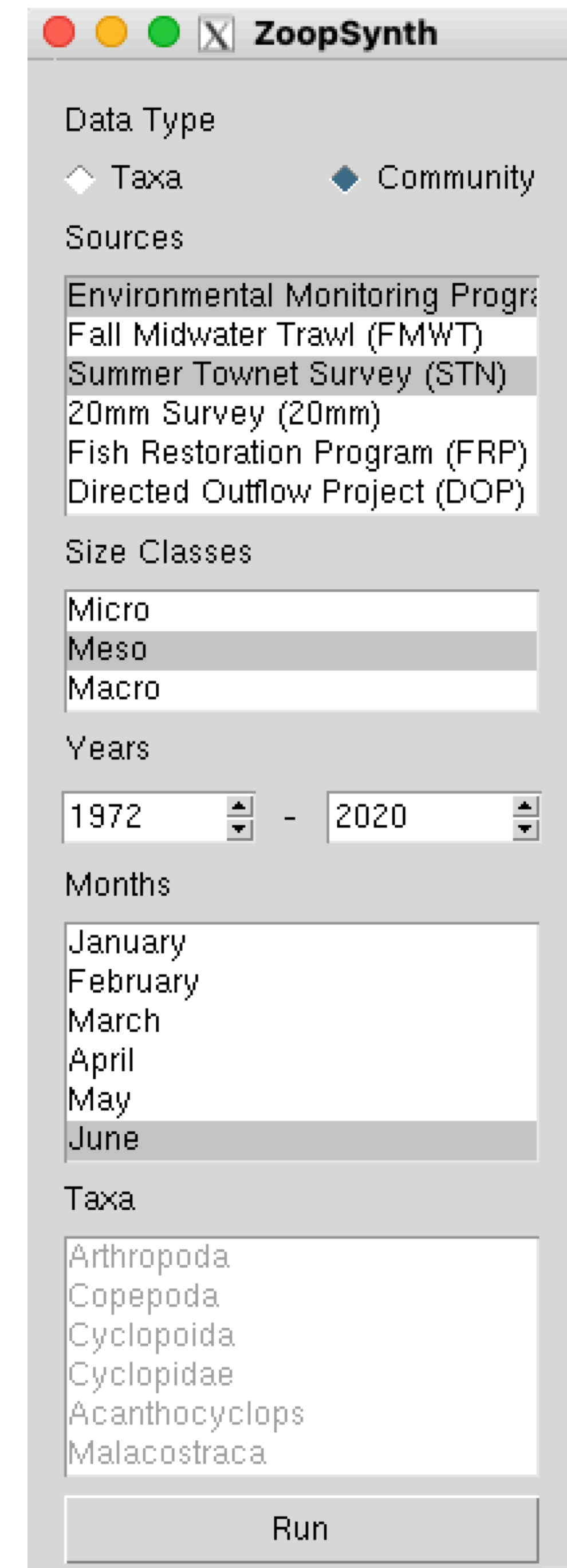


GUI apps with R & tcltk

An example based on functionality in ZoopSynth



GUI Packages

- Shiny
 - Web framework
 - Modern, big ecosystem
- RGtk2
 - Package removed from CRAN in 2021
- qtbase
 - GitHub repo last updated 5 years ago
 - Package removed from CRAN in 2020
- tcltk
 - Included in base R distribution
 - Dated, limited widgets
- tcltk2
 - Additional commands and widgets
- tickle
 - Opinionated abstraction over tcltk

GUI Packages

- Shiny
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GUI Packages

- Shiny
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 - Modern, big ecosystem
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 - Package removed from CRAN in 2021
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 - GitHub repo last updated 5 years ago
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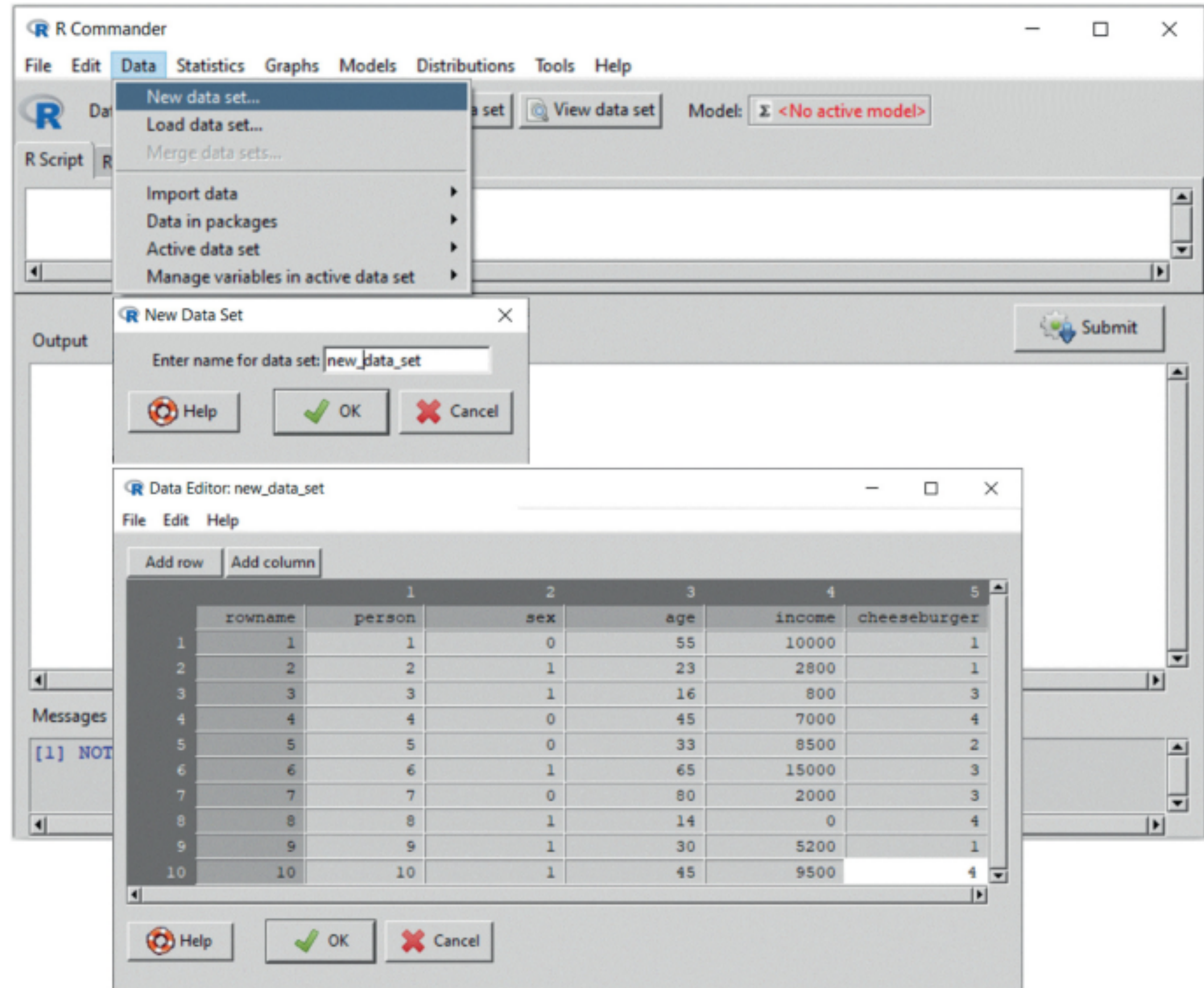
Tcl/Tk: tool command language/toolkit
(pronounced tickle-teak)

Many languages have bindings to Tcl/Tk,
including Python, Ruby, and Perl

- tcltk
 - Included in base R distribution
 - Dated, limited widgets
- tcltk2
 - Additional commands and widgets
- tickle
 - Opinionated abstraction over tcltk

R Commander

- [Rcmdr package](#)
- GUI for R statistics and graphics
- Built with tcltk package



Demo

R Packages & Variables

```
library(tcltk)
library(zoooper)
library(lubridate)
library(dplyr)
library(ggplot2)
```

```
source_names = c("Environmental Monitoring Program (EMP)", "Fall Midwater Trawl (FMWT)",
                 "Summer Townet Survey (STN)", "20mm Survey (20mm)",
                 "Fish Restoration Program (FRP)", "Directed Outflow Project (DOP)")
source_codes = c("EMP", "FMWT", "STN", "20mm", "FRP", "DOP")
source_colors <- setNames(RColorBrewer::brewer.pal(6, "Set2"), source_codes)
size_codes = c("Micro", "Meso", "Macro")
zooop_data = NULL
```

The screenshot shows the ZoopSynth application window. It has a title bar with standard window controls (red, yellow, green buttons and a close button) and the text 'ZoopSynth'. The main content area is divided into several sections:

- Data Type:** Two radio buttons are present: 'Taxa' (selected) and 'Community'.
- Sources:** A list of six survey programs: 'Environmental Monitoring Program (EMP)', 'Fall Midwater Trawl (FMWT)', 'Summer Townet Survey (STN)', '20mm Survey (20mm)', 'Fish Restoration Program (FRP)', and 'Directed Outflow Project (DOP)'. The 'Summer Townet Survey (STN)' is currently selected.
- Size Classes:** A list of three size classes: 'Micro', 'Meso', and 'Macro'. 'Meso' is selected.
- Years:** Two spinners for selecting years, currently set to 1972 and 2020.
- Months:** A list of months from 'January' to 'June'. 'June' is selected.
- Taxa:** A list of taxonomic groups: 'Arthropoda', 'Copepoda', 'Cyclopoida', 'Cyclopidae', 'Acanthocyclops', and 'Malacostraca'. 'Cyclopidae' is selected.
- Run:** A large button at the bottom right labeled 'Run'.

R Packages & Variables

```
library(tcltk)
library(zoooper)
library(lubridate)
library(dplyr)
library(ggplot2)
```

```
source_names = c("Environmental Monitoring Program (EMP)", "Fall Midwater Trawl (FMWT)",
  "Summer Townet Survey (STN)", "20mm Survey (20mm)",
  "Fish Restoration Program (FRP)", "Directed Outflow Project (DOP)")
source_codes = c("EMP", "FMWT", "STN", "20mm", "FRP", "DOP")
source_colors <- setNames(RColorBrewer::brewer.pal(6, "Set2"), source_codes)
size_codes = c("Micro", "Meso", "Macro")
zooop_data = NULL
```

ZoopSynth

Data Type
 Taxa Community

Sources

- Environmental Monitoring Program (EMP)
- Fall Midwater Trawl (FMWT)
- Summer Townet Survey (STN)
- 20mm Survey (20mm)
- Fish Restoration Program (FRP)
- Directed Outflow Project (DOP)

Size Classes

- Micro
- Meso
- Macro

Years
1972 - 2020

Months

- January
- February
- March
- April
- May
- June

Taxa

- Arthropoda
- Copepoda
- Cyclopoida
- Cyclopidae
- Acanthocyclops
- Malacostraca

Run

tcl Variables

tclVar() creates binding between R and tcl variables

```
datatype = tclVar("Community")
```

```
sources = tclVar()  
tclvalue(sources) = source_names
```

```
size_classes = tclVar()  
tclvalue(size_classes) = size_codes
```

```
min_yr = tclVar(1972)  
max_yr = tclVar(2020)
```

```
months = tclVar()  
tclvalue(months) = month.name
```

```
taxa = tclVar()  
tclvalue(taxa) = completeTaxaList
```

The screenshot shows the ZoopSynth application window with the following configuration options:

- Data Type:** Community (selected)
- Sources:** Environmental Monitoring Program, Fall Midwater Trawl (FMWT), Summer Townet Survey (STN), 20mm Survey (20mm), Fish Restoration Program (FRP), Directed Outflow Project (DOP)
- Size Classes:** Micro, Meso, Macro
- Years:** 1972 - 2020
- Months:** January, February, March, April, May, June
- Taxa:** Arthropoda, Copepoda, Cyclopoida, Cyclopidae, Acanthocyclops, Malacostraca

A "Run" button is located at the bottom of the window.

tcl Variables

```
datatype = tclVar("Community")
```

```
sources = tclVar()  
tclvalue(sources) = source_names
```

```
size_classes = tclVar()  
tclvalue(size_classes) = size_codes
```

```
min_yr = tclVar(1972)  
max_yr = tclVar(2020)
```

```
months = tclVar()  
tclvalue(months) = month.name
```

```
taxa = tclVar()  
tclvalue(taxa) = completeTaxaList
```

Initial Values

The screenshot shows the ZoopSynth application window with the following configuration options:

- Data Type:** Radio buttons for Taxa and Community. Community is selected.
- Sources:** A list box containing: Environmental Monitoring Program, Fall Midwater Trawl (FMWT), Summer Townet Survey (STN), 20mm Survey (20mm), Fish Restoration Program (FRP), and Directed Outflow Project (DOP).
- Size Classes:** A list box containing: Micro, Meso, and Macro.
- Years:** Two spinners for start and end years, set to 1972 and 2020.
- Months:** A list box containing: January, February, March, April, May, and June.
- Taxa:** A list box containing: Arthropoda, Copepoda, Cyclopoida, Cyclopidae, Acanthocyclops, and Malacostraca.
- Run:** A button at the bottom.

tcl Variables

```
datatype = tclVar("Community")
```

```
sources = tclVar()  
tclvalue(sources) = source_names
```

```
size_classes = tclVar()  
tclvalue(size_classes) = size_codes
```

```
min_yr = tclVar(1972)  
max_yr = tclVar(2020)
```

```
months = tclVar()  
tclvalue(months) = month.name
```

```
taxa = tclVar()  
tclvalue(taxa) = completeTaxaList
```

Choices

The screenshot shows the ZoopSynth application window with the following sections:

- Data Type:** Radio buttons for Taxa and Community. Community is selected.
- Sources:** A list box containing: Environmental Monitoring Program, Fall Midwater Trawl (FMWT), Summer Townet Survey (STN), 20mm Survey (20mm), Fish Restoration Program (FRP), and Directed Outflow Project (DOP).
- Size Classes:** A list box containing: Micro, Meso, and Macro.
- Years:** Two spinners for the start and end years, set to 1972 and 2020.
- Months:** A list box containing: January, February, March, April, May, and June.
- Taxa:** A list box containing: Arthropoda, Copepoda, Cyclopoida, Cyclopidae, Acanthocyclops, and Malacostraca.
- Run:** A button at the bottom.

Named Frames & Widgets

```
base <- tktoplevel()
tkwm.title(base, "ZoopSynth")
mainframe = ttkframe(base, padding = c(10, 10, 10, 10))

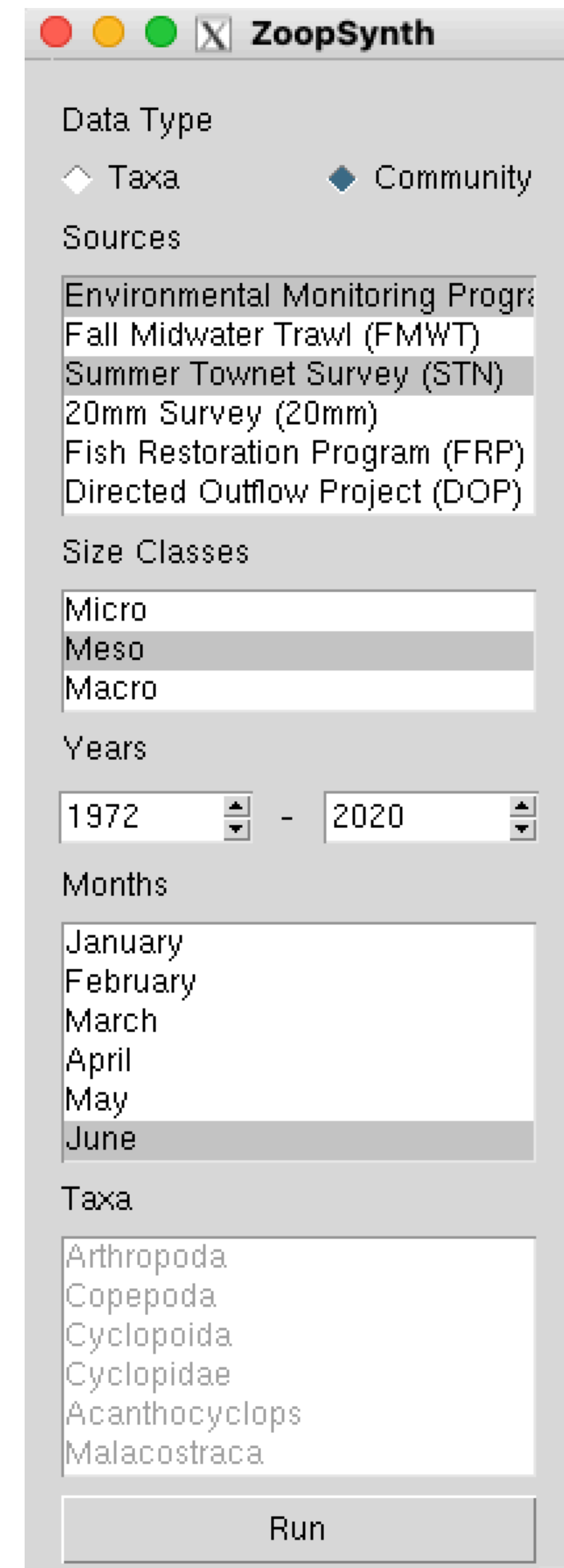
sources_lb = tklistbox(mainframe, listvariable = sources, selectmode = "multiple",
                       exportselection = FALSE, height = 6)

size_classes_lb = tklistbox(mainframe, listvariable = size_classes, selectmode = "multiple",
                             exportselection = FALSE, height = 3)

years_lb = tklistbox(mainframe, listvariable = years, selectmode = "multiple",
                     exportselection = FALSE, height = 6)

months_lb = tklistbox(mainframe, listvariable = months, selectmode = "multiple",
                      exportselection = FALSE, height = 6)

taxa_lb = tklistbox(mainframe, listvariable = taxa, selectmode = "multiple",
                    exportselection = FALSE, height = 6, state = "disabled")
```



Named Frames & Widgets

```
base <- tkoplevel()
tkwm.title(base, "ZoopSynth")
mainframe = ttkframe(base, padding = c(10, 10, 10, 10))

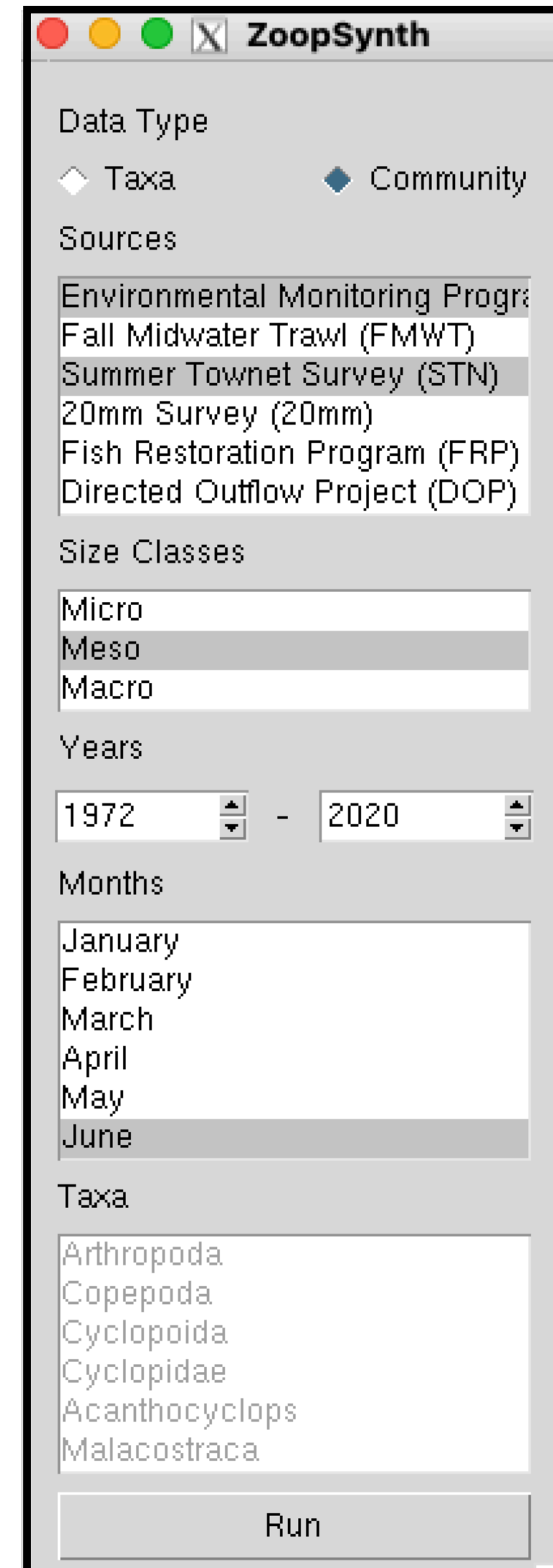
sources_lb = tklistbox(mainframe, listvariable = sources, selectmode = "multiple",
                       exportselection = FALSE, height = 6)

size_classes = tklistbox(mainframe, listvariable = size_classes, selectmode = "multiple",
                          exportselection = FALSE, height = 3)

years = tkcalendar(mainframe, min_year = 1972, max_year = 2020)

months_lb = tklistbox(mainframe, listvariable = months, selectmode = "multiple",
                      exportselection = FALSE, height = 6)

taxa_lb = tklistbox(mainframe, listvariable = taxa, selectmode = "multiple",
                    exportselection = FALSE, height = 6, state = "disabled")
```



Named Frames & Widgets

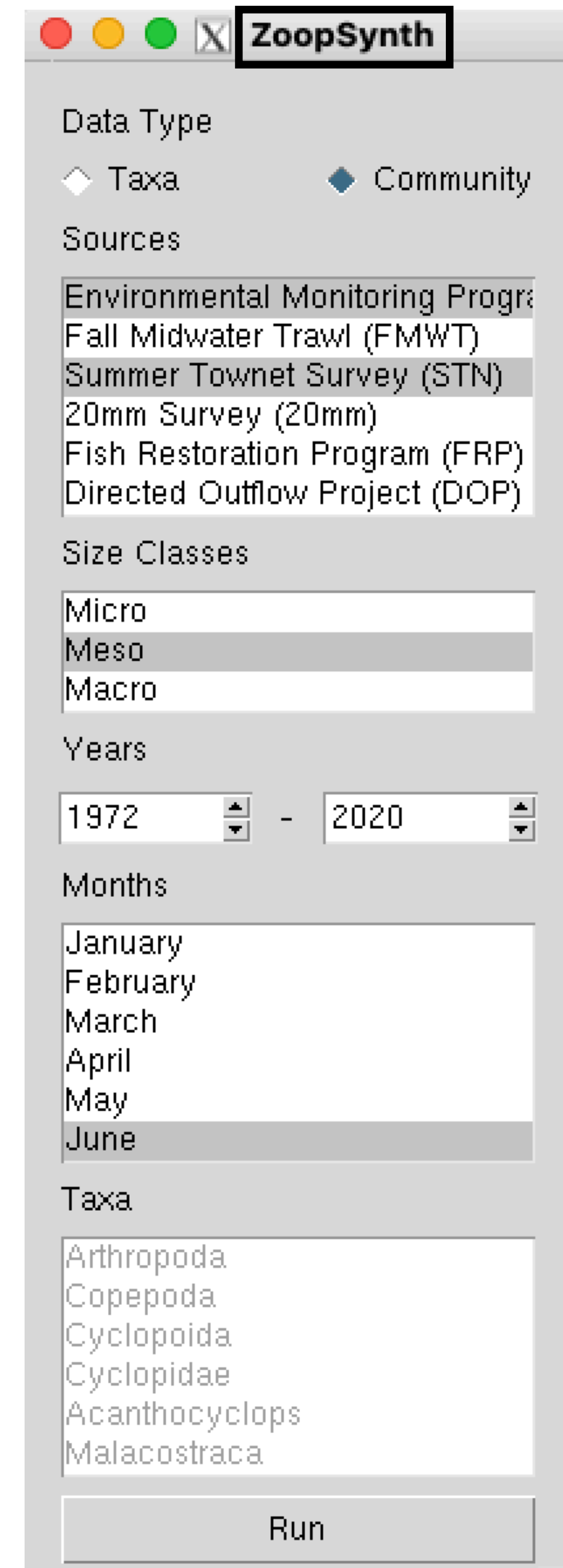
```
base <- tktoplevel()
tkwm.title(base, "ZoopSynth")
mainframe = ttkframe(base, padding = c(10, 10, 10, 10))

sources_lb = tklistbox(mainframe, listvariable = sources, selectmode = "multiple",
                      exportselection = FALSE, height = 6)

sizes_lb = tklistbox(mainframe, listvariable = size_classes, selectmode = "multiple",
                    exportselection = FALSE, height = 3)

months_lb = tklistbox(mainframe, listvariable = months, selectmode = "multiple",
                     exportselection = FALSE, height = 6)

taxa_lb = tklistbox(mainframe, listvariable = taxa, selectmode = "multiple",
                   exportselection = FALSE, height = 6, state = "disabled")
```



Named Frames & Widgets

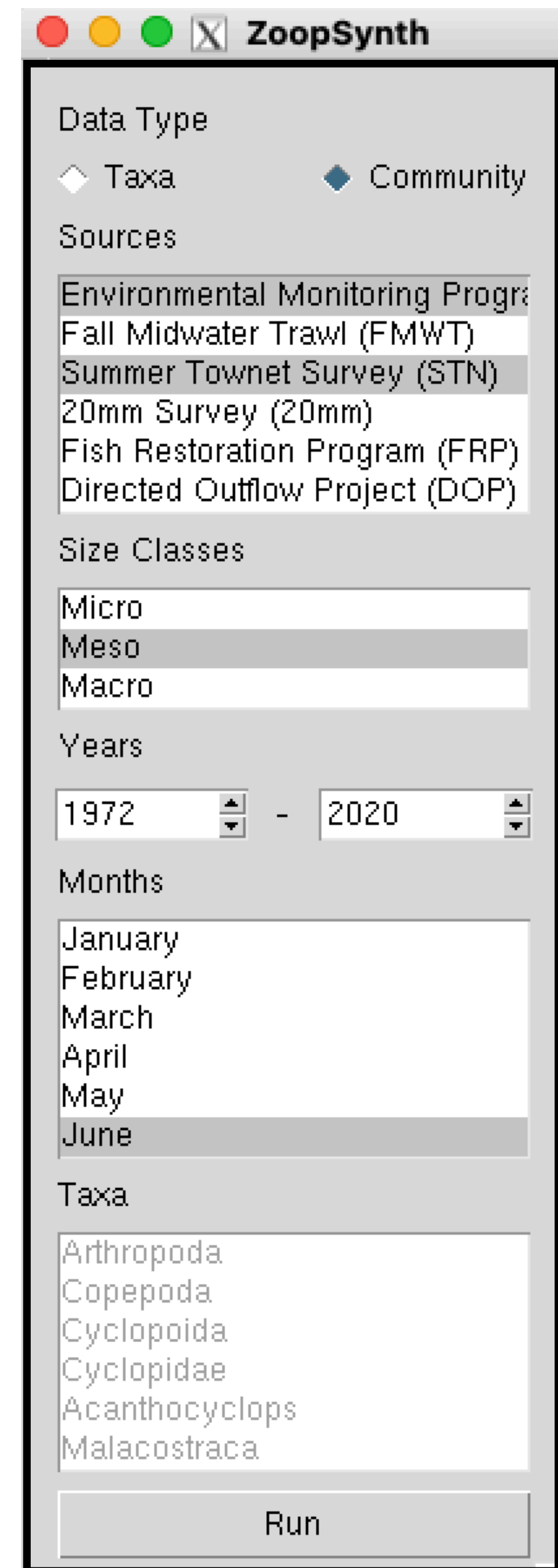
```
base <- tktoplevel()
tkwm.title(base, "ZoopSynth")
mainframe = ttkframe(base, padding = c(10, 10, 10, 10))

sources_lb = tklistbox(mainframe, listvariable = sources, selectmode = "multiple",
                      exportselection = FALSE, height = 6)

sizes_lb = tklistbox(mainframe, listvariable = size_classes, selectmode = "multiple",
                    exportselection = FALSE, height = 3)

months_lb = tklistbox(mainframe, listvariable = months, selectmode = "multiple",
                     exportselection = FALSE, height = 6)

taxa_lb = tklistbox(mainframe, listvariable = taxa, selectmode = "multiple",
                   exportselection = FALSE, height = 6, state = "disabled")
```



Named Frames & Widgets

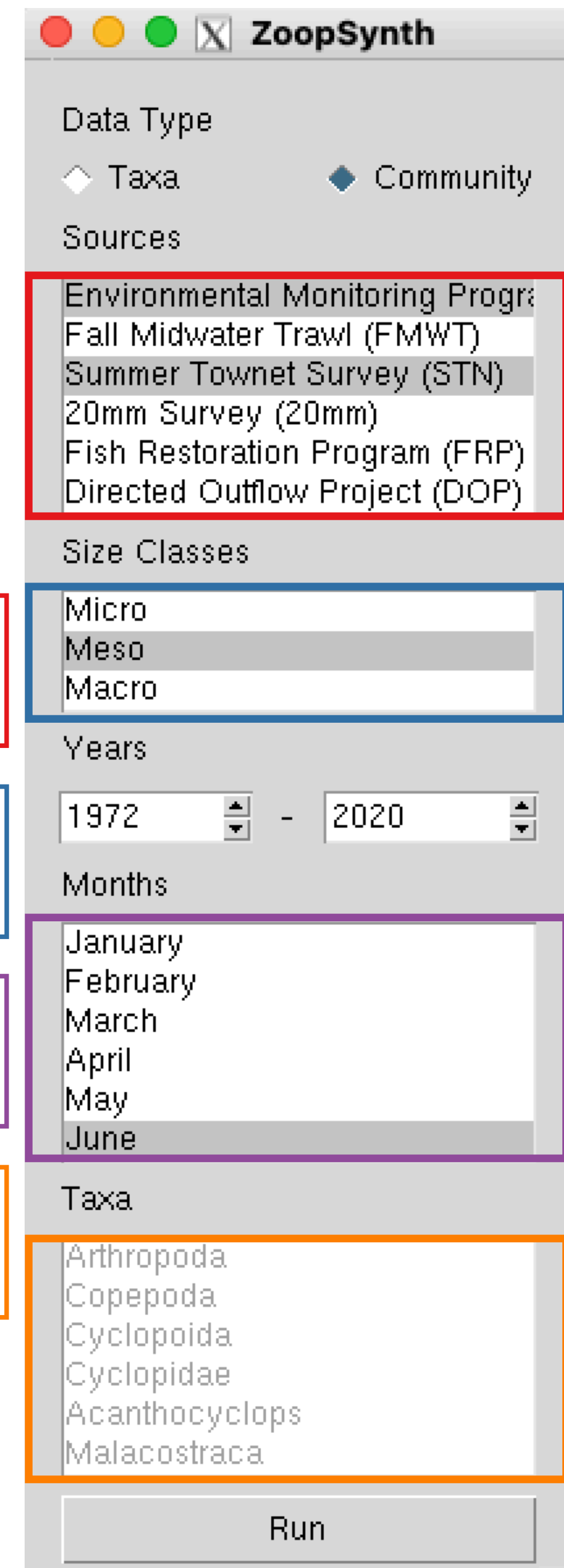
```
base <- tkoplevel()
tkwm.title(base, "ZoopSynth")
mainframe = ttkframe(base, padding = c(10, 10, 10, 10))
```

```
sources_lb = tklistbox(mainframe, listvariable = sources, selectmode = "multiple",
                       exportselection = FALSE, height = 6)
```

```
sizes_lb = tklistbox(mainframe, listvariable = size_classes, selectmode = "multiple",
                     exportselection = FALSE, height = 3)
```

```
months_lb = tklistbox(mainframe, listvariable = months, selectmode = "multiple",
                      exportselection = FALSE, height = 6)
```

```
taxa_lb = tklistbox(mainframe, listvariable = taxa, selectmode = "multiple",
                    exportselection = FALSE, height = 6, state = "disabled")
```



Named Frames & Widgets

```
base <- tkoplevel()
tkwm.title(base, "ZoopSynth")
mainframe = ttkframe(base, padding = c(10, 10, 10, 10))

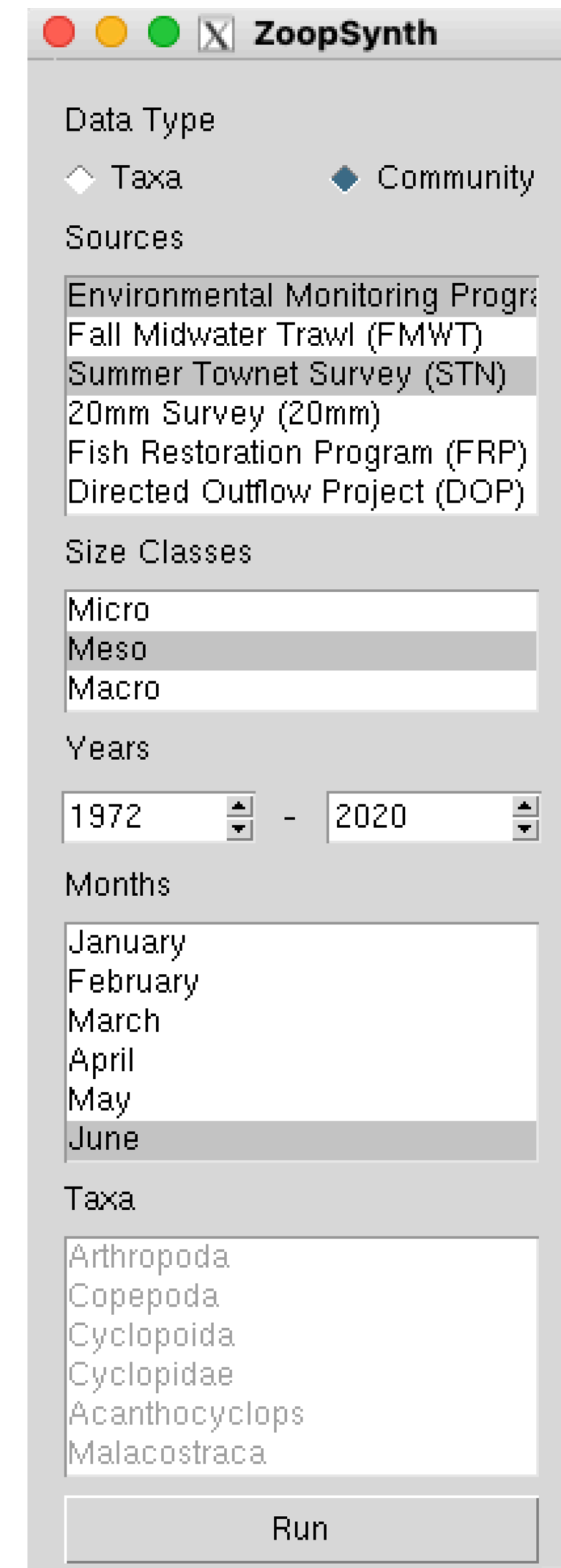
sources_lb = tklistbox(mainframe, listvariable = sources, selectmode = "multiple",
                      exportselection = FALSE, height = 6)

sizes_lb = tklistbox(mainframe, listvariable = size_classes, selectmode = "multiple",
                    exportselection = FALSE, height = 3)

months_lb = tklistbox(mainframe, listvariable = months, selectmode = "multiple",
                     exportselection = FALSE, height = 6)

taxa_lb = tklistbox(mainframe, listvariable = taxa, selectmode = "multiple",
                   exportselection = FALSE, height = 6, state = "disabled")
```

listvariable needs to be a tcl variable.



Named Frames & Widgets

```
base <- tkoplevel()
tkwm.title(base, "ZoopSynth")
mainframe = ttkframe(base, padding = c(10, 10, 10, 10))

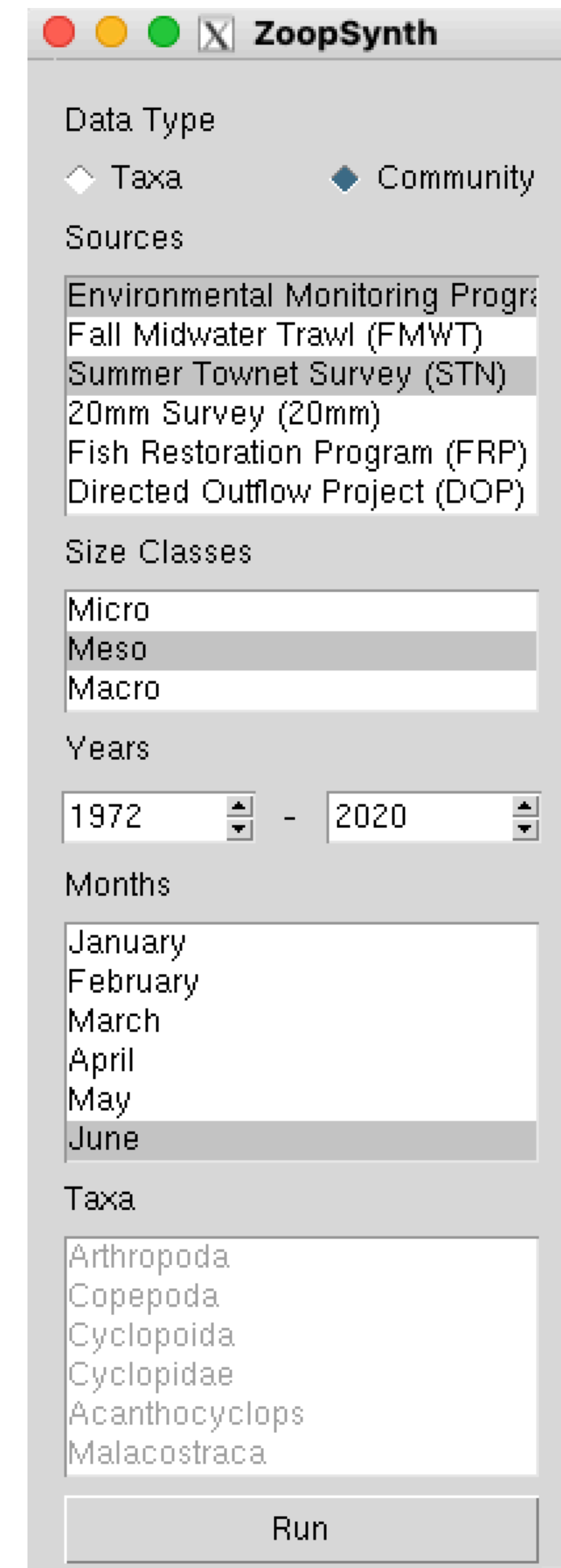
sources_lb = tklistbox(mainframe, listvariable = sources, selectmode = "multiple",
                       exportselection = FALSE, height = 6)

sizes_lb = tklistbox(mainframe, listvariable = size_classes, selectmode = "multiple",
                    exportselection = FALSE, height = 3)

months_lb = tklistbox(mainframe, listvariable = months, selectmode = "multiple",
                     exportselection = FALSE, height = 6)

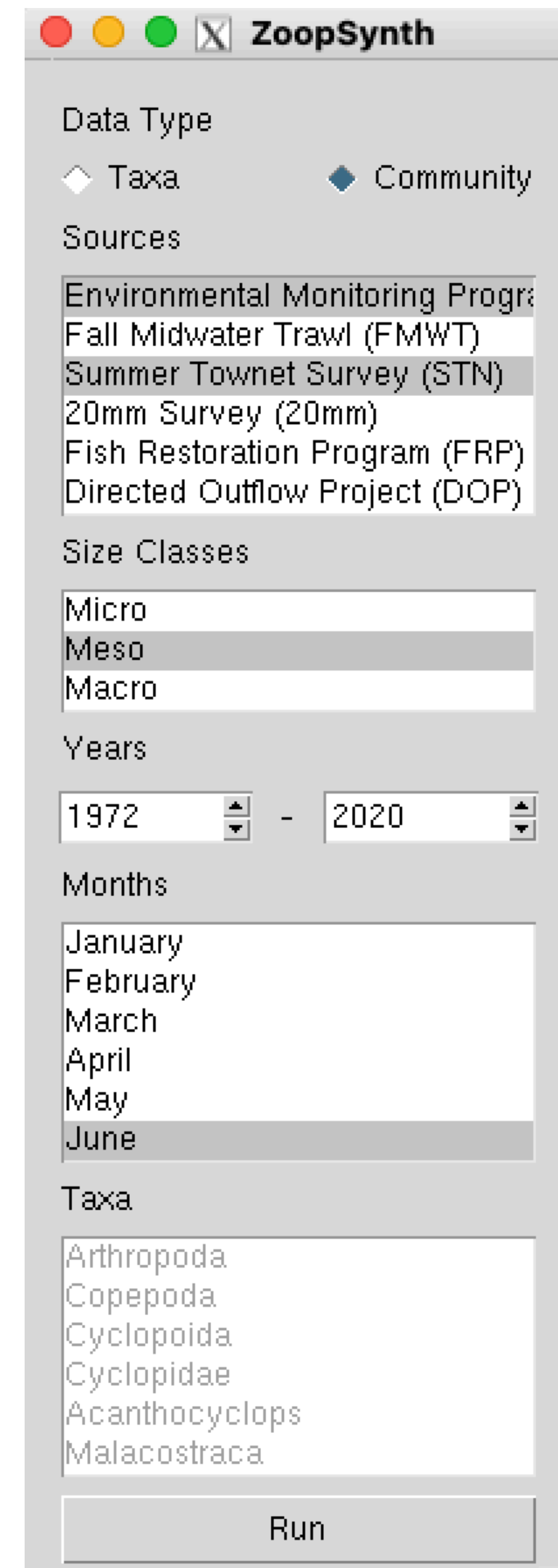
taxa_lb = tklistbox(mainframe, listvariable = taxa, selectmode = "multiple",
                   exportselection = FALSE, height = 6, state = "disabled")
```

When `exportselection = TRUE`, clicking in one listbox removes selections for other listboxes.



Initial Listbox Selections

```
# need to loop through selections when not consecutive
for (i in c(0, 2)) tkselection.set(sources_lb, i)
# only select one size class initially
tkselection.set(sizes_lb, 1)
# if consecutive, can specify first and last index to select multiple
tkselection.set(months_lb, 5, 7)
# indexing is 0-based so this selects Jun-Aug
```



The screenshot shows the ZoopSynth application window with the following settings:

- Data Type:** Community (selected)
- Sources:** Environmental Monitoring Program, Fall Midwater Trawl (FMWT), Summer Trawl Survey (STN), 20mm Survey (20mm), Fish Restoration Program (FRP), Directed Outflow Project (DOP)
- Size Classes:** Micro, Meso (selected), Macro
- Years:** 1972 - 2020
- Months:** January, February, March, April, May, June (selected)
- Taxa:** Arthropoda, Copepoda, Cyclopoida, Cyclopidae, Acanthocyclops, Malacostraca

A "Run" button is located at the bottom of the interface.

Layout

	Col 0	Col 1	Col 2
Row 0	Data Type		
1	◆ Taxa	◆ Community	
2	Sources		
3	Environmental Monitoring Program Fall Midwater Trawl (FMWT) Summer Townet Survey (STN) 20mm Survey (20mm) Fish Restoration Program (FRP) Directed Outflow Project (DOP)		
4	Size Classes		
5	Micro Meso Macro		
6	Years		
7	1972	-	2020
8	Months		
9	January February March April May June		
10	Taxa		
11	Arthropoda Copepoda Cyclopoida Cyclopidae Acanthocyclops Malacostraca		
12	Run		

- Three geometry managers
 - Grid
 - Pack
 - Place
- Grid is recommend over pack.
- Place is for low-level control.

Radio Buttons

```
tkgrid(ttklabel(mainframe, text = "Data Type"),  
       row = 0, column = 0, sticky = "w", padx = 5, pady = 5)
```

```
tkgrid(ttkradiobutton(mainframe, text = "Taxa", value = "Taxa", variable = datatype,  
                      command = function(...) tkconfigure(taxa_lb, state = "normal")),  
       row = 1, column = 0, sticky = "w", padx = 5)
```

```
tkgrid(ttkradiobutton(mainframe, text = "Community", value = "Community", variable = datatype,  
                    command = function(...) tkconfigure(taxa_lb, state = "disabled")),  
       row = 1, column = 2, sticky = "w", padx = 5)
```

The screenshot shows the 'ZoopSynth' application window. The 'Data Type' window is open, showing two radio buttons: 'Taxa' (selected) and 'Community'. Below the radio buttons are several filter sections:

- Sources:** Environmental Monitoring Program, Fall Midwater Trawl (FMWT), Summer Townet Survey (STN), 20mm Survey (20mm), Fish Restoration Program (FRP), Directed Outflow Project (DOP).
- Size Classes:** Micro, Meso, Macro.
- Years:** 1972 - 2020.
- Months:** January, February, March, April, May, June.
- Taxa:** Arthropoda, Copepoda, Cyclopoida, Cyclopidae, Acanthocyclops, Malacostraca.

A 'Run' button is located at the bottom of the window.

Radio Buttons

```
tkgrid(ttklabel(mainframe, text = "Data Type"),  
       row = 0, column = 0, sticky = "w", padx = 5, pady = 5)
```

```
tkgrid(ttkradiobutton(mainframe, text = "Taxa", value = "Taxa", variable = datatype,  
                      command = function(...) tkconfigure(taxa_lb, state = "normal")),  
       row = 1, column = 0, sticky = "w", padx = 5)
```

```
tkgrid(ttkradiobutton(mainframe, text = "Community", value = "Community", variable = datatype,  
                    command = function(...) tkconfigure(taxa_lb, state = "disabled")),  
       row = 1, column = 2, sticky = "w", padx = 5)
```

The screenshot shows the ZoopSynth application window. The interface includes the following elements:

- Data Type:** Two radio buttons are present: "Taxa" (selected) and "Community".
- Sources:** A list of sources including Environmental Monitoring Program, Fall Midwater Trawl (FMWT), Summer Townet Survey (STN), 20mm Survey (20mm), Fish Restoration Program (FRP), and Directed Outflow Project (DOP).
- Size Classes:** A list of size classes including Micro, Meso, and Macro.
- Years:** Two spinners for selecting years, currently set to 1972 and 2020.
- Months:** A list of months from January to June, with June selected.
- Taxa:** A list of taxa including Arthropoda, Copepoda, Cyclopoida, Cyclopidae, Acanthocyclops, and Malacostraca.
- Run Button:** A button labeled "Run" at the bottom of the window.

Radio Buttons

```
tkgrid(ttklabel(mainframe, text = "Data Type"),  
       row = 0, column = 0, sticky = "w", padx = 5, pady = 5)
```

```
tkgrid(ttkradiobutton(mainframe, text = "Taxa", value = "Taxa", variable = datatype,  
                      command = function(...) tkconfigure(taxa_lb, state = "normal")),  
       row = 1, column = 0, sticky = "w", padx = 5)
```

```
tkgrid(ttkradiobutton(mainframe, text = "Community", value = "Community", variable = datatype,  
                    command = function(...) tkconfigure(taxa_lb, state = "disabled")),  
       row = 1, column = 2, sticky = "w", padx = 5)
```

The screenshot shows the ZoopSynth application window. The interface includes several sections:

- Data Type:** Two radio buttons are present: "Taxa" (unchecked) and "Community" (checked and highlighted with a black border).
- Sources:** A list of sources including "Environmental Monitoring Program", "Fall Midwater Trawl (FMWT)", "Summer Townet Survey (STN)", "20mm Survey (20mm)", "Fish Restoration Program (FRP)", and "Directed Outflow Project (DOP)".
- Size Classes:** A list of size classes including "Micro", "Meso", and "Macro".
- Years:** Two spinners for selecting years, currently set to 1972 and 2020.
- Months:** A list of months from "January" to "June", with "June" selected.
- Taxa:** A list of taxa including "Arthropoda", "Copepoda", "Cyclopoida", "Cyclopidae", "Acanthocyclops", and "Malacostraca".
- Run:** A button at the bottom right labeled "Run".

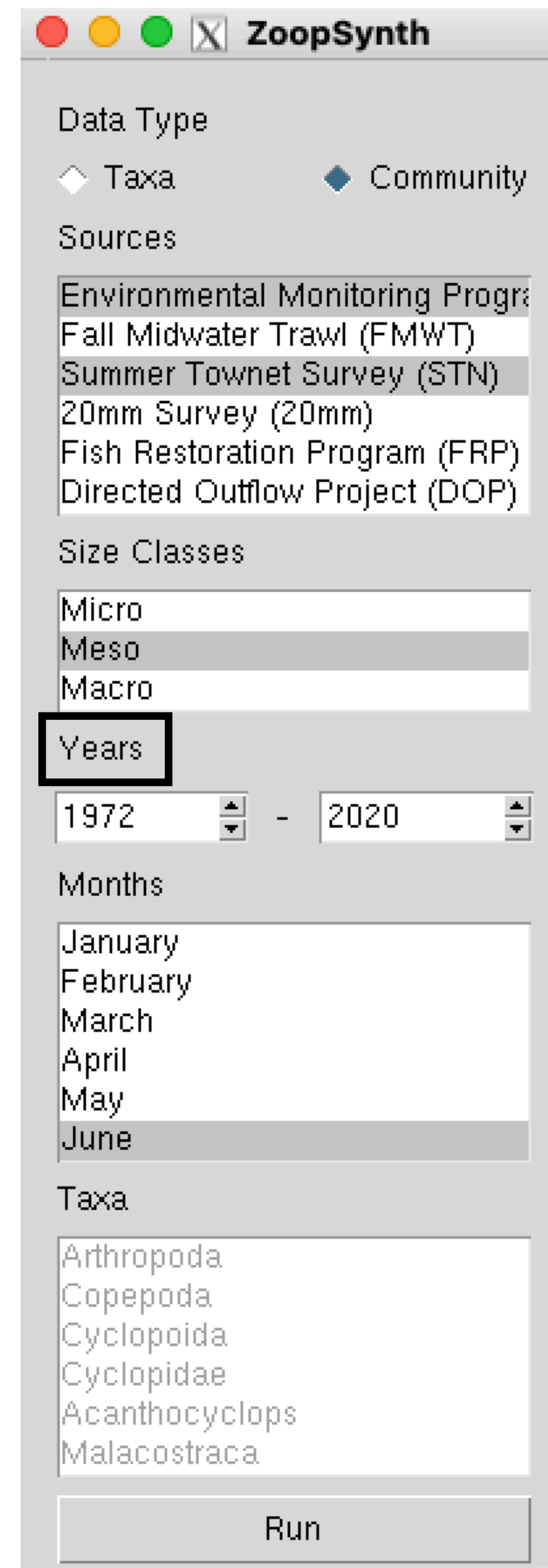
Spinbox

```
tkgrid(ttklabel(mainframe, text = "Years"),  
       row = 6, column = 0, sticky = "we", padx = 5, pady = 5)
```

```
tkgrid(ttkspinbox(mainframe, textvariable = min_yr, from = 1972, to = 2020,  
                 increment = 1, width = 5),  
       row = 7, column = 0, sticky = "we", padx = 5)
```

```
tkgrid(ttklabel(mainframe, text = "-"),  
       row = 7, column = 1, sticky = "we", padx = 5, pady = 5)
```

```
tkgrid(ttkspinbox(mainframe, textvariable = max_yr, from = 1972, to = 2020,  
                 increment = 1, width = 5),  
       row = 7, column = 2, sticky = "we", padx = 5)
```



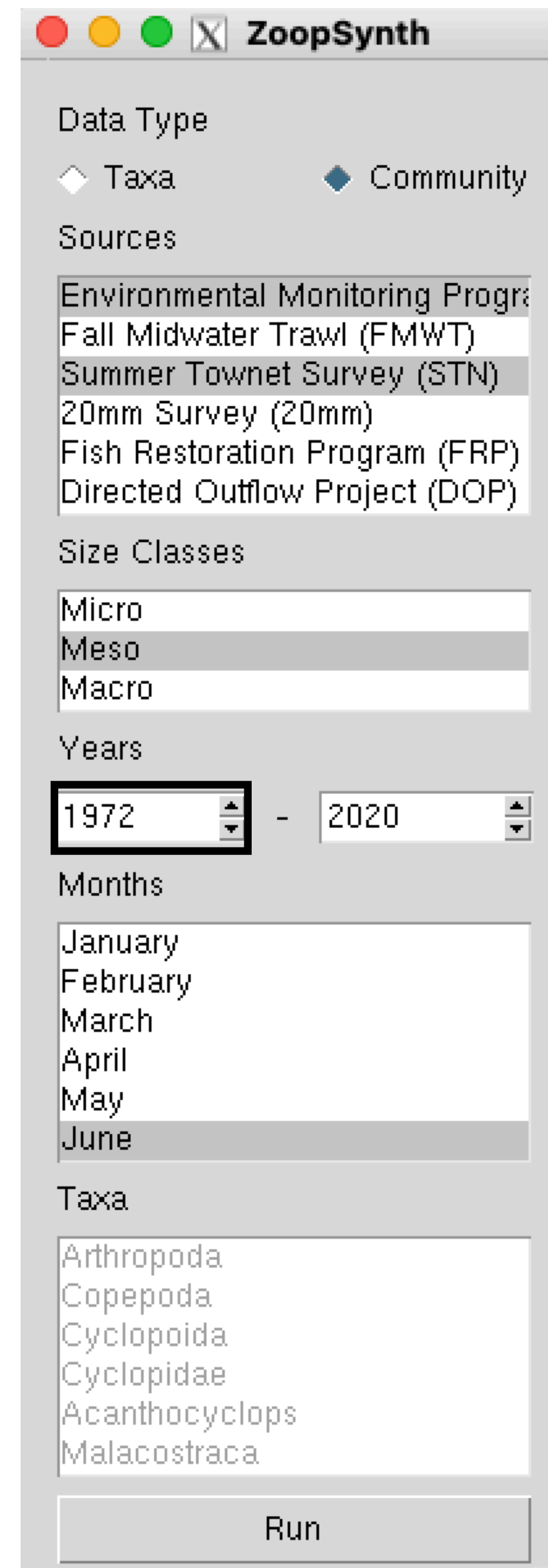
Spinbox

```
tkgrid(ttklabel(mainframe, text = "Years"),  
       row = 6, column = 0, sticky = "we", padx = 5, pady = 5)
```

```
tkgrid(ttkspinbox(mainframe, textvariable = min_yr, from = 1972, to = 2020,  
                 increment = 1, width = 5),  
       row = 7, column = 0, sticky = "we", padx = 5)
```

```
tkgrid(ttklabel(mainframe, text = "-"),  
       row = 7, column = 1, sticky = "we", padx = 5, pady = 5)
```

```
tkgrid(ttkspinbox(mainframe, textvariable = max_yr, from = 1972, to = 2020,  
                 increment = 1, width = 5),  
       row = 7, column = 2, sticky = "we", padx = 5)
```



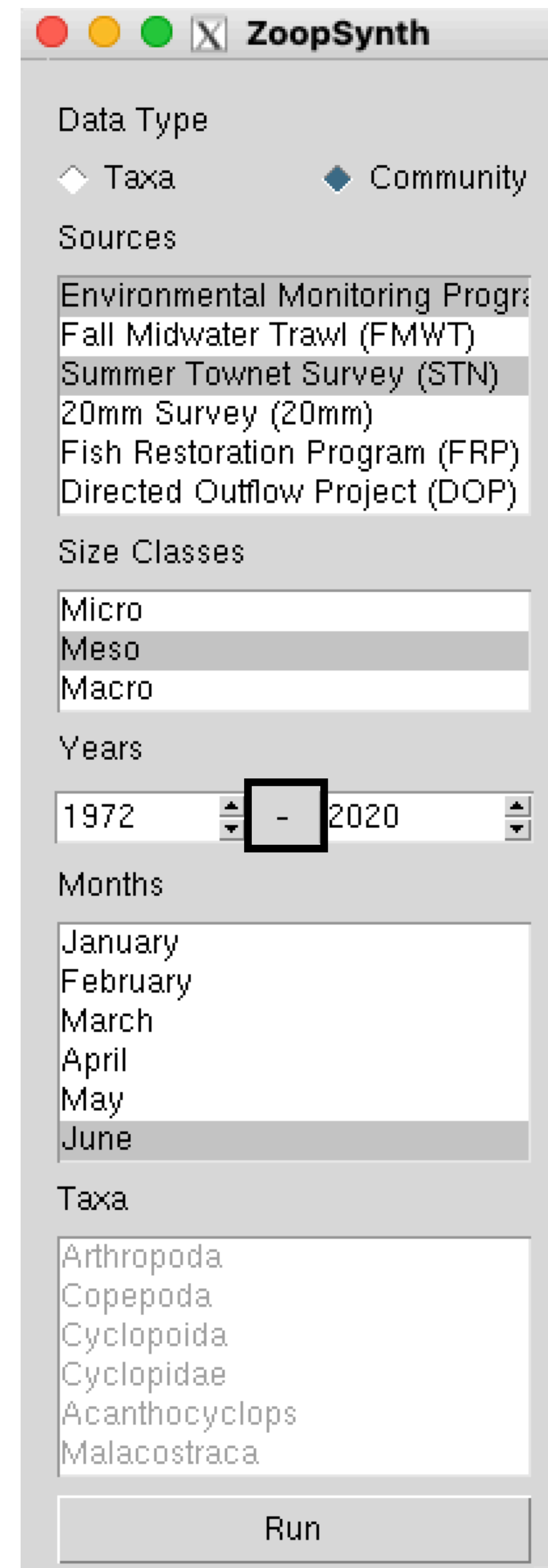
Spinbox

```
tkgrid(ttklabel(mainframe, text = "Years"),  
       row = 6, column = 0, sticky = "we", padx = 5, pady = 5)
```

```
tkgrid(ttkspinbox(mainframe, textvariable = min_yr, from = 1972, to = 2020,  
                 increment = 1, width = 5),  
       row = 7, column = 0, sticky = "we", padx = 5)
```

```
tkgrid(ttklabel(mainframe, text = "-"),  
       row = 7, column = 1, sticky = "we", padx = 5, pady = 5)
```

```
tkgrid(ttkspinbox(mainframe, textvariable = max_yr, from = 1972, to = 2020,  
                 increment = 1, width = 5),  
       row = 7, column = 2, sticky = "we", padx = 5)
```



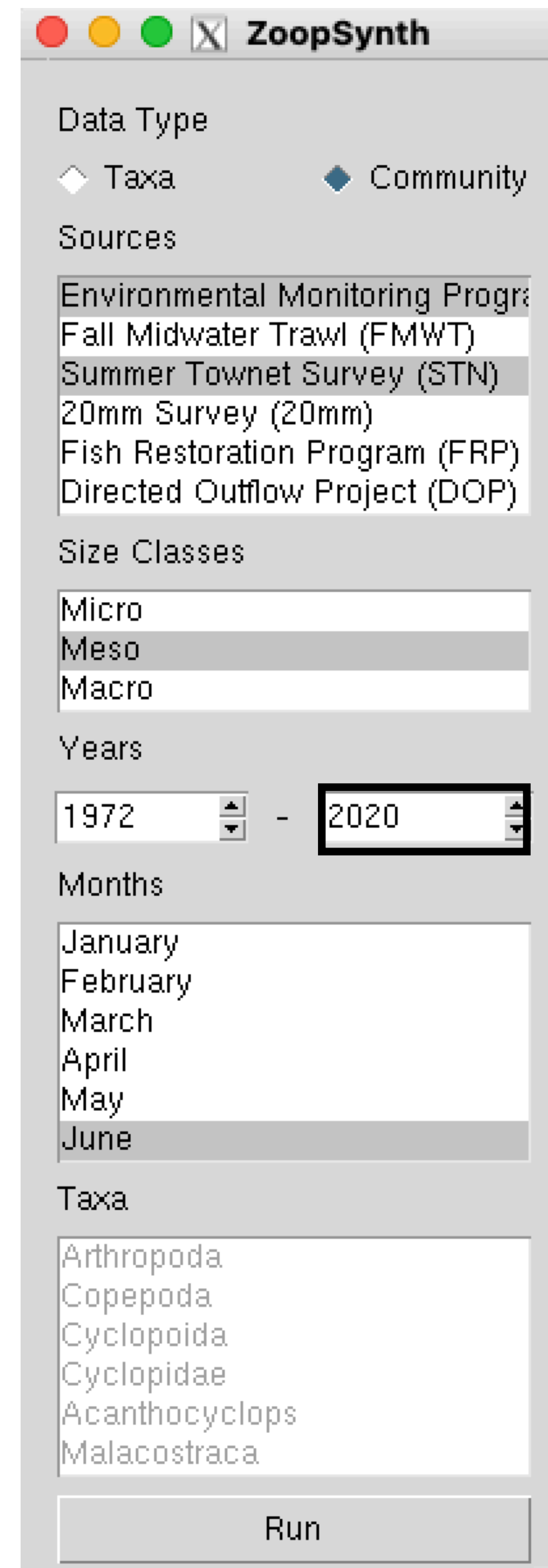
Spinbox

```
tkgrid(ttklabel(mainframe, text = "Years"),  
       row = 6, column = 0, sticky = "we", padx = 5, pady = 5)
```

```
tkgrid(ttkspinbox(mainframe, textvariable = min_yr, from = 1972, to = 2020,  
                 increment = 1, width = 5),  
       row = 7, column = 0, sticky = "we", padx = 5)
```

```
tkgrid(ttklabel(mainframe, text = "-"),  
       row = 7, column = 1, sticky = "we", padx = 5, pady = 5)
```

```
tkgrid(ttkspinbox(mainframe, textvariable = max_yr, from = 1972, to = 2020,  
                 increment = 1, width = 5),  
       row = 7, column = 2, sticky = "we", padx = 5)
```



Commands

```
tkgrid(tkbutton(mainframe, text = "Run", command = fetch_and_plot),  
       row = 12, column = 0, columnspan = 3, sticky = "we", padx = 5, pady = 5)
```

The screenshot shows the ZoopSynth application window. At the top, there are window control buttons (red, yellow, green) and the title 'ZoopSynth'. Below the title bar, the interface is organized into several sections:

- Data Type:** Two radio buttons are present: 'Taxa' (unselected) and 'Community' (selected).
- Sources:** A list of data sources with 'Environmental Monitoring Program' selected. Other sources include 'Fall Midwater Trawl (FMWT)', 'Summer Townet Survey (STN)', '20mm Survey (20mm)', 'Fish Restoration Program (FRP)', and 'Directed Outflow Project (DOP)'.
- Size Classes:** A list with 'Meso' selected. Other options are 'Micro' and 'Macro'.
- Years:** Two spinners are shown, with the first set to '1972' and the second to '2020', separated by a minus sign.
- Months:** A list of months with 'June' selected. Other months listed are 'January', 'February', 'March', 'April', and 'May'.
- Taxa:** A list of taxonomic groups with 'Arthropoda' selected. Other groups include 'Copepoda', 'Cyclopoida', 'Cyclopidae', 'Acanthocyclops', and 'Malacostraca'.

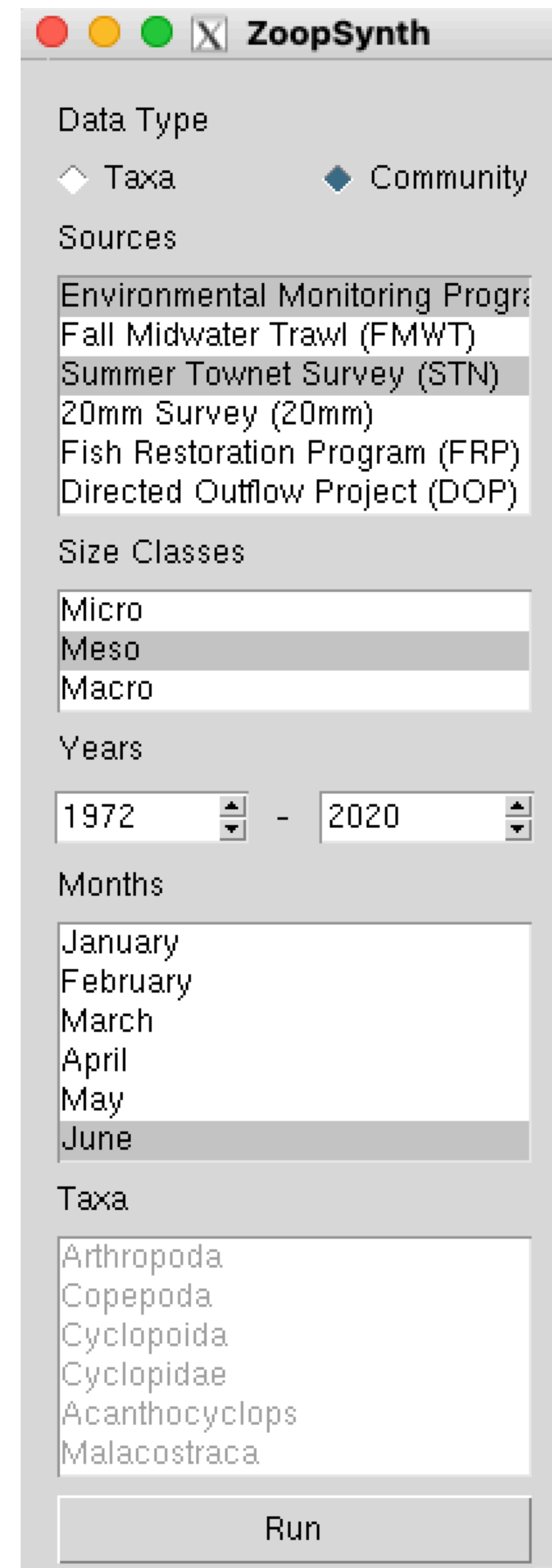
At the bottom of the window, there is a large 'Run' button, which is highlighted with a black border in the image.

Commands

```
tkgrid(tkbutton(mainframe, text = "Run", command = fetch_and_plot),  
       row = 12, column = 0, columnspan = 3, sticky = "we", padx = 5, pady = 5)
```

```
fetch_and_plot <- function(...){  
  fetch()  
  plot_samples(zoop_data, source_colors)  
}
```

A command function should take no arguments (except ...) and should not return values.

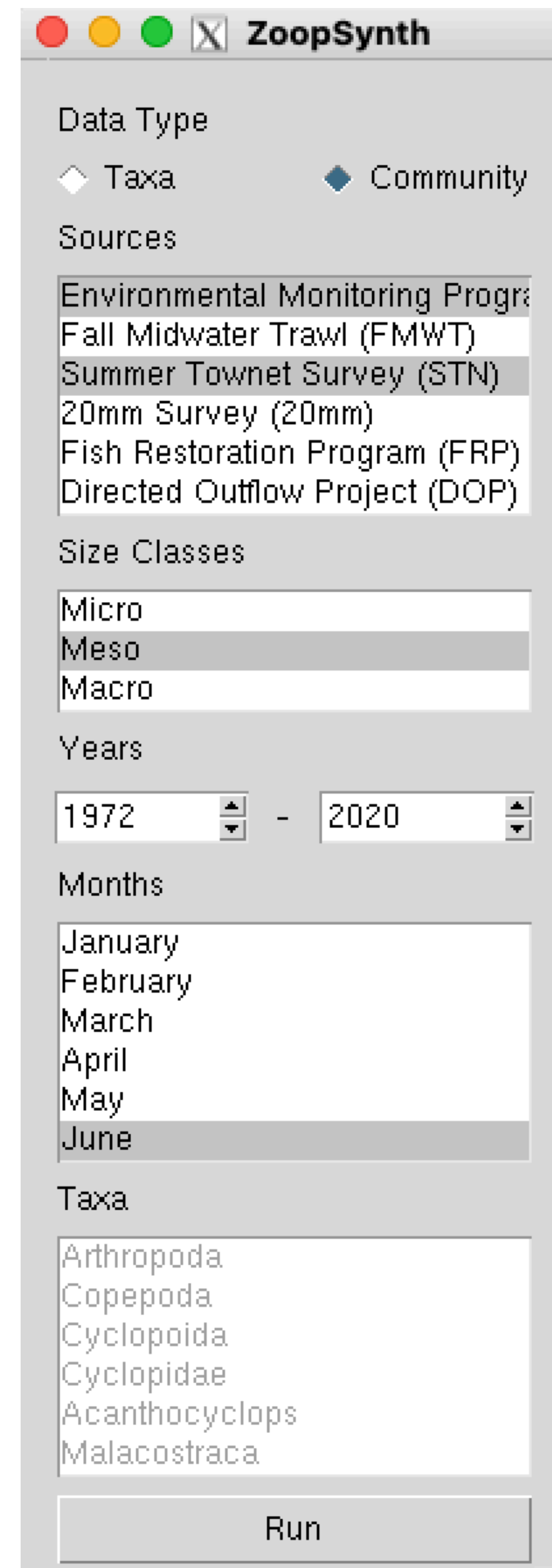


Commands

```
tkgrid(tkbutton(mainframe, text = "Run", command = fetch_and_plot),  
       row = 12, column = 0, columnspan = 3, sticky = "we", padx = 5, pady = 5)
```

```
fetch <- function(...){  
  tx = NULL  
  if (tclvalue(datatype) == "Taxa"){  
    tx = completeTaxaList[as.numeric(tkcurselection(taxa_lb)) + 1]  
  }  
}
```

```
zoop_data <- Zoopsynther(  
  Data_type = tclvalue(datatype),  
  Sources = source_codes[as.numeric(tkcurselection(sources_lb)) + 1],  
  Size_class = size_codes[as.numeric(tkcurselection(sizes_lb)) + 1],  
  Taxa = tx,  
  Months = as.numeric(tkcurselection(months_lb)) + 1,  
  Years = as.numeric(tclvalue(min_yr)):as.numeric(tclvalue(max_yr)),  
  All_env = FALSE) |>  
  prep_samples()  
}
```



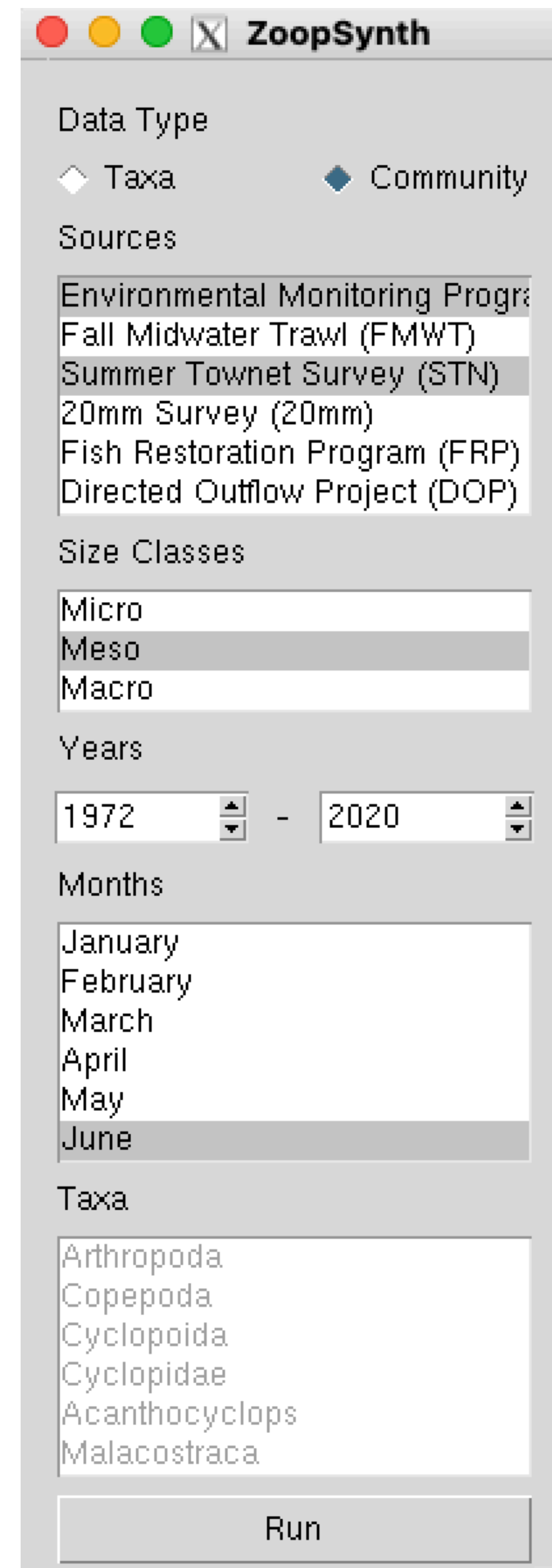
Commands

```
tkgrid(tkbutton(mainframe, text = "Run", command = fetch_and_plot),  
       row = 12, column = 0, columnspan = 3, sticky = "we", padx = 5, pady = 5)
```

```
fetch <- function(...){  
  tx = NULL  
  if (tclvalue(datatype) == "Taxa"){  
    tx = completeTaxaList[as.numeric(tkcurselection(taxa_lb)) + 1]  
  }  
}
```

```
zoop_data <<- Zoopsynther(  
  Data_type = tclvalue(datatype),  
  Sources = source_codes[as.numeric(tkcurselection(sources_lb)) + 1],  
  Size_class = size_codes[as.numeric(tkcurselection(sizes_lb)) + 1],  
  Taxa = tx,  
  Months = as.numeric(tkcurselection(months_lb)) + 1,  
  Years = as.numeric(tclvalue(min_yr)):as.numeric(tclvalue(max_yr)),  
  All_env = FALSE) |>  
  prep_samples()  
}
```

Not best practice to use the super assignment operator (<<-).



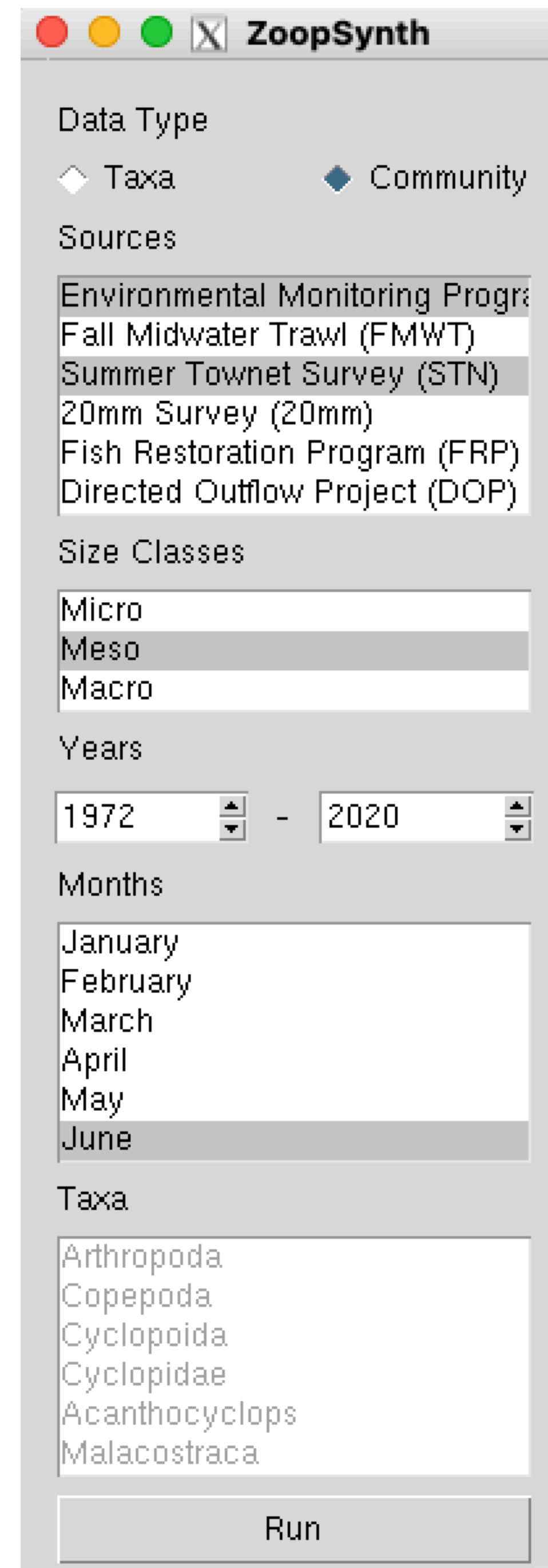
Commands

```
tkgrid(tkbutton(mainframe, text = "Run", command = fetch_and_plot),  
       row = 12, column = 0, columnspan = 3, sticky = "we", padx = 5, pady = 5)
```

```
fetch <- function(...){  
  tx = NULL  
  if (tclvalue(datatype) == "Taxa"){  
    tx = completeTaxaList[as.numeric(tkcurselection(taxa_lb)) + 1]  
  }  
}
```

```
zoop_data <- Zoopsynther(  
  Data_type = tclvalue(datatype),  
  Sources = source_codes[as.numeric(tkcurselection(sources_lb)) + 1],  
  Size_class = size_codes[as.numeric(tkcurselection(sizes_lb)) + 1],  
  Taxa = tx,  
  Months = as.numeric(tkcurselection(months_lb)) + 1,  
  Years = as.numeric(tclvalue(min_yr)):as.numeric(tclvalue(max_yr)),  
  All_env = FALSE) |>  
  prep_samples()  
}
```

Retrieve current value from a tcl variable.



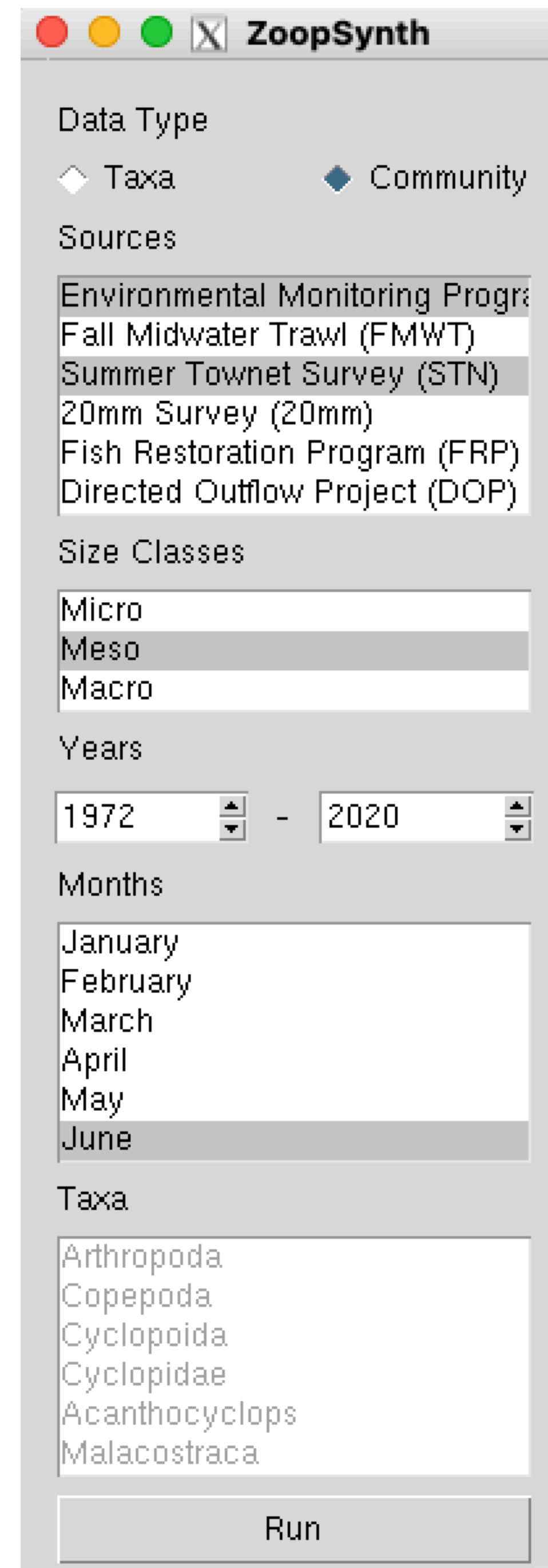
Commands

```
tkgrid(tkbutton(mainframe, text = "Run", command = fetch_and_plot),  
       row = 12, column = 0, columnspan = 3, sticky = "we", padx = 5, pady = 5)
```

```
fetch <- function(...){  
  tx = NULL  
  if (tclvalue(datatype) == "Taxa"){  
    tx = completeTaxaList[as.numeric(tkcurselection(taxa_lb)) + 1]  
  }  
}
```

```
zoop_data <- Zoopsynther(  
  Data_type = tclvalue(datatype),  
  Sources = source_codes[as.numeric(tkcurselection(sources_lb)) + 1],  
  Size_class = size_codes[as.numeric(tkcurselection(sizes_lb)) + 1],  
  Taxa = tx,  
  Months = as.numeric(tkcurselection(months_lb)) + 1,  
  Years = as.numeric(tclvalue(min_yr)):as.numeric(tclvalue(max_yr)),  
  All_env = FALSE) |>  
  prep_samples()  
}
```

Retrieve zero-based indices for selected months.
Zoopsynther() accepts numeric month; add one to
indices to get months.



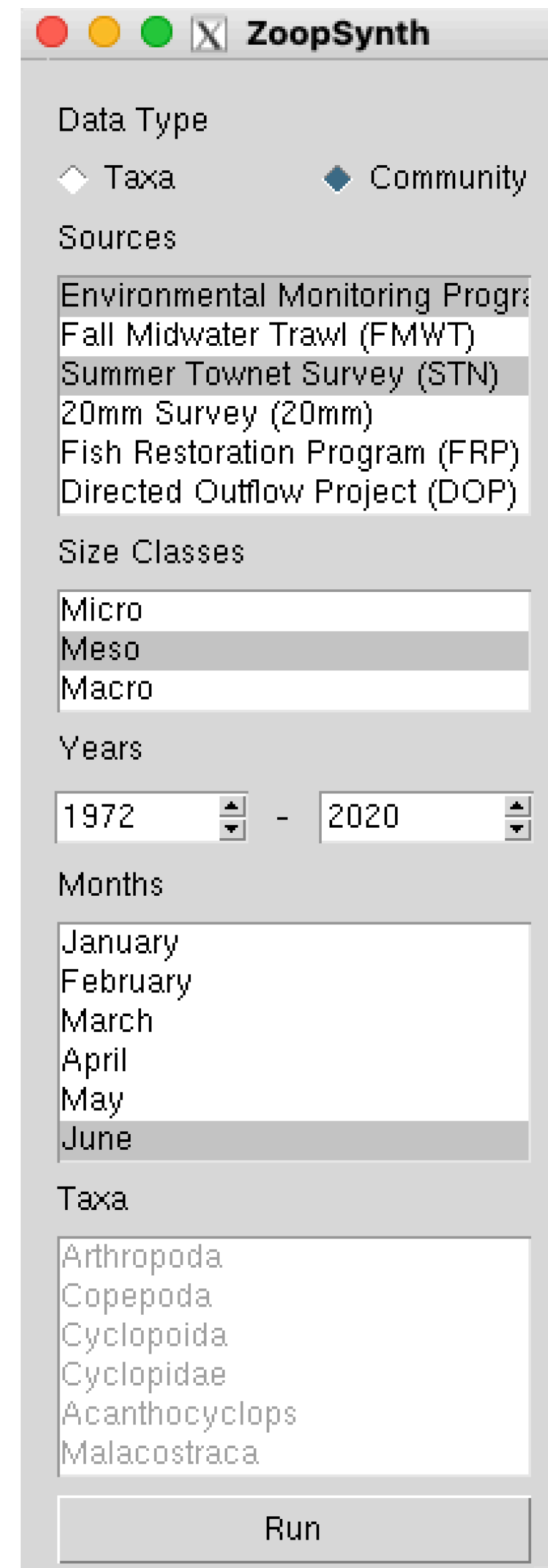
Commands

```
tkgrid(tkbutton(mainframe, text = "Run", command = fetch_and_plot),  
       row = 12, column = 0, columnspan = 3, sticky = "we", padx = 5, pady = 5)
```

```
fetch <- function(...){  
  tx = NULL  
  if (tclvalue(datatype) == "Taxa"){  
    tx = completeTaxaList[as.numeric(tkcurselection(taxa_lb)) + 1]  
  }  
}
```

```
zoop_data <- Zoopsynther(  
  Data_type = tclvalue(datatype),  
  Sources = source_codes[as.numeric(tkcurselection(sources_lb)) + 1],  
  Size_class = size_codes[as.numeric(tkcurselection(sizes_lb)) + 1],  
  Taxa = tx,  
  Months = as.numeric(tkcurselection(months_lb)) + 1,  
  Years = as.numeric(tclvalue(min_yr)):as.numeric(tclvalue(max_yr)),  
  All_env = FALSE) |>  
  prep_samples()  
}
```

Retrieve zero-based indices for selected sources.
Zoopsynther() accepts source codes (e.g., EMP, STN);
use indices to get values from source_codes vector.



Plotting

```
plot_samples <- function(data, source_colors){  
  # need to open device window before plotting  
  # set the device type based on the OS  
  os = Sys.info()[['sysname']]  
  if (os == "Darwin"){  
    quartz(width = 12)  
  } else if (os == "Windows") {  
    windows(width = 12)  
  } else {  
    X11(width = 12)  
  }  
  
  plot(ggplot_samples(data, source_colors))  
}
```

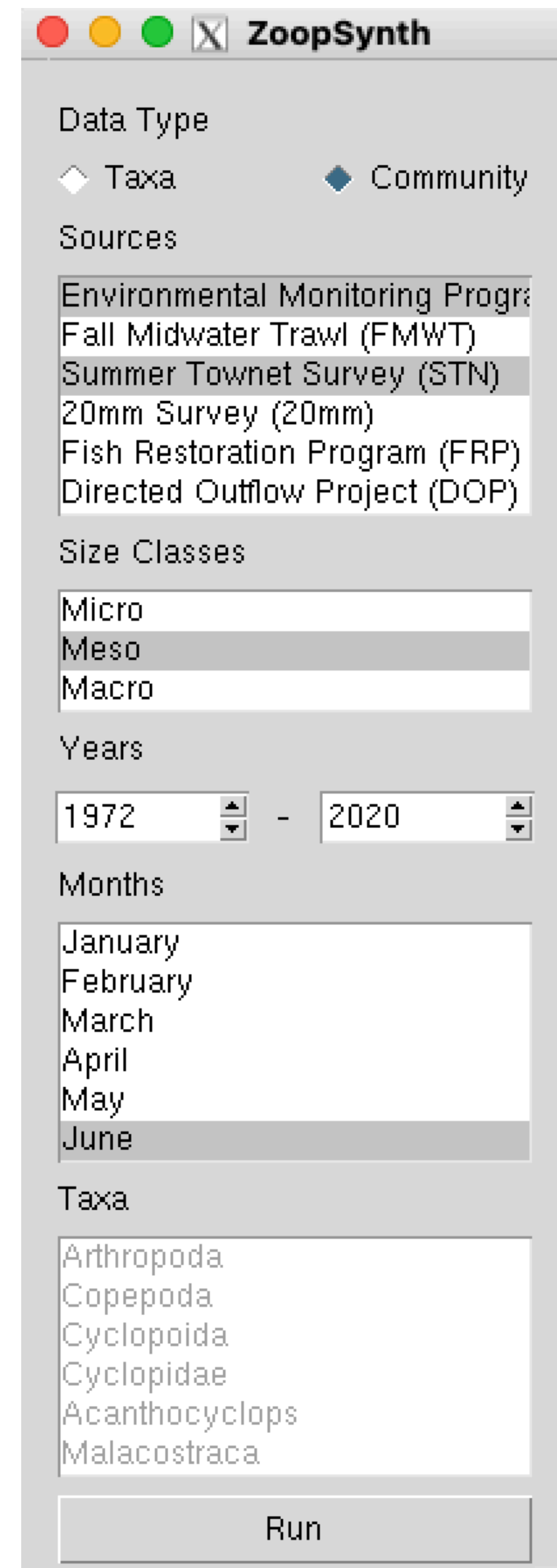
The screenshot shows the ZoopSynth application window. It features several sections for data filtering:

- Data Type:** Radio buttons for 'Taxa' (selected) and 'Community'.
- Sources:** A list of data sources including 'Environmental Monitoring Program', 'Fall Midwater Trawl (FMWT)', 'Summer Townet Survey (STN)', '20mm Survey (20mm)', 'Fish Restoration Program (FRP)', and 'Directed Outflow Project (DOP)'. 'Summer Townet Survey (STN)' is currently selected.
- Size Classes:** A list of size classes including 'Micro', 'Meso', and 'Macro'. 'Meso' is selected.
- Years:** Two spinners for selecting a range of years, currently set to 1972 and 2020.
- Months:** A list of months from 'January' to 'June'. 'June' is selected.
- Taxa:** A list of taxonomic groups including 'Arthropoda', 'Copepoda', 'Cyclopoida', 'Cyclopidae', 'Acanthocyclops', and 'Malacostraca'. 'Cyclopidae' is selected.
- Run:** A button at the bottom right to execute the plot.

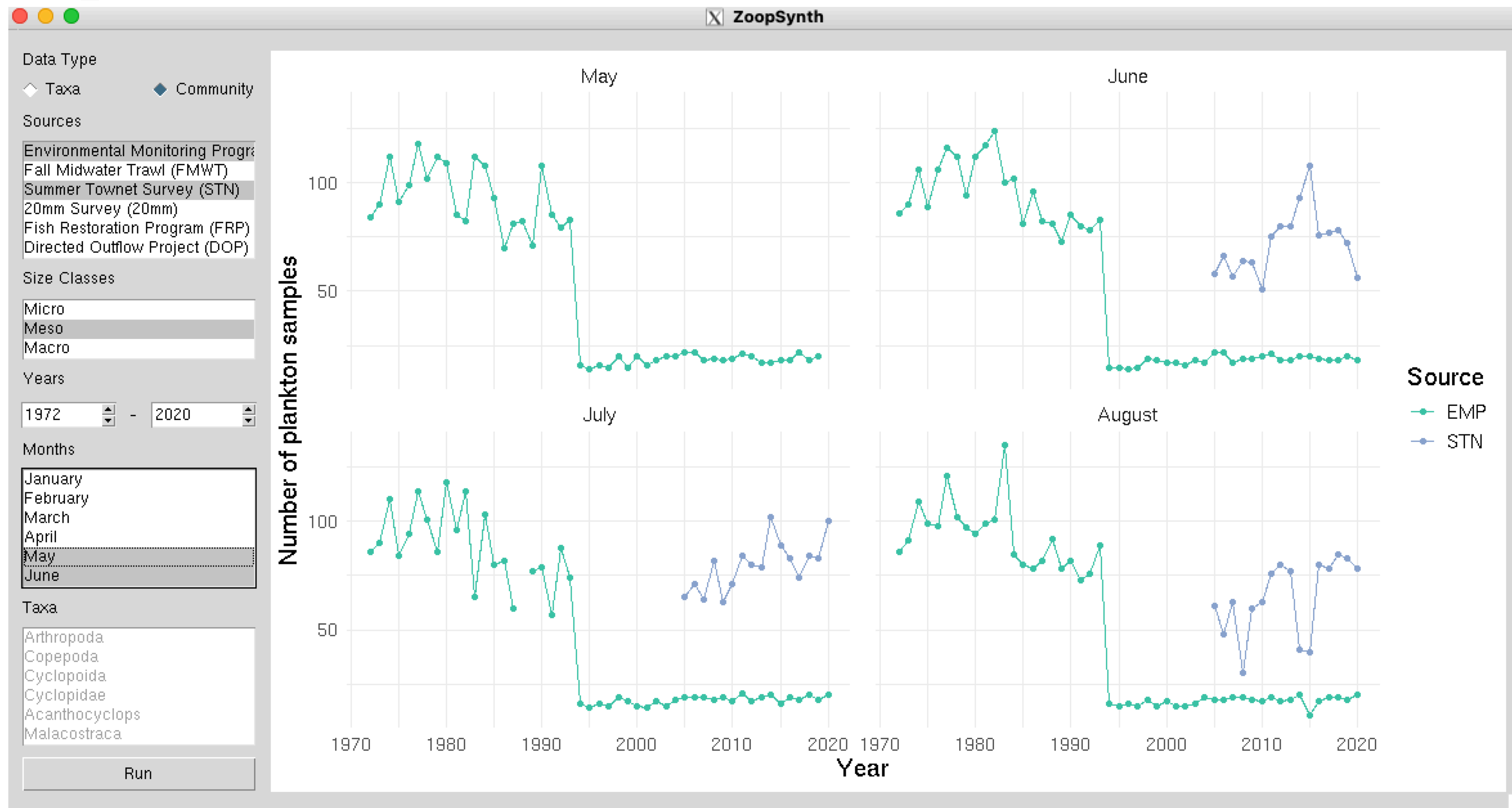
Plotting

```
plot_samples <- function(data, source_colors){  
  # need to open device window before plotting  
  # set the device type based on the OS  
  os = Sys.info()[['sysname']]  
  if (os == "Darwin"){  
    quartz(width = 12)  
  } else if (os == "Windows") {  
    windows(width = 12)  
  } else {  
    X11(width = 12)  
  }  
  
  plot(ggplot_samples(data, source_colors))  
}
```

Need to call plot() on a ggplot object for it to be displayed in the device window.



tkrplot



Documentation

Most of the functions in the **tcltk** package are really just a thin layer covering an underlying Tcl command. Converting all the Tcl/Tk documentation for R is a daunting task, so you have to make do with the help for Tcl/Tk itself. This is fairly easy once you get the hang of some simple translation rules.

Documentation

Most of the functions in the **tcltk** package are really just a thin layer covering an underlying Tcl command. Converting all the Tcl/Tk documentation for R is a daunting task, so you have to make do with the help for Tcl/Tk itself. This is fairly easy once you get the hang of some simple translation rules.

pathName **selection** *option arg*

This command is used to adjust the selection within a listbox. It has several forms, depending on *option*:

pathName **selection anchor** *index*

Sets the selection anchor to the element given by *index*. If *index* refers to a non-existent element, then the closest element is used. The selection anchor is the end of the selection that is fixed while dragging out a selection with the mouse. The index **anchor** may be used to refer to the anchor element.

pathName **selection clear** *first ?last?*

If any of the elements between *first* and *last* (inclusive) are selected, they are deselected. The selection state is not changed for elements outside this range.

pathName **selection includes** *index*

Returns 1 if the element indicated by *index* is currently selected, 0 if it is not.

pathName **selection set** *first ?last?*

Selects all of the elements in the range between *first* and *last*, inclusive, without affecting the selection state of elements outside that range.

```
tkselection.set(sizes_lb, 1)
```

```
# if consecutive, can specify first and last index to select multiple
```

```
tkselection.set(months_lb, 5, 7)
```

Resources

- ZoopSynth-tcltk GitHub repo: <https://github.com/hinkelman/ZoopSynth-tcltk>
- Phil Spector's Class Notes (Ch. 12): <https://www.stat.berkeley.edu/~spector/s133/all2011.pdf>
- tcltk package includes four demos: tkcanvas, tkdensity, tkfaq, and tktttest
- tcltk primer: <https://journal.r-project.org/articles/RN-2001-026/RN-2001-026.pdf>
- Tk Commands documentation: <https://www.tcl.tk/man/tcl8.6/TkCmd/contents.htm>