AL Fish Guide

P2: Design Documentation
CS 495

Submitted by:

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Change History:

- Creation, Filled out some of introduction - 2/1/2017 - Derek Russell
- More basic setup of structure, project description - 2/2/2017 - Matt Williams
- Added primary and secondary objectives - 2/6/2017 - Matt Williams
- Modifications to Primary and Secondary objectives, and added Functional Requirements - 2/7/2017 - Derek Russell
- Modified Introduction and Scope - 2/7/2017 - Ryan Josey
- Added Non-functional requirements - 2/7/2017 - Matt Williams
- Modified Introduction, Scope, Goals, Relevant Definitions, Project Description, Primary Features, Secondary Features, Functional and Non-Functional Requirements - 2/9/2017 - Ryan Josey
- Modified Primary and Secondary features; Added Use Case descriptions - 2/21/2017 - Derek Russell, Ryan Josey
- Cleaned up formatting of Use Cases, added UI images to Project Description - 2/21/2017 - Ryan Josey
- Formatting updates, Table of contents page numbers / linking - 3/1/17 - Matt Williams
- Added information to the activity diagrams - 3/1/2017 - Derek Russell
- Added brief descriptions to Class / use case diagram, updated table of contents - 3/2/2017 - Matt Williams
- Updated Diagram descriptions, general spacing - 3/2/2017 - Ryan Josey

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- Update Class Diagram and Use Case information - 3/23/2017 - Derek Russell, Matt Williams
- Updated formatting, added cover page, added class descriptions, priorities and description to FR and NF requirements, new definitions - 3/28/2017 - Matt Williams
- Added new Use Case Diagram and Descriptions - 3/28/2017 - Derek Russell
- Added new Activity Diagrams and Descriptions - 3/28/2017 - Derek Russell
- Added Sequence Diagrams and Descriptions - 3/28/2017 - Matt Williams
- Proof read entire document - 3/29/2017 - Ryan Josey
- Updated format and images – 4/04/2017 – Ryan Josey

Table of Contents:

I. Introduction

A. Motivation:

The motivation for this project started with a desire to create an application that involved using user's GPS location. We had a connection with the Geological Survey of Alabama (GSA) and they expressed interest in an GPS based application to be used in the field to locate and identify fish species. Currently, GSA staff rely on reference books while out in the field to help identify fish species they find during survey work. We feel that by providing the GSA with an application they could use in the field instead of having to carry a reference book would help improve the efficiency of their surveys. We also envision research students, recreational fishermen, and nature enthusiast using this app. Realizing there could be a large population of users that would utilize this app is what motivated us to build this app.

B. Scope:

The scope of this project covers all areas of Alabama, including the Mobile basin and all currently known species of fish in the State of Alabama. Our original plan is to focus on a small subset of species. This subset will include the current legal game fish in the State of Alabama. We do not plan on branching out to other states at this time because our main source of fish records comes from GSA whose research is only for the State of Alabama. In the future, there is a possibility of expansion to include other states through a partnership with the U.S. Geological Survey (USGS), but this is not an immediate priority.

C. Goals:

The goal of this app is to provide the user with a list of fish that can be found in a user's defined radius of their current location. The user's current location will be found using the phone's built-in GPS. Then a list of nearby fish will be populated using survey data provided by the GSA. The list will include a thumbnail image and the name of the fish. The idea behind this is to provide a subset of fish so the user can quickly identify what species of fish they have found. Each fish will have their own page which will include a picture of the fish, common name, scientific name, description, and defining characteristics. The user will also be allowed to see a list of all the fish species that are found throughout Alabama. We would also like to have an interactive map that would allow for users to search a specific species of fish and have their locations displayed on

an map. This would help the user when trying to find a specific fish and where to go to locate it.

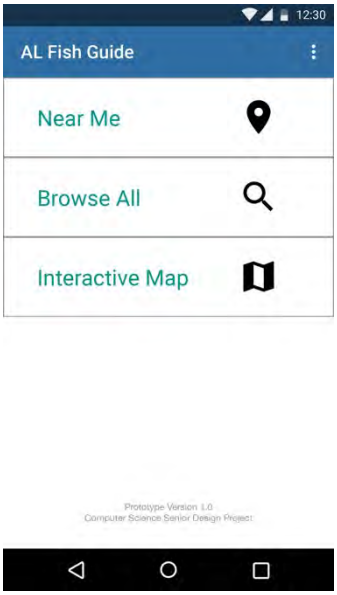
D. Relevant Definitions:

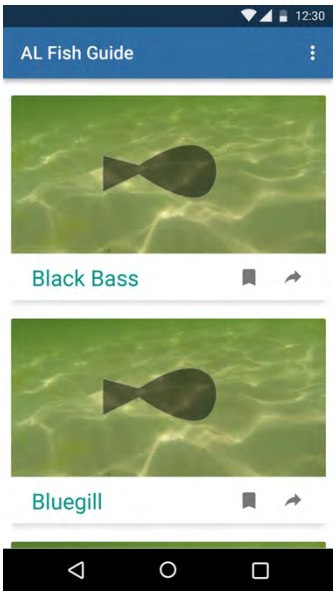
1. **GSA** - Geological Survey of Alabama
2. **GPS** - Global Positioning System
3. **In The Field** - This pertains to researchers or app users that are studying fish in the fish species natural habitat. This can include but is not limited to: streams, rivers, ponds, lakes, or bays.
4. **Ichthyoregion** - A set region delineated by being geographically consistent and that contains a homogeneous fish fauna.
5. **Fauna** - Fish species, including the fish of a particular region or period, considered as a group.

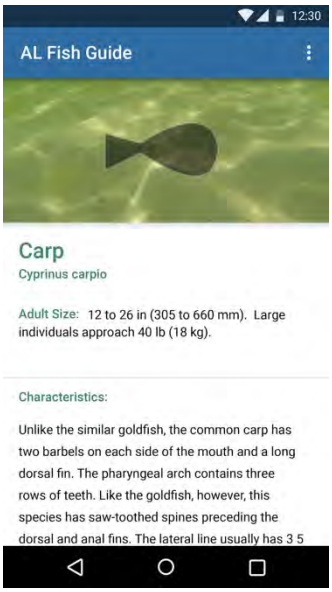
II. Project Description

For this project we will be creating an Android App that helps with the identification of different fish species in the State of Alabama. The main feature of this app will be using a user's GPS location to determine and display what types of fish species will appear near that location. This will aid users in not only identifying what type of fish species that they may encountered, but it will also be helpful in determining specific locations that a fish species will most likely appear. We will be working with the GSA, who will be providing the data during the process of building this app. The GSA's data will include fish images, common name, scientific name, description, defining characteristics, and locations.

UI Prototype: Interactive View







Primary Features:

The main goal of this application is to provide the following primary features. We consider these primary features a must in terms of completing the application. They are:

1. Fish species information page that displays all of the stats of that fish species. This includes:
    a. A picture of the fish species that can be enlarged when tapped/selected
    b. The common name
    c. The scientific name
    d. A detailed description including habitat, biology, and distribution.
    e. The characteristics of the fish
2. Find species near you feature. This takes the user's GPS location into account and will provide a subset of all of the fish species that can be found within a specified radius of the user's location.
3. Find species location feature. This allows the user to select a species and will provide the areas / locations where that species of fish can be found.
4. Browse all list that allows the user to browse all of the fish species within the state.

Secondary Features:

Secondary features are features that are not required in order for the app to be functional, but are features that we would like to add once the primary features are complete. Some secondary features do have a higher priority over other secondary features, however the list below is in no particular order:

1. An offline mode that facilitates use when in the field to minimize data usage with pictures and assets or for when out of range for cell services.
2. The ability to view the locations of a species on a map (this will be on species specific page).
3. An interactive map with all the fish locations on a map where the user can select a specific location and be shown all the fish in that location.
4. Light and dark mode variations to allow user customizations for ease of use. **[Time Permitting]**
5. Ability to pull down on a list to refresh the list of species.

6. An option to allow users to customize the size of the radius for use when they wish to search for fish using their location.
7. A main menu that includes additional activities such as “about” and “settings.” The “about” activity will display information about the app, team, and copyright info. The “settings” activity will accumulate the various settings discussed in the previous secondary features.

III. Functional and Nonfunctional Requirements

Functional Requirements:

1. **[High Priority: Required]** - A scrollable list that will display fish species that can be found in Alabama.
    a. Each item in the list will correspond to a specific species of fish.
2. **[High Priority: Required]** - A page to display all information on a species of fish. This includes:
    a. A picture of the fish species that can be enlarged when tapped/selected
    b. The common name
    c. The scientific name
    d. A detailed description including habitat, biology, and distribution.
    e. The characteristics of the fish
3. **[High Priority: Required]** - Ability to locate the species of fish in a surrounding radius of the user based on GPS location.
4. **[High Priority: Required]** - Ability to search for locations of fish that can be found at by their common names.

All of our Functional Requirements are considered vital and are required in order for us to achieve success with this project. Because of this, all functional requirements are considered high priority and required tasks.

Non - Functional Requirements:

1. Efficiency - **[High Priority: Required]**
    a. The app needs to be efficient for use when in the field. There is a lot of data that has to be accumulated, and it needs to work in an efficient manner in able to quickly return results to the user.

2. Ease of Use - **[Medium Priority - Possible]**
    a. The app needs to be easy to use for several different reasons:
        i. The primary uses of this app will be in the field, which means it needs to be easy to use when out on location / in different environments.
        ii. We have a range of users in our target audience, which means that the app requires ease of use to accommodate these different user groups.
3. Reliability – **[High Priority – Required]**
    a. This app is designed to be used in many locations/environments so it needs to be reliable and able to work/perform for multiple locations
    b. The subset of data that is provided while doing a location based search will need to be reliable for the user's current location
4. Security / Authentication - **[Future Work - Time Permitting]**
    a. Security is a major concern in terms of securing the different APIs that we will use
    b. Security and Authentication is also a larger issue if we include any form of crowdsourcing or reporting feature, as we would need a means of verifying correct and proper input.
5. Accessibility - **[Future Work - Time Permitting]**
    a. This is very similar to ease of use, but the app has to be accessible for use by many different target groups
    b. When working with government data, there are stricter rules in regards accessibility.

We have set a priority for each non-functional requirement in order for us to focus on the most important requirements first. While these are non-functional and are not required for our app to work, efficiency and reliability are two requirements that have high priority. Reliability and efficiency are high priority because we consider these to be essential to achieve our goal of having users use our app when out in the field, specifically in secluded locations. All of the other non-functional requirements are marked with lower priorities mainly so we could focus on the most important items in order to meet our deadlines. It is our desire to include the lower priority points however, we believe we can still achieve our goal even if we are not able to meet these requirements.

IV. Diagrams

Use Cases:

Use Case: View Fish List

Context: The "View Fish List" use case will allow a user to view a full list of fish found in Alabama.

Actors: General User

Main Success Story:

1. System gets full list of fish
2. System displays list of fish found throughout Alabama in alphabetical order

Use Case: View Nearby Fish

Context: The "View Nearby Fish" use case will use user's current GPS location to populate a list of fish species that can be found in nearby locations.

Actors: General User

Main Success Story:

1. System will collect user's current GPS location
2. Using the user's current GPS location, the system will populate a list of nearby fish species
3. The list of fish species will be displayed in alphabetical order

Use Case: Search For Fish

Context: The "Search For Fish" use case allows the user to search for a fish by their common or scientific name.

Actors: General User

Main Success Story:

1. User will enter a common or scientific name of a fish
2. The system will populate a list of fish with similar names

Use Case: View Fish Map

Context: The “View Fish Map” use case displays a map view that shows locations of fish throughout Alabama.

Actors: General User

Main Success Story:

1. System gets a full list of fish
2. System displays list of fish in alphabetical order
3. User selects specific fish
4. System displays a heat map of the fish distribution

Use Case: View Specific Fish Page

Context: The “View Specific Fish Page” use case will display a picture of the fish along with information including name, size, characteristics, distribution, biology, habitat, and a picture.

Actors: General User

Main Success Story:

1. The system gets a fish description
2. The system will display the corresponding fish picture and description

Use Case: View Fish Species Map

Context: The “View Fish Species Map” use case will display a map of all of the locations that a single fish species can be found in the State of Alabama.

Actors: General User

Main Success Story:

1. The system gets a fish map of locations
2. The system will display the corresponding map for the fish locations

Use Case: Modify Settings

Context: The “Modify Settings” use case will display the settings Activity for the user to modify settings for light/dark mode and updating the radius used to find nearby fish.

Actors: General User

Main Success Story:

1. The system will display the settings page
2. The user will modify the settings
3. The system will save the updated settings

Use Case: Navigate Menu Pages

Context: The “Navigate Menu Pages” use case allow the user to select a page to navigate to and display the selected page.

Actors: General User

Main Success Story:

1. The system provides a list of pages for the user to select
2. The user will select a page to navigate to
3. The system will display the corresponding page

Use Case: Home Page Activity

Context: The “Home Page” use case will display four buttons for the user to select from to navigate to activities including View Nearby Fish, View Fish List, View Fish Map, and Search For Fish.

Actors: General User

Main Success Story:

1. The system will display four buttons for each main activity
2. The user will choose one activity they wish to navigate to
3. The system will then load the appropriate activity

Use Case: About Activity

Context: The “About Activity” use case will display the About page and allow the user to select certain interactions such as contacting the developers, or contacting the GSA.

Actors: General User

Main Success Story:

1. The system displays the About Activity
2. The user chooses to select an interaction or not. If the user selects an interaction, the system loads the appropriate corresponding page

Use Case: View All Fish

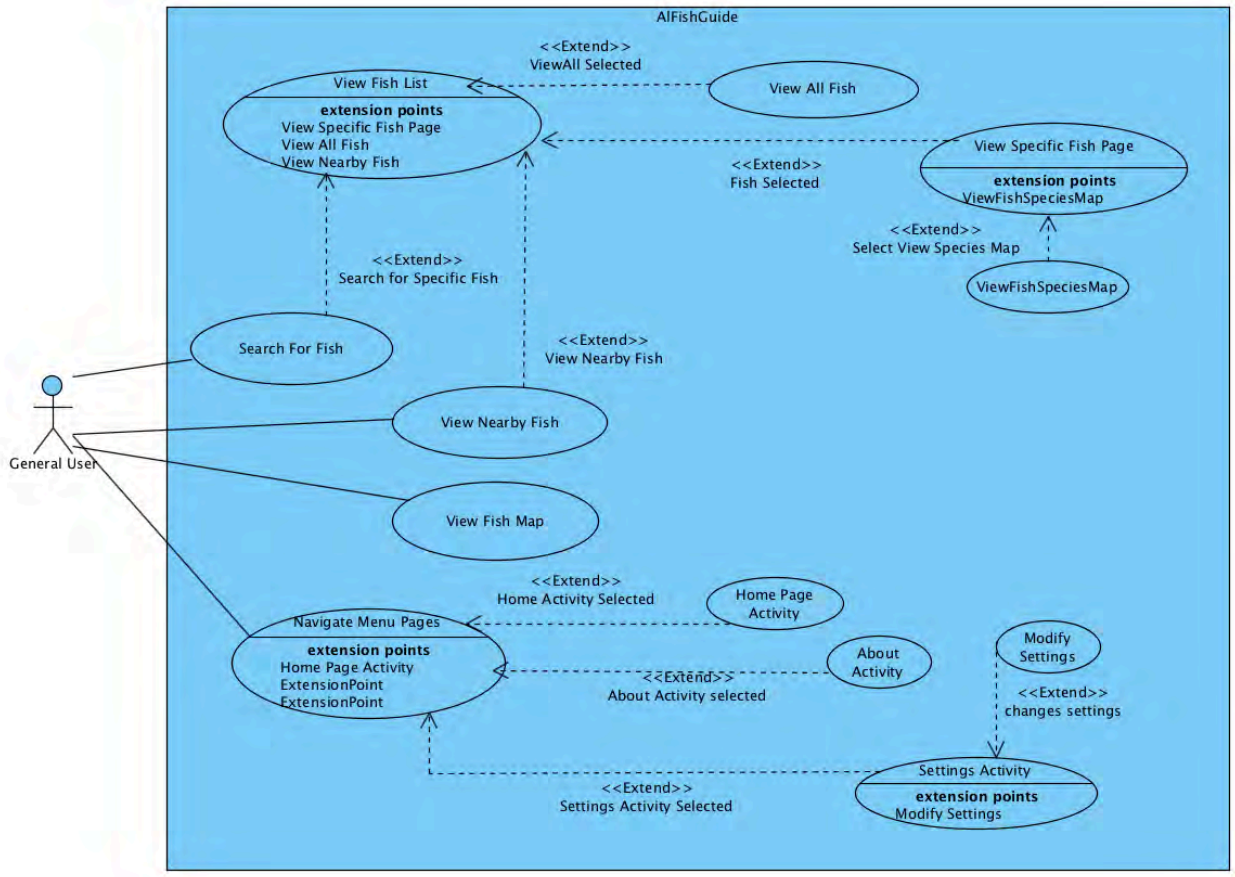
Context: The “View All Fish” use case will query the database to fetch all fish. The resulting fish data will then be used to generate a fish list that will be used by the View Fish List use case.

Actors: General User

Main Success Story:

1. The system queries the database to retrieve all fish information.
2. The resulting data is used to generate a list of fish that will be used by the View Fish List use case.

Use Case Diagram:

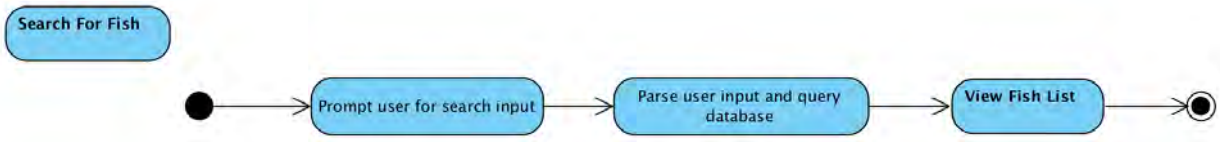


The above diagram shows the overall structure of our use cases. Use cases describe the different way that a user can and will use our app. The user will have several options for use cases including: viewing a full list of fish, viewing a fish map, searching for fish, viewing nearby fish, and navigating menu pages. If the user chooses the Search For Fish, View Nearby Fish, or View All Fish, the user will be navigated to the View Fish List use case which will display a list of fish for the user to browse through and potentially select a specific fish. In the event a user selects a specific fish they will be navigated to the View Specific Fish Page use case where they will be able to browse information on the fish species. The View Specific Fish Page use case will also provide the option for the user to select the View Fish Species Map use case that displays a map view of all points where that fish species can be found throughout Alabama.

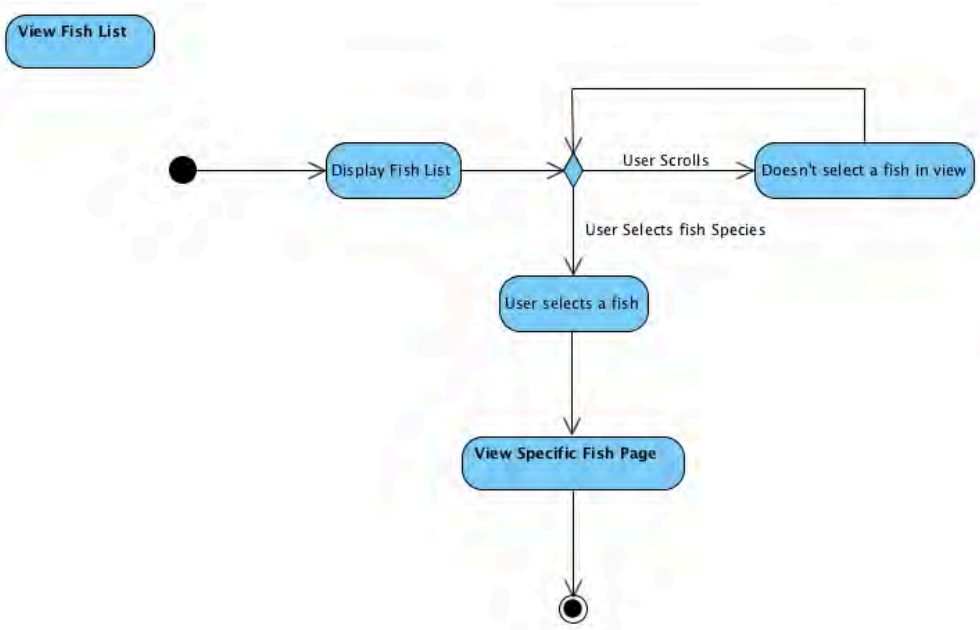
If the user chooses to view the fish map they will be presented with a map containing all the points of every species and their corresponding locations throughout Alabama. Lastly, the user could choose to navigate through the menu options of the application. This use case will allow the user to navigate to Home Page use case, About Activity use case and Settings Activity

use case. If the user chooses the Settings Activity, they will be able to modify the settings in the use case including radius size for nearby fish, and toggle a light/dark mode for the application.

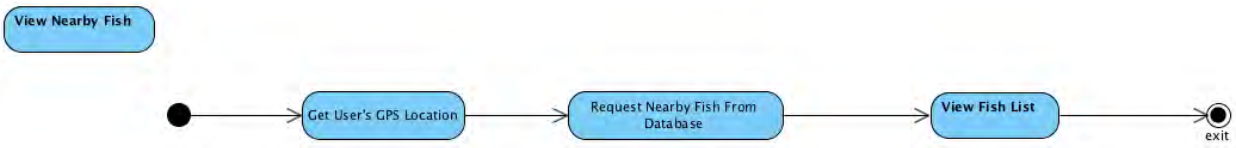
Activity Diagrams:



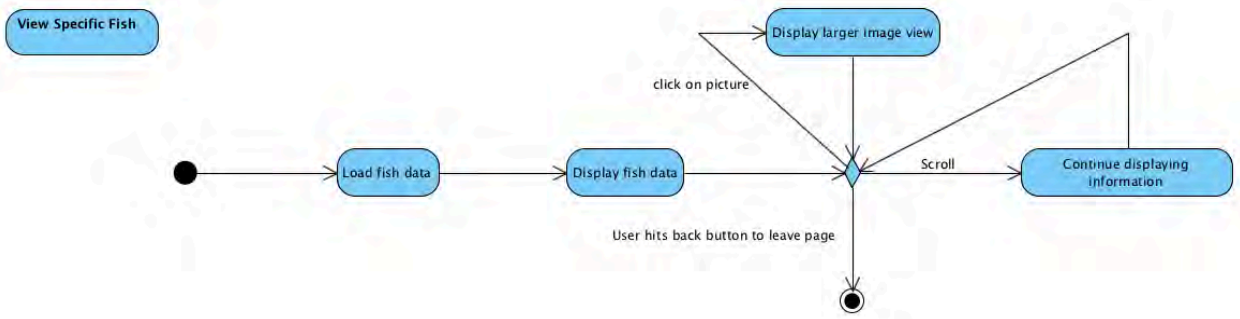
This diagram shows the flow of actions when a user searches for a specific fish. The user will input a fish name in the search requirements, the user's input will be parsed and then used to query the database for all fish that match the input. This will then move to the use case View Fish List.



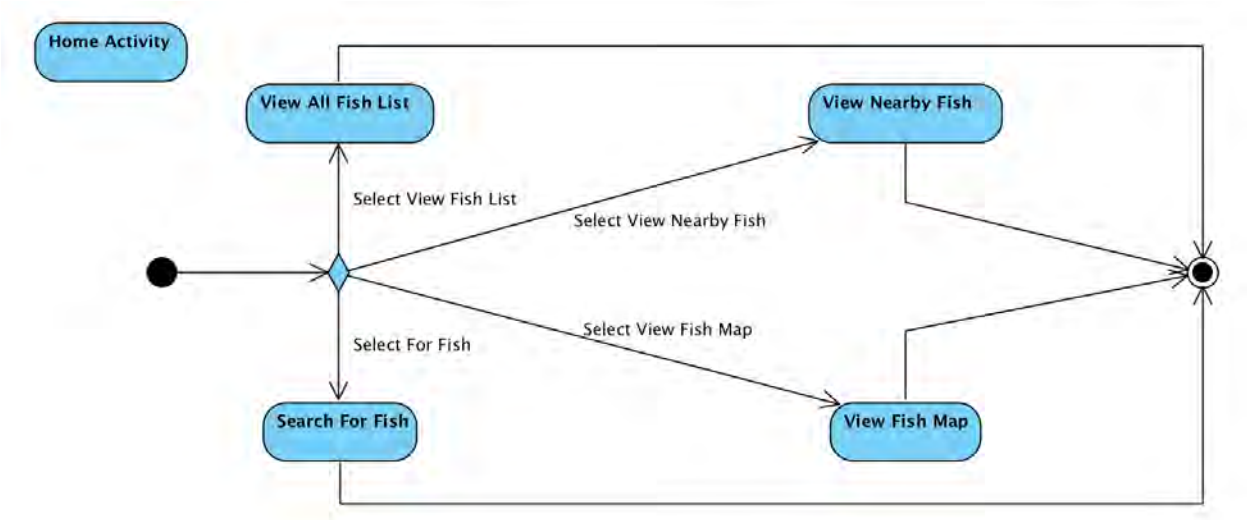
This diagram shows the flow of actions a user would take when using the fish list. The list of fish will be pulled from database during the get fish list, the data will then be transformed into a usable format during the generate fish list. Next, a user will select a fish from the displayed list to move to the View Specific Fish Page use case.



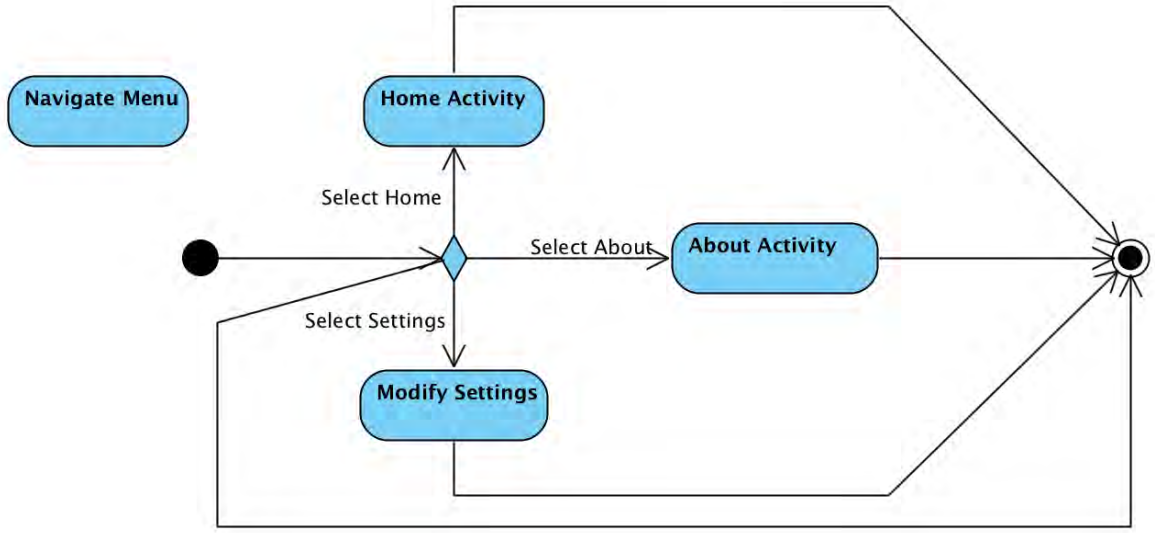
This diagram shows how a user's GPS location is used to generate a fish list. The user's GPS location will be used to query the database for fish close to the location. Once the query has been sent to the database and a list has been returned, the activity moves into the View Fish List use case.



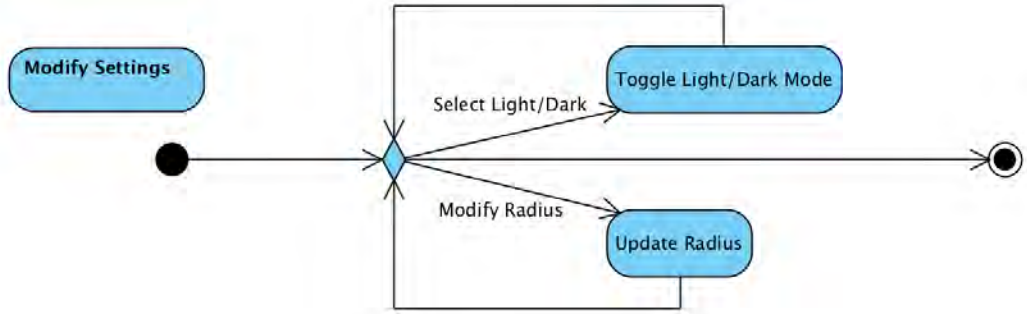
This diagram shows the View Specific Fish use case. Once the data (species specific) is loaded and displayed, the user has the option to select the picture to see an enlarged view of the picture or to scroll down the activity to continue viewing the displayed information.



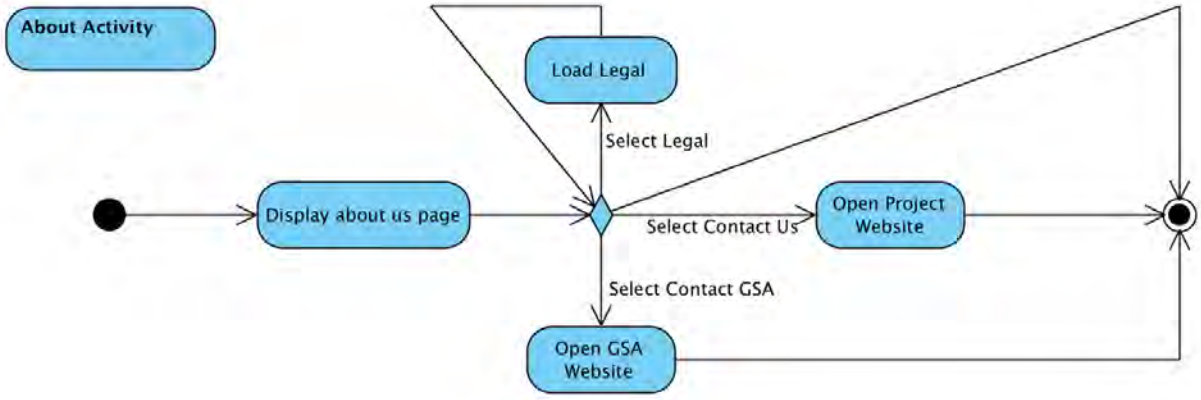
This diagram shows the use case for the Home Activity. From the Home Activity, the user can navigate to four different activities: View All Fish, Search For Fish, View Nearby Fish, or View Fish Map.



The diagram above shows the activity diagram for the use case Navigate Menu. From the Navigate Menu use case, the user can move to the Home Activity, About Activity, and Modify Settings Activities.



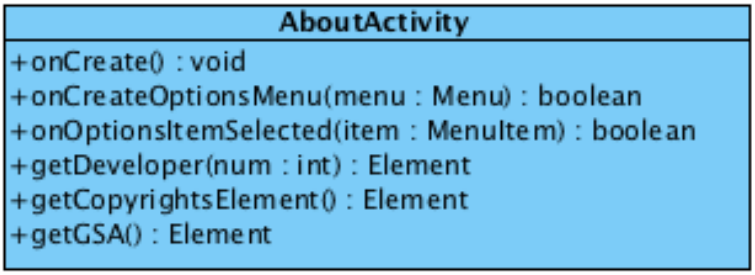
The Diagram above shows the activity diagram for Modifying Settings use case. In this use case, the user has the option to modify both settings for the application. The user can update the radius or toggle the light/dark mode.



The above diagram shows the About Activity. From this use case the user will be presented with the About Us page. From this page the user has the ability to select legal which will load the legal information pertaining to the project. The user can also select the Contact Us button which will open the project's website. Last, the user can select to contact GSA which will navigate the user to the GSA website.

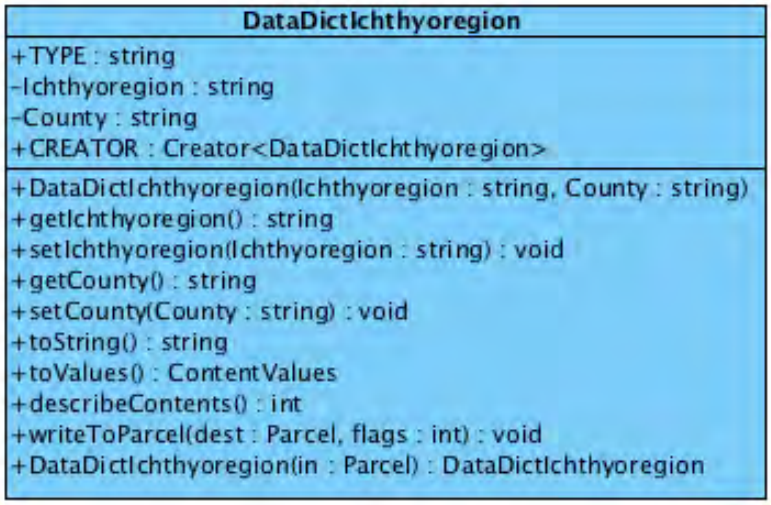
Class Diagrams:

About Us Class



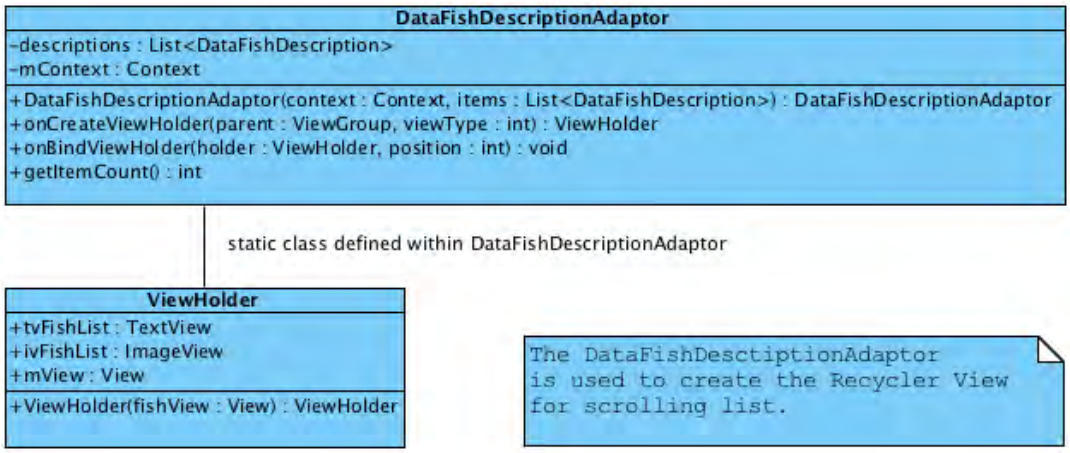
The About Us Class represents the activity that displays an About Us page in the app. This page provides details on the developers, the app, and the Geological Survey of Alabama. The About Us Activity also provides information on the app version number, as well as links to contact either the developers or the GSA.

Data Dictionary Ichthyoregion Class



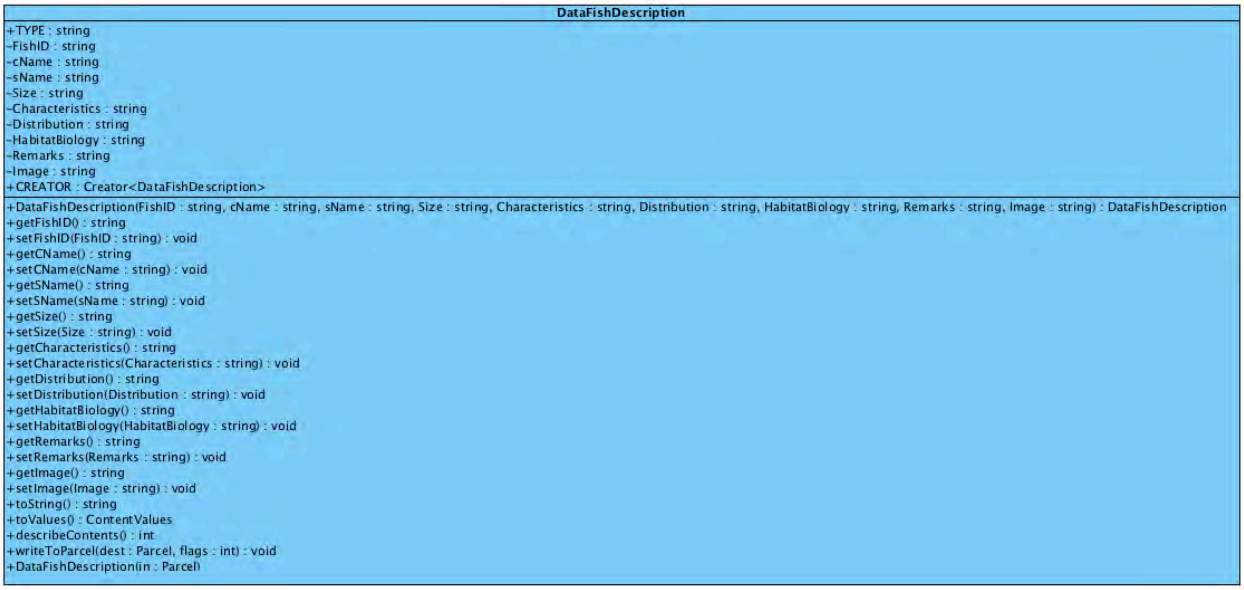
The Data Dictionary Ichthyoregion Class is created for storing and keeping track of the Ichthyoregions along with what county in the state is associated with each Ichthyoregion.

Data Fish Description Adaptor



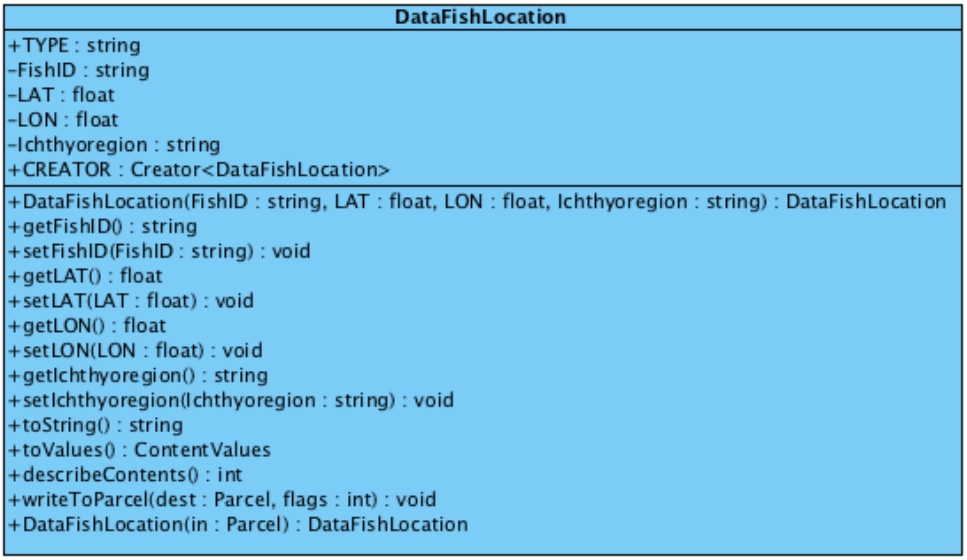
The Data Fish Description Adaptor Class is used to create the recycler View. What this means is, we provide it with a list of fish and this class turns that list into a scrollable and interactive list that we control.

Data Fish Description



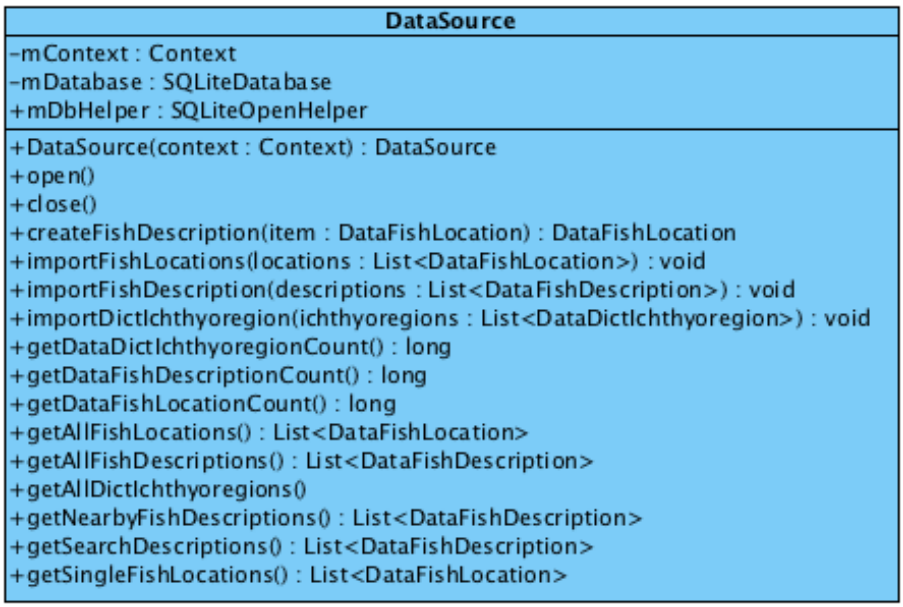
The Data Fish Description class is used to keep track of the data of a specific fish species. It keeps all of the data associated with a single species such as IDs, names, descriptions, size, characteristics, habitat, biology, and a location of the image associated with that species.

Data Fish Location Class



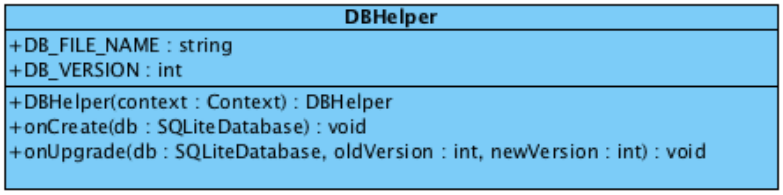
The Data Fish Location Class is used to keep track of all of the specific geographic locations of all fish. It includes the ID of the fish, the latitude, the longitude, and the Ichthyoregion that this location occurs in.

Data Source



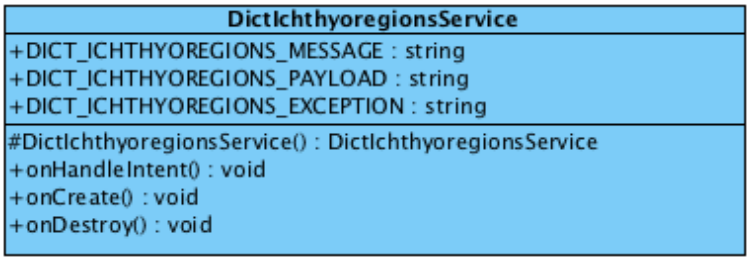
The Data Source class allows us to have multiple instances of our database. The Data Source class handles all interactions with the database.

DB Helper Class



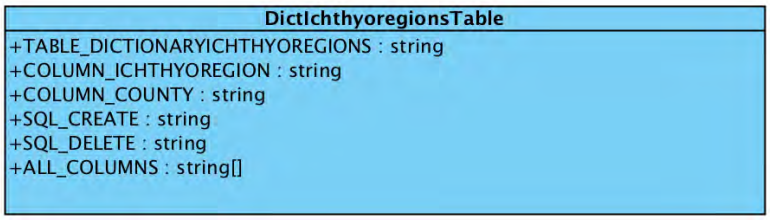
The DB Helper Class is a class designed to manage the database and manages upgrades to the database. This class manages any changes made to the database.

Dictionary Ichthyoregion Service Class



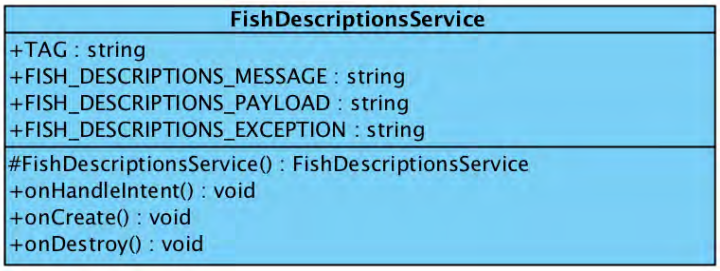
The Dictionary Ichthyoregion Service Class is used for helping to build and extract the Dictionary Ichthyoregions table that provides the information on the Ichthyoregions and the counties in the state.

Dictionary Ichthyoregion Table Class



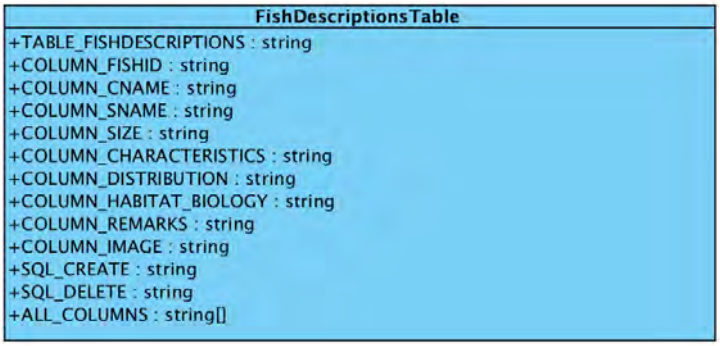
The Dictionary Ichthyoregion Table is a class that describes the table that holds the information in the DataIchthyoregions class.

Fish Descriptions Service Class



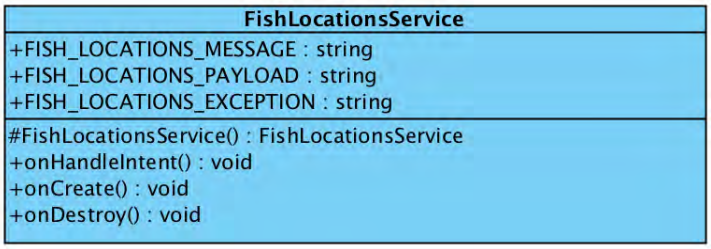
The Fish Descriptions Service class is a class created to help download and extract the data from the website to prepare for importing it into the local database.

Fish Descriptions Table Class



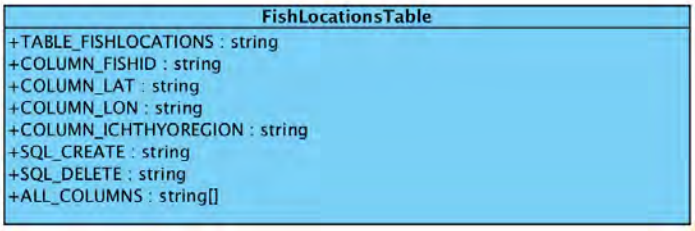
The Fish Descriptions Table class is a class that describes the structure of our table that holds our data on the individual fish species.

Fish Locations Service Class



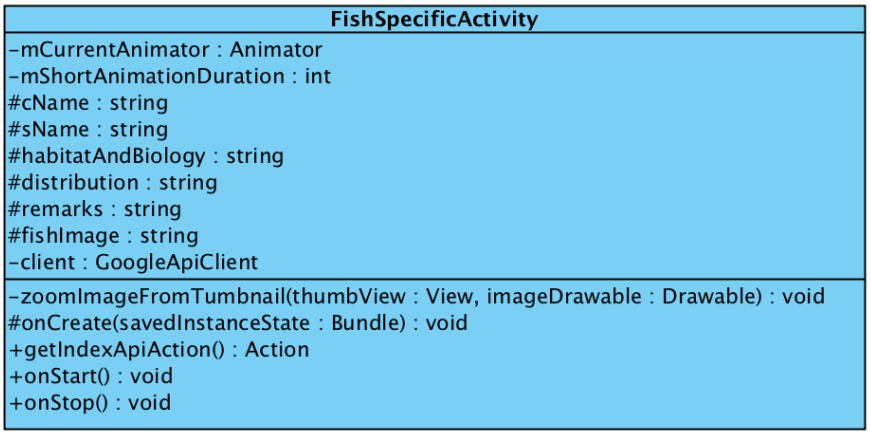
The Fish Locations Service class downloads the data from the website regarding the locations of the fish. It also prepares this information to be imported into the local database.

Fish Locations Table Class



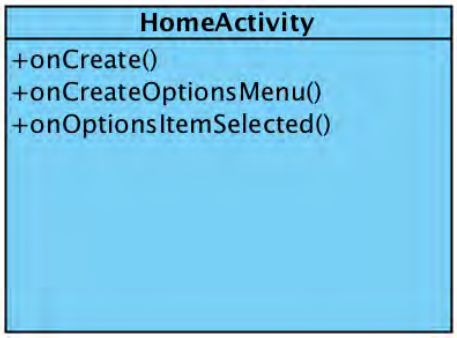
The Fish Locations Table class is a class that describes the structure of our table that contains our information on the locations of where a fish is found.

Fish Specific Activity Class



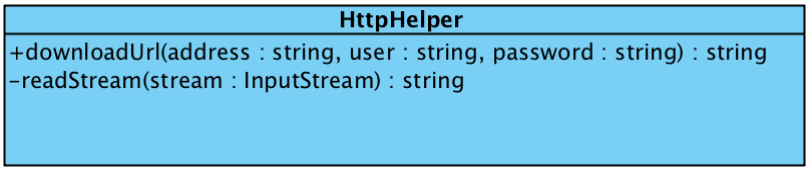
The Fish Specific Activity Class describes the activity that loads the Fish Specific Activity, which provides all of the stored information on a given fish species.

Home Activity Class



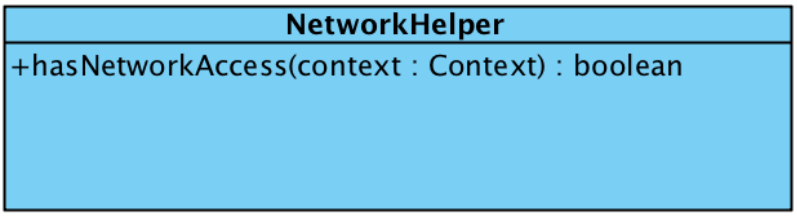
The Home Activity class describes the activity that loads our home screen, which provides the user with a choice of which activities they want to view

Http Helper Class



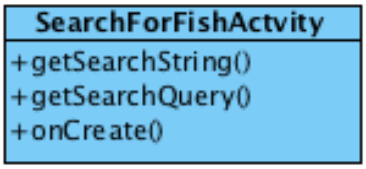
The Http Helper Class is used to help get and connect to a webserver, in order to import the data into the database.

Network Helper Class



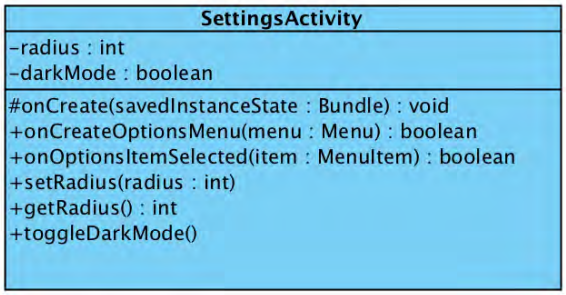
The network helper class is used to verify if the user has a current network connection.

Search For Fish Activity Class



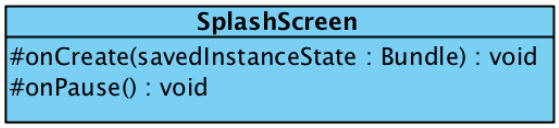
The Search for Fish Activity Class is used to represent the Search for Fish Activity, which allows for the user input a name, and search for a specific fish species.

Settings Activity Class



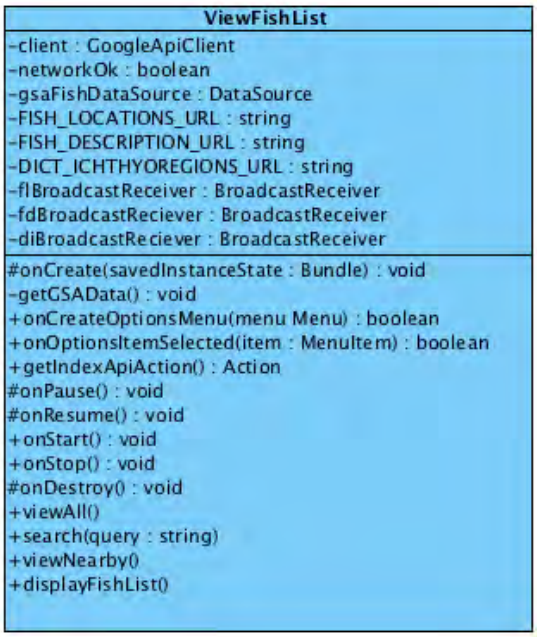
The Settings Activity class represents the Settings Activity where the user is provided a list of settings, and they can interact and change certain app settings.

Splash Screen Class



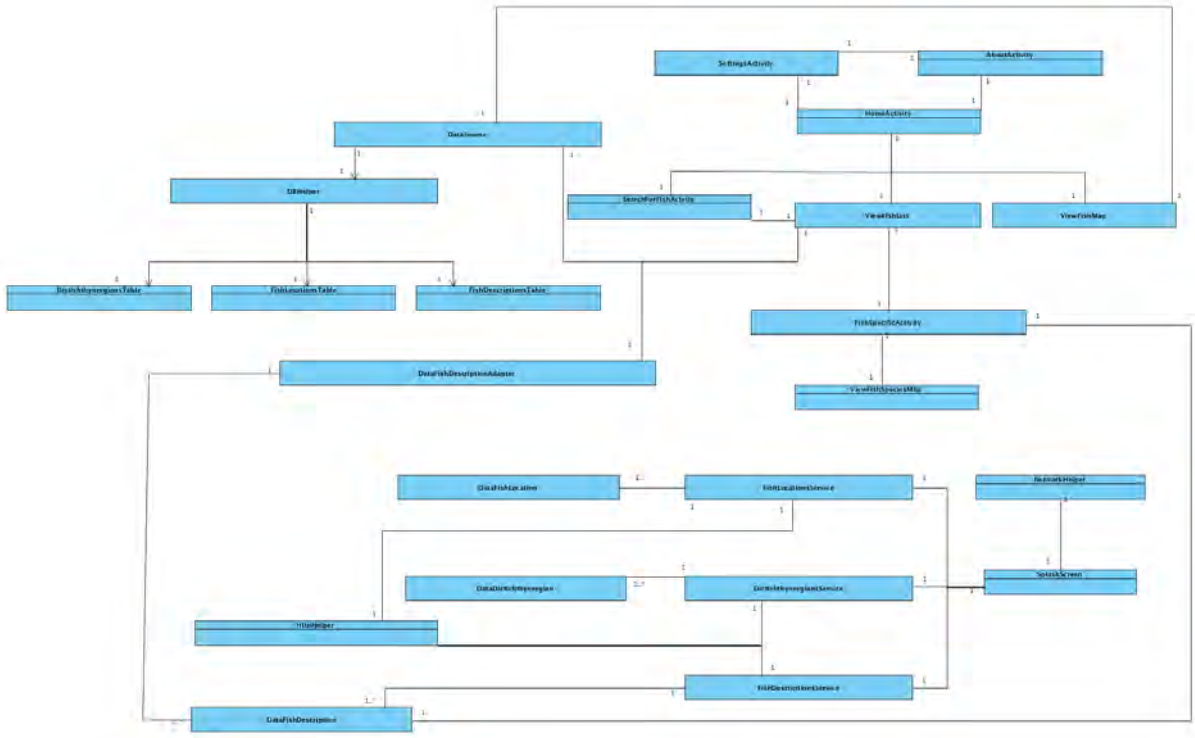
The Splash Screen Class represents the Splash Screen which is the initial loading screen of the app. This Screen is used to display the logo of the GSA, as well as to allow for the database information to complete its loading process.

View Fish List Class

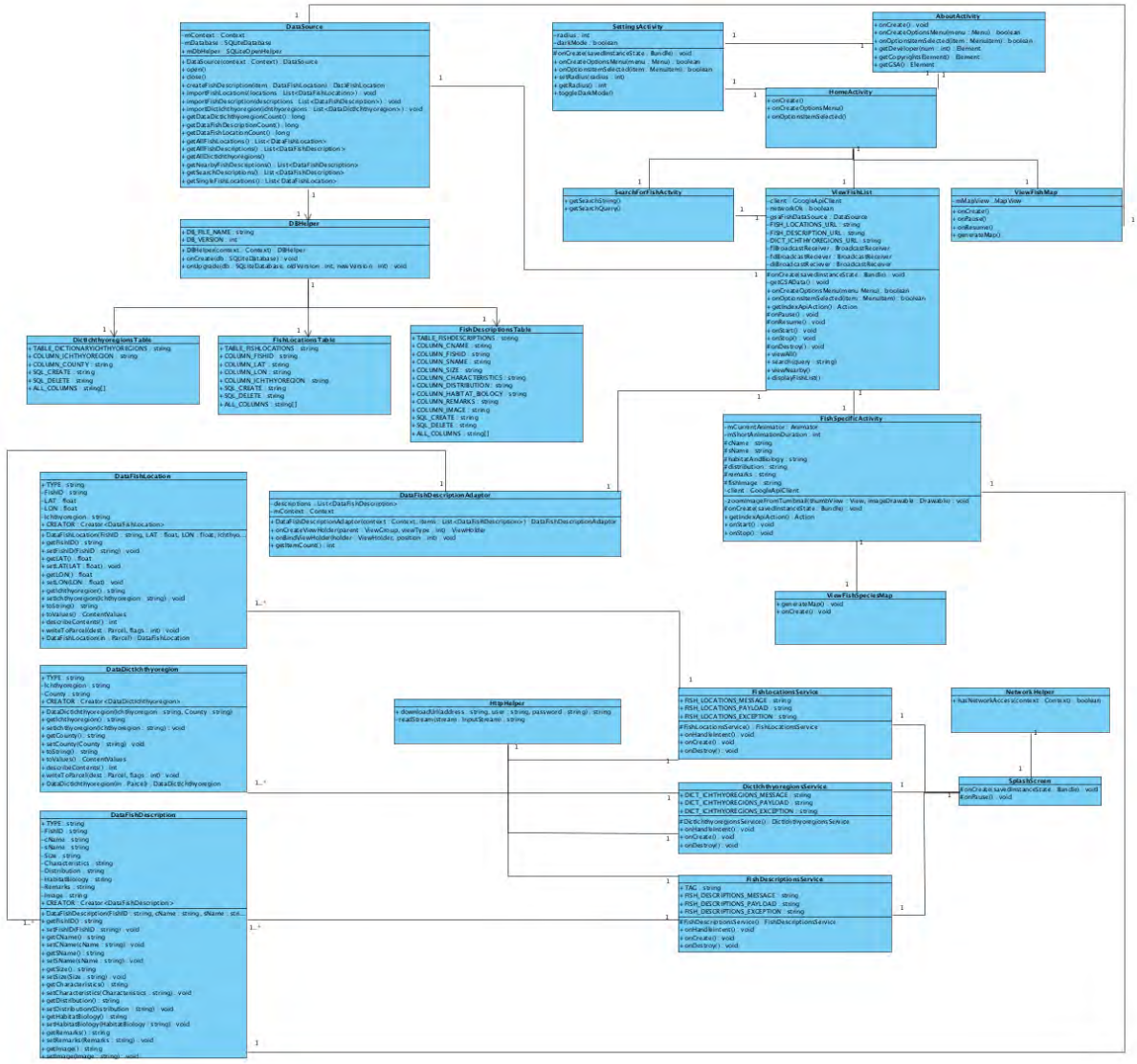


The Fish List Class is used to keep track of a fish list, which is a list of selected fish, along with information that is needed to populate the recycler view later.

High Level Class Diagram:

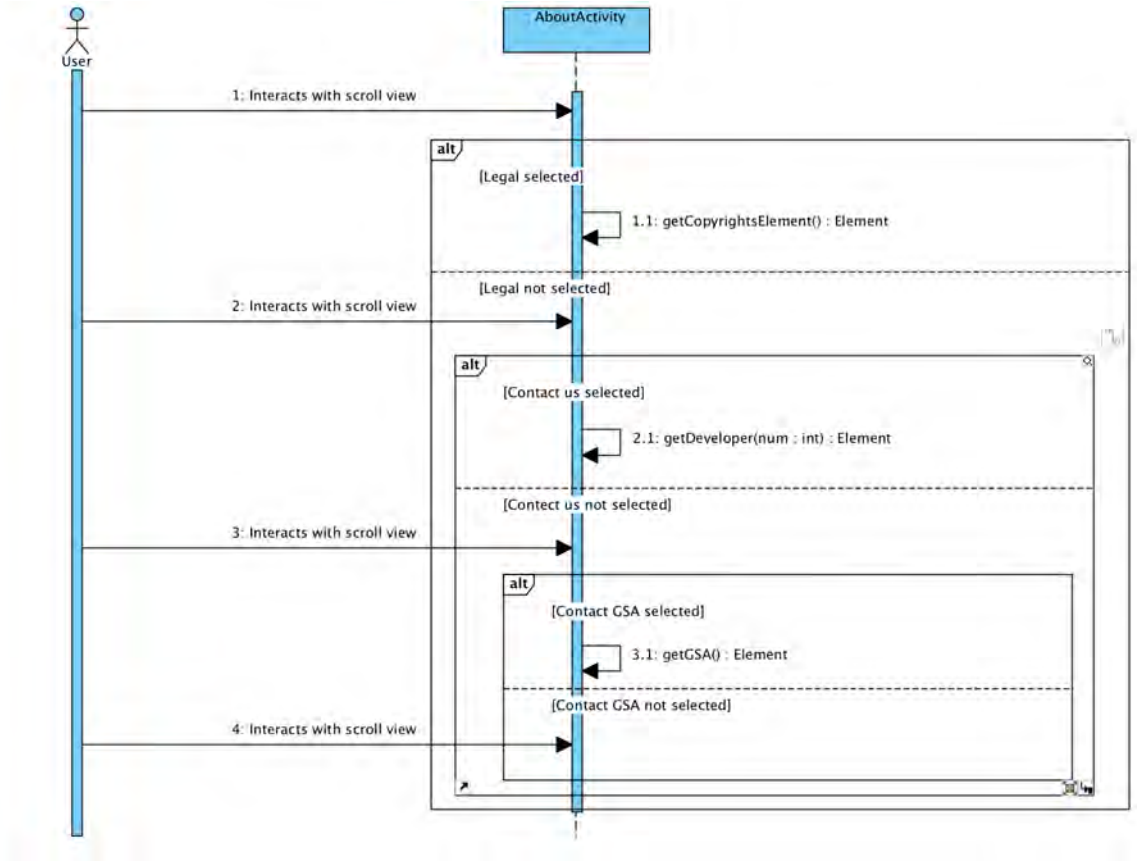


Detailed Class Diagram:



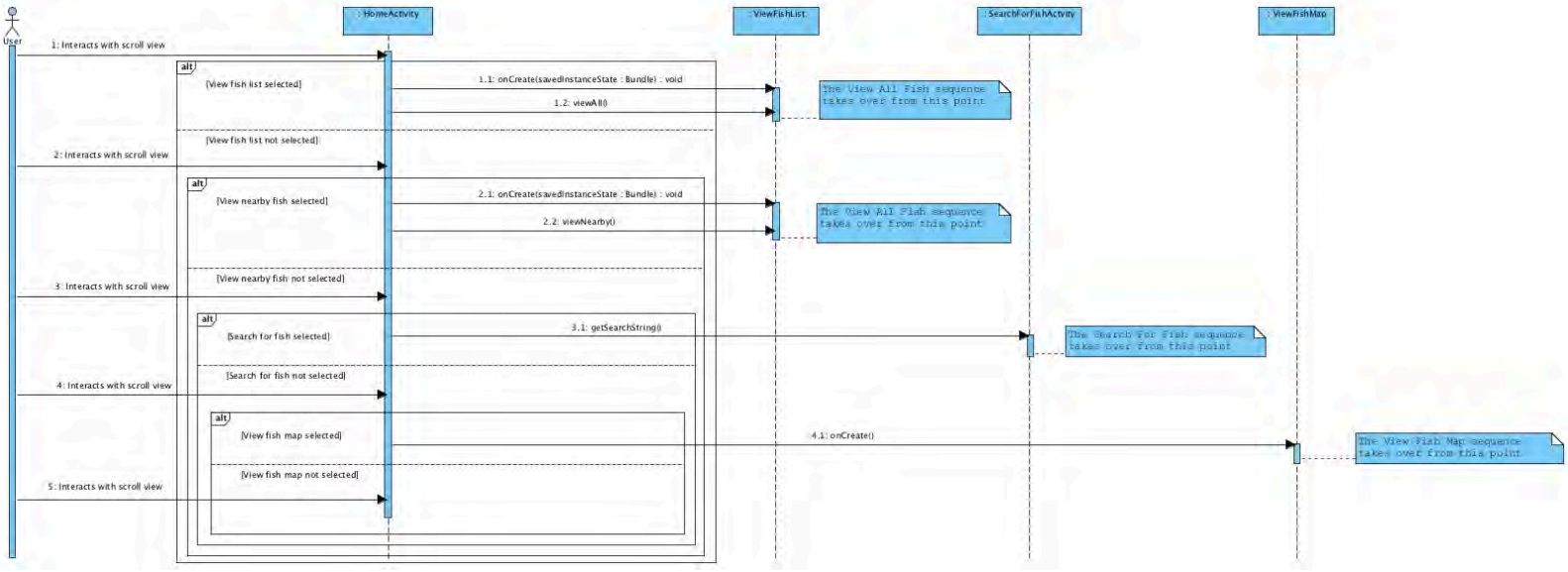
Sequence Diagrams:

About Activity Sequence



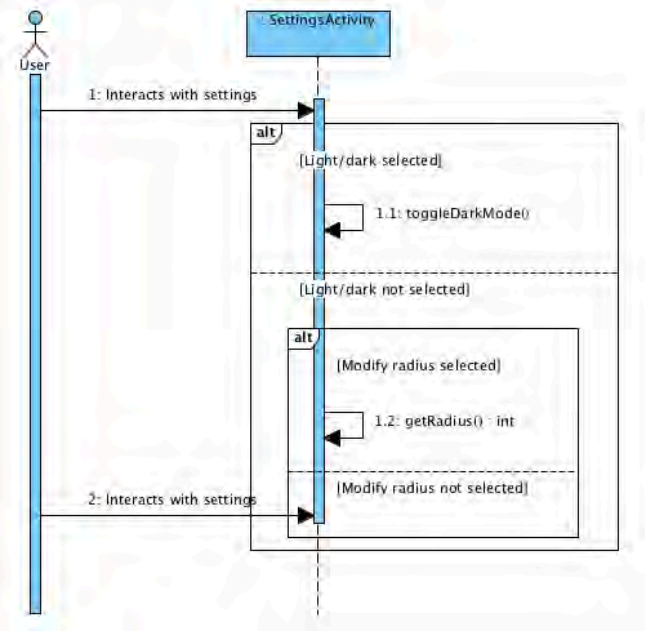
The About Activity Sequence displays the sequence the user takes when viewing the About page of our app. Once the About page is loaded, the user can choose to select certain options, such as clicking the Contact Us button. If the user selects any of the available options, separate methods are called such as getDeveloper() if the Contact the Developers button is pressed, or getGSA() if the Contact the GSA button is pressed. If the user does not select any options, the activity is completed.

Home Activity Sequence



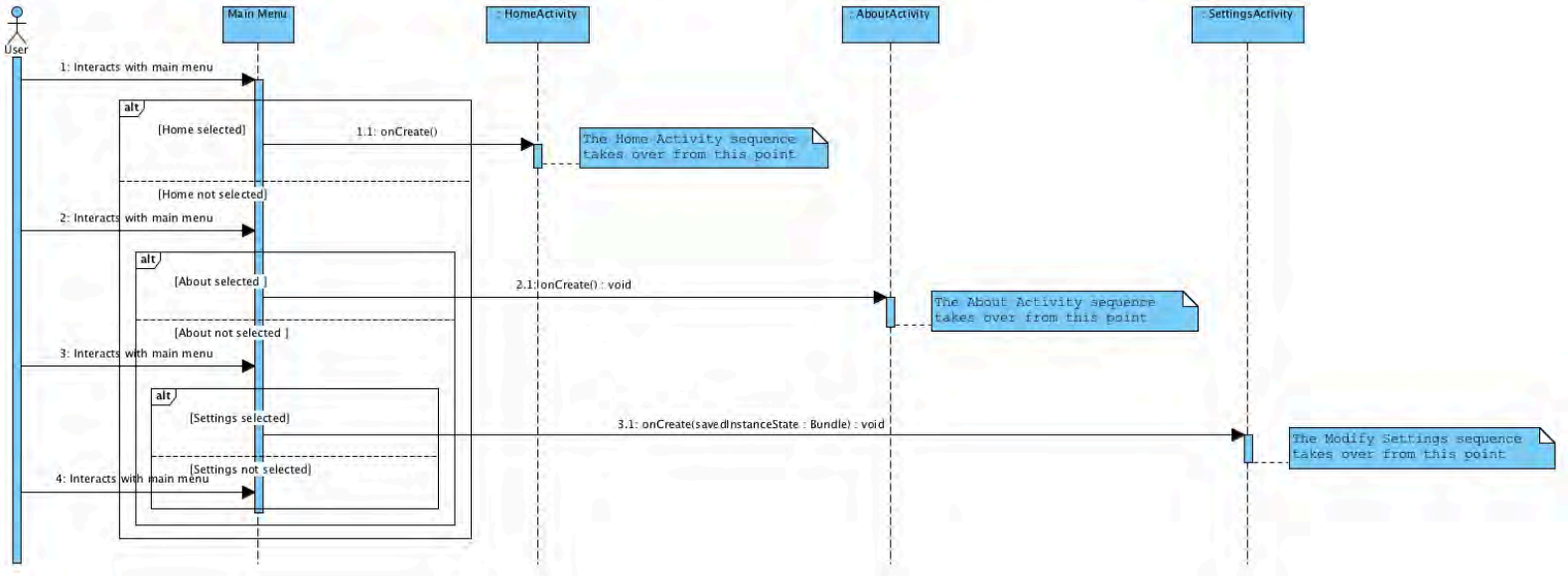
The Home Activity Sequence displays the sequence of events the user can take when viewing the home activity of our app. Once the home activity is loaded, the user can select several different actions such as starting the View All Fish Activity, starting the View Nearby Fish Activity, starting the View Fish Map, or starting the Search For Fish Activity. Once the user selects an option by pressing the appropriate button, the respective activity begins.

Modify Settings Sequence



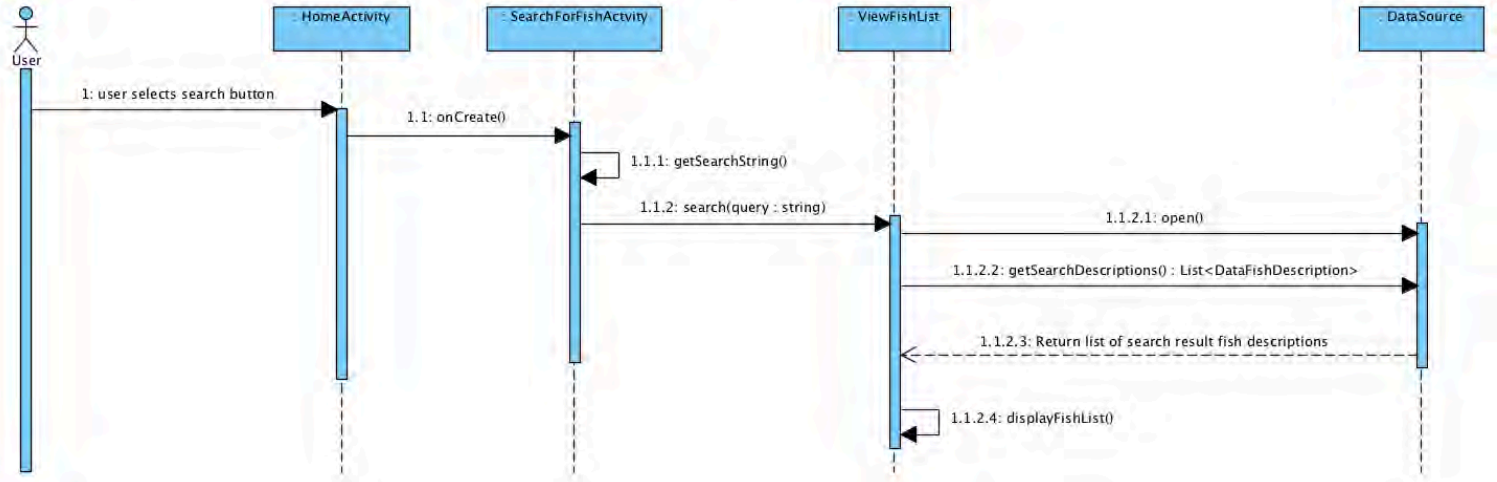
The Modify Sequence displays the sequence the user takes when modifying the settings on the Settings Activity of our app. Once the Settings Activity is loaded, the user can choose to select certain options, such as changing the radius size or toggling the Light/Dark mode. If the user selects any of the available options, separate methods are called such as toggleDarkMode() if the toggle light/dark mode option is selected, or getRadius() if the user changes the radius size. If the user does not select any options, the activity is completed.

Navigate Menu Sequence



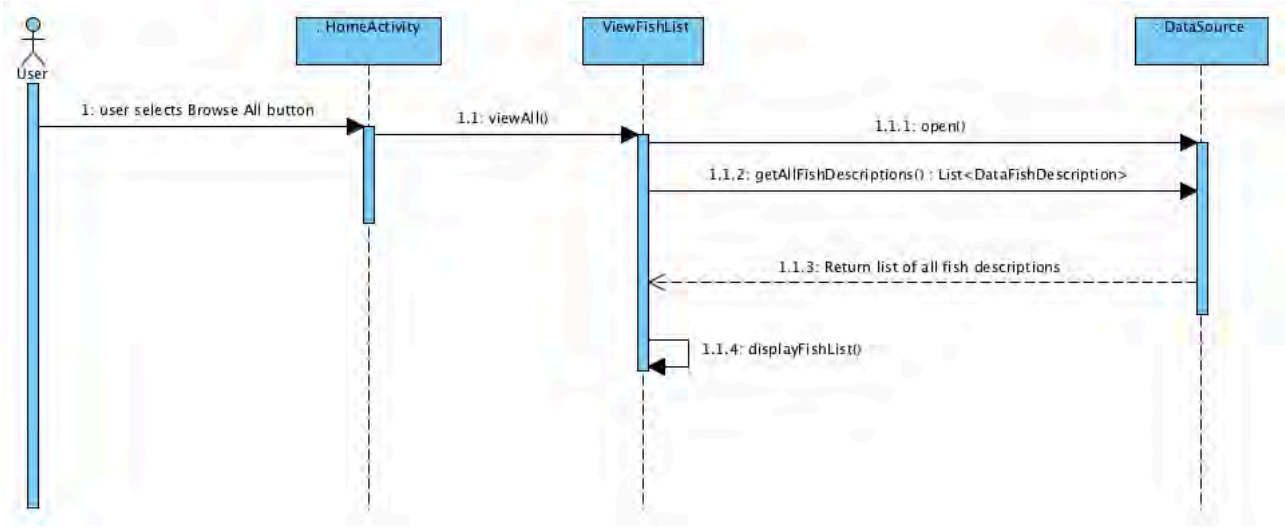
The Navigate Menu Sequence displays the sequence the user takes when navigating the app menus. Once the Menu activity is loaded, the user can choose to select certain optionst, such as selecting the page they wish to navigate to. The menu will be available for the user to select from most, if not all, pages. If the user selects any of the available options, the appropriate activity begins. If the user does not make a selection, the activity ends.

Search For Fish Sequence



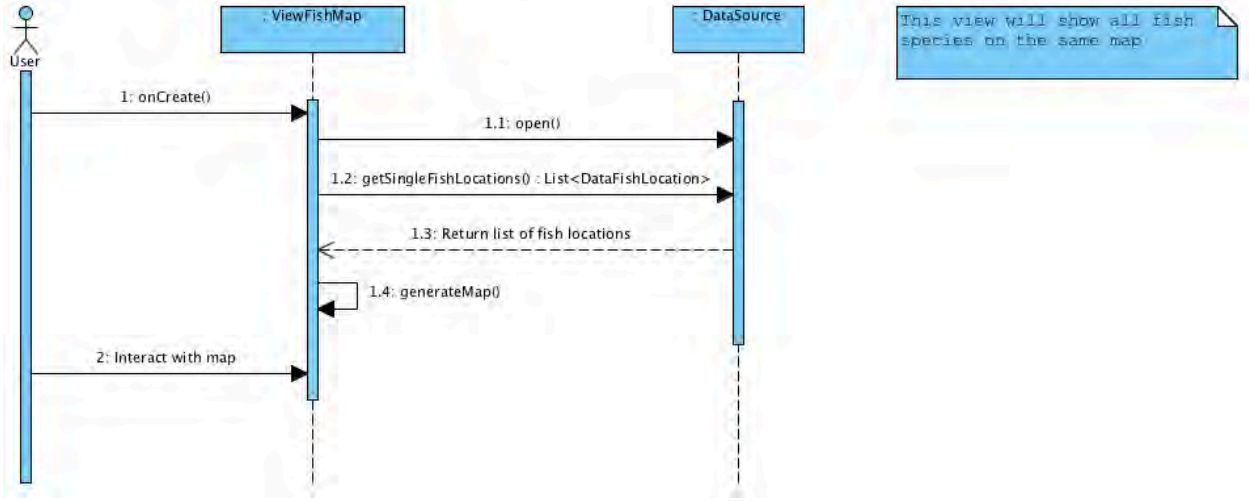
The Search For Fish Sequence displays the sequence the user takes when searching for a specific fish species. Once the Search Activity is loaded, the user can choose to select certain options, such as clicking the Contact Us button. If the user selects any of the available options, separate methods are called such as getDeveloper() if the Contact the Developers button is pressed, or getGSA() if the Contact the GSA button is pressed. If the user does not select any options, the activity is completed.

View All Fish Sequence



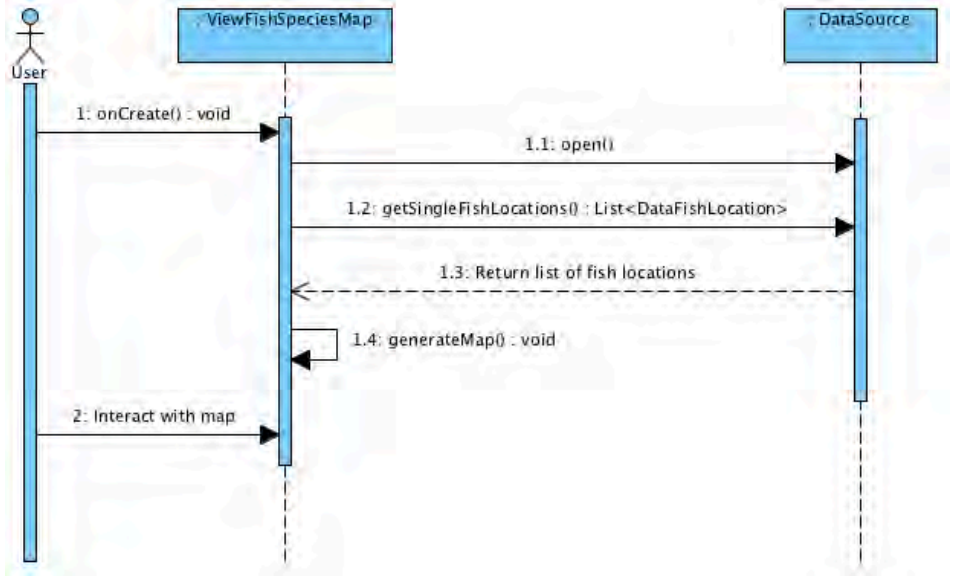
The View All Fish Sequence displays the sequence the user takes when viewing the all of the fish species in the State of Alabama. Once the user selects the browse all button, the viewAll() method is called, and a ViewFishList object is created. This object then talks with the DataSource to retrieve the information and populate the list with all of the correct fish information, and then displays the updated fish list to the user.

View Fish Map Sequence



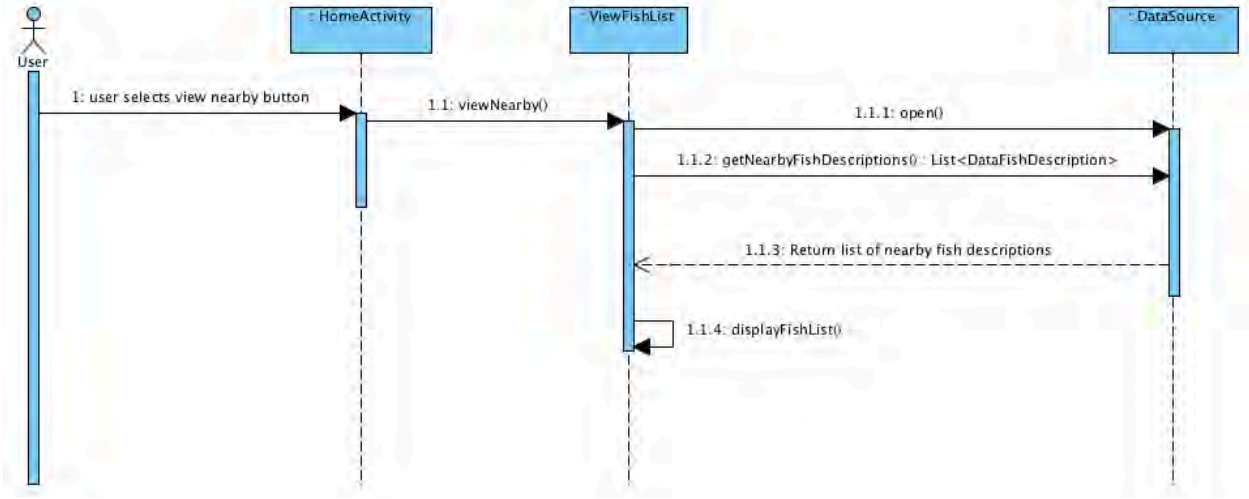
The View Fish Map Sequence displays the sequence the user takes when viewing the map of all of the fish locations in the State of Alabama. Once the View Fish Map activity is loaded, the ViewFishMap object then coordinates with the Data Source to retrieve the information of all of the locations of fish from the database. Once a list is returned, the ViewFishMap object generates the map and displays this map to the user. The user then has the option to interact with the map.

View Fish Species Map Sequence



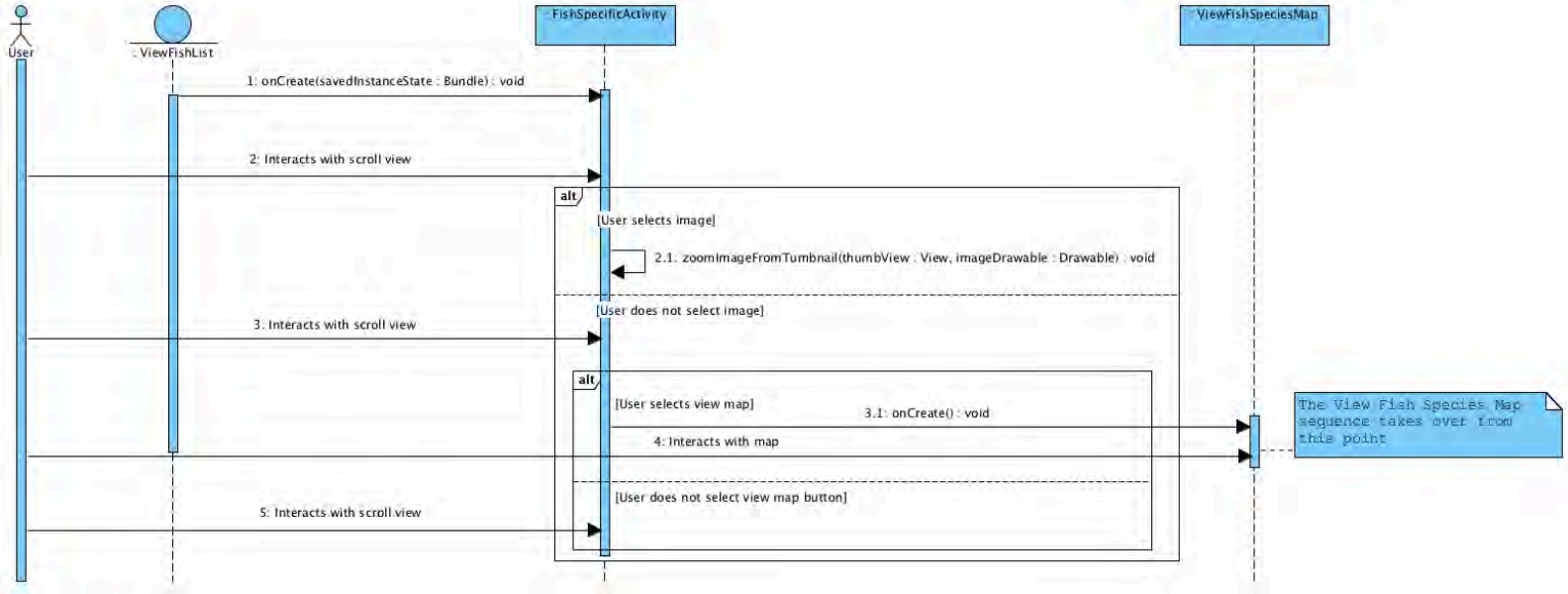
The View Fish Species Map Sequence displays the sequence the user selecting the view the map of all of the locations of a single species of fish in the State of Alabama. Once the View Fish Species Map activity is loaded, the activity then coordinates with the Data Source to retrieve the information of all of the locations of the respective fish species from the database. Once a list is returned, the View Fish Species Map object generates the map and displays this map to the user. The user then has the option to interact with the map.

View Nearby Fish Sequence



The View Nearby Fish Sequence displays the sequence the user takes when selecting to view a list of all fish that are nearby to the user's current GPS location. Once the user selects the option to view nearby fish, a View Fish List object is generated. This object then coordinates with the Data Source to retrieve the information of all of the locations of nearby fish from the database. Once a list is returned, the list is displayed to the user. The user can also then interact with the list, such as selecting a species.

View Specific Fish Activity Sequence



The View Specific Fish Activity Sequence displays the sequence the user takes when viewing the information of a single fish species. Once the user selects a species from a Fish List, a View Fish Specific Activity is loaded. This activity then coordinates with the Data Source to retrieve the information pertaining to the appropriate fish species. This information is displayed to the user. The user can then select to view the picture in a large format or view a map of all the locations the respective fish species appears in the State of Alabama. If the user selects to view the map, the View Fish Species Map Sequence begins. If the user does not select anything, the activity ends.