Evolution of the Earth and Life
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Lecture 27
Introduction to PaleoDB

Most paleontologist labs and museum hosts a humungous collection of rocks, fossils, and minerals. When scientists study these fossil records, they publish it. Paleo-biology database is a website, which is a catalogue of all these published fossil records, where you will find these across time and across space.

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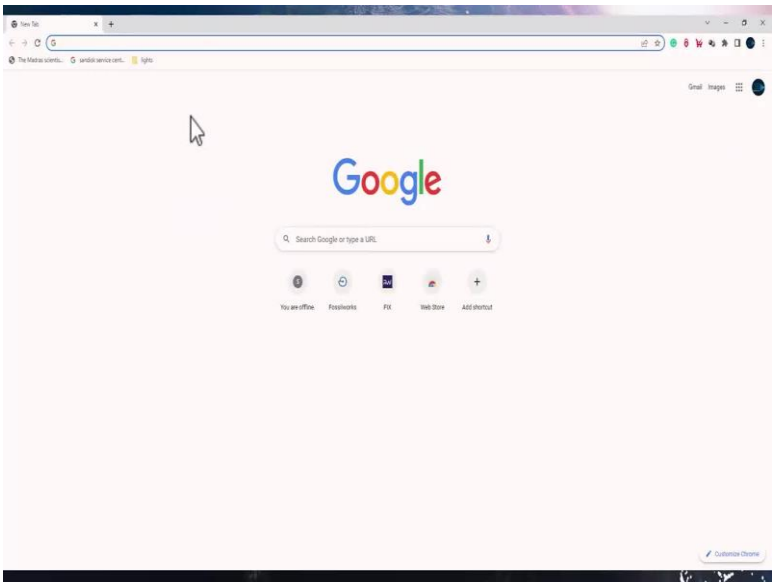
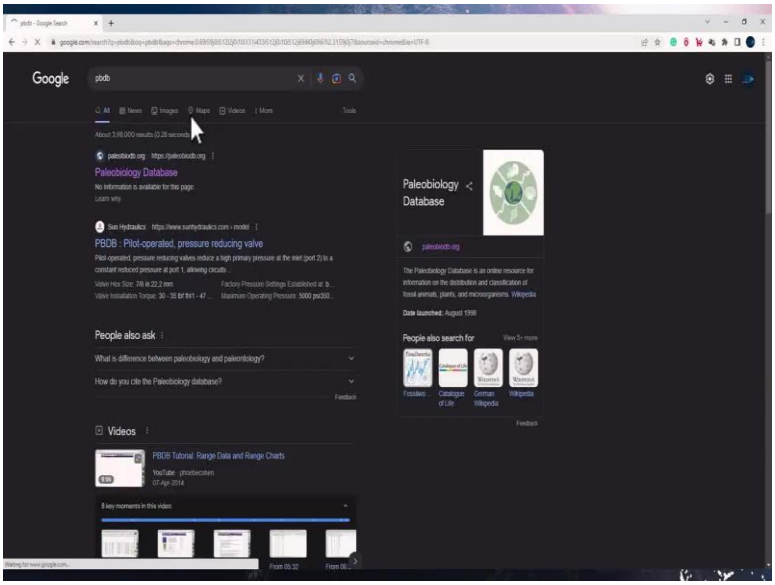
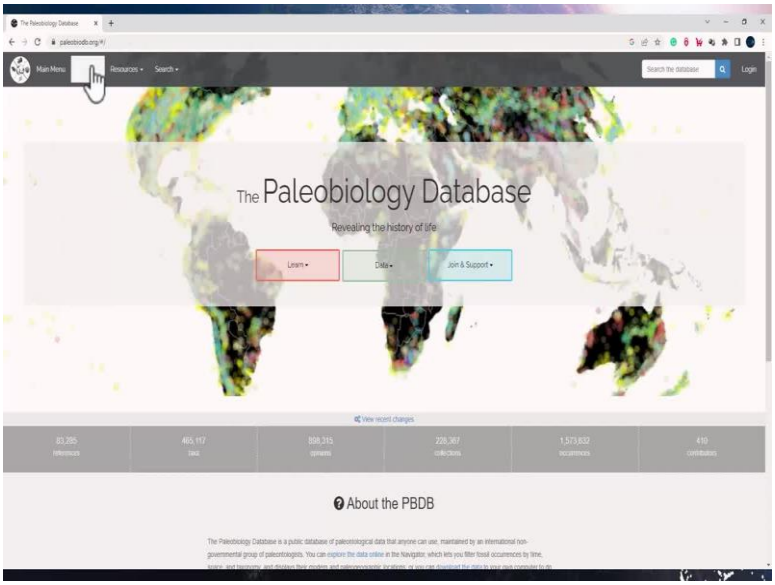
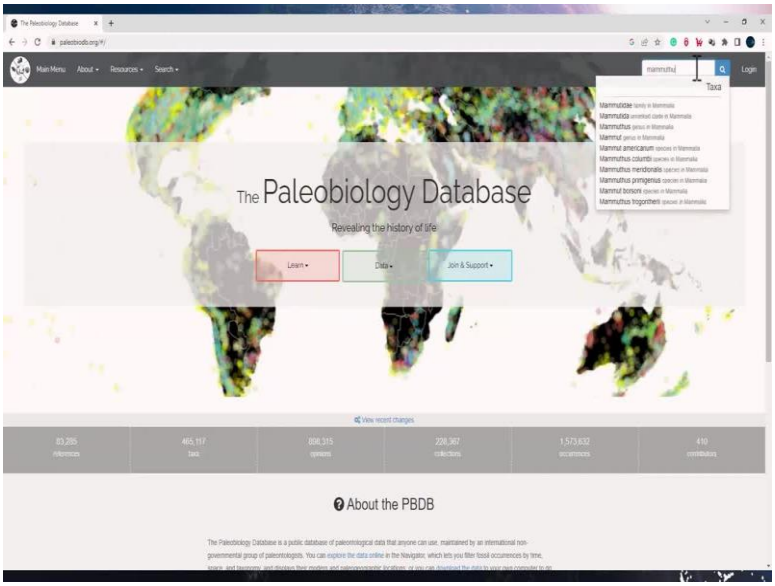





Main Menu
Resources
Search
Login
The Paleobiology Database
Revealing the history of life
Learn
Data
Join & Support
About the PBDB


Main Menu
About
Resources
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Login
Taxa
The Paleobiology Database
Revealing the history of life
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Data
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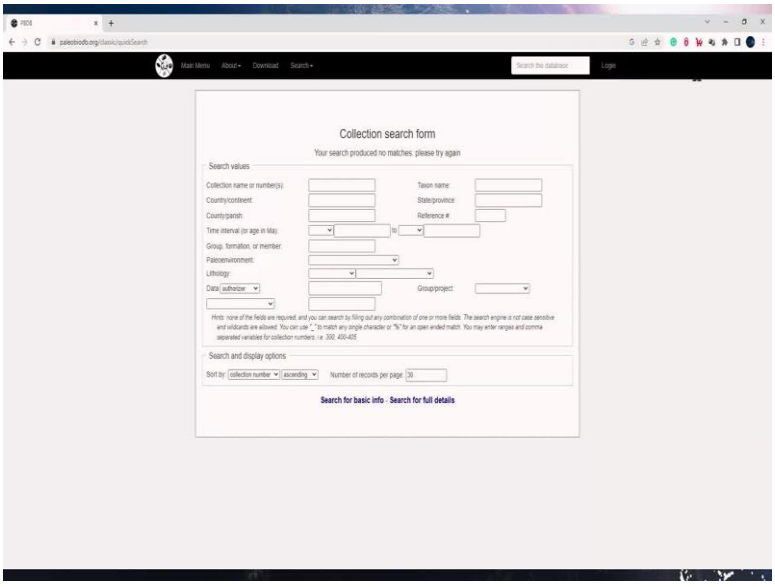
About the PBDB


Main Menu
About
Download
Search
Login
Collection search form
Your search produced no matches: please try again
Search values
Search and display options
Search for basic info
Search for full details

So, let us explore the app and see the features in it. You can find the website by just searching PB-DB. And the first link would take you there, or you can just type paleobiodb.org. You will see this graphical interface where you have these three options and you can see that this database is constantly updated.

Whatever recent changes are made to the database are usually displayed on the home page, you can see the number of references which are used for this database, the tags which are recorded, and the collection and occurrences and the number of contributors who have made this database. To search things here, you can directly search it over here and say you want to search or tags on monitors and click enter.

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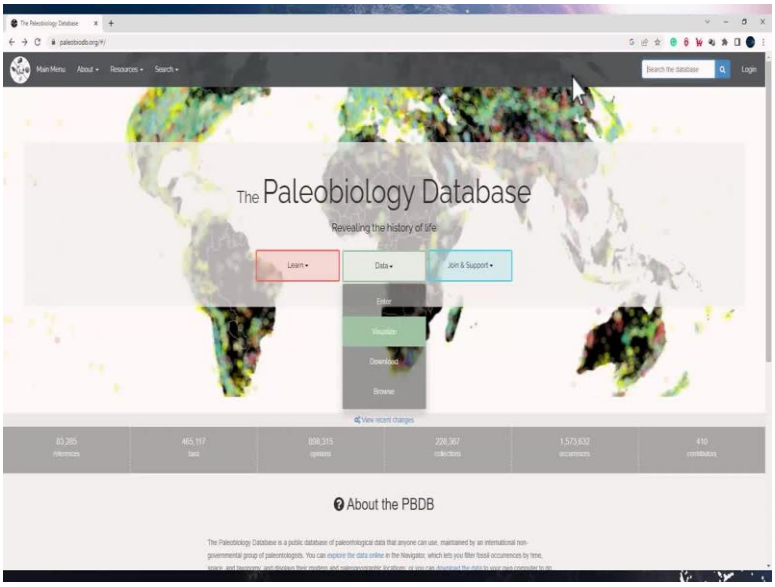
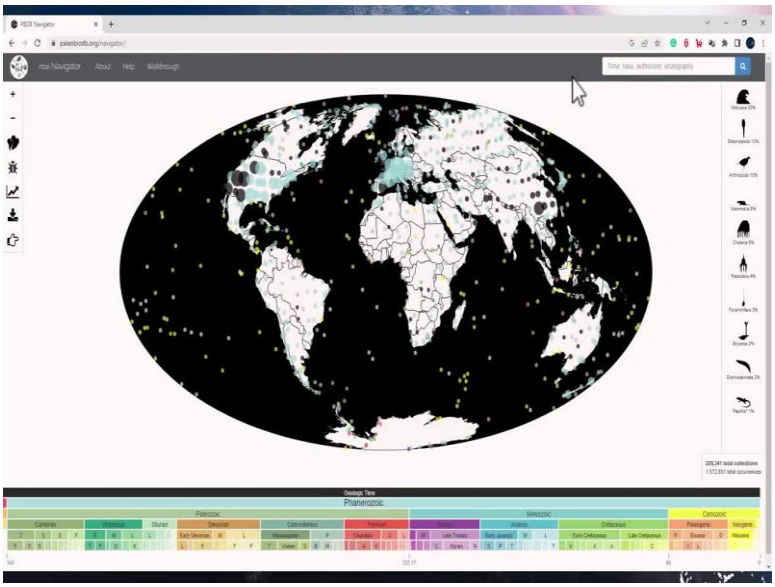
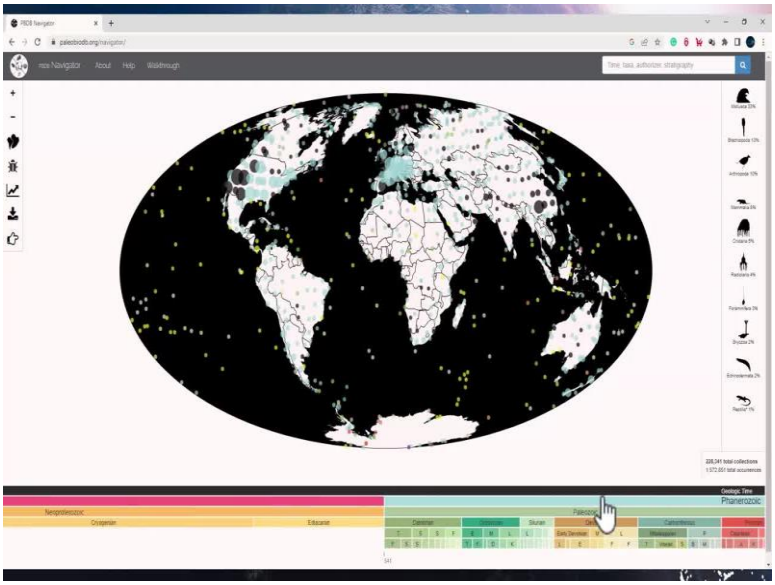
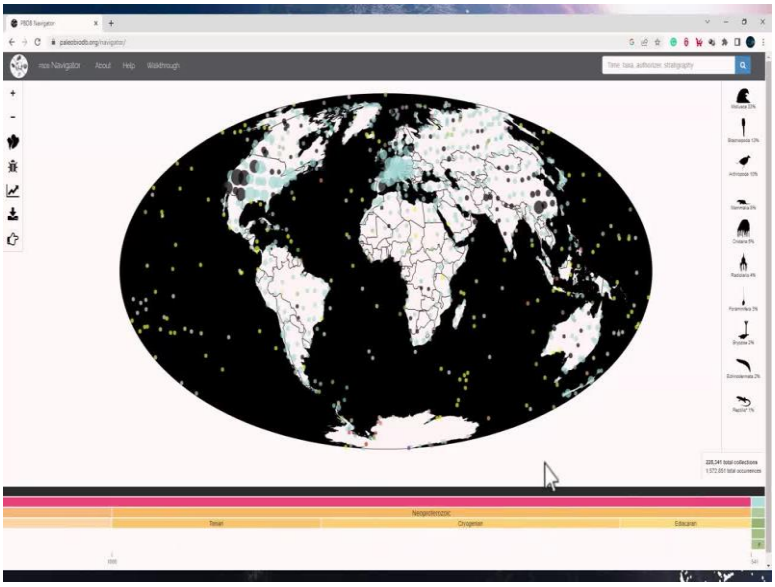
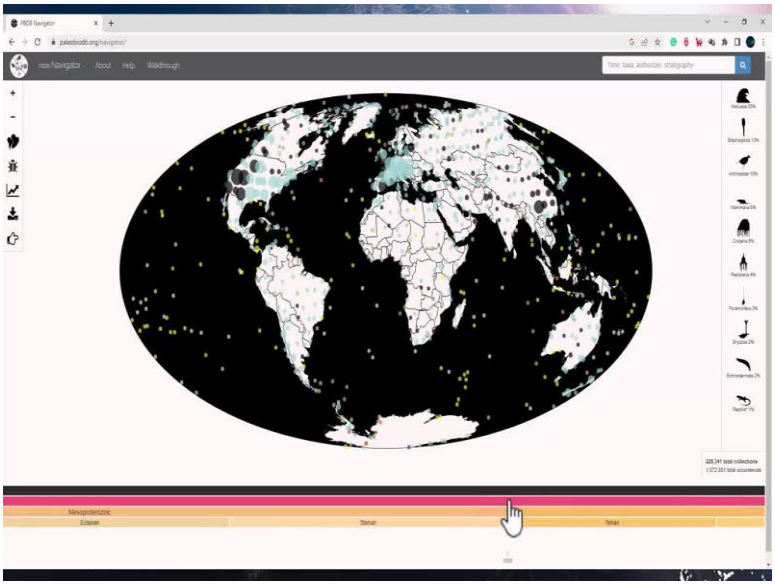
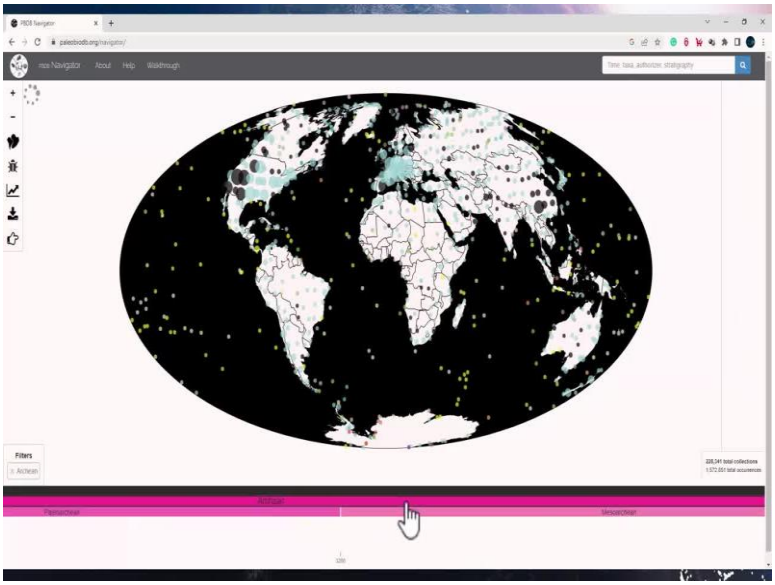





Phanerozoic
Neoproterozoic
Cryogenian
Ediacaran


Neoproterozoic
Tonian
Cryogenian
Ediacaran


Neoproterozoic
Ediacaran
Stenian
Tonian



So, to explore this navigator, you can go to data and click on visualize you could see that the map has appeared and there are a lot of interactive tools on the left and at the bottom. At the bottom, you could see that it is all color-coded geological timescale. Over the map, you can see all the citations of fossils in various location of Earth.

Now, if you look at the bottom panel, you would see the geological timescale. Using your cursor, you can move this and go to different age. If you go really back in time, say in the archaean and you click on it, you will see the same color code for any fossil occurrence of that time. And you could see for the archaean, which is way back in the geological timescale, there are barely any fossil records.

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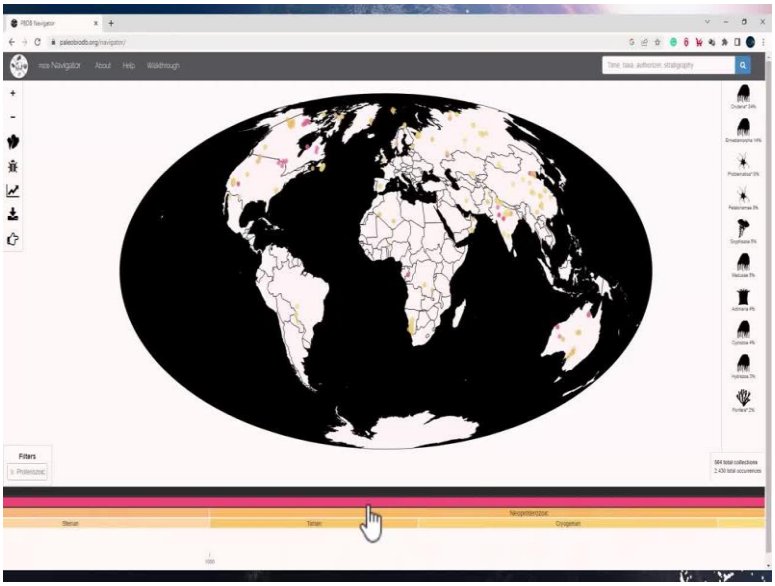

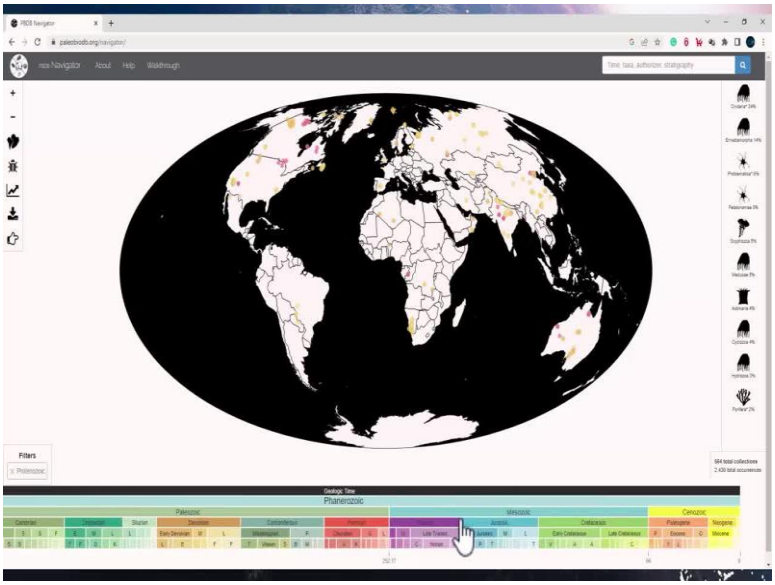

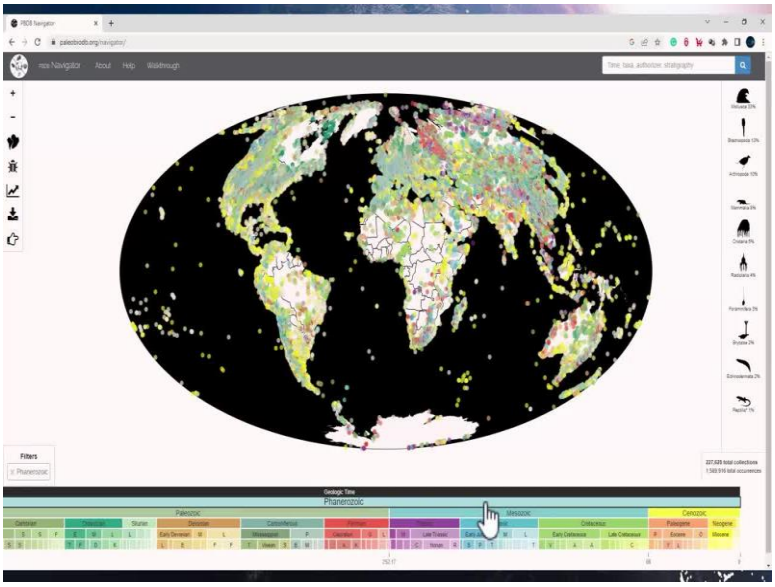

So, let us go to a more recent timeline. Let me click on Proterozoic and I can now see all the fossil records for the Proterozoic. When I am checking the fossil records for any of the ages, you will see on the right bottom corner, the number of collections and the occurrences for that time. And if I now click on Phanerozoic you will see the fossil records have increased tremendously. At the right bottom, the numbers are now 2,27,628 collections which have all these 15,69,916 total occurrences.

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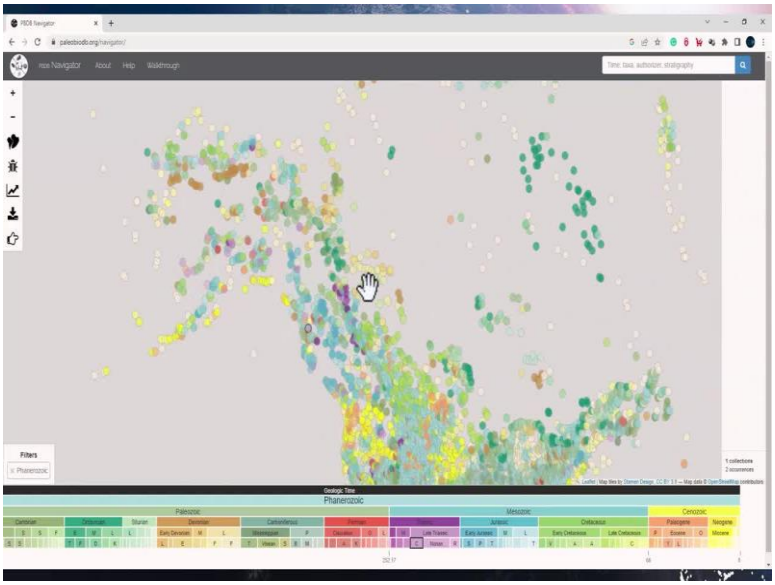
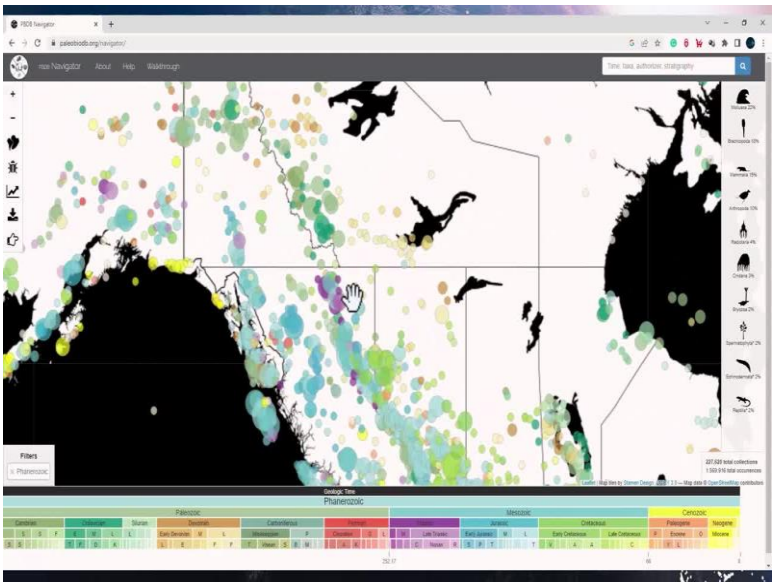
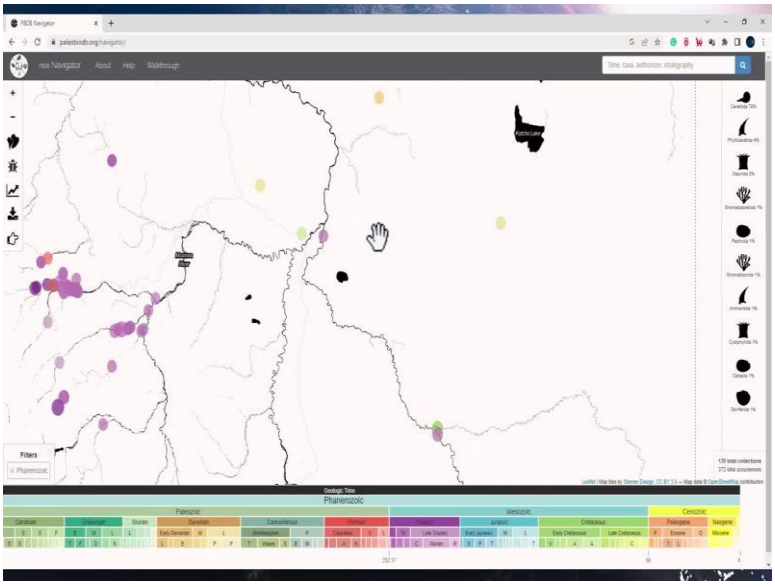
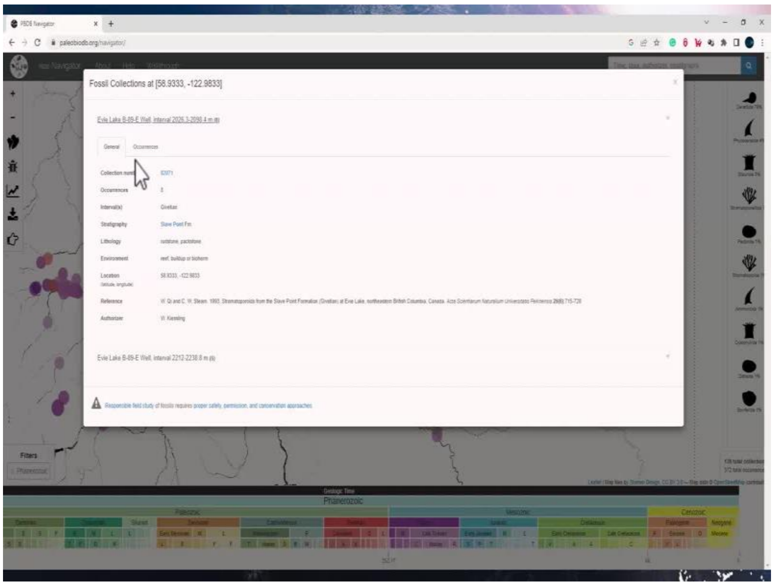
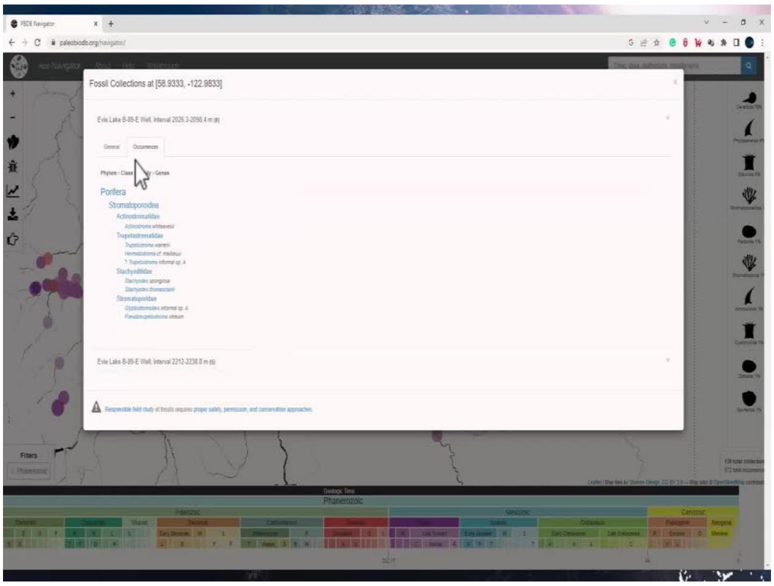
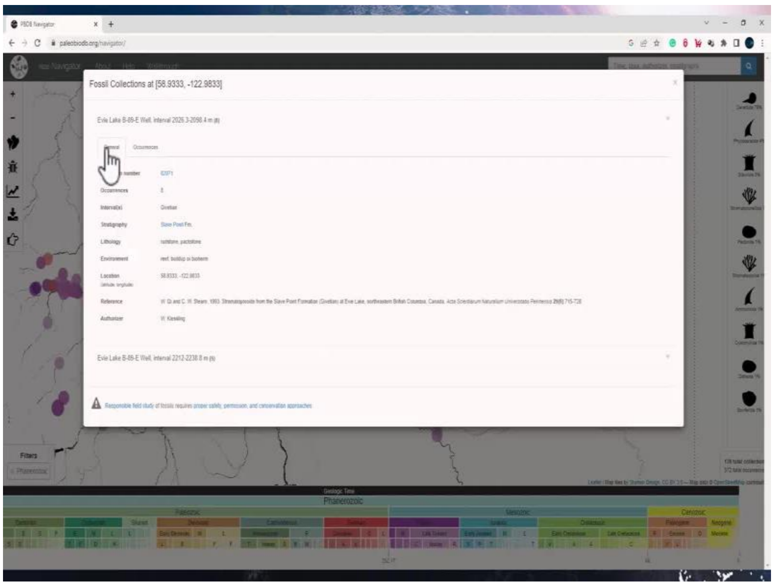







Fossil Collections at [56.9333, -122.9833]
Phanerozoic


Fossil Collections at [56.9333, -122.9833]
Porifera
Stromatoporoidea
Phanerozoic


Fossil Collections at [56.9333, -122.9833]
Phanerozoic

Since there are so many circles which are present on in any of these locations, they are all colored differently. And each color represents that time and each circles represent the age of the fossil. If I click on any of the circles, you would see that on the geological timescale it is also highlighted. So, if I go on this green circle over here, it is showing in the Cretaceous time. If I go here, it is from the Devonian, and this one is from the Triassic.

If I click or tap on any of the circles, it would give me more details of the collection number, the number of occurrences at that location, what is the time interval, and the stratigraphy in which this was found lithology, the environment for this occurrence and the details of the occurrences which includes the information of phylum, class, family genus, all for that fossil collection. In the General panel, you will also see the reference from which this data has been derived and the location in terms of latitude and longitude.

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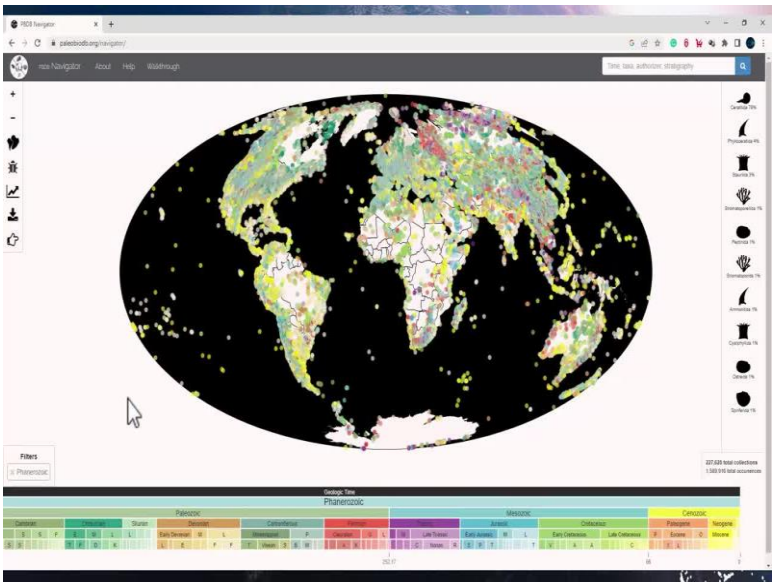
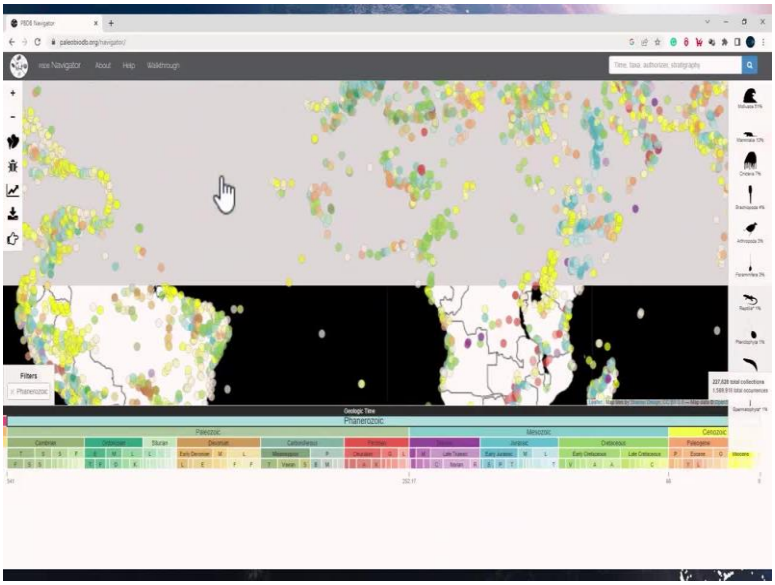
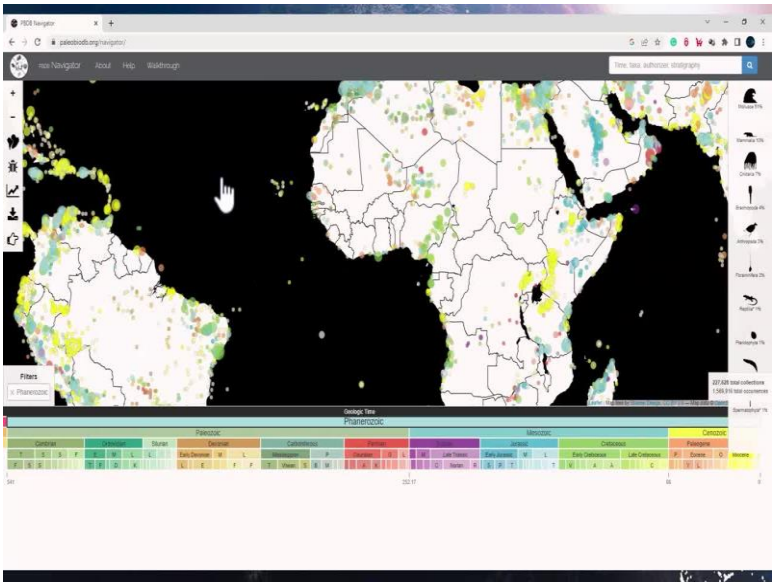
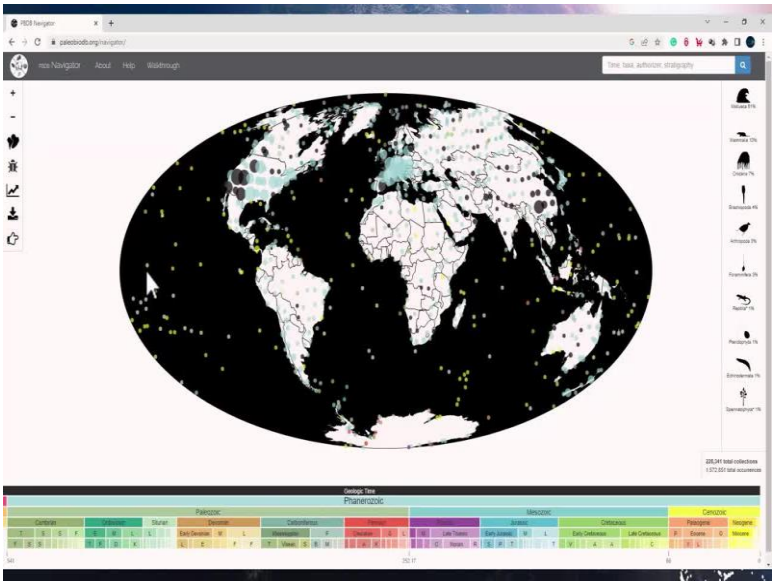


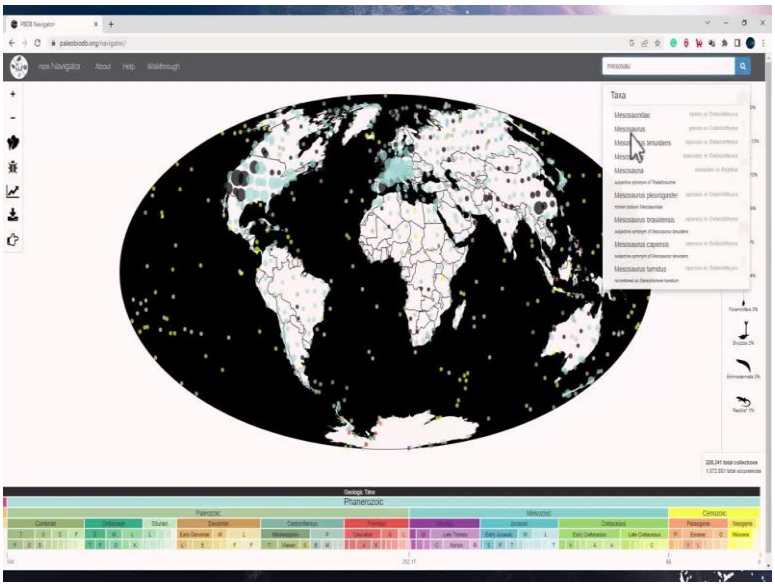

Geologic Time
Phanerozoic
Paleozoic
Mesozoic
Cenozoic

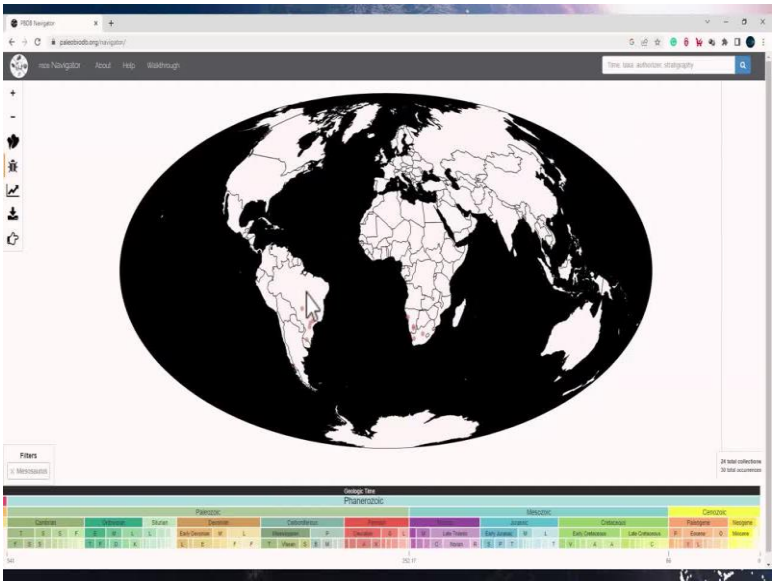

Geologic Time
Phanerozoic
Paleozoic
Mesozoic
Cenozoic


Geologic Time
Phanerozoic
Paleozoic
Mesozoic
Cenozoic

You must have noticed as we click on different geological timescale now Let us explore the tools which are present at the left top corner with the plus tool. So, the first so the first tool on the top is the plus and with that, you can zoom in on the map to see the fossil collections. And with this subtraction sign, you can zoom out of the screen. Since we are looking at all the fossil records in the Phanerozoic time, the filters at the left bottom corner show Phanerozoic. So, if I uncheck it and close it, it will reset it back to normal.

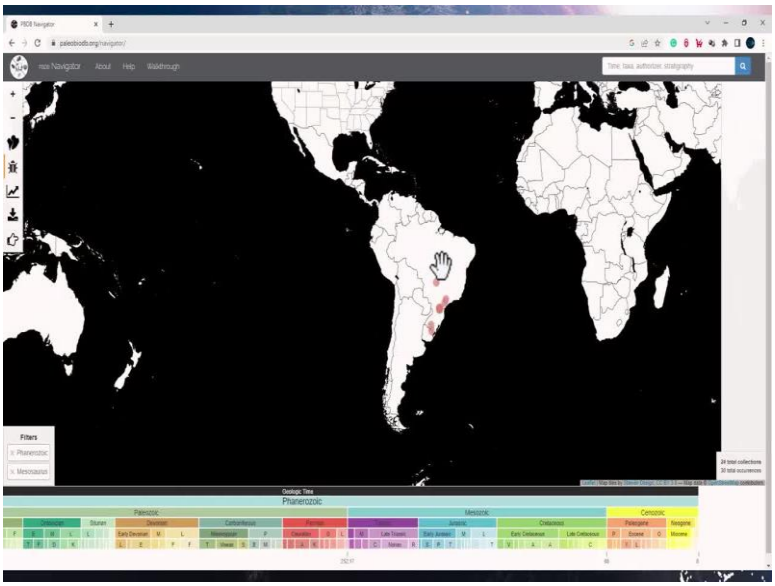
(Refer Slide Time: 05:46)

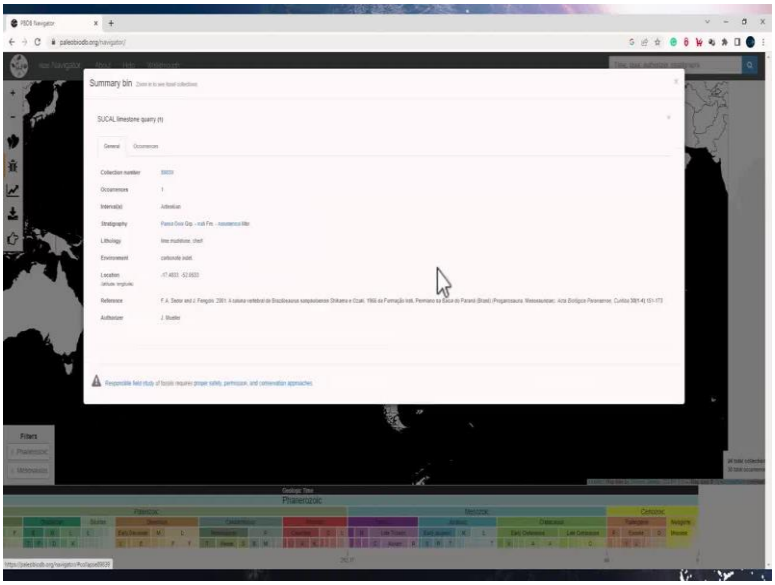


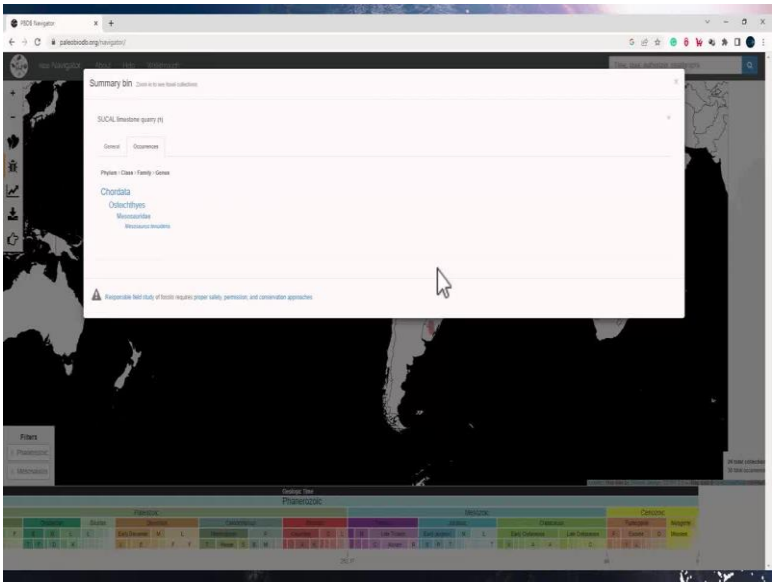


Now, let us try searching a specific tags on from the search panel which is available at the right top corner. If I type mesosaurus, it will show me the collection of mesosaurus and you can see all of these are from Permian. If I try to search for the same in Proterozoic there are no occurrences of it. So, the fossil record for all of this are specifically from the Phanerozoic time and most from Permian or all are from Permian.

(Refer Slide Time: 06:28)

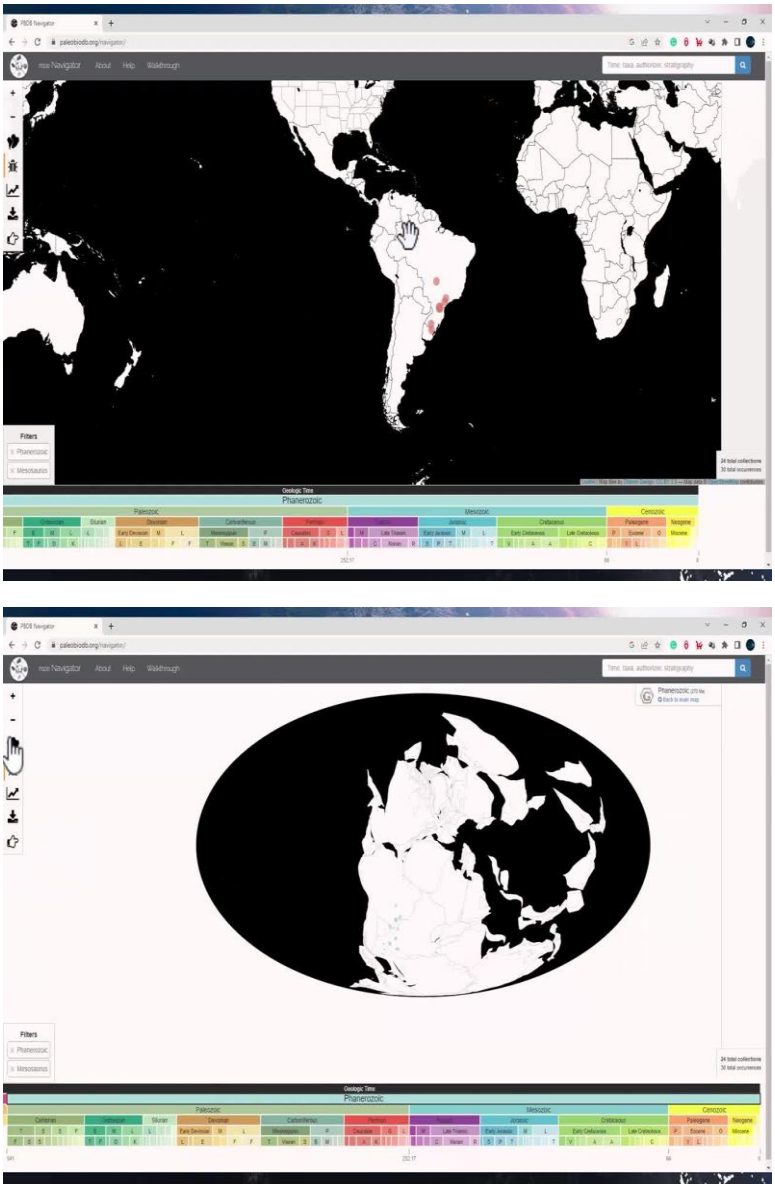






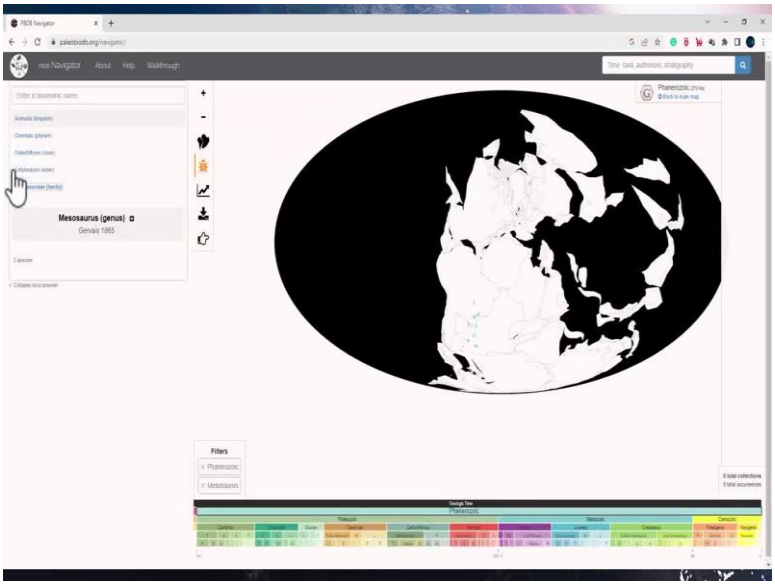
Now, let me try clicking on any of these circles. I can see that this is been found the collection is from sucal limestone quarry and this is the collection code for it. It was found in limestone, mud stone churt, and the environment is carbonate, the latitude and longitude for this location, and the reference paper. I can also check the occurrences in the occurrences I can check that this is a genus. It is from the phylum Chordata class osteichthyes, family Mesosauridae and genus mesosaurus.

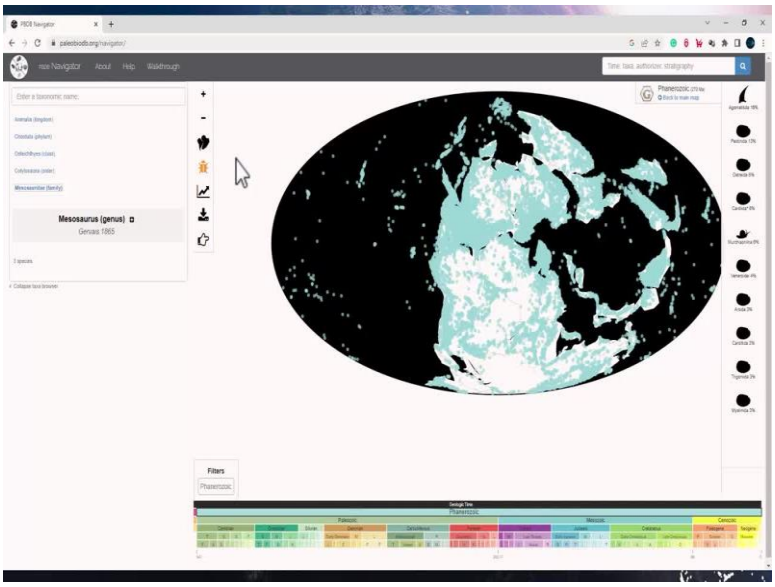
(Refer Slide Time: 07:10)



Now, these fossils are present in the current map and on these geological spaces. In order to see how the map looked like for Permian, you can use the third tool which is present on the top panel. And if you click on it, it will show you the geological map, which is why this catalogue is so useful because you can see them across the stratigraphy and also across geographic location. So, with the stratigraphy, you can see the occurrence in time and with the geographic information, you can see its occurrence in space.

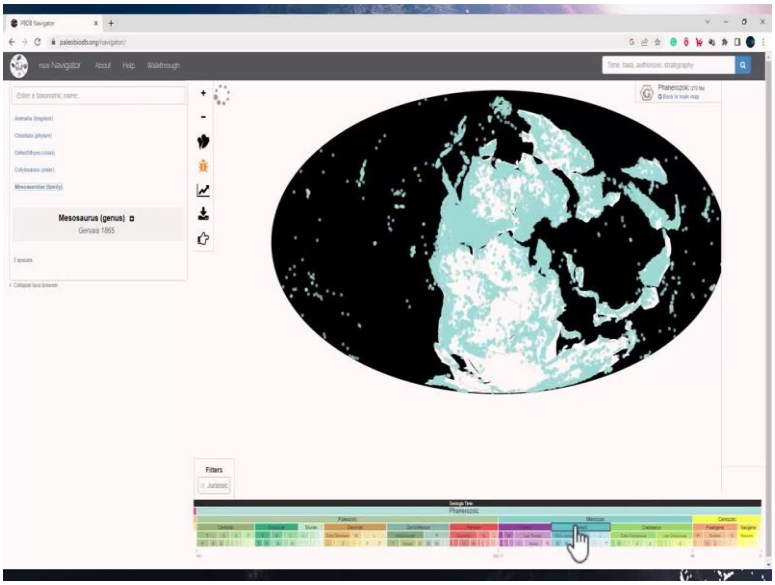
(Refer Slide Time: 07:47)

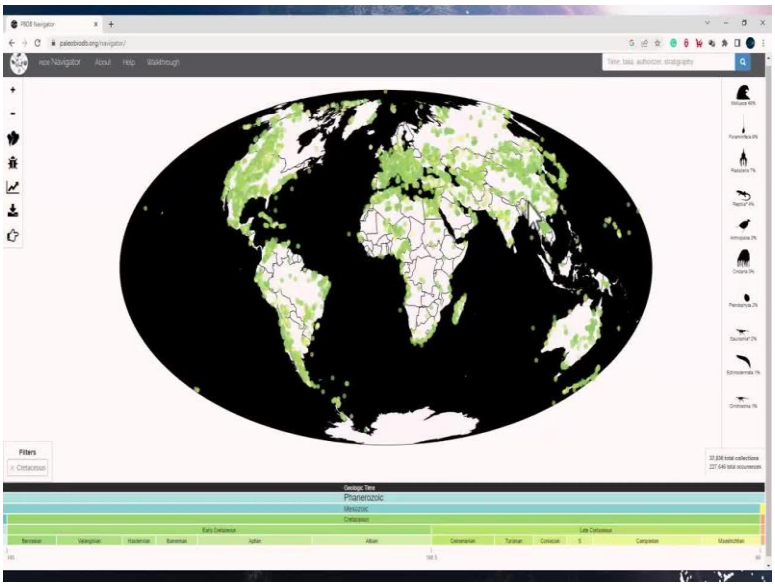


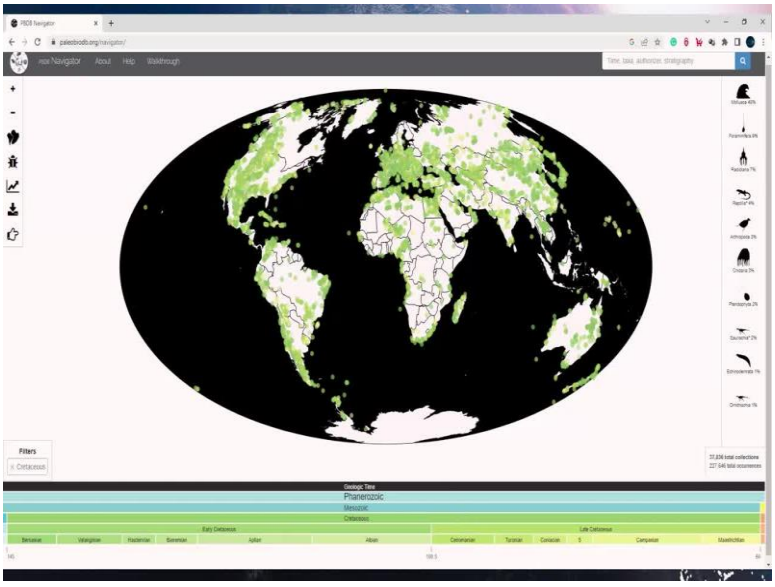


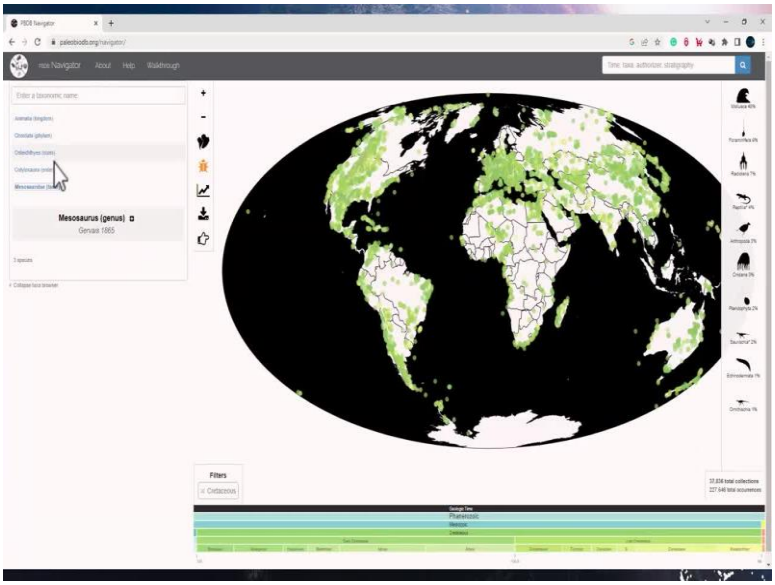
The fourth tool, which is the toggle taxons a browser, if you click on it, you will see the various taxon, which are. If you click on the fourth tool, which is the toggle tags on browser, you will see the taxon on information for the same. So, let me uncheck the mesosaurus option and just go to Phanerozoic. So, for the Phanerozoic, you can see all the taxon's which are here, you can also type the taxonomic name over here and search for something for this time.

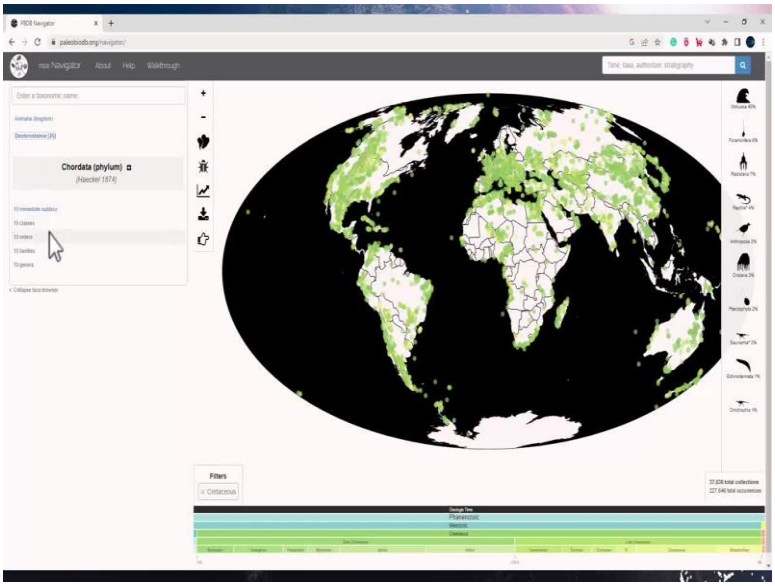
(Refer Slide Time: 08:19)





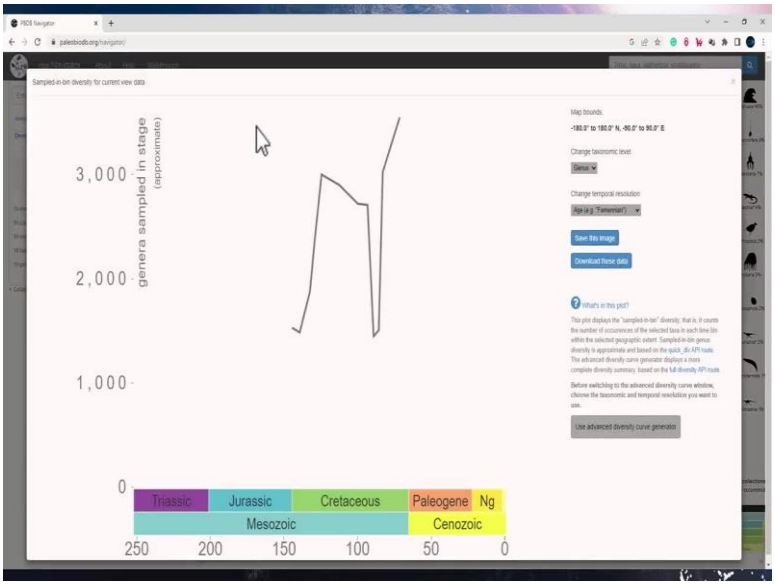


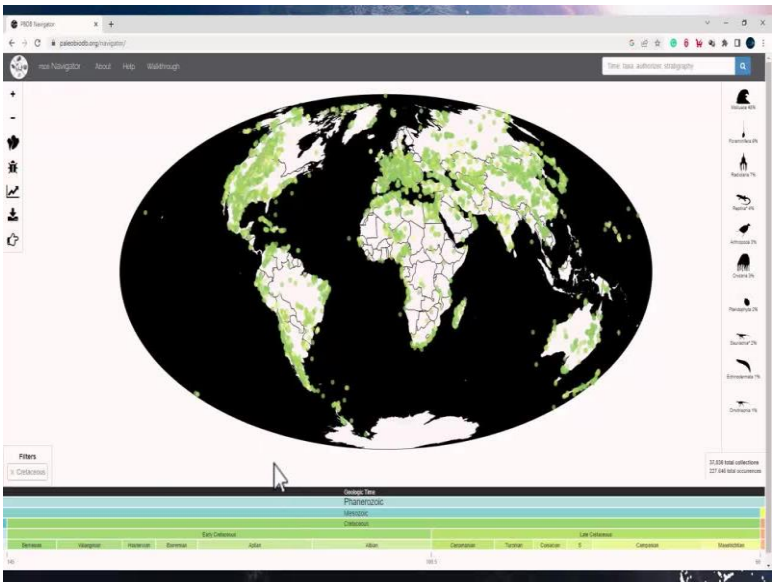


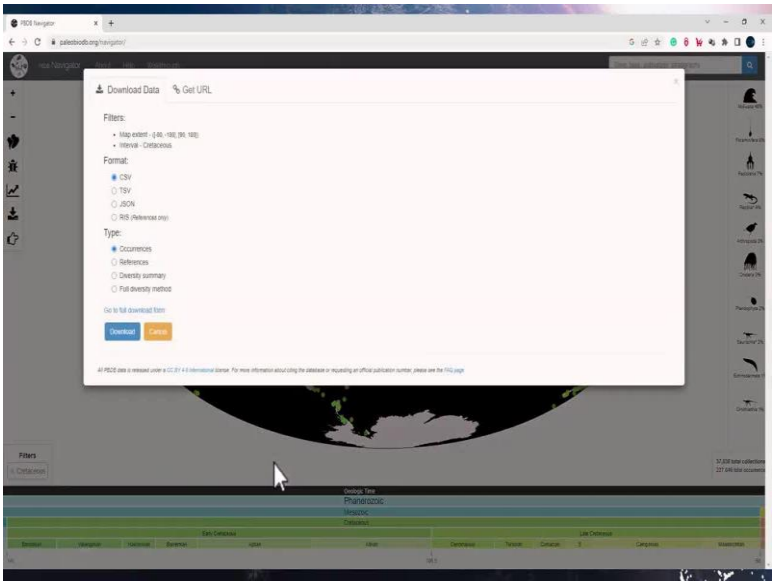


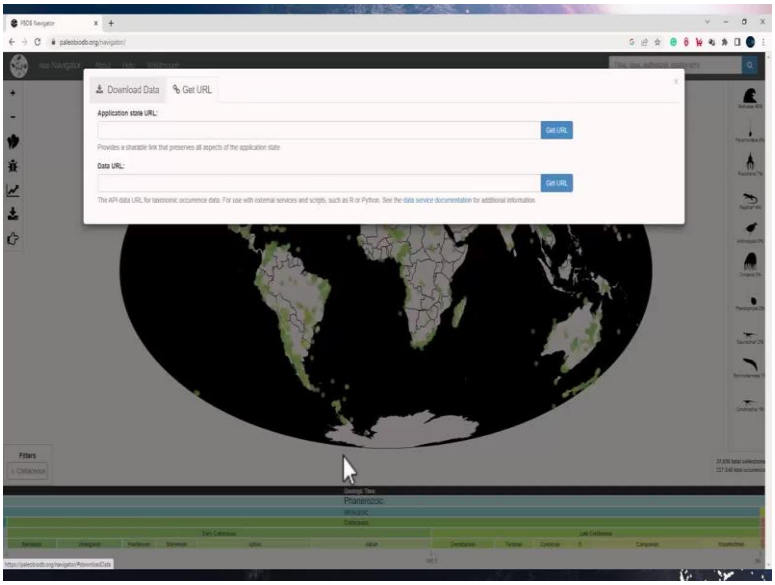
If I check in Jurassic by clicking on it, and I am close the browser, I can now see the fossil records in Jurassic or cretaceous. So, go to the main map and now check for Cretaceous. And see all the fossil records for Cretaceous. If I go on to the toggle taxon browser, I would have the information for all of this. And so, if I click on any of that, I can see all the classes, orders and families within that taxon.

(Refer Slide Time: 09:03)



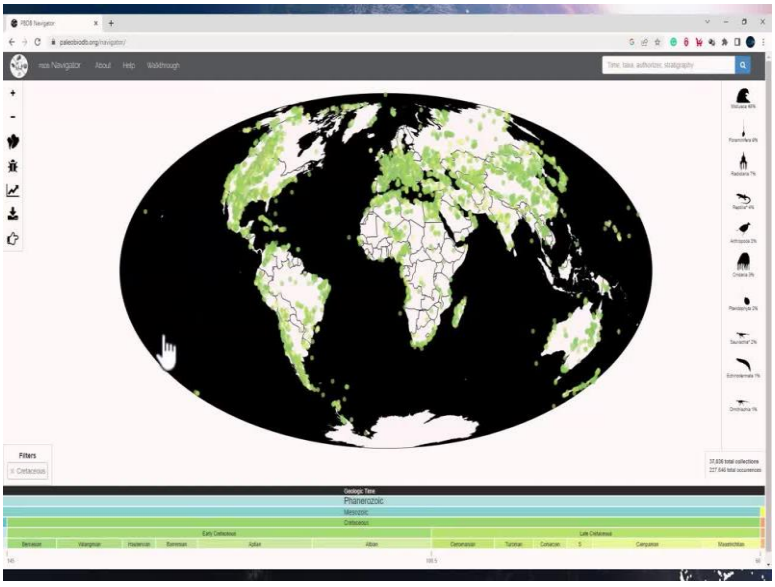


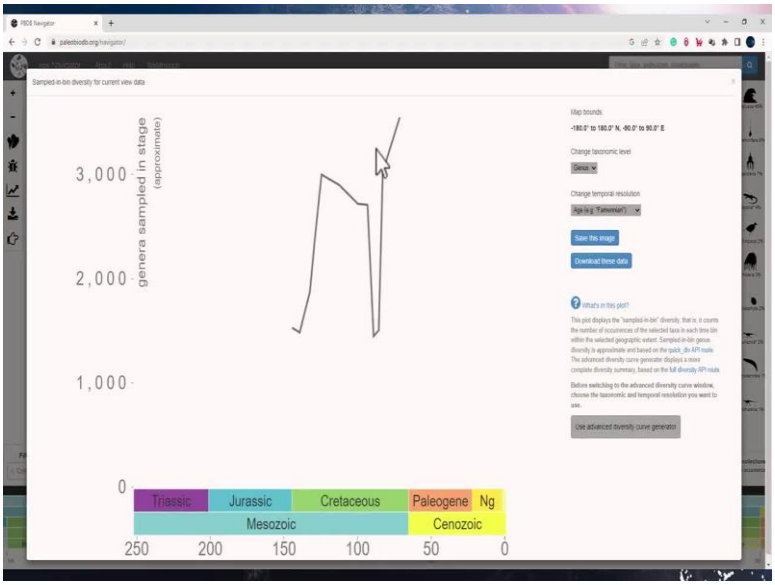


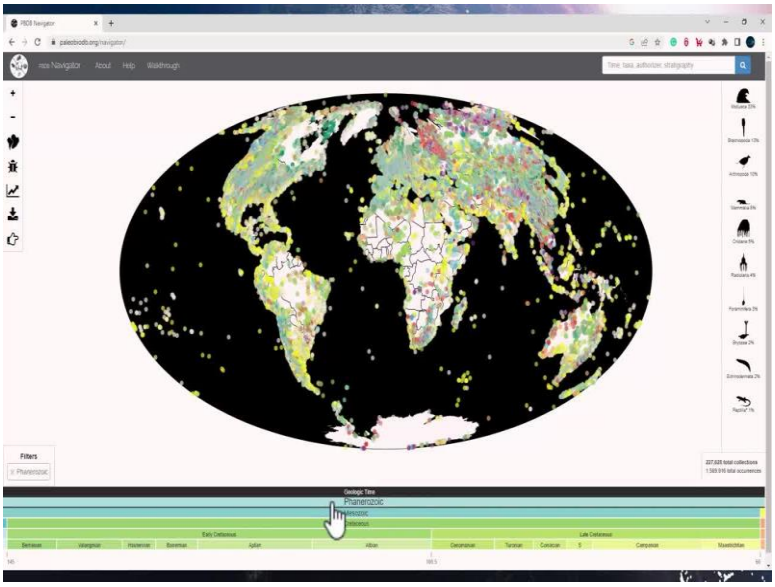


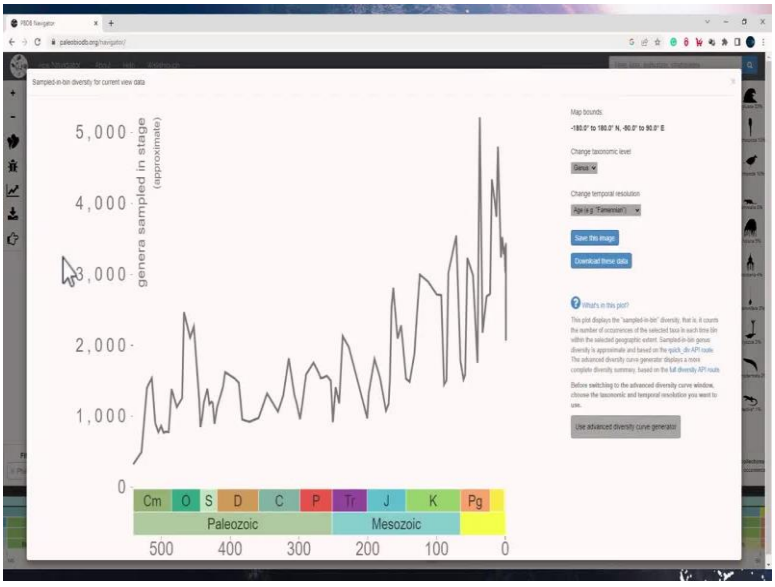
So, for the same time, you can also check the diversity graph of it, which would be here. So, for Cretaceous, I can also take a screenshot of this map and download this data by using this download tool, which is the last second tool from the top. I can also get a link for it or I can download the references the diversity summary or full diversity method along with it.

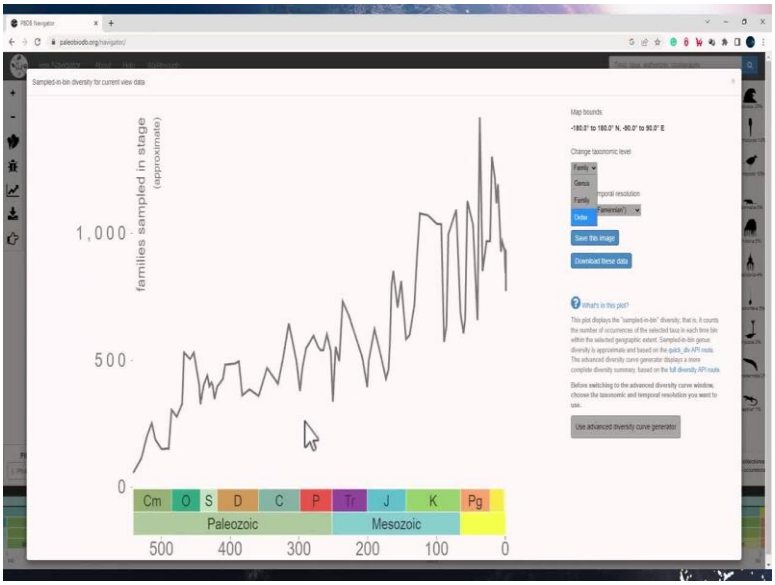
(Refer Slide Time: 09:34)




Sampled-in-bin diversity for current view data
genera sampled in stage (approximate)
3,000
2,000
1,000
0
Triassic
Jurassic
Cretaceous
Paleogene
Ng
Mesozoic
Cenozoic
250
200
150
100
50
0
Map bounds:
-180.0° to 180.0° N, -90.0° to 90.0° E
Change taxonomic level:
Genus
Change temporal resolution:
Save this image
Download these data
What's in this plot?
Use advanced diversity curve generator

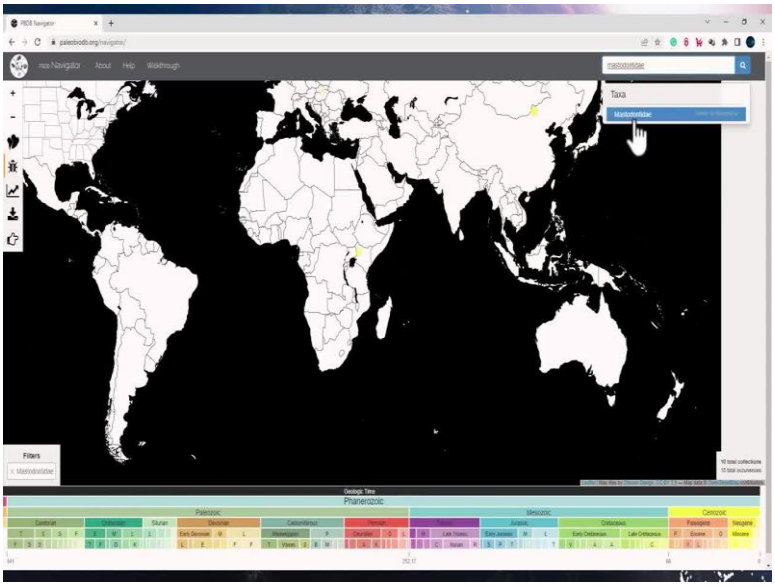

Filters
Phanerozoic
Geologic Time
Phanerozoic
Paleozoic
Mesozoic
Cenozoic

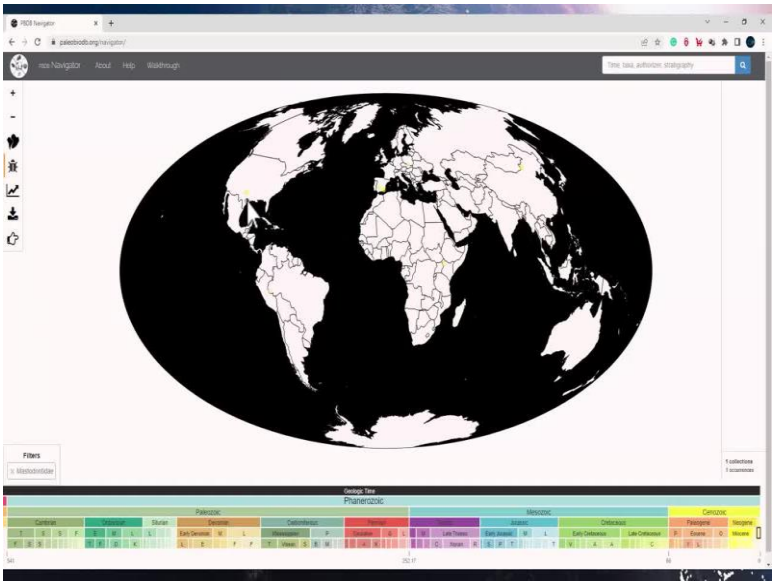

Sampled-in-bin diversity for current view data
genera sampled in stage (approximate)
5,000
4,000
3,000
2,000
1,000
0
Cm
O
S
D
C
P
Tr
J
K
Pg
Paleozoic
Mesozoic
500
400
300
200
100
0
Map bounds:
-180.0° to 180.0° N, -90.0° to 90.0° E
Change taxonomic level:
Genus
Change temporal resolution:
Save this image
Download these data
What's in this plot?
Use advanced diversity curve generator

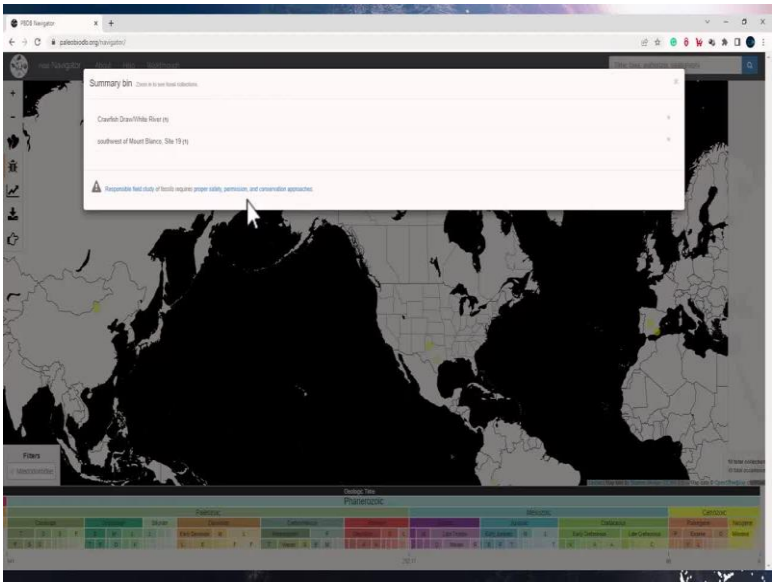


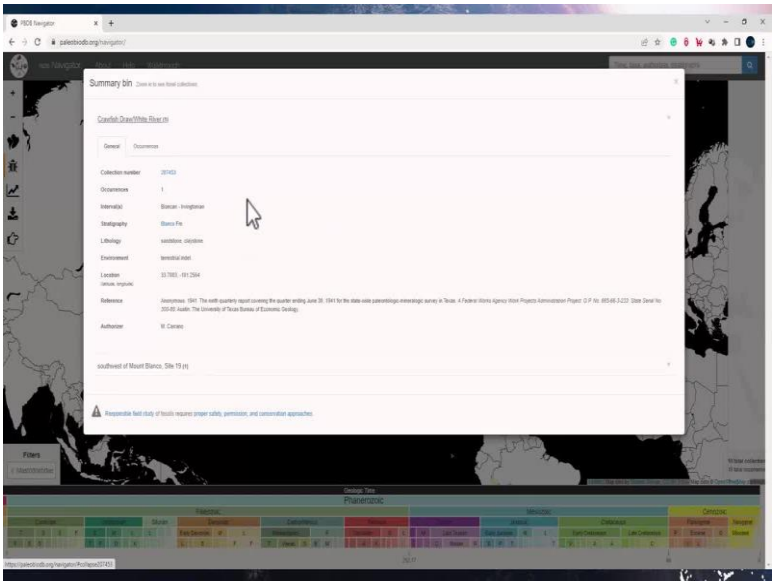
In order to see how the diversity has changed over time, you can use the next tool which is the diversity curve. If you click on it, you will see the diversity curve for Cretaceous. Let us look at a wider time range and make sense of the data which you get from diversity curve. So, I will click on Phanerozoic and now if I go to the diversity curve data, you will see that the x axis represents the geological time, the y axis shows the number of samples which are available. And you can see that the diversity has increased significantly across the time. You can also download this diversity curve by clicking here or you can save this image. You can view this information for the genus, different families or the orders.

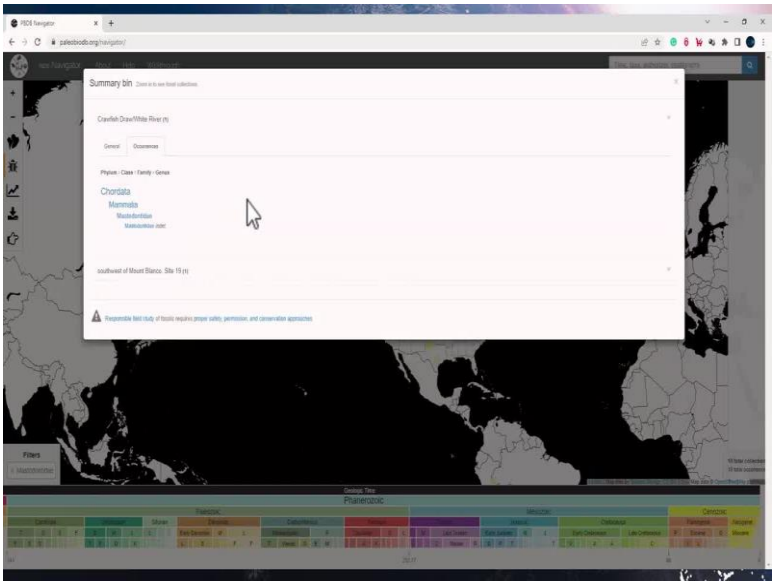
(Refer Slide Time: 10:31)

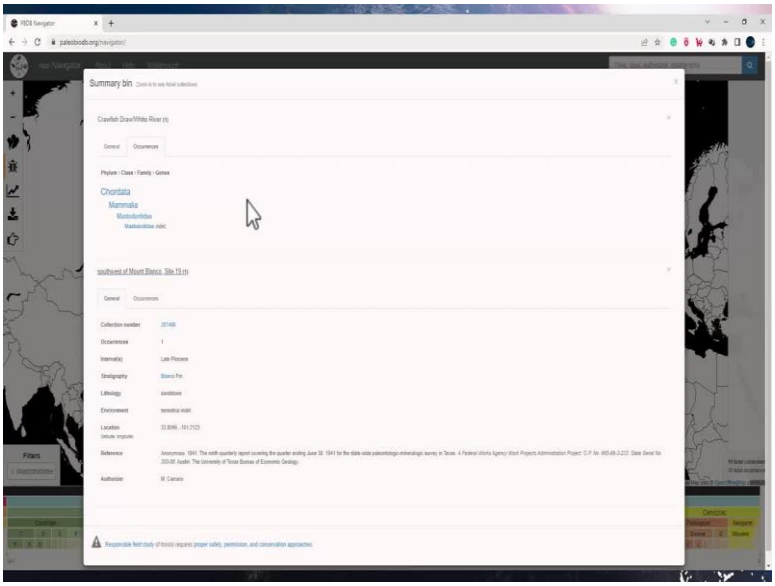


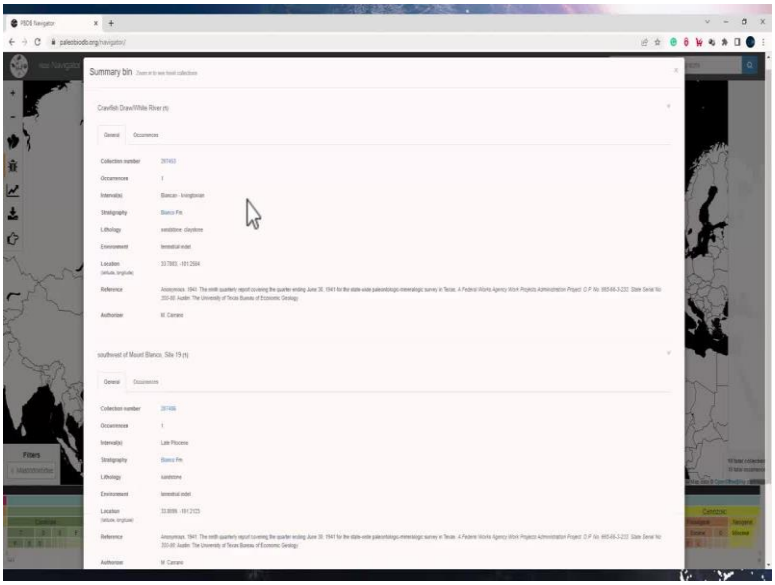

Navigator
About
Help
Walkthrough
Filters
Geologic Time
Phanerozoic
Paleozoic
Mesozoic
Cenozoic

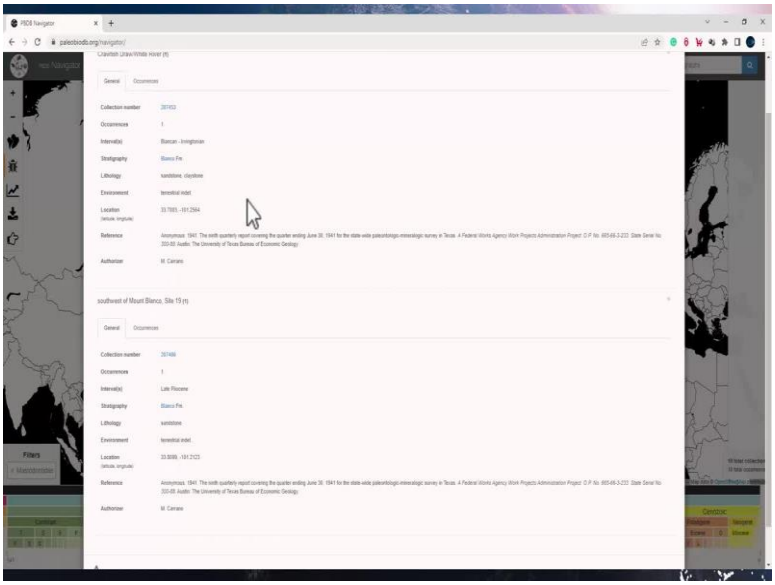

Summary bin
Crawfish Draw/White River (1)
southwest of Mount Blanco, Site 19 (1)
Filters
Geologic Time
Phanerozoic


Summary bin
Crawfish Draw/White River (1)
General
Occurrences
Collection number
Occurrence
Interval(s)
Stratigraphy
Lithology
Environment
Location
Reference
Authorizer
southwest of Mount Blanco, Site 19 (1)
Filters
Geologic Time
Phanerozoic


Summary bin
Crawfish Draw/White River (1)
General
Occurrences
Phylum › Class › Family › Genus
Chordata
Mammalia
Mastodontidae
Mastodontidae indet.
southwest of Mount Blanco, Site 19 (1)
Responsible field study of fossils requires proper safety, permission, and conservation approaches
Filters
Geologic Time
Phanerozoic


Summary bin
Crawfish Draw/White River (1)
General
Occurrences
Phylum › Class › Family › Genus
Chordata
Mammalia
Mastodontidae
Mastodontidae indet.
southwest of Mount Blanco, Site 19 (1)
General
Occurrences
Collection number
Occurrences
Interval(s)
Late Pliocene
Stratigraphy
Blanco Fm.
Lithology
sandstone
Environment
terrestrial indet.
Location
Reference
Authorizer
M. Carrano
Responsible field study of fossils requires proper safety, permission, and conservation approaches
Filters

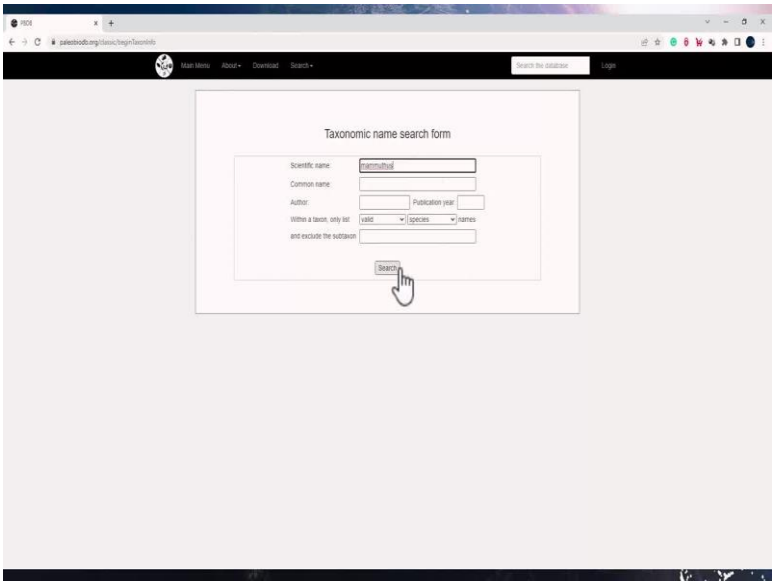

Summary bin
Crawfish Draw/White River (1)
General
Occurrences
Collection number
Occurrences
Interval(s)
Blancan - Irvingtonian
Stratigraphy
Blanco Fm.
Lithology
sandstone, claystone
Environment
terrestrial indet.
Location
Reference
Authorizer
M. Carrano
southwest of Mount Blanco, Site 19 (1)
General
Occurrences
Collection number
Occurrences
Interval(s)
Late Pliocene
Stratigraphy
Blanco Fm.
Lithology
sandstone
Environment
terrestrial indet.
Location
Reference
Authorizer
M. Carrano
Filters

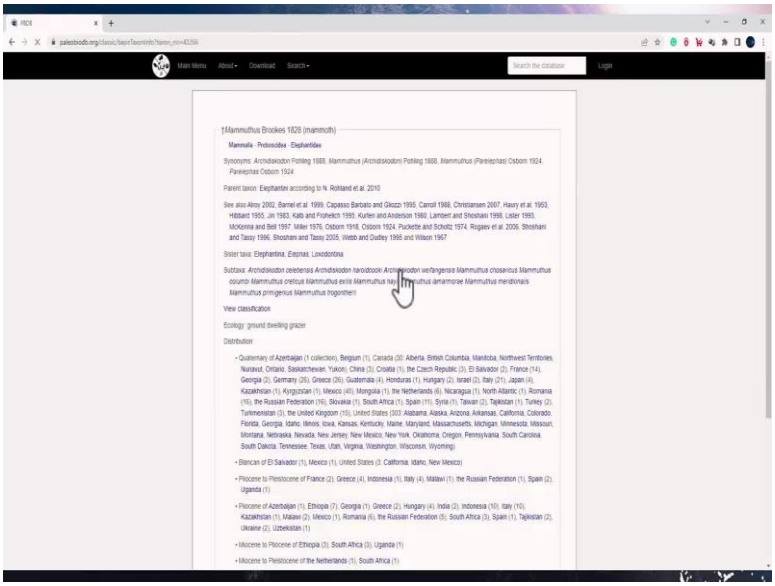


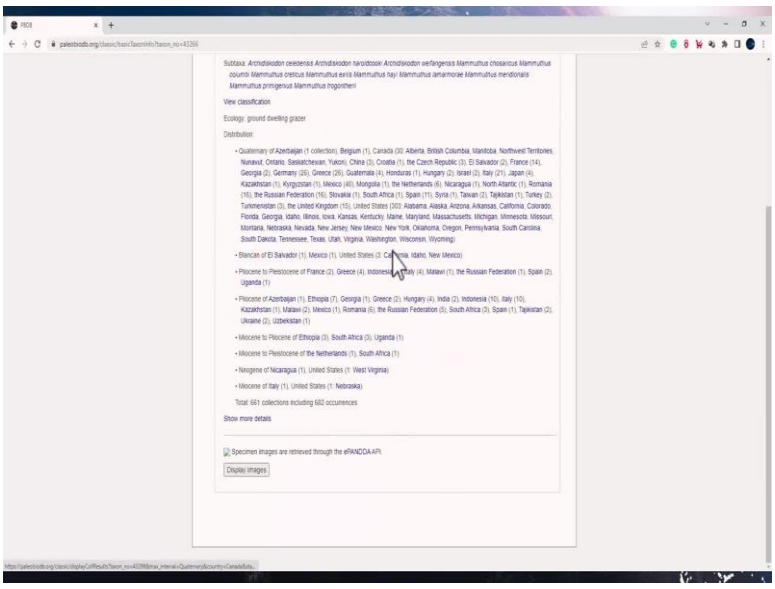
And you can do similar search for any other taxon too. So, let me search another one mastodontidae and look for its fossil occurrences. We can find it in all of them and Cenozoic. And if I click on any one of them I can check that there are two collections, this one it is number, there is one occurrence of it and is present in sandstone-claystone lithology and environment is terrestrial.

Similarly, I can go back to the other collection and southwest of Mount Blanco, and this has a different collection number and this is present in sandstone lithology also interstitial environment. I can also compare these two collections parallelly and check for the references which have cited these.

(Refer Slide Time: 11:45)

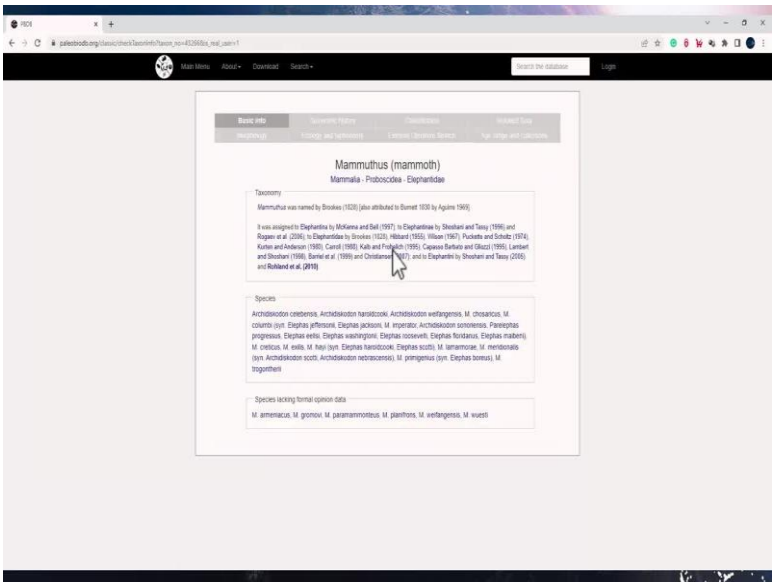

Taxonomic name search form
Scientific name:
mammuthus
Common name:
Author:
Publication year:
Within a taxon, only list
valid
species
names
and exclude the subtaxon
Search

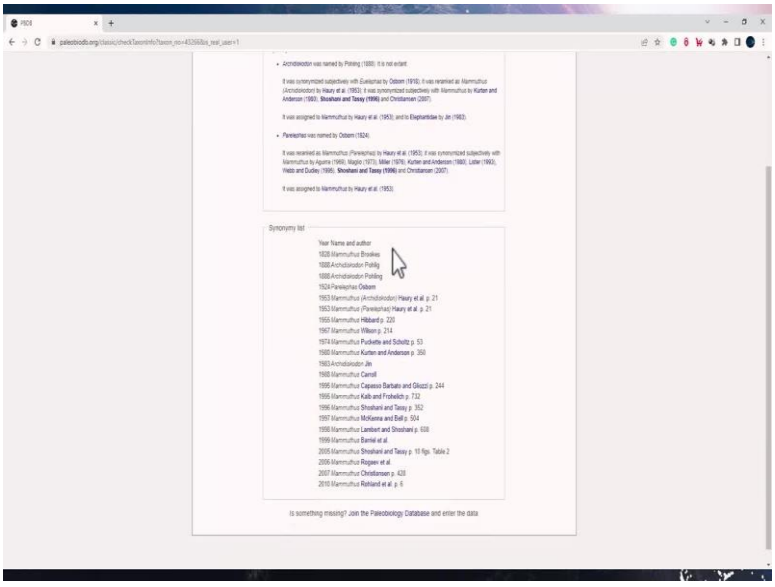

1 Mammuthus Brookes 1828 (mammoth)
Mammalia - Proboscidea - Elephantidae
Synonyms: Archidskodon Pohlig 1888, Mammuthus (Archidskodon) Pohlig 1888, Mammuthus (Pareiselphas) Osborn 1924, Pareiselphas Osborn 1924
Parent taxon: Elephantini according to N. Rohland et al. 2010
See also Alroy 2002, Barnel et al. 1999, Capasso Barbato and Gliozzi 1995, Carroll 1988, Christiansen 2007, Haury et al. 1993, Hibbard 1955, Jin 1983, Kalb and Frohlich 1985, Kurten and Anderson 1980, Lambert and Shoshani 1998, Lister 1993, McKenna and Bell 1997, Miller 1976, Osborn 1918, Osborn 1924, Puckette and Scholtz 1974, Rogaev et al. 2006, Shoshani and Tassy 1996, Shoshani and Tassy 2005, Webb and Dudley 1956 and Wilson 1967
Sister taxa: Elephantina, Elephas, Loxodontina
Subtaxa: Archidskodon celebensis Archidskodon haroldcooki Archidskodon wetjangensis Mammuthus chosaricus Mammuthus columbi Mammuthus creticus Mammuthus exilis Mammuthus hayi Mammuthus jamarmorae Mammuthus meridionalis Mammuthus primigenius Mammuthus trogontherii
View classification
Ecology: ground dwelling grazer
Distribution:
• Quaternary of Azerbaijan (1 collection), Belgium (1), Canada (30: Alberta, British Columbia, Manitoba, Northwest Territories, Nunavut, Ontario, Saskatchewan, Yukon), China (3), Croatia (1), the Czech Republic (3), El Salvador (2), France (14), Georgia (2), Germany (26), Greece (36), Guatemala (4), Honduras (1), Hungary (2), Israel (2), Italy (21), Japan (4), Kazakhstan (1), Kyrgyzstan (1), Mexico (40), Mongolia (1), the Netherlands (6), Nicaragua (1), North Atlantic (1), Romania (16), the Russian Federation (16), Slovakia (1), South Africa (1), Spain (11), Syria (1), Taiwan (2), Tajikistan (1), Turkey (2), Turkmenistan (3), the United Kingdom (15), United States (303: Alabama, Alaska, Arizona, Arkansas, California, Colorado, Florida, Georgia, Idaho, Illinois, Iowa, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Montana, Nebraska, Nevada, New Jersey, New Mexico, New York, Oklahoma, Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Utah, Virginia, Washington, Wisconsin, Wyoming)
• Blancan of El Salvador (1), Mexico (1), United States (3: California, Idaho, New Mexico)
• Pliocene to Pleistocene of France (2), Greece (4), Indonesia (1), Italy (4), Malawi (1), the Russian Federation (1), Spain (2), Uganda (1)
• Pliocene of Azerbaijan (1), Ethiopia (7), Georgia (1), Greece (2), Hungary (4), India (2), Indonesia (10), Italy (10), Kazakhstan (1), Malawi (2), Mexico (1), Romania (6), the Russian Federation (5), South Africa (3), Spain (1), Tajikistan (2), Ukraine (2), Uzbekistan (1)
• Miocene to Pliocene of Ethiopia (3), South Africa (3), Uganda (1)
• Miocene to Pleistocene of the Netherlands (1), South Africa (1)

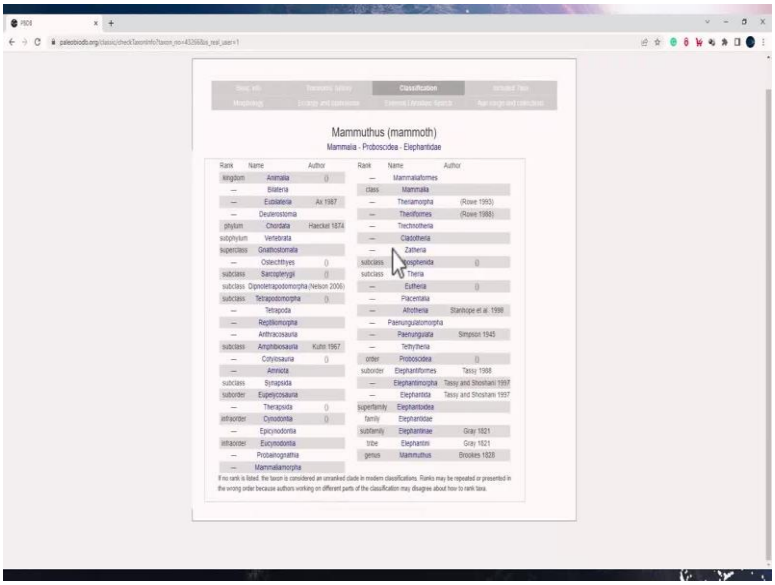

Subtaxa: Archidskodon celebensis Archidskodon haroldcooki Archidskodon wetjangensis Mammuthus chosaricus Mammuthus columbi Mammuthus creticus Mammuthus exilis Mammuthus hayi Mammuthus jamarmorae Mammuthus meridionalis Mammuthus primigenius Mammuthus trogontherii
View classification
Ecology: ground dwelling grazer
Distribution:
• Quaternary of Azerbaijan (1 collection), Belgium (1), Canada (30: Alberta, British Columbia, Manitoba, Northwest Territories, Nunavut, Ontario, Saskatchewan, Yukon), China (3), Croatia (1), the Czech Republic (3), El Salvador (2), France (14), Georgia (2), Germany (26), Greece (36), Guatemala (4), Honduras (1), Hungary (2), Israel (2), Italy (21), Japan (4), Kazakhstan (1), Kyrgyzstan (1), Mexico (40), Mongolia (1), the Netherlands (6), Nicaragua (1), North Atlantic (1), Romania (16), the Russian Federation (16), Slovakia (1), South Africa (1), Spain (11), Syria (1), Taiwan (2), Tajikistan (1), Turkey (2), Turkmenistan (3), the United Kingdom (15), United States (303: Alabama, Alaska, Arizona, Arkansas, California, Colorado, Florida, Georgia, Idaho, Illinois, Iowa, Kansas, Kentucky, Maine, Maryland, Massachusetts, Michigan, Minnesota, Missouri, Montana, Nebraska, Nevada, New Jersey, New Mexico, New York, Oklahoma, Oregon, Pennsylvania, South Carolina, South Dakota, Tennessee, Texas, Utah, Virginia, Washington, Wisconsin, Wyoming)
• Blancan of El Salvador (1), Mexico (1), United States (3: California, Idaho, New Mexico)
• Pliocene to Pleistocene of France (2), Greece (4), Indonesia (1), Italy (4), Malawi (1), the Russian Federation (1), Spain (2), Uganda (1)
• Pliocene of Azerbaijan (1), Ethiopia (7), Georgia (1), Greece (2), Hungary (4), India (2), Indonesia (10), Italy (10), Kazakhstan (1), Malawi (2), Mexico (1), Romania (6), the Russian Federation (5), South Africa (3), Spain (1), Tajikistan (2), Ukraine (2), Uzbekistan (1)
• Miocene to Pliocene of Ethiopia (3), South Africa (3), Uganda (1)
• Miocene to Pleistocene of the Netherlands (1), South Africa (1)
• Neogene of Nicaragua (1), United States (1: West Virginia)
• Miocene of Italy (1), United States (1: Nebraska)
Total: 661 collections including 682 occurrences
Show more details
Specimen images are retrieved through the eFAUNDA API.
Display images

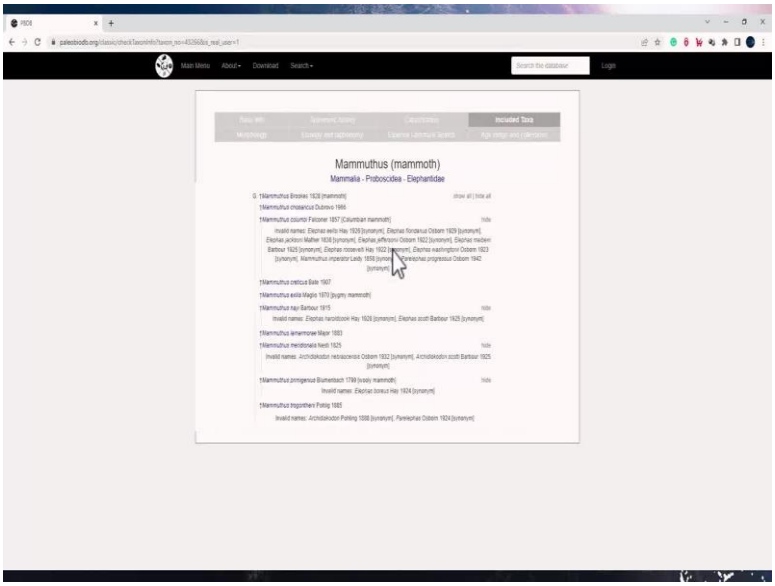
There is another way of browsing these data, for that you can go to the homepage and go to the search tool over here. In the search tool search for fossil taxa. You can either search it by the common name or search it by the scientific name. So, let me search the same things Mammothes here as well. When I go to search, I will see all the distributions across the map and how many of them are present. So, you can see that there is one occurrence in Russia, whereas three in China and so on.

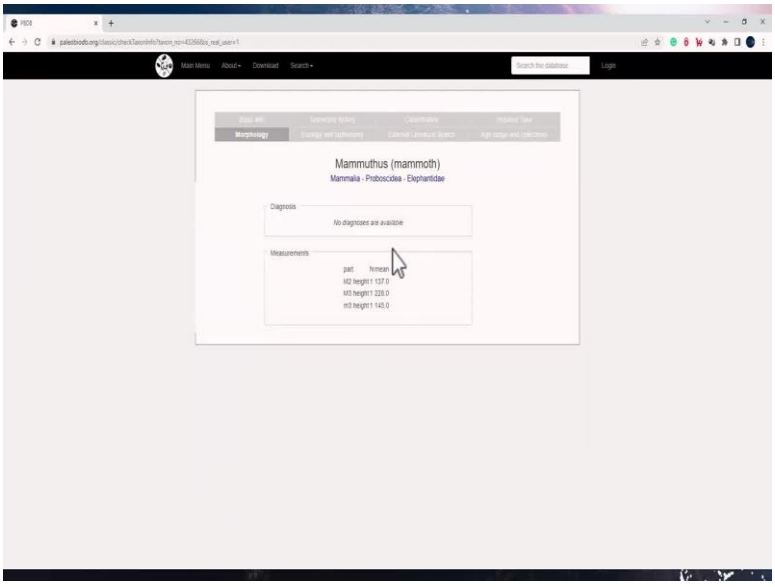
(Refer Slide Time: 12:26)

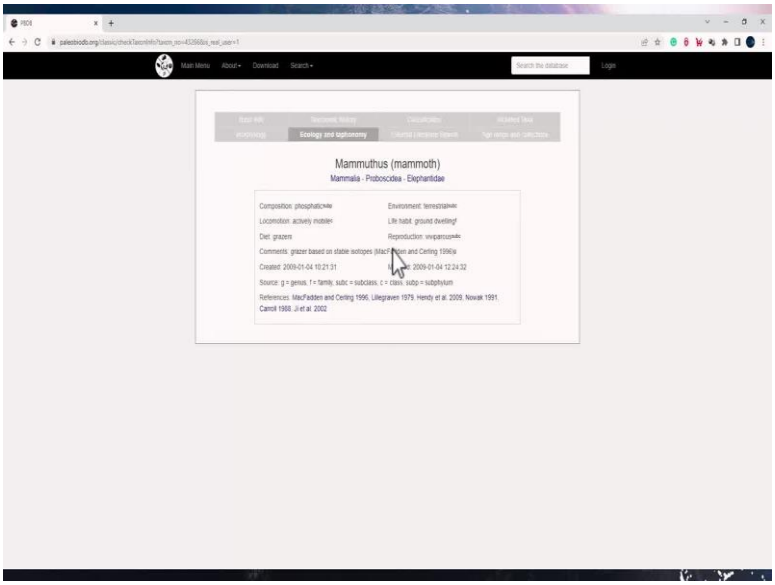





Mammuthus (mammoth)
Mammalia - Proboscidea - Elephantidae
Rank Name Author
kingdom Animalia ()
— Bilateria
— Eubilateria Ax 1987
— Deuterostomia
phylum Chordata Haeckel 1874
subphylum Vertebrata
superclass Gnathostomata
— Osteichthyes ()
subclass Sarcopterygii ()
subclass Dipnotetrapodomorpha (Nelson 2006)
subclass Tetrapodomorpha ()
— Tetrapoda
— Reptiliomorpha
— Amniota
subclass Synapsida
suborder Eupelycosauria
— Therapsida ()
infraorder Cynodontia ()
— Epicynodontia
infraorder Eucynodontia
— Probainognathia
— Mammaliamorpha
Rank Name Author
— Mammaliaformes
class Mammalia
— Theriimorpha (Rowe 1993)
— Theriiformes (Rowe 1988)
— Trechnotheria
— Cladotheria
— Zatheria
subclass Symmetrodonta ()
subclass Theria
— Eutheria ()
— Placentalia
— Afrotheria Stanhope et al. 1998
— Paenungulatomorpha
— Paenungulata Simpson 1945
— Tethytheria
order Proboscidea ()
suborder Elephantiformes Tassy 1988
— Elephantimorpha Tassy and Shoshani 1997
— Elephantida Tassy and Shoshani 1997
superfamily Elephantoidea
family Elephantidae
subfamily Elephantinae Gray 1821
tribe Elephantini Gray 1821
genus Mammuthus Brookes 1828
If no rank is listed, the taxon is considered an unranked clade in modern classifications. Ranks may be repeated or presented in the wrong order because authors working on different parts of the classification may disagree about how to rank taxa.


Main Menu
About
Download
Search
Login
Mammuthus (mammoth)
Mammalia - Proboscidea - Elephantidae

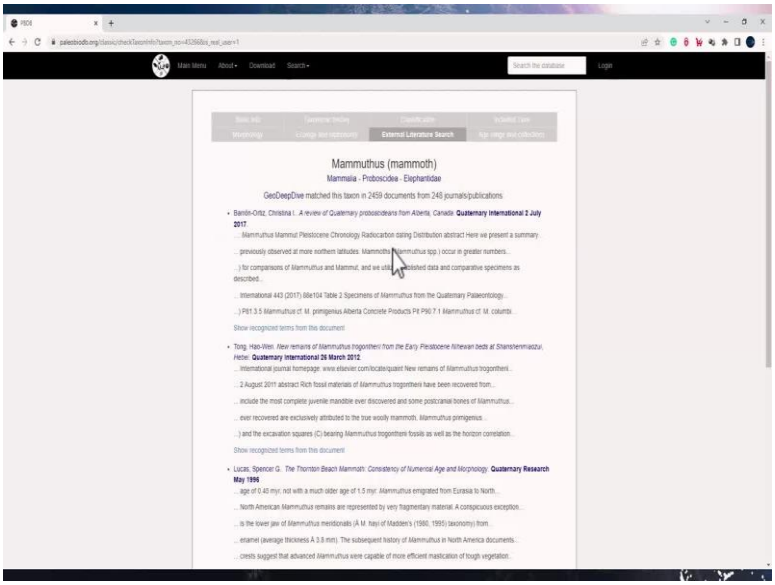

Main Menu
About
Download
Search
Login
Mammuthus (mammoth)
Mammalia - Proboscidea - Elephantidae
Diagnosis
No diagnoses are available
Measurements

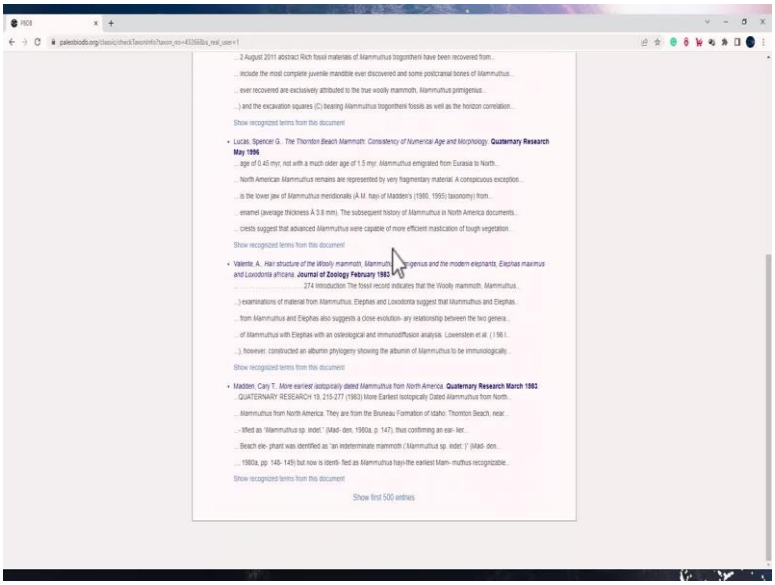


If I click on more details, I now have more set of tools. So, I can check not just the basic information, I can check the taxonomic history of it, I can check the classification information, I can also see what are the included taxa for it. We can also look at the morphology and ecology and taphanomy.

So, in ecology and taphanomy you can see mamothese which are the mamoths, you will see that their diet is of grazers, the reproduction is viviparous, the life habitat is ground dwelling, the environment is terrestrial under locomotion is actively mobile. You will get all this information for any taxon that you have searched.

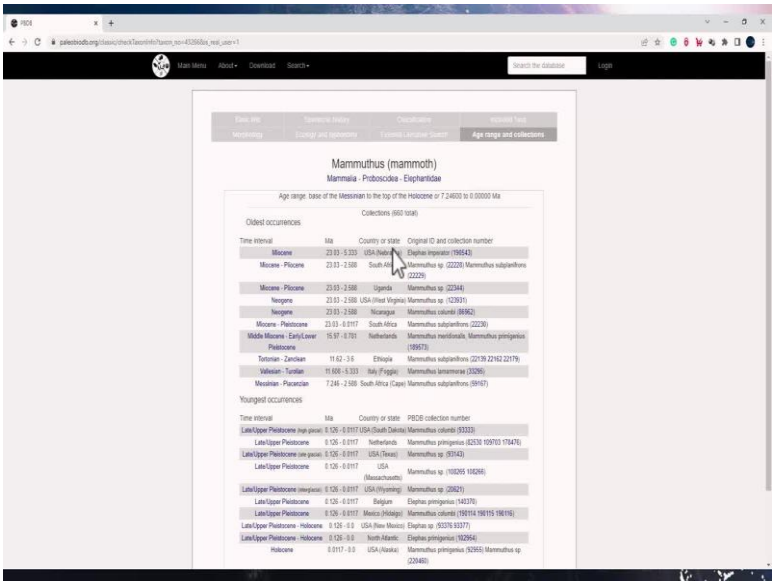
(Refer Slide Time: 13:20)

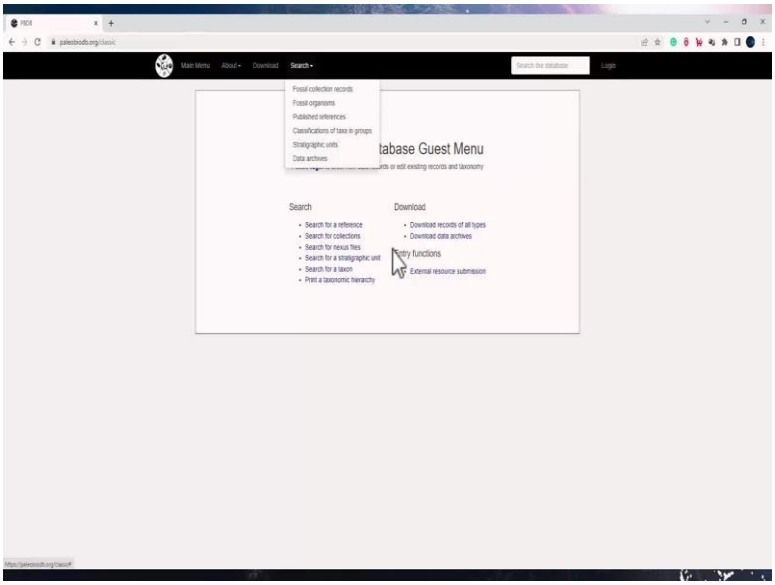


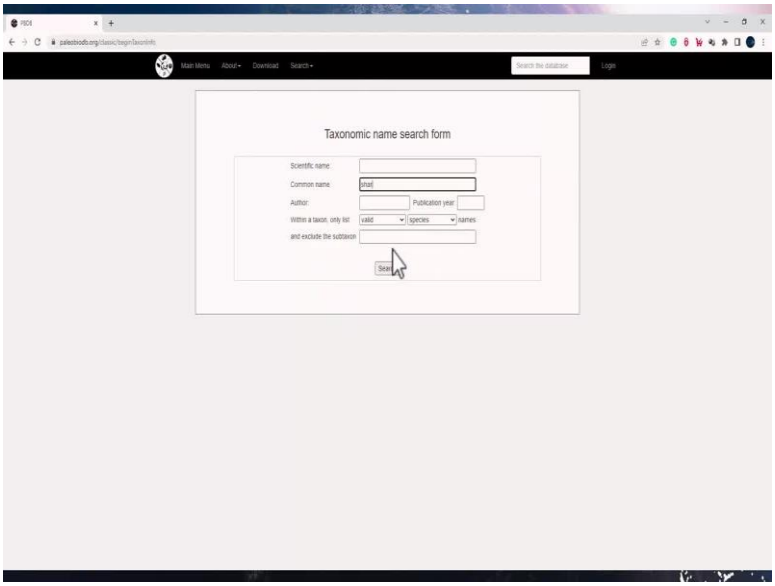


And you will also see this option over here which is external literature search. When you click on it, the information that you see gives you the references of all the literature which is not a part of the database or the catalogue map that you see. So, the external literature tool comes very handy for any of the missing data which is not put on the catalogue.

(Refer Slide Time: 13:46)

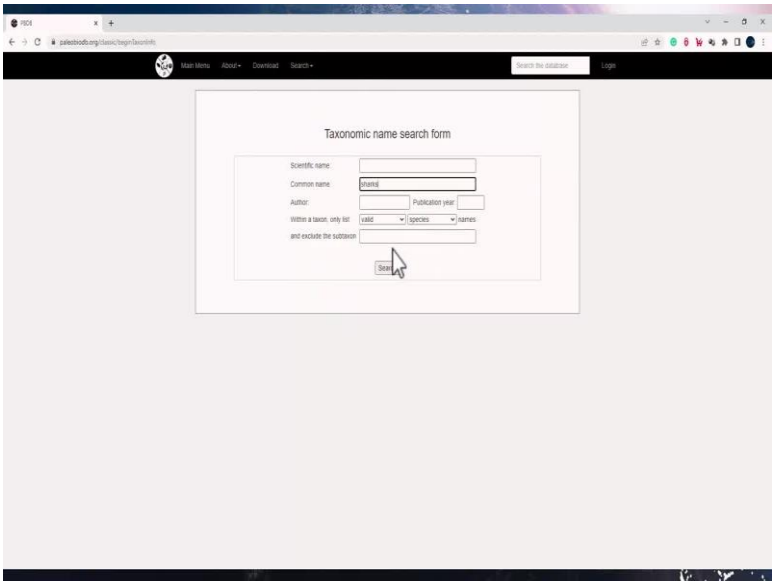


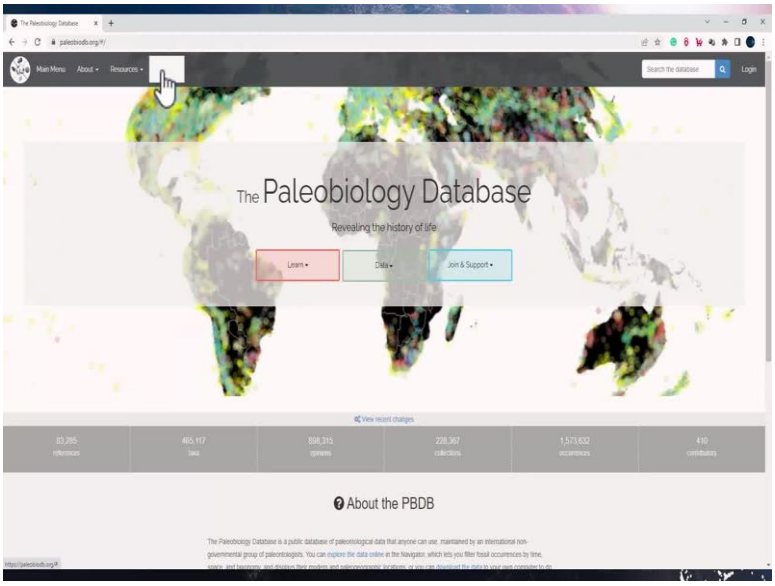


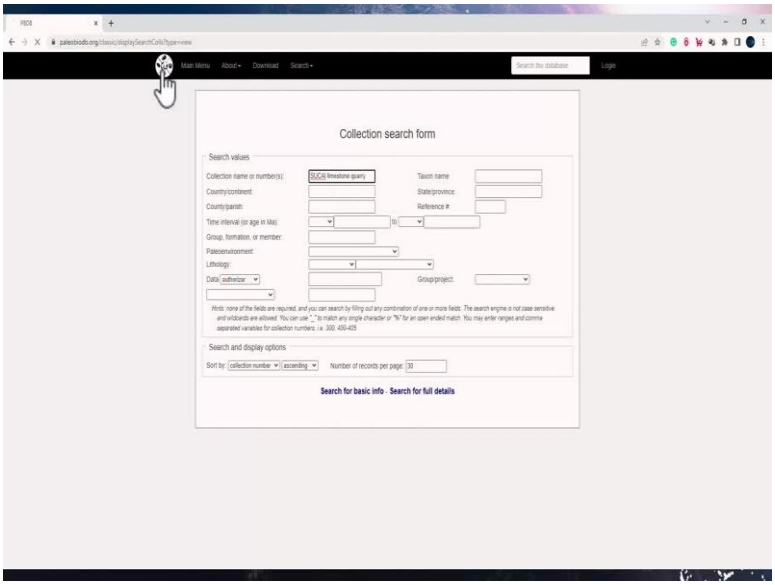


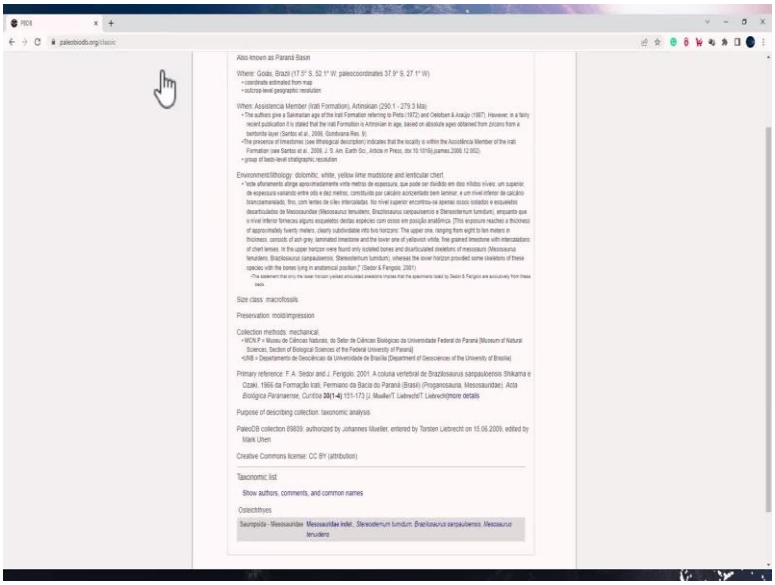
The last tool which is age, range, and collection has all the occurrences, the old ones and the new ones listed here. If I go to search panel, and I searched fossil organism, and I type a common name, say sharks.

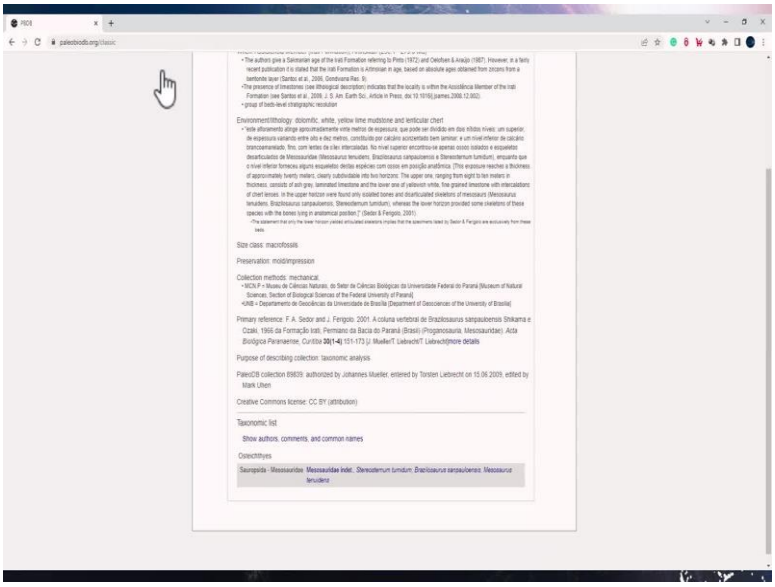
(Refer Slide Time: 14:06)











With the search tool you can also explore the database using the collection record. So, if I go to fossil collection record and I type the collection name or number. So, if I type the name, I sucal limestone quarry, it should pull all the information of this collection and we can also see the authors and…

So, with this you can see the environmental information about this collection, you can see the preservation mode, you can also see the collection method which is been used. You can see all the references for this specific collection. Hope this tutorial on paleobiology database was useful, have fun exploring it.