

Mapping Freshwater Piscine diversity of Pune District using Geospatial Technologies

Using Quantum GIS and Google Earth

Tutorial ID: IGET_CP_001

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Mapping Freshwater Piscine diversity of Pune District

Objective: To map freshwater piscine diversity of Pune district using geospatial technologies.

Software: Quantum GIS 2.8.2 and Google Earth

Level: Advanced

Time required: 1 Hour

Prerequisites and Geospatial Skills

1. Quantum GIS should be installed on computer and basic knowledge of QGIS interface
2. Google Earth should be installed and basic knowledge about its interface
3. Should have completed all the GIS and RS tutorials from the IGET portal.

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Data Credit: Zoological Survey of India, Pune

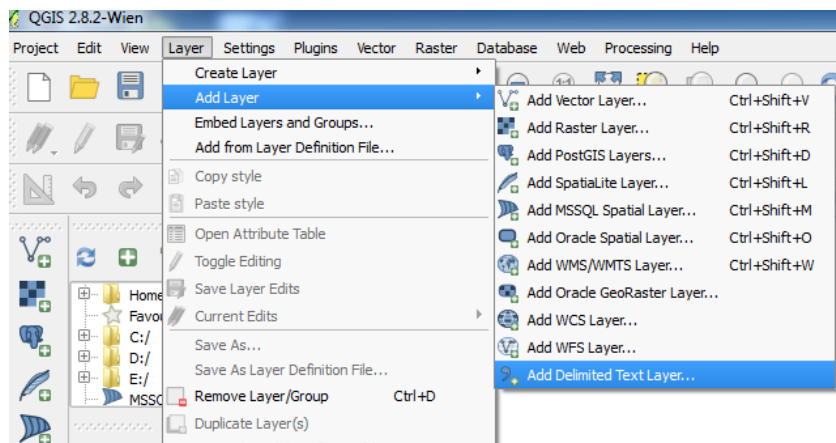
Introduction

The diversity of fish species is declining rapidly in India. The freshwater fish species are ten times more vulnerable than their marine and brackish water counterparts. Many fishery biologists and policy makers involved in inland fisheries management and planning are unaware of geospatial technology and its potential for fisheries planning and management. This tutorial aimed to give you a basic idea about compilation and processing of raw database into useful GIS data layers for further analysis. We will use piscine datasets of Pune districts collected from *Zoological Survey of India*, Pune and genus details extracted from the *FishBase consortium*.

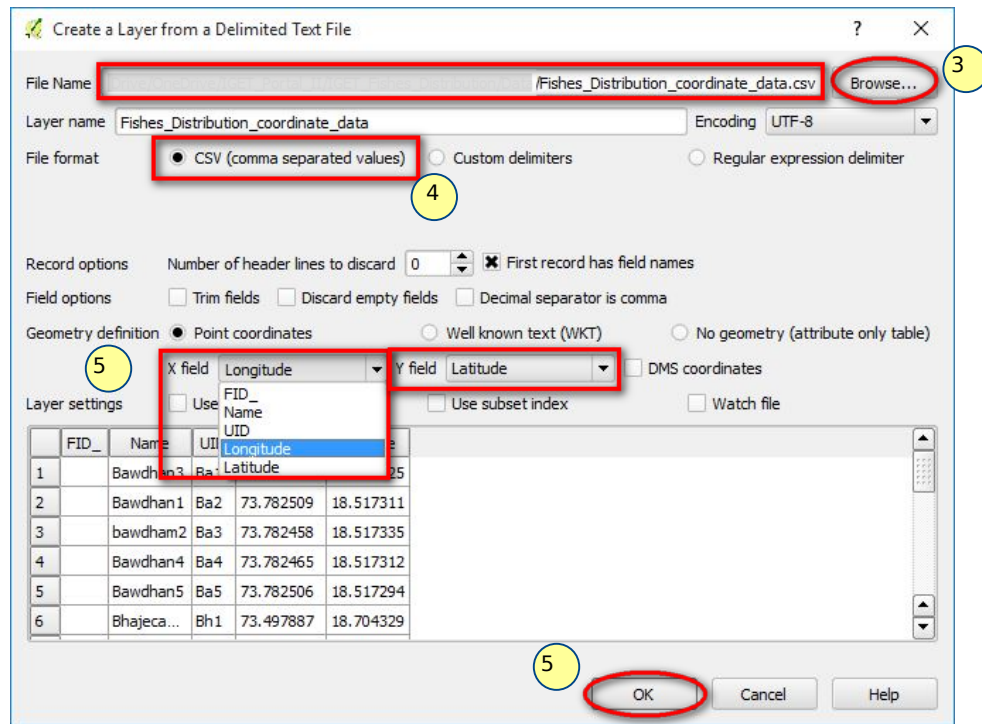
In the first section, we will learn how to convert a *Comma Separated Values (CSV)* text file into a shape file. The csv file contains the locations of fish species collected by using GPS. Explore the fields and available data in the '*Fishes_Distribution_coordinate_data.csv*' file by opening it using notepad before proceeding further.

Note: Whenever the data is collected or obtained from any secondary source make sure that the data is arranged in similar format and file is saved as '.csv' file.*

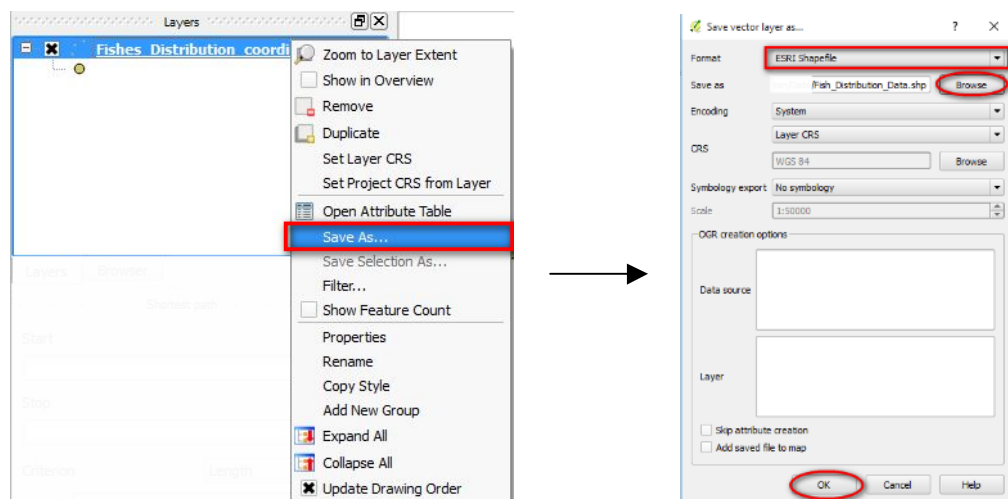
1. Open QGIS.
2. Goto **Menu Bar** → **Layer** → **Add Layer** → **Add Delimited Text Layer**.



3. In the pop-up window browse for '*Fishes_Distribution_coordinate_data.csv*' file under '**File name**'.
4. Keep the *Layer name* as default. Make sure that the '*File Format*' is selected as '**CSV(Comma separated values)**'.
5. Then goto '*X field*' and select '**Longitude**' and '*Y fields*' as '**Latitude**' and click '**OK**'
6. You need to select '**WGS 84**' as reference coordinate system in '*Coordinate Reference System Selector*' pop-up window, because the location data is collected using GPS device and click '**OK**' to finish.



7. Now the data is represented by an event point layer in the map canvas. We need to save this event layer as a point shape file before further use. For this, *right click* on the event layer and select '**Save As**' to save the file in an appropriate folder in '**ESRI Shape file**' format with an appropriate name '**Fish_Distribution_Data.shp**'.

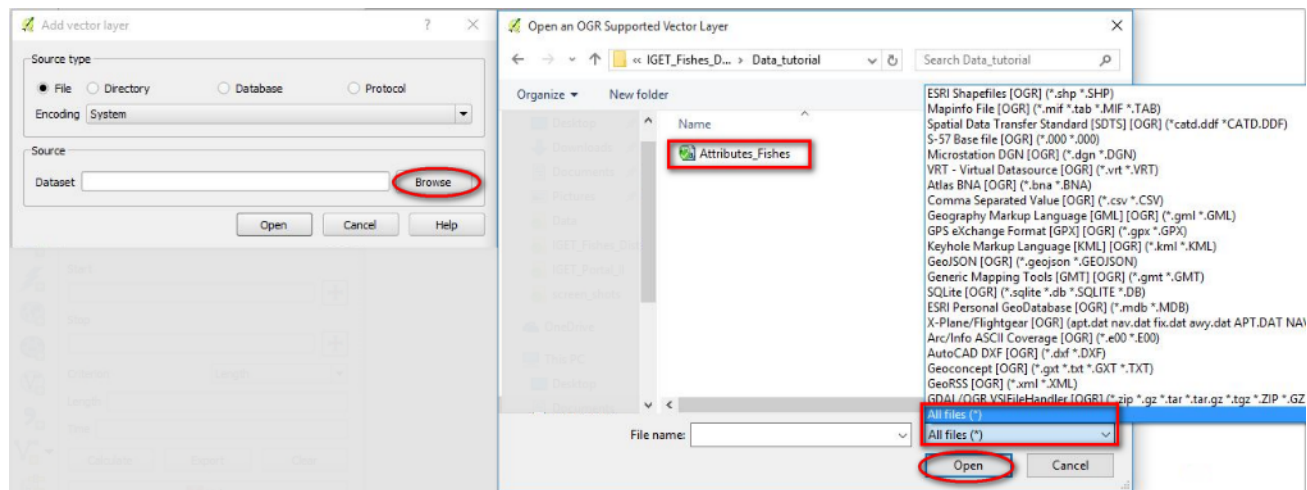



8. Now you can remove the event layer from map canvas and add the shapefile of '*fish distribution*' to map canvas, if it is not loaded. Before proceeding further check the *attribute table* of the shape file.

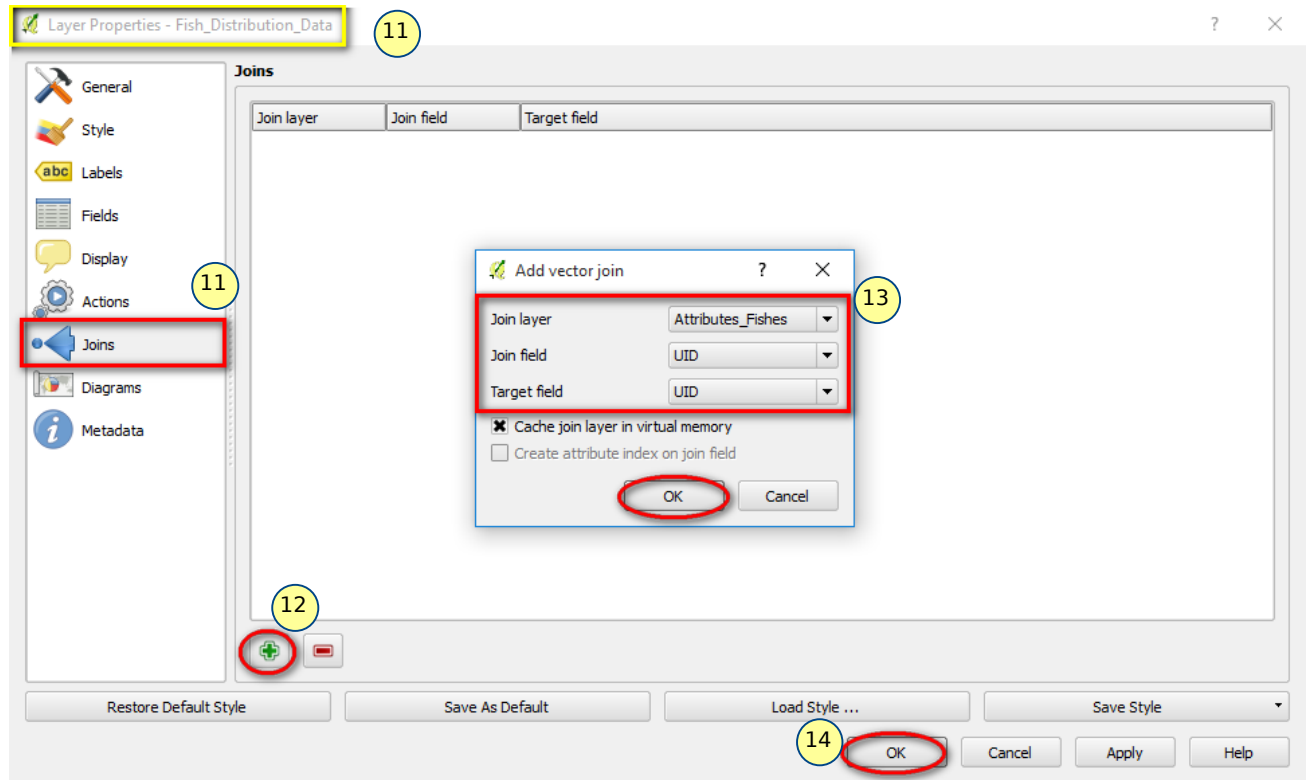
By now we are successful in generating the shapefile from the preprocessed raw dataset, i.e., CSV. The *attribute table* of *fish species distribution* shape file contains a unique identification filed (*UID*) to identify the fish species. We will use this field as a primary key to link the

attributes like genus of species, habitat, length of the species etc., from another *CSV* file. In this tutorial, we are using few attributes out of many. However, you can select as many attributes based on your requirements and this dataset is available for free on fishbase.org website. These attributes can be manually input into the attribute table of shape file or you can preprocess the data in excel datasheet. In this tutorial, we are supplying a preprocessed *CSV* file of *attributes of fish*. Have a look at the data before proceeding further. You can see *UID* field is common in both the '*attribute table of shape file*' and '*csv file of fish attributes*'. We will use this *UID* field as primary key to join the '*attributes of fish*' to the shape file using '*join and relate*'.

9. Add '**Attributes_Fishes.csv**' file to QGIS by using '*Add Vector layer*' tool. (Please refer [IGET_GIS_009](#), steps 9-10 for more details).



10. Now we will join the table to the point layer using '*UID*' as primary key. (Refer [IGET_GIS_009](#) for more details on joining table)
11. Open '*Layer Properties*' of *Fish_distribution_Data.shp* (double click on the layer to open properties window) and select '**Joins**'.
12. Click on the small  sign located in left bottom of the '*Join*' window.
13. It will pop-up '*Add vector join*' window. Select, '**Attributes_Fishes**' from the dropdown menu of '*Join Layer*' and '**UID**' in '*Join field*' and '*Target field*' and Click '**OK**'.



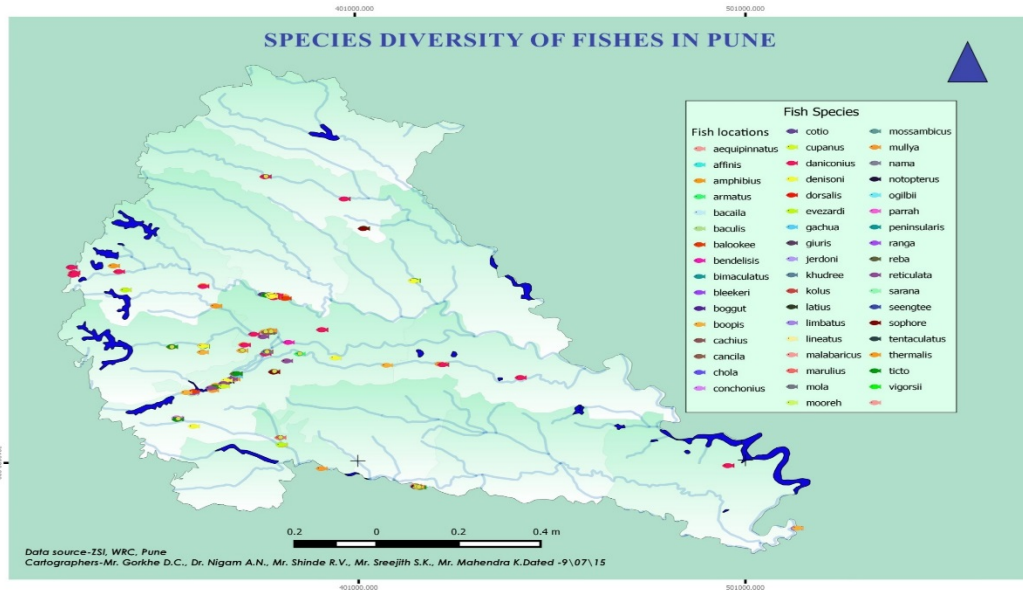
14. 'Attributes_Fishes' will be added to the list of 'Joins' section. Review the details before click 'OK' in the Layer properties window.
15. Open the attribute table of the 'Fish_distribution_Data.shp' file and review if the join is proper or not. If not, review the datasets and try to join again after corrections.

FID_	Name	UID	Longitude	Latitude	Attributes_Fishes_Genus	Attributes_Fishes_species	Attributes_Fishes_Location	Attributes_Fishes_Max_Length	Attributes_Fishes_Habitat
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16. The join which we have done is a virtual event. Therefore, right click on the 'Fish_distribution_Data.shp' layer and select 'Save As' to save the file in an appropriate folder in 'ESRI Shape file' format with an appropriate name 'Fish_Distribution_Data_Attrib.shp'. Add the saved shape file to the QGIS, if it is not loaded to the map canvas.
17. Now we can fire different sets of queries on 'Fish_Distribution_Data_Attrib.shp' to find relevant information.
18. Since, our dataset belongs to the Pune district, adding Pune administrative boundary to the map canvas will give better visualization. Therefore, load Pune administrative boundary, i.e., 'Pune_Tehsil.shp' to the QGIS.

Exercise:

- i. Create a Map of fish diversity in Pune District using appropriate symbology as shown below.

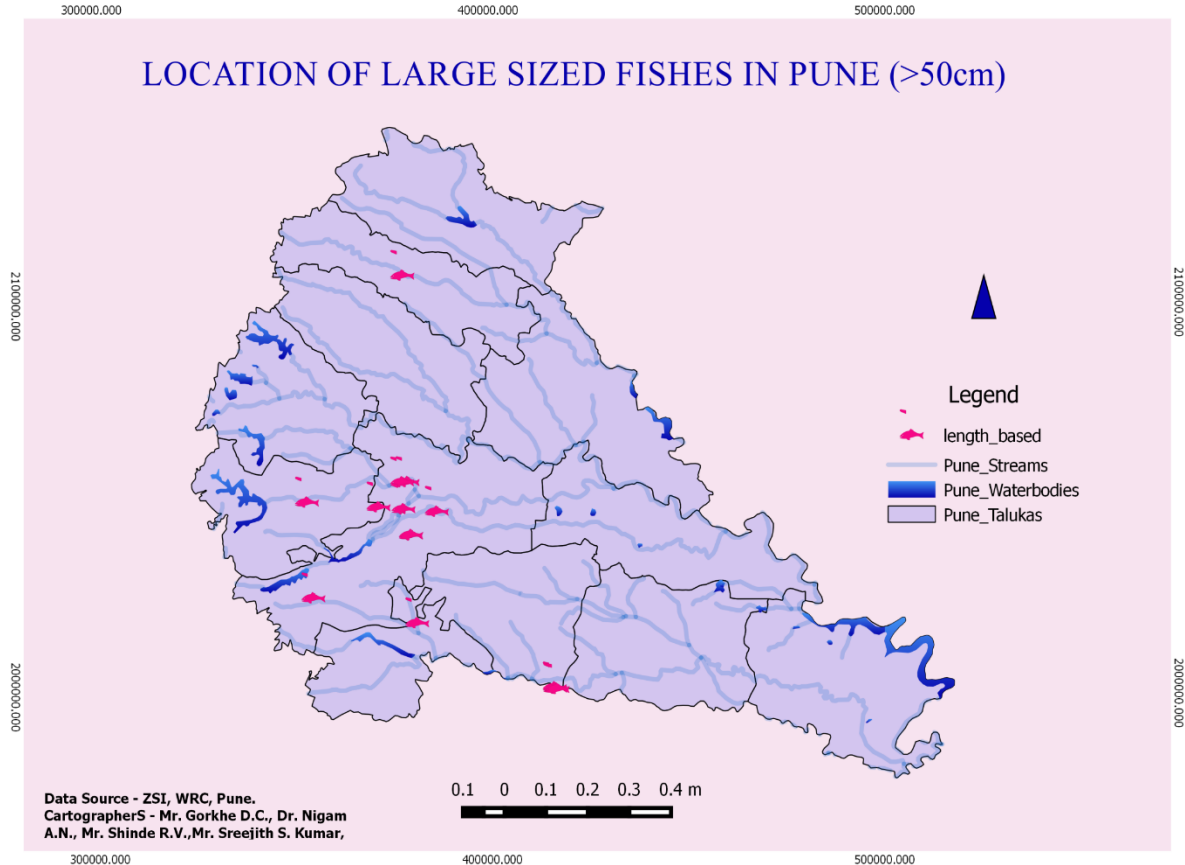


- ii. Create a Map of all the fishes whose length is at least 50cm?

Hint: Use expression based filter and extract fishes with length atleast 50cm. Then select all the entries. Export it as different layer and create a map out of it.

FID	Name	UID	Longitude	Latitude	ibutes_Fishes_Gei	ibutes_Fishes_spe	ibutes_Fishes_Loci	ites_Fishes_Max_L	ibutes_Fishes_Hat
1	NULL	Bawdhan1	Ba2						ine, freshw...
17	NULL	ghodr1	Gb1						ine, freshw...
24	NULL	gj2	Gun2						ine, freshw...
27	NULL	hadapsar1	H1						ine, freshw...
54	NULL	kt4	Kat4						ine, freshw...
55	NULL	kt5	Kat5						ine, freshw...
110	NULL	m5	Mul5						ine, freshw...
122	NULL	m17	Mul17						ine, freshw...
161	NULL	Nashrapur2	Nash2						ine, freshw...
162	NULL	n1	Nira1						ine, freshw...
163	NULL	n2	Nira2						ine, freshw...
167	NULL	nrd4	Nrb4						ine, freshw...
196	NULL	Paud3	Paud3						ine, freshw...
220	NULL	Sambhaji_Bridg...	Sam6						ine, freshw...

The Map should look similar to this:



- iii. Create map showing distribution of Channa, Garra, Lepidocephalichtys, Pethia, Rasbora genus of species. Label the map according to genus of the species.
- iv. Overlay the output of Exercise 2 on a 'Google Earth' in map canvas. (Open the Google Earth Image using 'OpenLayer Plugin' - Refer [IGET_GIS_11](#))
- v. Map the distribution of Fishes in Mula River whose length is more than 15cm.

Creating a Web page for the data

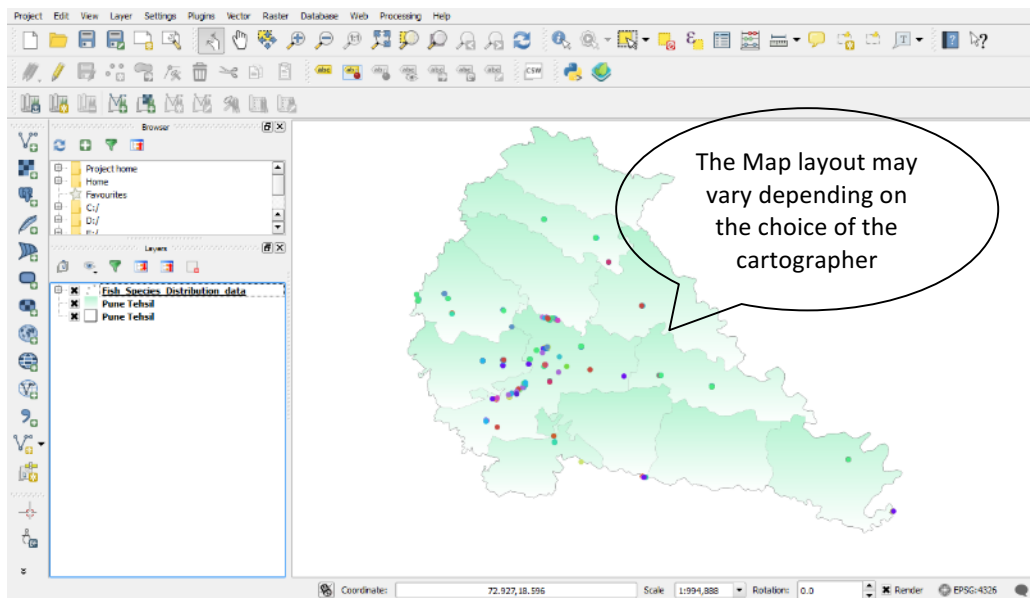
Once the data preparation done successfully, we can display our data on a web page. We recommend to use QGIS 2.8.0 or above for this part of the tutorial. We will be using 'QGIS2Web' plugin to accomplish our task. We will try and export fish diversity map to a web page. So make sure that the shape of fish species diversity 'Fish_Distribution_Data_Attrib.shp' loaded into QGIS map canvas with proper symbology.

19. To install QGIS2Webb plugin, goto **Plugins** → **Manage and Install plugins**.

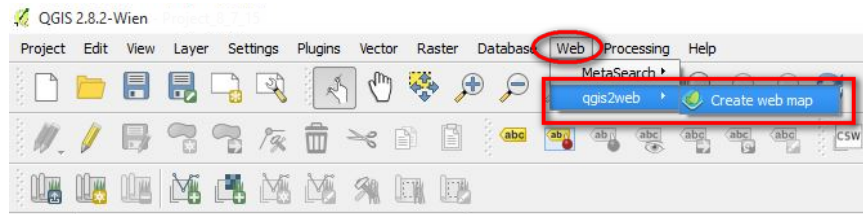
20. In the popup window of 'Plugins' window select **Not installed** and search for '**QGIS2Web**' in **search** window and select the '**QGIS2Web**' and click on '**Install plugin**' to install it (You need internet connection to accomplish this task).



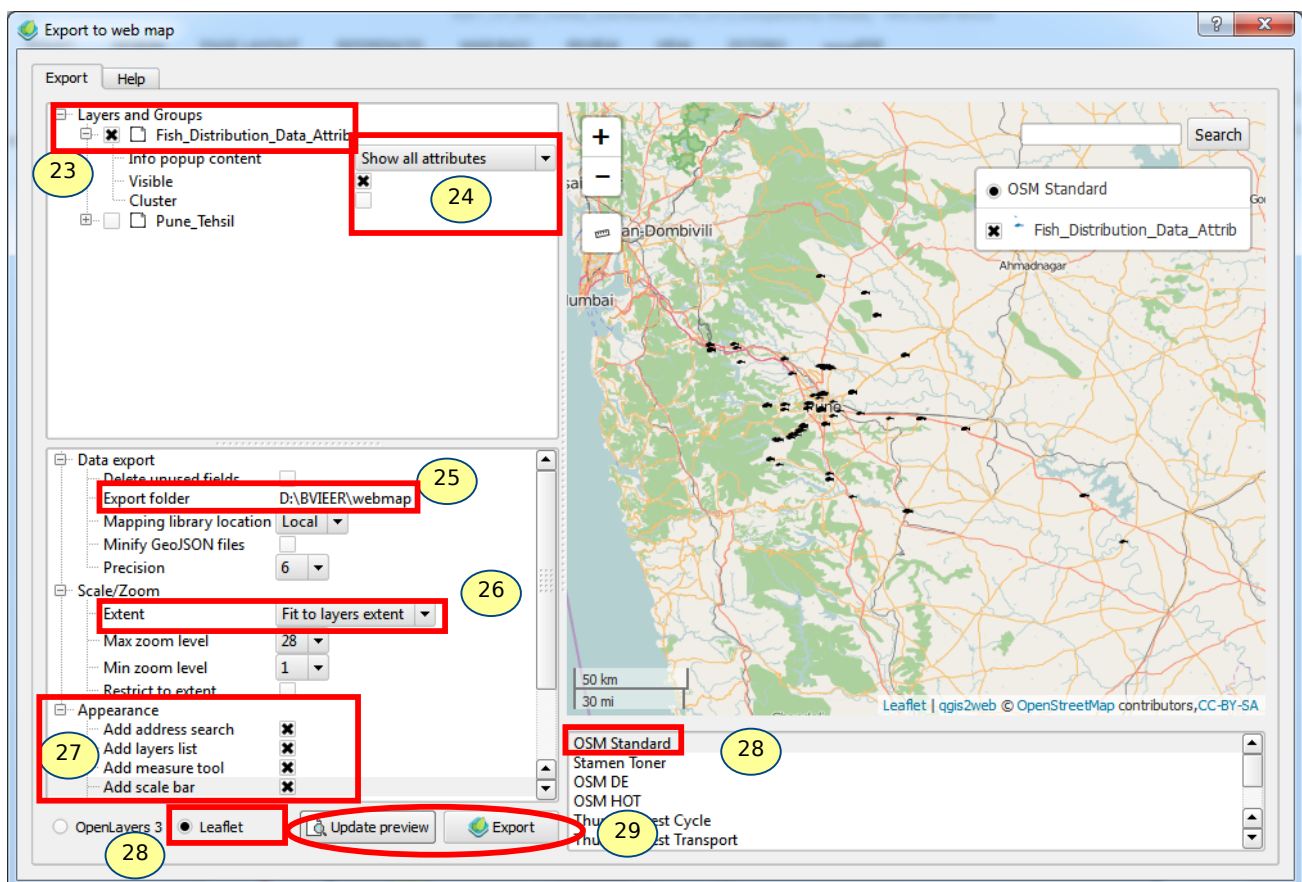
21. Open the required layers in map canvas with proper symbology.



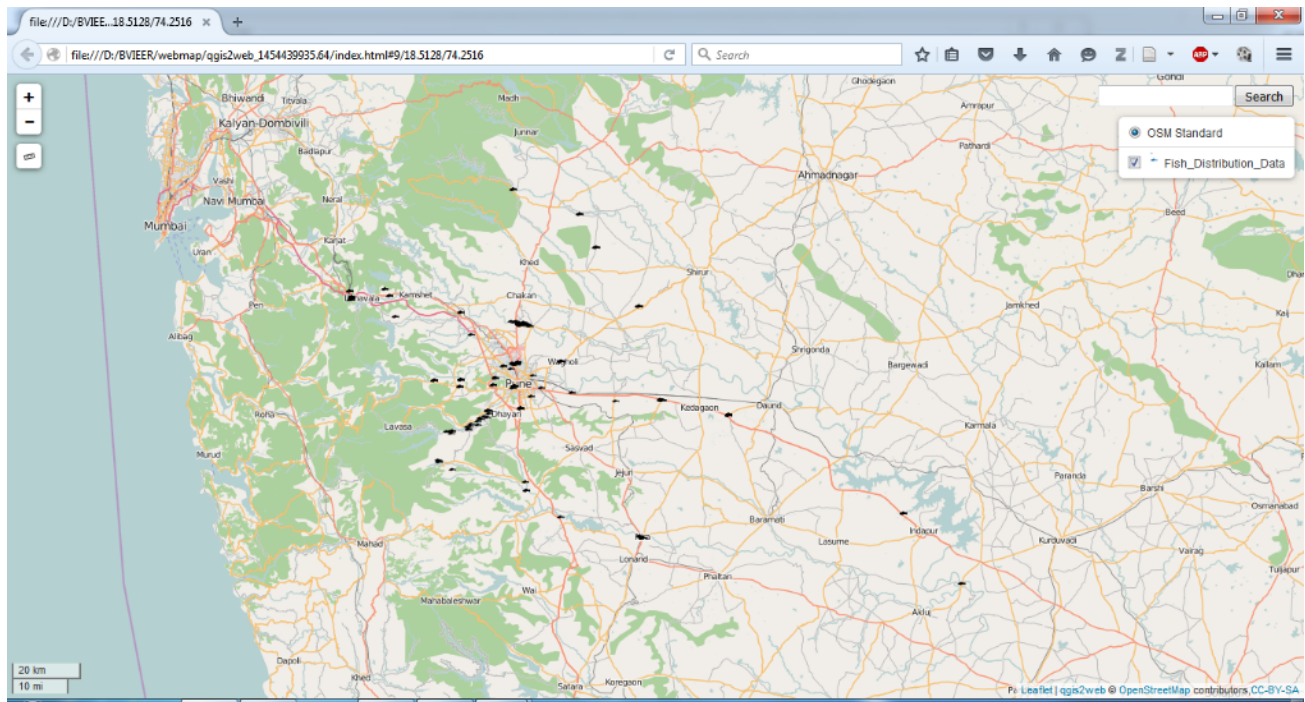
22. Navigate to *Menu bar*, Click on **Web** → **Qgis2web** → **Create web map** to open 'Export to web map' window. We will change few of the setting in this window.



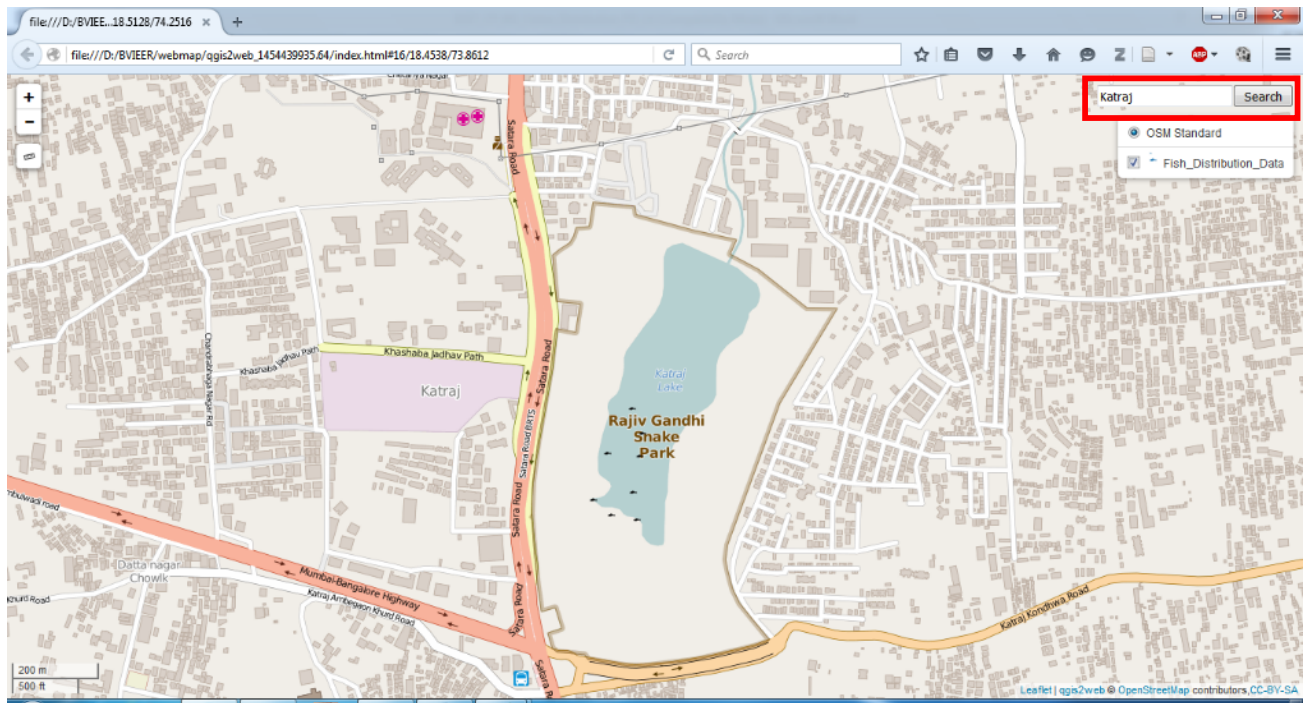
23. The '**Export**' tab in 'Export to web map' gives option for selecting or deselecting the layers. You can uncheck the layers which you don't want to display on web. For this exercise we will consider only one layers named '*Fish_Distribution_Data_Attrib*'.
24. Next click on the *dropdown arrow* in front of '**Info popup content**' and select '**Show all attributes**' under '*Fish_Distribution_Data_Attrib*'. This indicates that when we click on the specific feature on the web map, all the attributes linked with that feature will popup.



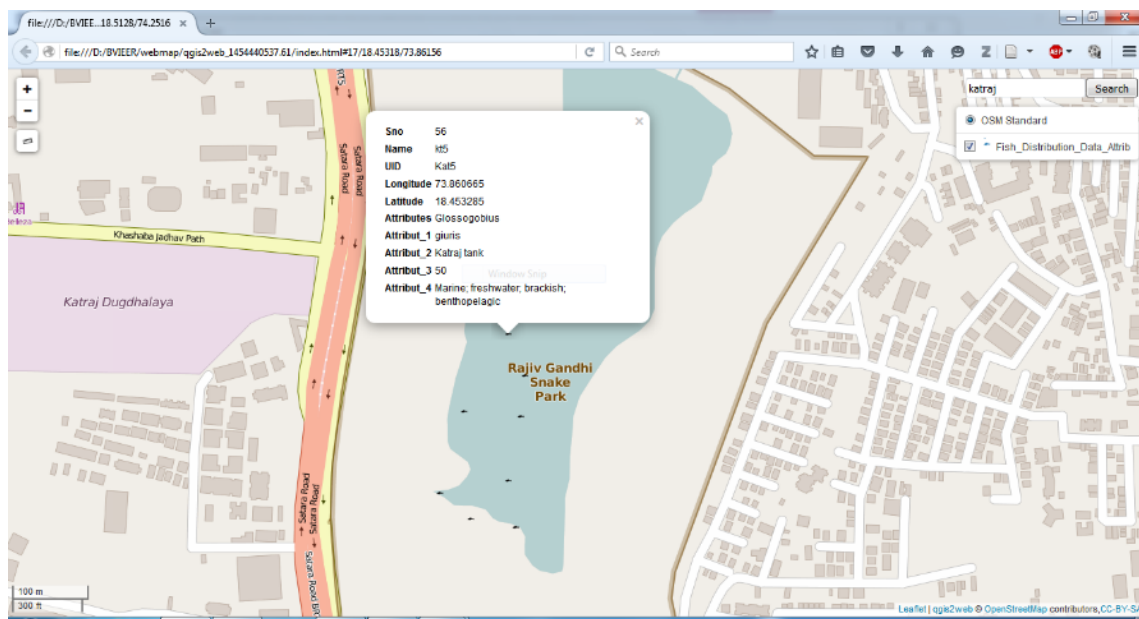
25. Now we will move on to the below section of the 'Export to web map' window. Under 'Data Export', click on 'Export Folder' to select the folder in 'Choose export folder' window (You can create a new folder by name of 'WebMap' and select the same as export folder).
26. Under 'Scale/Zoom' options, select the 'Extent' as 'Fit to layer extent' to fit the final web map to the layer extent while display on web page.
27. Under 'Appearance' option check the check boxes of 'Add address search', 'Add layer list', 'Add measure tool' and 'Add scale bar'.
28. Check the radio button of 'leaflet' and select 'OSM Standard' to choose open street map as base layer.
29. Click on 'Update Preview' to preview the output web map and click on 'Export' to export the map as web map.
30. Once you click on 'Export', the plugin directs you to the default browser with the display of web map.



31. You can zoom to particular location on map to have a look of piscine distribution, for example zoom to the 'Upper Katraj Lake'. You can use search box to accomplish the task. Type 'Katraj' and hit 'Enter' button and zoom in to appropriate extent using scroll wheel of your mouse.



32. When you hover over any fish feature symbol (a one click on a feature), a window will popup showing all the attributes related to that fish species.



By the end this tutorial you must be in a position to plot the raw data collected by yourself using GPS or from secondary sources in GIS environment and make meaningful maps out of it. Also you should be in a position to share your data as a web map.