indicus	1)Giant water bug	30
		2)Gerridae	1)Gerris	Water scorpion	25
3)	1)Diptera	1)Culcidae	1)culex Linnaeus	Culex	10
		2)Chironomidae	2)Chironomus plumosus	chironomus	8
4)	1)Mantodea	1)Mantidae	1)Stalitia maculata	Asian Jumping mantis	2
5)	1)Plecoptera	1)Capaniidae	1)stonefly larvae	Stonefly larvae	5
6)	1)Trichoptera	1)Rhyacophilidae	1)Caddisfly larvae	Caddisfly larvae	8
7)	1)Coleoptera	1)Dytiscidae	1)Dytiscus linnaeus	Little diver	4

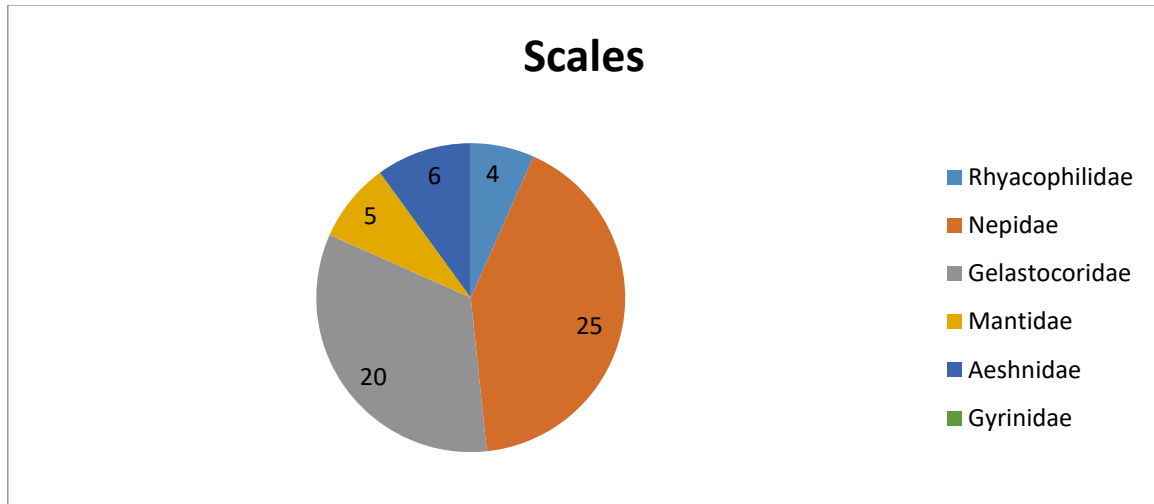
Study survey of aquatic insects collection in Heti lake family wise recorded species Ranatra linearis (Nepidae) collect in higher quantity and stalitia macula (Mantidae) collect in lower quantity.



STUDY SURVEY OF AQUATIC INSECT IN WARATI DOHA ON MARCH -2023

Sr. No	Order	Family	Scientific Name	Common Name	Quantity
1)	1)Trichoptera	1)Rhyacophilidae	1)Caddisfly larvae	Caddisfly larvae	4
2)	Hemiptera	1)Nepidae	1)Nepa cinerea	Water scorpion	10
		2)Gelastocoridae	1)Gelastocoris oculatus	Water stick insect Toad bug	15 20
3)	1)Mantodea	1)Mantidae	1)Statilia maculata	Asian Jumping mantis	5
4)	1)Odonata	2)Aeshnidae	1)Dragonfly larvae	Dragonfly larvae	6
5)	Coleoptera	1)Gyrinidae	1) Gyrinus natator	Common whirligig beetle	12

Study survey of aquatic insects collection in Warati Doha family wise recorded species Gelastocoris oculatus (Gelastocoridae) collect in higher quantity and stoneflies (Capniidae) larvae collect in lower quantity.



STUDY SURVEY OF AQUATIC INSECT IN HETI LAKE ON MARCH -2023

Sr. No	Order	Family	Scientific Name	Common Name	Quantity
1)	Hemiptera	1)Nepidae	1)Ranatra linearis	Water stick insect	12
		2)Belostomatidae	1)Lethocerusindicus	Giant water bug	15
2)	1)Odonata	2)Aeshnidae	1)Dragonfly larvae	Dragonfly larvae	16
3)	1)Plecoptera	1)Capaniidae	1)stonefly larvae	Stonefly larvae	12
4)	1)Mantodea	1)Mantidae	1)Statilia maculata	Asian Jumping mantis	8

Study survey of aquatic insects collection in Heti lake family wise recorded species Dragonfly larvae (Aeshnidae) collect in higher quantity and statilia macula (Mantidae) collect in lower quantity

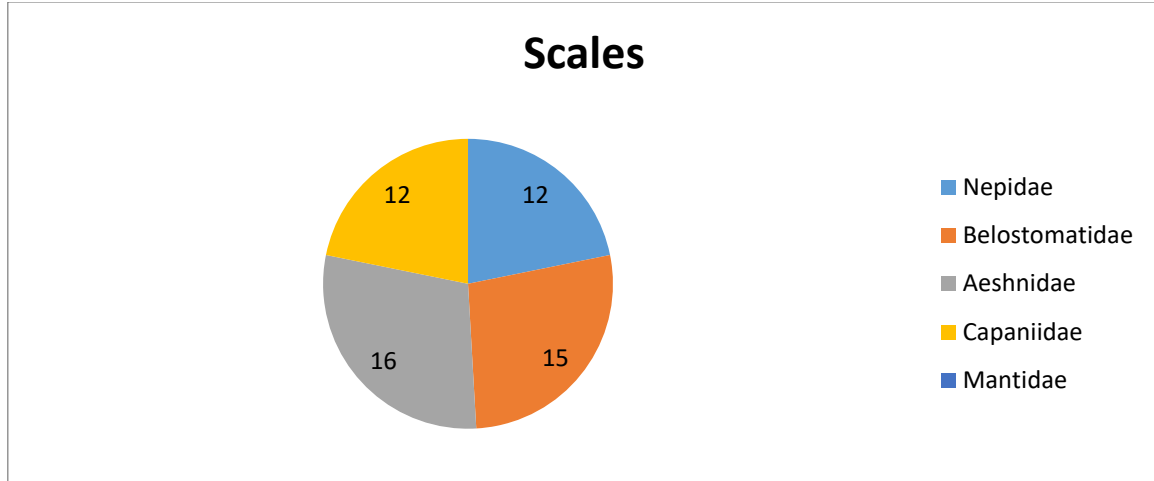
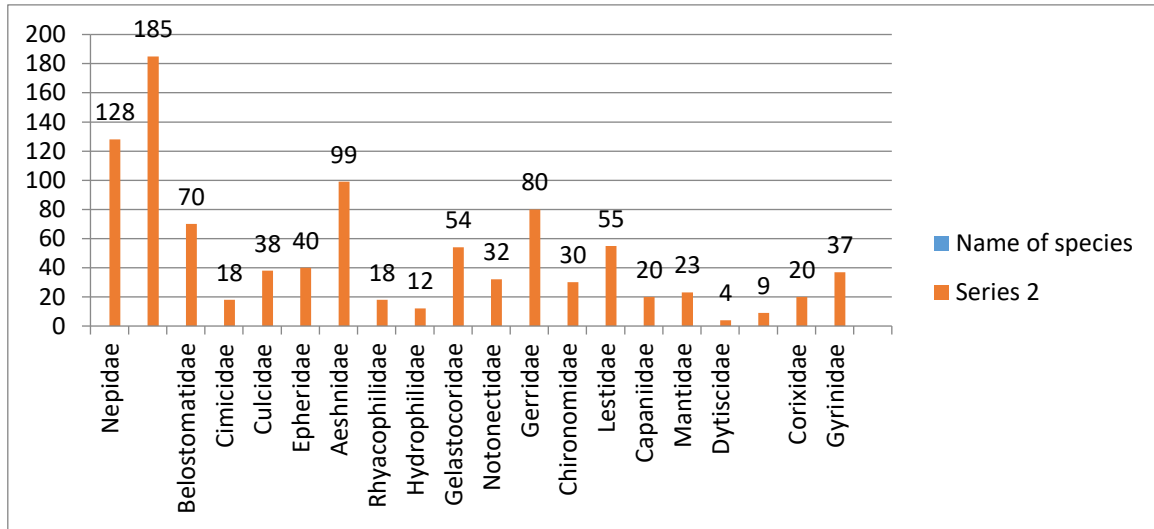


TABLE: ABUNDANCE OF RECORDED SPECIES AT SELECTED SITES

Sr .No	Family	Name of species	No. of species
1)	Nepidae	1)Nepa cinerea	128
		2)Ranatra linearis	185
2)	Belostomatidae	1)Lithocerus indicus	70
3)	Cimicidae	1)Cimex linnaeus	18
4)	Culcidae	1)culex linnaeus	38
5)	Epheridae	1)Mayfly larvae	40
6)	Aeshnidae	1)Dragonfly larvae	99
7)	Rhyacophilidae	1) Caddisfly larvae	18
8)	Hydrophilidae	1)Hydrophilus	12
9)	Gelastocoridae	1)Gelastocoris oculatus	54
10)	Notonectidae	1) Notonecta linnaeus	32
11)	Gerridae	1)Gerris	80
12)	Chironomidae	1)Chironomus plumosus	30
13)	Lestidae	1)Damsel fly larvae	55
14)	Capaniidae	1)Stonefly larvae	20
15)	Mantidae	1)Statilia maculata	23
16)	Dytiscidae	1)Cybister tripunctatus	4

		2)Dytiscus linnaeus	9
17)	Corixidae	1)Corixa punctata	20
18)	Gyrinidae	1)Gyrinus natater	37



IV.DISCUSSION

The present study indicated that Warati Doha and Heti Lake water bodies are rich in aquatic insects. The diversity of insect fauna of these lotic ecosystem was represented by. As a result of these study a total of 20 individual aquatic insects representing 18 families from 8 order were collected during the study period from two sampling station Warati Doha and Heti Lake in November, December, January, February and March composition and distribution of aquatic insects communities in two Ghat.

In the present study in Warati Doha in November month 9 individual aquatic insects are collected, there are Ranatra linearis (Nepidae) are collect in higher quantity and caddisfly larvae (Rhyacophilidae) collect in lower quantity. Then the second site of Heti Lake in November 10 aquatic insects are collect there are Gerries (Gerridae) are collect in higher quantity and Hydrophilus (Hydrophilidae) are collect in lower quantity.

The second month December Warati Doha 7 individual of aquatic insects species are found Ranatra linearis (Nepidae) are collect in higher quantity and stoneflies larvae (capniidae) are collect in lower quantity. site second in Heti Lake found 8 individual aquatic insects there are Dragonfly nymph (Aeshnidae) are collect in higher quantity and Hydrophilus (Hydrophilidae) are collect in lower quantity.

Third month January during study period in Heti lake found 12 individual Species there are Lethocerus indicus (Belostomatidae) found in most abundance are collect and Notonecta (Notonectidae) found in lower quantity. then the site second January on Warati doha during study period found 7 individual Species Gyrinus natater (Gyrinidae) are collect in higher quantity and chironomus plumosus (chironomidae) are lower quantity.

Fourth month on February during study period in Warati doha found 9 individual aquatic insects there are Dragonfly larvae (Aeshnidae) are collect in high quantity as compare to the other species. And Mayfly larvae (Ephemeridae) are collect in lower quantity. site second February on Heti lake found to 11 individual Species, there are Ranatra linearis (Nepidae) are collect in higher quantity and statilia macula (Mantidae) are collect in lower quantity.

Fifth month on March during study period Warati doha found to be 7 individual aquatic insects there are Gelastocorisoculatus (Gelastocoridae) are collect in higher quantity as compared to the other species and the stoneflies larvae (capniidae) are collect in lower quantity. site second March on Heti lake found to 5 individual Species, there are Lethocerus indicus (Belostomatidae) are collect in higher quantity and Ranatra linearis (Nepidae) are collect in lower quantity.



During my study period it is find out site second Warati doha highest total no. Of individual are recorded as compare to site Frist Heti lake Nepa cinerea, Ranatra linearis, and Dragonfly larvae are highest number species present on both water bodies Gelastocoris oculatus (Toad bug) are also present in highest quantity in present on Heti lake Hydrophilidae beetles inhabit the shallower region of water bodies with abundant microphytes and feed usually on detritus, algae and decaying vegetation matter (Khan and Ghoshi 2001) . Order and family wise recorded species form study area given in observation table Heti lake and Warati doha and family wise draw pie chart. Dytiscus, cybister, corixa, Notonecta, cimex Linnaeus lowest number species are found in Ghat.

The biodiversity of aquatic insect communities in a given basin water ecosystem reflect the environmental conditions. The sensitive species inhabiting the habitats of the adverse environmental conditions are gradually eliminated and the tolerant species establish their colonies and grow in abundance The structure and composition of biotic community is well reflected with altering water quality and are also shown in their distribution, diversity and abundance pattern of species. Most aquatic habitats with acceptable water quality and substrate conditions support diverse macro invertebrate community. Such community responds to changing habitats and community structure such as invertebrate abundance and composition. Present study reveals greater diversity and abundance of insects in Heti lake and Warati doha. The results of the study revealed greater diversity of aquatic insects in basin areas Heti lake and Warati doha of with a possibility of pollution in lower reaches and suggest effectively for stringent biomonitoring programmes.

V.CONCLUSION / SUMMARY

During this study diversity of aquatic insects several that the Aquatic insect play a vital role in the ecological structure and ecosystem in Bhaleshwar and Arhernawargaon Ghat of Wainganga river. The ubiquitous sensitive and sedentary nature of the Aquatic insects helps to we them on the bio monitoring of water quality and they have been used to assess the biological integrity of stream ecosystem. aquatic insect not only nutrient cycle through their feeding strategies but also support communities of larger organisms like fish ,frog and others . The Aquatic insect collected form two sampling site of Ghat the order Hemiptera family Nepidae was most diverse in number of individual followed by odonata family (Aeshnidae) , Diptera (chironomidae) , coleoptera (Mantodea) , Tricoptera, plecoptera etc.They are having macrophytic density revealed rich insect species belonging to Hemiptera are mostly singnflyngfed dependence of this group on the macrophyte for food, shelter and breeding purpose. the prevalence of these insects support the eutrophic state of water body.

This study documents the composition of aquatic insect communities in different sites studied. It shows the effect of natural and manmade interferences on the diversity of aquatic insects. Aquatic insects are probably best known for their ability to indicate the water quality in a particular environment. If a sample of the aquatic insects in a particular place is analyzed, in terms of sensitive kind versus tolerant kinds one can get a good measure of the environmental health.

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Nepa cinerea (Water scorpion)



Ranatra linearis(Water stick insect)



Dragonfly larvae



Lethocerus indicus (Giant water bug)



Mayfly larvae



Statilia maculate (Asian jumping mantis)



Cimex linnaeus (Bed bug)



Stonefly larvae



Damselfly larvae



Hydrophilus (Water beetle)



Chironomus plumosus (Chironomus larvae)



Culex linnaeus (Culex)



Gelastocoris cocculatus (Toad bug)



Gyrinus natator (Whirligig beetle)



Gerris (Water striders)



Cybister (Diving beetle)



Dytiscus linnaeus (Little diver)



Corixa (Aquatic bug)



Notonecta Linnaeus (Back swimmer)



Caddisfly larvae