

Appendix I4

**Zooplankton Raw Data Source
Description**

Lower Hillsborough River Recovery Strategy – Master Zooplankton Data README

Southwest Florida Water Management District

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About

This document summarizes the Zooplankton data used to construct the Zooplankton master dataset for the Lower Hillsborough River (LHR) Recovery Strategy for the period of January 1, 1996 to December 31, 2023 as part of the Task 10 data deliverable for Task Work Order 22TW0003992.

README documentation is provided within each section, divided by data source, within this file.

Johnson, Mirmiran, & Thompson (JMT)

File Name: /JMT/Zooplankton/JMT_Zoo_FrEco.xlsx

This is a spreadsheet of zooplankton species collected by JMT for the District during seven events occurring between 2020 and 2023 (20TW0002884, 21TW0003677). Zooplankton collection was completed with a conical plankton net and data were recorded as both number of individuals and individuals per_m3.

The source for this data is Data/JMT/Zooplankton in SharePoint.

The seven individual excel spreadsheets were combined manually (copy paste to single excel file). These files were:

- Zooplankton_2020_Fall_Data
- Zooplankton_2020_Spring_Data
- Zooplankton_2021_Spring_Data
- Zooplankton_2022_Spring_Data
- Zooplankton_2023_Spring_Data
- Zooplankton_2023_Summer_Data
- Zooplankton_2023_Winter_Data

The JMT_Zoo_FrEco.xlsx file has a tab for per_m3 and for individual counts.

These data were last modified 06/26/2024 and downloaded 06/26/2024. The period of record for this data is 2020 – 2023.

Data are provided as counts of species identified to lowest practical taxonomic unit and a number per volume (m3).

Summary Statistics:

source	n site-dates	n dates	n sites	n taxa
JMT	36	6	6	76

Tampa Bay Water

File Name: /TBW_HBMP/Data_Download_20230815/Plankton/HBMP Plankton Archive Database 20191204.accs

This is a Microsoft Access database of data collected by the Tampa Bay Water Hydrobiological Monitoring Program. This program was conducted from June 2000 through June 2011 in the Hillsborough River and several other tributaries and embayments in eastern Tampa Bay, Florida.

The source for this data is Data/TBW_HBMP/Data_Download_20230815/Plankton in sharepoint.

The following database sheets were exported from the database as .xlsx files and then read into R:

- HBMP_USF_Plankton
- HBMP_USF_Deployment
- HBMP_USF_TaxonomicCodes

These data were last modified 9/05/2023 and downloaded from the project SharePoint data repository on 9/06/2023. The period of record for this data is 2000 – 2011.

Data are provided as counts of species identified to lowest practical taxonomic unit along with a sampling effort.

Sites (using associated latitude/longitude) were joined within QGIS to study area (GIS layer provided by the WMD). A csv file of sites (TBW_HBMP_zooplankton_river_sections.csv) was brought into R and joined to taxa data. Data outside of the Hillsborough River were discarded.

Summary Statistics:

source	n site-dates	n dates	n sites	n taxa
TBW HBMP	1800	150	12	414

Water and Air Research, Inc. (WAR)

File Name: /WAR/Second_FiveYear_Assess/Biology/Zooplankton 30 Day No Flow w WQ.xlsx

This is a spreadsheet of zooplankton species collected by TBW/HBMP from 2000-2011 and reduced to days of no flow over the dam, as well as the data collected by WAR in 2018. This data sheet contains duplicates, and the data are not included in the master data set.

The source for this data is Data/WAR/Second_FiveYear_Assess/Biology in SharePoint.

These data were last modified 8/23/2023 and downloaded 9/05/2023.

Data are provided as counts and counts per meter cubed of species identified to lowest practical taxonomic unit.

File Name: /WAR/Bio_2018/Appendix A Zooplankton Count Data FrEco.xlsx

This is a spreadsheet of zooplankton collected by WAR in 2018.

The source for this data is Data/WAR/Bio_2018 in SharePoint.

These data were last modified 9/05/2023 and downloaded 9/06/2023.

Data were provided as counts along with information for calculating a sampling effort. Effort was calculated by multiplying the surface area of the bag (0.19634954) by the number of revolutions of the flow meter. Counts were divided by this effort.

Summary Statistics:

source	n site-dates	n dates	n sites	n taxa
WAR	8	2	4	45

Additional Data

No additional data from the FDEP Statewide Biological Database could be used. EPC data was phytoplankton only and was not included.

Water Management District

Morris Bridge Sink Data

File Name: /FrEco/MBS_consolidated_bio.xlsx

Zooplankton data from yearly sampling PDF reports were extracted and placed into a consolidated excel file, and added to the master data set.

Combine and Export Master Dataset

File Name:

Each data set was manipulated within R to have columns of:

- Date - the date of observation
- Year - the year of observation
- Site - the distinct site identifier
- Final Taxa - the synonymized taxa name
- n - the number observed
- result_m3 - density of organisms in m3
- Source - the source of the data
- Salinity Tolerance - literature associated values of salinity for taxa
- sampling effort - the sampling effort (m3)
- Location - Morris Bridge Sink or Lower Hillsborough River
- River Segment - Upper, Middle, Lower, or Downstream
- MFL Period - Period 1, 2, 3, 4, or 5

The data sets were then combined into one file using `bind_rows()`.

Species synonymy

File Name and path: /FrEco/Benthic Synonymy Final.xlsx

The preliminary Master data set was used to create a distinct table of taxa. These were manually examined for duplicates (misspellings, etc). A look up table was created based on that exercise and used to finalize species names.

Distinct Zooplankton Species

Final Taxa

Acari

Acartia tonsa

Achirus lineatus flexion larvae

Achirus lineatus juveniles

Achirus lineatus postflexion larvae

Achirus lineatus preflexion larvae

Albula vulpes postflexion larvae

Final Taxa

Alpheus estuariensis juveniles
Alpheus viridari juveniles
Alteutha sp.
Ambidexter symmetricus juveniles
Ambidexter symmetricus postlarvae
Ameiurus catus juveniles
Ameiurus catus postflexion larvae
Americamysis almyra
Americamysis bahia
Americamysis stucki
Anchistropus minor
Anchoa cubana juveniles
Anchoa hepsetus adults
Anchoa hepsetus eggs
Anchoa hepsetus juveniles
Anchoa hepsetus postflexion larvae
Anchoa mitchilli adults
Anchoa mitchilli eggs
Anchoa mitchilli juveniles
Anchoa mitchilli postflexion larvae
Anchoa mitchilli preflexion larvae
Anchoa spp. flexion larvae
Anchoa spp. preflexion larvae
Anopsilana jonesi
Archosargus probatocephalus juveniles
Archosargus probatocephalus postflexion larvae
Aurelia aurita
Bairdiella chrysoura flexion larvae
Bairdiella chrysoura juveniles
Bairdiella chrysoura postflexion larvae
Bairdiella chrysoura preflexion larvae
Bathygobius soporator flexion larvae
Bathygobius soporator postflexion larvae
Bathygobius soporator preflexion larvae
Beroe ovata

Final Taxa

Bosmina sp.
Bosminopsis deitersi
Bougainvillia sp.
Bowmaniella dissimilis
Branchiostoma floridae
Brasilomysis castroi
Brevoortia patronus juveniles
Brevoortia smithi juveniles
Brevoortia spp. metamorphs
Brevoortia spp. postflexion larvae
Bunops sp.
Calanoida spp.
Calanopia americana
Callianassa sp. juveniles
Callianassa sp. postlarvae
Callinectes sapidus juveniles
Camptocercus rectirostris
Cassidinidea ovalis
Centrarchid preflexion larvae
Centropages hamatus
Centropages velificatus
Ceriodaphnia sp.
Chaetodipterus faber postflexion larvae
Chasmodes saburrae flexion larvae
Chasmodes saburrae postflexion larvae
Chironomidae
Chloroscombrus chrysurus flexion larvae
Chloroscombrus chrysurus juveniles
Chloroscombrus chrysurus postflexion larvae
Chloroscombrus chrysurus preflexion larvae
Chrysaora quinquecirrha
Cirolana jonesi
Cladocera spp.
Clytia sp.
Coronatella monacantha

Final Taxa

Craspedacusta sowerbii
Cyathura polita
Cyclops sp.
Cynoscion arenarius flexion larvae
Cynoscion arenarius juveniles
Cynoscion arenarius postflexion larvae
Cynoscion arenarius preflexion larvae
Cynoscion nebulosus flexion larvae
Cynoscion nebulosus juveniles
Cynoscion nebulosus postflexion larvae
Cynoscion nebulosus preflexion larvae
Cyprinodon variegatus eggs
Cyprinodon variegatus juveniles
Cyprinodon variegatus postflexion larvae
Dadaya macrops
Diaphanosoma brachyurum
Diaptomus sp.
Dormitator maculatus postflexion larvae
Dorosoma cepedianum juveniles
Dorosoma petenense juveniles
Dorosoma petenense metamorphs
Dorosoma spp. flexion larvae
Dorosoma spp. metamorphs
Dorosoma spp. postflexion larvae
Dorosoma spp. preflexion larvae
Edotea triloba
Elops saurus juveniles
Elops saurus postflexion larvae
Ergasilus sp.
Erichsonella attenuata
Etheostoma fusiforme preflexion larvae
Eucalanus sp.
Eucramus praelongus juveniles
Eucramus praelongus megalops larvae
Eucinostomus harengulus juveniles

Final Taxa

Eucinostomus sp. juveniles
Eucyclops speratus
Eugerres plumieri juveniles
Eugerres plumieri postflexion larvae
Euryalona occidentalis
Eurycercus lamellatus
Eurypanopeus depressus adults
Eurytemora affinis
Evadne tergestina
Farfantepenaeus duorarum juveniles
Fundulus grandis postflexion larvae
Fundulus majalis juveniles
Fundulus seminolis juveniles
Fundulus seminolis postflexion larvae
Fundulus spp. eggs
Fundulus spp. postflexion larvae
Gambusia holbrooki adults
Gambusia holbrooki juveniles
Gobiesox strumosus adults
Gobiesox strumosus flexion larvae
Gobiesox strumosus juveniles
Gobiesox strumosus postflexion larvae
Gobiesox strumosus preflexion larvae
Gobionellus oceanicus juveniles
Gobionellus spp. postflexion larvae
Gobiosoma bosc adults
Gobiosoma bosc juveniles
Gobiosoma robustum juveniles
Gobiosoma spp. postflexion larvae
Grimaldina brazzai
Halicyclops sp.
Hargeria rapax
Harrieta faxoni
Heterandria formosa adults
Heterandria formosa juveniles

Final Taxa

Heteromysis sp.

Hippocampus erectus juveniles

Hippolyte zostericola adults

Hippolyte zostericola juveniles

Hippolyte zostericola postlarvae

Hirudinea

Hypsoblennius spp. flexion larvae

Hypsoblennius spp. postflexion larvae

Ictalurus punctatus juveniles

Ilyocryptus sp.

Kurzia longirostris

Labidesthes sicculus flexion larvae

Labidesthes sicculus juveniles

Labidesthes sicculus postflexion larvae

Labidesthes sicculus preflexion larvae

Labidocera aestiva

Lagodon rhomboides juveniles

Latona setifera

Latonopsis fasciculata

Latreutes parvulus postlarvae

Leiostomus xanthurus juveniles

Lepisosteus sp. postflexion larvae

Lepomis auritus flexion larvae

Lepomis auritus preflexion larvae

Lepomis gulosus juveniles

Lepomis gulosus postflexion larvae

Lepomis macrochirus juveniles

Lepomis macrochirus postflexion larvae

Lepomis macrochirus preflexion larvae

Lepomis punctatus juveniles

Lepomis punctatus postflexion larvae

Lepomis spp. flexion larvae

Lepomis spp. juveniles

Lepomis spp. postflexion larvae

Lepomis spp. preflexion larvae

Final Taxa

Leptalpheus forceps juveniles
Leptochela serratorbita adults
Leptochela serratorbita juveniles
Leptochela serratorbita postlarvae
Leydigia sp.
Limulus polyphemus larvae
Liposarcus spp. eggs
Liposarcus spp. juveniles
Liriope tetraphylla
Lolliguncula brevis juveniles
Lucania goodei juveniles
Lucania goodei postflexion larvae
Lucania parva adults
Lucania parva eggs
Lucania parva juveniles
Lucania parva postflexion larvae
Lucifer faxoni juveniles and adults
Lucifer faxoni mysis
Lupinoblennius nicholsi flexion larvae
Lupinoblennius nicholsi postflexion larvae
Lysmata sp. juveniles
Macrocylops albidus
Membras martinica juveniles
Membras martinica preflexion larvae
Menidia beryllina juveniles
Menidia spp. adults
Menidia spp. eggs
Menidia spp. flexion larvae
Menidia spp. juveniles
Menidia spp. postflexion larvae
Menidia spp. preflexion larvae
Menticirrhus americanus juveniles
Menticirrhus spp. flexion larvae
Menticirrhus spp. postflexion larvae
Menticirrhus spp. preflexion larvae

Final Taxa

Mesocyclops edax
Mesocyclops leuckarti
Metamysidopsis swifti
Microgobius gulosus adults
Microgobius gulosus juveniles
Microgobius spp. flexion larvae
Microgobius spp. postflexion larvae
Microgobius thalassinus adults
Microgobius thalassinus juveniles
Micropterus salmoides juveniles
Micropterus salmoides postflexion larvae
Mnemiopsis mccradyi
Moinadaphnia macleayii
Monstrilla sp.
Mugil cephalus juveniles
Mugil cephalus postflexion larvae
Mugil curema juveniles
Munna reynoldsi
Mysidopsis furca
Notropis spp. flexion larvae
Notropis spp. juveniles
Notropis spp. preflexion larvae
Noturus gyrinus juveniles
Ogyrides alphaerostris juveniles and adults
Ogyrides alphaerostris postlarvae
Oithona spp.
Oligoplites saurus juveniles
Oligoplites saurus postflexion larvae
Oncaea spp.
Opisthonema oglinum postflexion larvae
Opsanus beta adults
Opsanus beta juveniles
Orthocyclops modestus
Osphranticum labronectum
Pagurus longicarpus juveniles

Final Taxa

Palaemon floridanus postlarvae
Palaemonetes pugio adults
Palaemonetes pugio juveniles
Palaemonetes spp. postlarvae
Palaemonetes vulgaris juveniles
Parasterope pollex
Penilia avirostris
Periclimenes spp. postlarvae
Petrolisthes armatus juveniles
Pinnixa sayana juveniles
Pinnixa sp. a juveniles
Poecilia latipinna adults
Poecilia latipinna juveniles
Polychaeta
Pomoxis nigromaculatus flexion larvae
Pomoxis nigromaculatus preflexion larvae
Prionotus spp. preflexion larvae
Probopyrus sp. (attached)
Pseudodiaptomus coronatus
Pseudosida bidentata
Rhithropanopeus harrisii adults
Rhithropanopeus harrisii juveniles
Rotifera spp.
Saphirella spp.
Sarsiella zostericola
Scaphroleberis kingi
Sciaenops ocellatus postflexion larvae
Sida crystallina
Simocephalus vetulus
Sinelobus stanfordi
Spelaemopsis sp.
Sphaeroma quadridentata
Sphaeroma terebrans
Squilla empusa larvae
Strongylura spp. postflexion larvae

Final Taxa

Symphurus plagiusa juveniles
Syngnathus louisianae juveniles
Syngnathus scovelli adults
Syngnathus scovelli juveniles
Taphromysis bowmani
Temora longicornis
Temora stylifera
Temora turbinata
Thor sp. juveniles
Tilapia melanotheron juveniles
Tilapia spp. juveniles
Tilapia spp. postflexion larvae
Tortanus setacaudatus
Tozeuma carolinense adults
Tozeuma carolinense juveniles
Tozeuma carolinense postlarvae
Trinectes maculatus adults
Trinectes maculatus flexion larvae
Trinectes maculatus juveniles
Trinectes maculatus postflexion larvae
Trinectes maculatus preflexion larvae
Upogebia spp. juveniles
Upogebia spp. postlarvae
Uromunna reynoldsi
Xenanthura brevitelson
alphaeid juveniles
alphaeid postlarvae
amphipods, caprellid
amphipods, gammaridean
anuran larvae
appendicularian, Oikopleura dioica
blenniid preflexion larvae
brachiopod, Glottidia pyramidata larvae
branchiurans, Argulus spp.
chaetognaths, sagittid

Final Taxa

cirriped cypris stage
cirriped nauplius stage
cladocerans, *Daphnia* spp.
clupeid eggs
coleopterans, chrysomelid larvae
coleopterans, curculionid adults
coleopterans, dytiscid adults
coleopterans, dytiscid larvae
coleopterans, elmidae adults
coleopterans, elmidae larvae
coleopterans, gyrid larvae
coleopterans, halophilid adults
coleopterans, halophilid larvae
coleopterans, hydrophilid larvae
coleopterans, noterid adults
coleopterans, noterid larvae
coleopterans, scirtid larvae
collembolas, podurid
cumaceans
cymothoid sp. a (*Lironeca*) juveniles
cymothoid sp. a (*Livoneca*)
cymothoid sp. a (*Livoneca*) juveniles
cymothoid sp. b juveniles
cymothoid sp. c juveniles
cymothoid sp. d juveniles
decapod megalopae
decapod mysids
decapod zoeae
dipteran, *Chaoborus punctipennis* larvae
dipterans, ceratopogonid larvae
dipterans, chironomid larvae
dipterans, culicid larvae
dipterans, ephydrid larvae
dipterans, muscid larvae
dipterans, pupae

Final Taxa

dipterans, sciomyzid larvae
dipterans, stratiomyid larvae
dipterans, tabanid larvae
ephemeropteran larvae
fish eggs, atherinomorph
fish eggs, percomorph
foraminiferans
gastropods, opisthobranch
gastropods, prosobranch
gerreid postflexion larvae
gerreid preflexion larvae
gobiid eggs
gobiid flexion larvae
gobiid postflexion larvae
gobiid preflexion larvae
hemichordate larvae
hemipterans, belostomatid adults
hemipterans, corixid adults
hemipterans, corixid juveniles
hemipterans, gerrid adults
hemipterans, naucorid adults
hemipterans, nepid adults
hemipterans, pleid adults
isopod sp. a
lepidopterans, pyralid larvae
medusa sp. a
medusa sp. b
medusa sp. c
medusa sp. d
medusa sp. e
medusa, Bougainvillia sp.
medusa, Eutima sp.
medusa, Obelia sp.
medusa, sp. f (28 long, slender tentacles)
medusa, sp. g (like Rhopalonema wt/ top knob)

Final Taxa

myodocopod sp. a
mysid free embryos
mysid sp. A
mysid sp. b
nematodes
neuropterans, Climacia spp. larvae
odonates, anisopteran larvae
odonates, zygopteran larvae
oligochaetes
ostracods, podocopid
paguroid juveniles
paguroid megalops larvae
paracalanids
pelecypods
penaeid metamorphs
penaeid postlarvae
porcellanid (not P. armatus) juveniles
processid juveniles
processid postlarvae
pycnogonids
scyphozoan ephyrae
shrimps, unidentified juveniles
shrimps, unidentified postlarvae
siphonostomatids
sipunculids
thaliaceans
trichopteran larvae
turbellarians
unidentified Americamysis juveniles
unidentified calanoids
unidentified freshwater cyclopoids
unidentified harpacticoids
xanthid juveniles

Master Zooplankton Data

This master data set is to be used for all taxa analyses.

The Final Master Zooplankton data set was output as a csv file titled Master_zooplankton_data.csv and also saved as an RSD file.

Summary Statistics:

source	n site-dates	n dates	n sites	n taxa
Master	1856	162	21	425