Plot results of GeomComp_Compute.nb

Preliminaries

In[•]:=
```
Clear["Global`*"]
```

Specify "GoldenRatio"

In[•]:=
```
AbundSeries = "GoldenRatio";
```

Load results and set export directory

In[•]:=
```
SetDirectory[
 FileNameJoin[{NotebookDirectory[], "../results/GoldenRatio_binom/"}]]

files = FileNames["k*.txt"] (* Get list of all result files *)
Get[#] & /@ files; (* Load all their contents (variable definitions) *)


SetDirectory[FileNameJoin[{NotebookDirectory[], "../figs/"}]]
```

Out[•]= /Users/marknovak/Git/GeomComp/GeometricComplexity/results/GoldenRatio_binom

Out[•]= {k2fixRogersH2.txt, k2fixRogersH3.txt, k2varRogersH2.txt, k2varRogersH3.txt}

Out[•]= /Users/marknovak/Git/GeomComp/GeometricComplexity/figs

The data files each have four independent variables (*Nmax, Pmax, number of prey levels, number of pred levels*) and one response variable (*geometric complexity*).

In[]:=
```
varRogersH2 // TableForm
```

Out[]//TableForm=

21	1	5	1	2.67684
21	2	5	2	2.72351
21	3	5	3	2.73661
21	5	5	4	2.71661
21	8	5	5	2.66991
34	1	6	1	3.10307
34	2	6	2	3.15028
34	3	6	3	3.16518
34	5	6	4	3.15886
34	8	6	5	3.13671
55	1	7	1	3.52298
55	2	7	2	3.5735
55	3	7	3	3.59069
55	5	7	4	3.59331
55	8	7	5	3.58596
89	1	8	1	3.93476
89	2	8	2	3.98877
89	3	8	3	4.00497
89	5	8	4	4.01696
89	8	8	5	4.01916
144	1	9	1	4.34108
144	2	9	2	4.39213
144	3	9	3	4.41325
144	5	9	4	4.42706
144	8	9	5	4.44085
233	1	10	1	4.74812
233	2	10	2	4.79916
233	3	10	3	4.82198
233	5	10	4	4.83592
233	8	10	5	4.84951

Convenience function to append complexity differences to independent variables

Denom_ is the measure to which the Numer_ measure is relativized.
Note that only real part of complex numbers are returned (i.e. we ignore what are usually small imaginary parts)

In[]:=
```
Relativize[dataDenom_, dataNumer_] :=
  Join[dataDenom[[All, {1, 2, 3, 4}]],
   Transpose[{Re[dataNumer[[All, 5]]] - dataDenom[[All, 5]]}], 2];
(* Simply replaces division by subtraction *)
```

In[]:=

In[•]:=
```
blankplot = ListPlot[{0}, Axes → False, PlotStyle → None];

MyListLinePlot[
  data_,
  predVars_,
  axislabels_,
  plotlabel_,
  plotRange_,
  colors_] :=
 ListLinePlot[
  Transpose[
   SplitBy[data, Part[#, predVars[[1]]] &][[All, All, {predVars[[1]], 5}]]],
  ScalingFunctions → {"Log", "Linear"},
  ColorFunction → Function[{x, y},
    Which[y ≥ 0.02, colors[[1]], y ≤ -0.02, colors[[2]], True, colors[[3]]]],
  ColorFunctionScaling → False,
  PlotRange → plotRange,
  PlotRangePadding → 0.05,
  PlotLegends → False,
  Axes → False,
  Frame → True,
  PlotStyle →
   LineStyle[[1 ;; Length[DeleteDuplicates[data[[All, predVars[[2]]]]]]]],
  FrameLabel → axislabels,
  ImagePadding → {{60, 10}, {40, 20}},
  PlotRangeClipping → False,
  Epilog → {Text[Style[plotlabel, 12], Scaled[{0.5, 1.1}]]}
 ]
```

Varying max abundance, varying number of levels

```
In[•]:= AxisFontSize = 10;
LegendFontSize = 12;
cm = 72 / 2.54;
colors1 = {GrayLevel[0.4], GrayLevel[0.4]};
colors2 = Append[ColorData[97, "ColorList"][[{1, 2}]], GrayLevel[0.4]];
LineStyle = {
   Dashing[{}],
   Dashing[{0.05, 0.01}],
   Dashed,
   DotDashed,
   Dotted
  };
legend = SwatchLegend[colors2, {"More flexible", "Less flexible"},
   LegendMarkers → Graphics[{EdgeForm[Black], Rectangle[]}],
   LegendLabel → "Relative to baseline",
   LegendFunction → (Framed[#, RoundingRadius → 5] &), LegendMargins → 5];
legendplot = ListPlot[{0}, Axes → False,
   PlotStyle → None, PlotLegends → Placed[legend, {Center, Center}]];
```

```
In[•]:= axislabelCompY = {"", Style["Geometric\ncomplexity", AxisFontSize]};
axislabelRelXY = {
   Style["Max. prey abundance (N_max)", AxisFontSize],
   Style["Difference", AxisFontSize]};
axislabelRelY = {"", Style["Difference", AxisFontSize]};
axislabelX = {Style["Max. prey abundance (N_max)", AxisFontSize], ""};
axislabelNone = {"", ""};
legendlabel = Style["Max. predator abundance (P_max)", LegendFontSize];
xrange = MinMax[varRogersH2[[All, 1]]];
```

Plots

In[•]:=
```
k2varRogersH2 = MyListLinePlot[
    varRogersH2,
    {1, 2},
    axislabelCompY,
    "Rogers2",
    {xrange, All},
    colors1
   ];
k2varRogersH2vRogersH3 = MyListLinePlot[
    Relativize[varRogersH2, varRogersH3],
    {1, 2},
    axislabelRelXY,
    "Rogers3-Rogers2",
    {xrange, All},
    colors2
   ];
```

Combined plots

In[•]:=
```
LineStylevar = LineStyle[[1 ;; Length[DeleteDuplicates[varRogersH2[[All, 2]]]]]];
```

In[•]:=
```
k2Allvar =
  Legended[
   GraphicsGrid[{
     {k2varRogersH2},
     {k2varRogersH2vRogersH3}
    },
    ImageSize → Large,
    Spacings → {0, -10}],
   Placed[
    LineLegend[
     Map[Directive, LineStylevar],
     DeleteDuplicates[varRogersH2[[All, 2]]],
     LegendLabel → legendlabel,
     LegendLayout → "Row"],
    Above]];
Export["GeomComp_var_k2_binom.pdf", Show[k2Allvar, ImageSize → 9 cm]];
```

Fixed max abundances, varying number of levels

```
In[•]:= axislabelCompY = {"", Style["Geometric\ncomplexity", AxisFontSize]};
        axislabelRelXY = {
           Style["Prey levels (L_N)", AxisFontSize],
           Style["Difference", AxisFontSize]};
        axislabelX = {Style["Prey levels (L_N)", AxisFontSize], ""};
        legendlabel = Style["Predator levels (L_P)", LegendFontSize];
        xrange = MinMax[fixRogersH2[[All, 3]]];
```

Plots

```
In[•]:= k2fixRogersH2 = MyListLinePlot[
           fixRogersH2,
           {3, 4},
           axislabelCompY,
           "Rogers2",
           {xrange, All},
           colors1
         ];
        k2fixRogersH2vRogersH3 = MyListLinePlot[
           Relativize[fixRogersH2, fixRogersH3],
           {3, 4},
           axislabelRelXY,
           "Rogers3-Rogers2",
           {xrange, All},
           colors2
         ];
```

Combined plots - Fix

```
In[•]:= LineStylefix = LineStyle[[1 ;; Length[DeleteDuplicates[fixRogersH2[[All, 4]]]]]];
```

In[•]:=
```
k2Allfix =
  Legended[
   GraphicsGrid[{
     {k2fixRogersH2},
     {k2fixRogersH2vRogersH3}
    },
    ImageSize → Large,
    Spacings → {0, -10}],
   Placed[
    LineLegend[
     Map[Directive, LineStylefix],
     DeleteDuplicates[fixRogersH2[[All, 4]]],
     LegendLabel → legendlabel,
     LegendLayout → "Row"],
    Above]];
Export["GeomComp_fix_k2_binom.pdf", Show[k2Allfix, ImageSize → 9 cm]];
```