

Biological parameters for groundfish of the NBSLME

Data Preparation workshop

Barbados

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Cynoscion acoupa (Acoupa weakfish, curvina, Bang bang, pescada amarela, Akoupa rouj)

Max. Age: NA

Max length:

107 cm FL

110 cm TL

De Almeida, 2008 (Maranhao state, Brazil)

IGFA, 2001

Growth:

L_∞ = 106 cm (TL)

K = 0.27

De Espinosa, 1972 (Lake Maracaibo, Venezuela)



Cynoscion acoupa (Acoupa weakfish, curvina, Bang bang, pescada amarela, Akoupa rouj)

Length-weight relations:

a = 0.0081 b= 2.99

a= 0.0107 b= 3.03

a=0.00444 b=3.20

a=0.0122124 b=2.914

Giarrizzo et al. 2006 (North Brazil)

Silva-Junior et al. 2007 (Maranhao state, Brazil)

Joyeux et al. 2008 (Para state North Brazil)

Levrel, 2012 (French Guiana)



Males (SL)

a= 0.019 b=2.935

Females (SL)

a= 0.019 b=2.924

Almeida et al. 2016 (Maranhao, North Brazil)

Almeida et al. 2016 (Maranhao, North Brazil)

Cynoscion acoupa (Acoupa weakfish, curvina, Bang bang, pescada amarela, Akoupa rouj)



Length at maturity:

Males: 39.9 cm TL

De Almeida, 2008 (Maranhao state Brazil)

Females: 42.7 cm FL

De Almeida, 2008 (Maranhao state Brazil)

Males: 39.9 cm TL

Almeida et al. , 2016 (Maranhao state, Brazil)

Females: 42.1 cm FL

Almeida et al. 2016 (Maranhao state, Brazil)

Both sexes: 49 cm

Levrel, 2012 (French Guiana)

Trophic level: 4.05 (se 0.70)

In Lake Maracaibo in Venezuela and in Maranhao state Brazil spawning has been observed year round without major reproductive periods.

Cynoscion virescens (Green weakfish, salmon, sea trout, cambucu, Akoupa cambucu, kandratiki)

Max. Age: NA

Max length: 115 cm TL (IGFA, 2001)



Growth: NA

Length-weight relations:

a = 0.005 b= 3.054 Freire et al. 2009 (southern Bahia, Brazil)

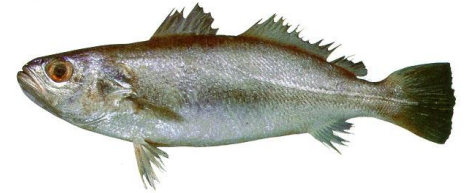
a= 0.00446 b= 3.1 Passos et al. 2012 (Parana state, Brazil)

Length at maturity: NA

Trophic level: 4.03 (se 0.70)

In French Guiana diet analysis showed that *C. virescens* feeds mainly on other finfish and on benthic crustaceans (shrimp and prawns)

Cynoscion jamaicensis (Jamaica weakfish, Akoupa mongolare, silver salmon, table bashaw, pescada-goete)



Max. Age: NA

Max length: 50 cm TL (Chao, 1978)

Growth:

Male: L_{∞} = 30.3 cm TL; K = 0.342

Female: L_{∞} = 32.1 cm TL; K = 0.345 Santos, 1963 (South Brazil)

Unsexed: L_{∞} = 39 cm TL; K = 0.40 Castro et al. 2005 (southeastern Brazil)

Unsexed: L_{∞} = 40 cm TL; K = 0.41 Castro et al. 2005 (southeastern Brazil)

Length-weight relations:

a = 0.00517 b = 3.13

a = 0.00601 b = 3.133

Passos et al. 2012 (Parana state, Brazil)

Joyeux et al. 2008 (Para state North Brazil)

Cynoscion jamaicensis (Jamaica weakfish, Akoupa mongolare, silver salmon, table bashaw, pescada-goete)

Length at maturity:

Male and Females: 25.1 cm TL

Females: 21.6 cm TL

Males: 22.4 cm TL

Marcano et al. 2002 (north Paria Peninsula, Venezuela)

Manickchand-Heileman & Julien-Flus, 1990 (Trinidad & Tobago)

Manickchand-Heileman & Julien-Flus, 1990 (Trinidad & Tobago)



Trophic level: 3.84 (se 0.66)

North of the Paria Peninsula in eastern Venezuela spawning occurred from September to February. In the same area absolute fecundity was between 46,354 and 554,400 and relative fecundity between 304 and 1042 with a mean of 583. Fecundity-length relationship parameters were $a = 0.00000145$ and $b = 4.49$ (Marcano & Alio, 2001).

Macrodon ancylodon (King weakfish, bangamary, Akoupa chasseur, pescada go, Dagoetifi, curvinata)

Max. Age: 7

Haimovici, 1988 (southern Brazil)

Max length: 45 cm TL

Cervigon, 1993

Growth:

Unsexed: Loo= 40.9 cm TL; K= 0.95

Hackett et al. 1997 (Guyana)

Unsexed: Loo= 48.9 cm TL; K= 0.55

Babb-Etcheld, 1997 (Suriname)

Unsexed: Loo= 40.9 cm TL; K= 0.95

Santos, 1963 (southern Brazil)

Unsexed: Loo= 39 cm TL; K= 0.40

Castro et al. 2005 (southeastern Brazil)

Unsexed: Loo= 40 cm TL; K= 0.41

Castro et al. 2005 (southeastern Brazil)

Unsexed: Loo= 47.4 cm TL; K= 0.42

Ikeda, 2003 (North Brazil)

Unsexed: Loo= 46.8 cm TL; K= 0.44

Ikeda, 2003 (North Brazil)



Several other growth curves from southern Brazil show lower K and higher Loo

Macrodon ancylodon (King weakfish, bangamary, Akoupa chasseur, pescada go, Dagoetifi, curvinata)



Length-weight relations:

a = 0.00436

b= 3.12

Passos et al. 2012 (Parana state, Brazil)

a= 0.00148

b= 3.536

Joyeux et al. 2008 (Para state North Brazil)

Males:

a = 0.0026

b= 3.37

Cardoso et al., 2018 (Maranhao, North Brazil)

Females:

a = 0.0092

b= 2.98

Cardoso et al., 2018 (Maranhao, North Brazil)

According to Fishbase $SL = 0 + 0.89 * TL$ from photograph

Macrodon ancylodon (King weakfish, bangamary, Akoupa chasseur, pescada go, Dagoetifi, curvinata)

Length at maturity:

Female: 18.6 cm TL

Male: 20.2 cm TL;

Female: 22.2 cm TL

Female: 21.5 cm TL

Female: 25.1 cm TL

Unsexed: 25.4 cm TL

Male and Females: 25.1 cm TL

Male and Females: 22.1 cm TL

Females: 25.1 cm TL

Male and Females: 22.2 cm TL

Male and Females: 20.2 cm TL

Male and Females: 21.1 cm TL

Males and Females: 21.13 cm TL

Males: 20.3 cm TL

Females: 22.14 cm TL

Trinidad-Santos & Freire 2015 (Para state, Brazil)

Trinidad-Santos & Freire 2015 (Maranhao state, Brazil)

Trinidad-Santos & Freire 2015 (Maranhao state, Brazil)

Trinidad-Santos & Freire 2015 (Para state, Brazil)

Trinidad-Santos & Freire 2015 (Amapa, Para and Maranhao states, Brazil)

Alio et al. 1997 (Gulf of Paria, Venezuela)

Marcano et al. 2002 (north Paria Peninsula, Venezuela)

Camargo & Isaac, 2005 (Caete estuary, Para, Northern Brazil)

Ikeda, 2003 (North Brazil)

Santos, 2007 (Para and Maranhao, North Brazil)

Santos, 2007 (Para and Maranhao, North Brazil)

Santos, 2007 (Para and Maranhao, North Brazil)

Cardoso et al., 2018 (Maranhao, North Brazil)

Cardoso et al., 2018 (Maranhao, North Brazil)

Cardoso et al., 2018 (Maranhao, North Brazil)



Macrodon ancylodon (King weakfish, bangamary, Akoupa chasseur, pescada go, Dagoetifi, curvinata)



Trophic level: 3.90 (se 0.65)

Absolute fecundity has been estimated in a range of 12,400 and 225,700, while relative fecundity ranged from 88 to 570, in the Rio de La Plata estuary in Argentina. Spawning has been observed year round in several studies in northern Brazil, and to a lesser extent with dominance during the second half of the year (see, Trinidad-Santos & Freire, 2015). North of the Paria Peninsula in eastern Venezuela spawning occurred from September to February. In the same area absolute fecundity was between 46,354 and 554,400 and relative fecundity between 304 and 1042 with a mean of 583. Fecundity-length relationship parameters were $a = 0.00000145$ and $b = 4.49$ (Marcano & Alio, 2001).

Nebris microps (smalleye croaker, Akoupa celeste, butterflyfish, botervis, Pescada banana)



Max. Age: NA

Max length: 40 cm TL

(Keith et al. 2000)

Growth: NA

Length-weight relations:

a = 0.00589

b = 3.04

Passos et al. 2012 (Parana state, Brazil)

a = 0.00780

b = 3.200

Silva-Junior et al. 2007 (Maranhao state, North Brazil)

Length at maturity: NA

Trophic level: 3.60 (se 0.69)

Micropogonias furnieri (whitemouth croaker, bashaw, cro-cro, corvina, tambour raye)



Max. Age: 7

Isaac, 1988 (Other studies show max ages up to 18 y –Uruguay)

Max length: 60 cm TL

(Nakamura et al., 1986) there is a report of 90 cm from Lagoa dos Patos, Brazil

Growth:

Unsexed: $L_{\infty} = 65.3$ cm TL; $K = 0.16$

Manickchand-Heileman & Kenny 1990 (Trinidad and Tobago)

Female: $L_{\infty} = 67.6$ cm TL; $K = 0.18$

Rodrigues, 1968 (Ceara state, Brazil)

Male: 68.6 cm TL; $K = 0.18$

Rodrigues, 1968 (Ceara state, Brazil)

Quite a number of studies have been done in other areas, especially in Brazil, but mainly concern sub-temperate and temperate zones.

Micropogonias furnieri (whitemouth croaker, bashaw, cro-cro, corvina, tambour raye)



Length-weight relations:

| | | |
|------------|---------|---|
| a = 0.03 | b= 2.64 | Manickchand-Heileman & Kenny 1990 (Trinidad and Tobago) |
| a= 0.0297 | b= 2.86 | Duarte et al. 1999 (Gulf of Salamanca, Colombia) |
| a= 0.0857 | b=3.03 | Etchevers, 1975 (Northeastern Venezuela) |
| a= 0.00457 | b=3.18 | Passos et al. 2012 (juveniles in Parana state, Brazil) |

According to Fishbase $SL= 0 + 0.868*TL$ from photograph

Micropogonias furnieri (whitemouth croaker, bashaw, cro-cro, corvina, tambour raye)



Length at maturity:

Female: 32.0 cm TL

Manickchand-Heileman & Kenny 1990 (Trinidad and Tobago)

Male: 28.0 cm TL

Manickchand-Heileman & Kenny 1990 (Trinidad and Tobago)

Other studies have been done in southern Brazil and Argentina

Trophic level: 3.27 (se 0.44)

In Trinidad and Tobago spawning has been observed year round, with more intensive spawning from February to August. Year round spawning has also been observed in Cuba and northern Brazil.

Lutjanus synagris (lane snapper, vivaneau raye, ariaco, pargo guanapo)



Max. Age: 10 Manooch, 1987 (southeast USA) older individuals have been reported in Bermuda (19) and Jamaica (14)

Max length: 60 cm TL IGFA, 2001

Growth:

Female: $L_{\infty} = 60.3$ cm TL; $K = 0.20$

Manickchand-Dass, 1987 (Gulf of Paria and north coast, Trinidad)

Male: 70.8 cm TL; $K = 0.22$

Manickchand-Dass, 1987 (Gulf of Paria and north coast, Trinidad)

Unsexed: $L_{\infty} = 50.5$ cm TL; $K = 0.231$

Alegria & Ferreira de Menezes, 1970 (Ceara state, Brazil)

Unsexed: $L_{\infty} = 51.0$ cm TL; $K = 0.20$

Gomez et al. 2001 (Gulf of Paria, Venezuela)

Quite a number of studies have been done in other areas, especially in Cuba and Mexico, but also in other Caribbean countries (e.g. Jamaica, Colombia, Puerto Rico) and southern Brazil.

Lutjanus synagris (lane snapper, vivaneau raye, ariaco, pargo guanapo)



Length-weight relations:

| | | |
|-------------|----------|--|
| a = 0.01490 | b= 2.994 | Joyeux et al. 2008 (Brazil from 0S to 25S) |
| a= 0.0083 | b= 3.153 | Lessa et al. 2004 (northeastern Brazil) |
| a=0.003 | b=3.569 | Ferreira et al. 1998 (Northeastern Brazil) |
| a= 0.0001 | b=2.64 | Gomez et al. 2001 (Gulf of Paria, Venezuela) |

Length at maturity:

| | |
|---------------------|---|
| Male: 25.0 cm TL | Manickchand-Dass, 1987 (Trinidad and Tobago) |
| Female: 31.0 cm TL | Manickchand-Dass, 1987 (Trinidad and Tobago) |
| Female: 23.4 cm TL | Trinidad-Santos & Freire 2015 (Ceara state, Brazil) |
| Unsexed: 36.8 cm TL | Gomez et al. 2001 (Gulf of Paria, Venezuela) |

Other studies have been done in Cuba, Jamaica and Bermuda

Lutjanus synagris (lane snapper, vivaneau raye,
ariaco, pargo guanapo)



Trophic level: 3.66 (se 0.80)

In Trinidad and Tobago spawning has been observed year round (Manickchand-Dass, 1987). On the other hand, in the Gulf of Paria, Venezuela, the percentage of mature individuals was higher from July to December. Average fecundity was estimated at 928,890 with a range from 510,872 to 1,225,118 (Gomez et al. 2011)

Lutjanus purpureus (southern red snapper, vivaneau rouge, pargo colorado)



Max. Age: NA

Max length: 100 cm TL

Allen, 1985 (a 112 cm male was reported for Para state, Brazil, Trindade-Santos & Freire, 2015)

Growth:

Unsexed: $L_{\infty}=85.1$ cm; $K=0.13$

Unsexed: $L_{\infty}=92.9$ cm; $K=0.103$

Unsexed: $L_{\infty}=100.68$ cm; $K=0.19$

Unsexed: $L_{\infty}=91.9$ cm; $K=0.245$

Unsexed: $L_{\infty}=98.0$ cm; $K=0.101$

Unsexed: $L_{\infty}=98.9$ cm; $K=0.09$

Manickchand-Heileman & Phillip, 1996 (Trinidad and Tobago)

Ximenes & Fonteles-Filho, 1988 (north and northeastern Brazil)

Gonzalez & Eslava, 1999 (eastern Venezuela)

Gonzalez et al. 1998 (Guianas shelf)

Lima, 1965

Menezes & Gesteira, 1974

Quite a number of studies have been done in other areas, especially in Cuba and Mexico, but also in other Caribbean countries (e.g. Jamaica, Colombia, Puerto Rico) and southern Brazil.

Lutjanus purpureus (southern red snapper, vivaneau rouge, pargo colorado)



Length-weight relations:

a = 0.0141 b= 2.99

a= 0.0117 b= 2.99

Manickchand-Heileman & Phillip, 1996 (Trinidad and Tobago)

Salles & Feitosa, 2000 (Ceara state, Brazil)

Length at maturity:

Male: 43.7 cm TL

Female: 43.0 cm TL

Male: 27.0 cm TL

Female: 39.0 cm TL

Male: 47.1 cm TL

Female: 46 cm TL

Male: 44.9 cm TL

Female: 47 cm TL

Female: 43 cm TL

Female: 43.7 cm TL

Trinidad-Santos & Freire 2015 (Para state, Brazil)

Trinidad-Santos & Freire 2015 (Para state, Brazil)

Manickchand-Heileman & Phillip, 1996 (Trinidad and Tobago)

Manickchand-Heileman & Phillip, 1996 (Trinidad and Tobago)

Almeida, 1965 (Northeast Brazil)

Almeida, 1965 (Northeast Brazil)

Gesteira et al., 1972

Gesteira et al., 1972

Gesteira & Ivo, 1973 (North and Northeast Brazil)

Souza, 2002 (North Brazil)

Lutjanus purpureus (southern red snapper,
vivaneau rouge, pargo colorado)



Trophic level: 3.85 (se 0.55)

In Trinidad and Tobago spawning has been observed between September and February (Manickchand-Heileman & Phillip, 1996). Similar patterns have been observed in north and northeastern Brazil with some inter-annual variability with more protracted periods in more recent years.

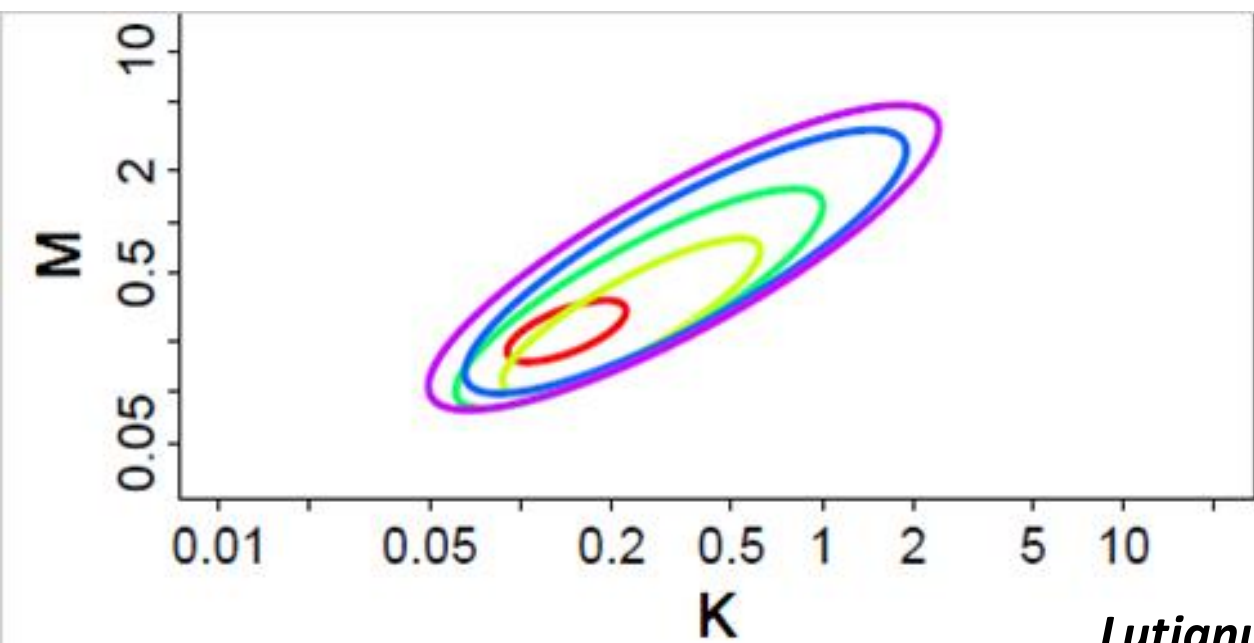
FishLife: Thorson, J.T. *et al.* 2017. Predicting life history parameters for all fishes worldwide. *Ecological Applications*. 27 (8): 2262-2276.

-Predicted life history parameters for > 32,000 species included in FishBase while accounting for the similarities for fishes that are taxonomically related explicitly representing residual error including correlations among parameters, and accounting for missing data.

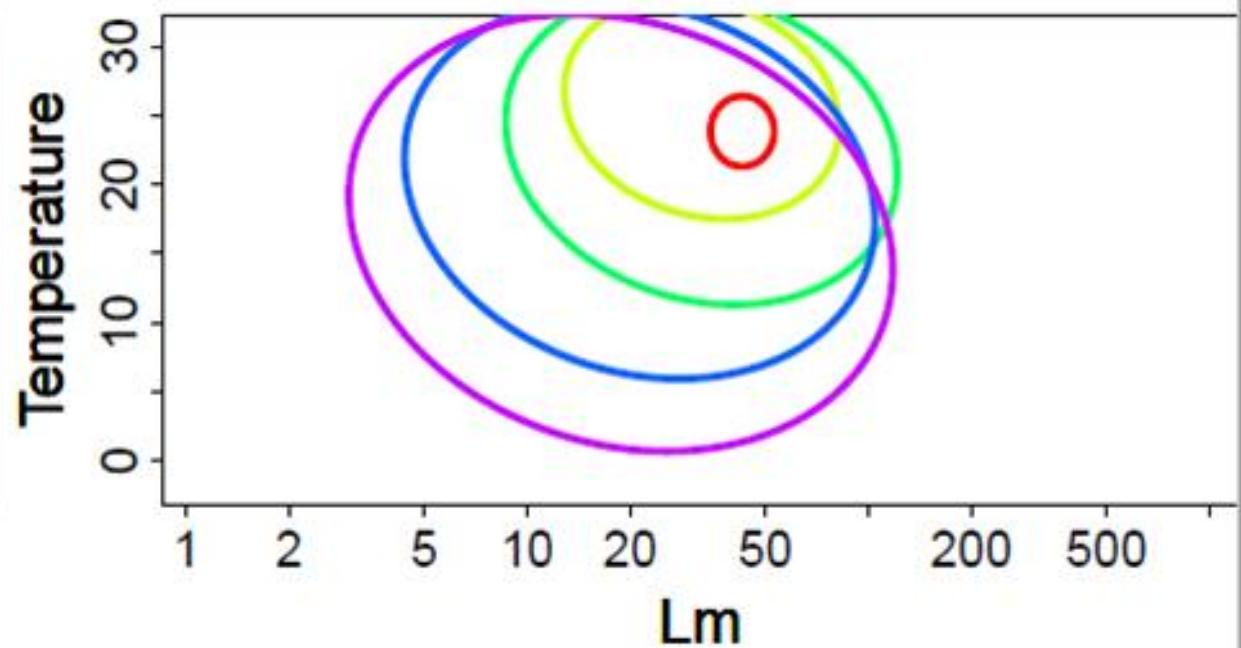
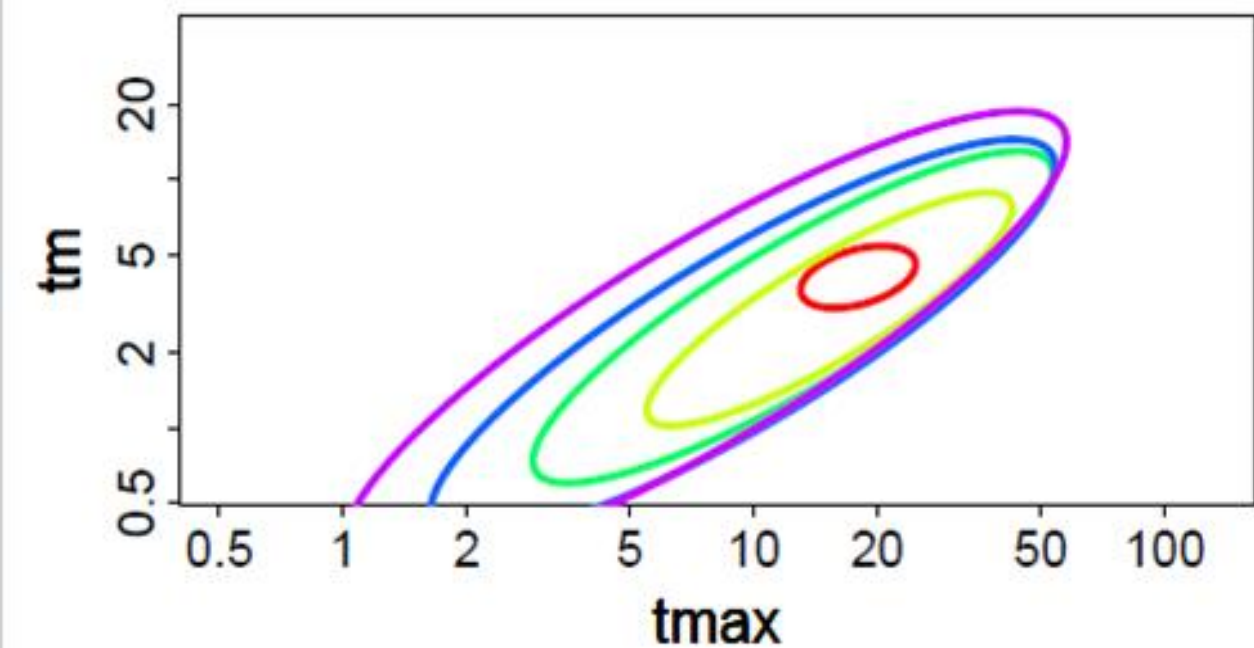
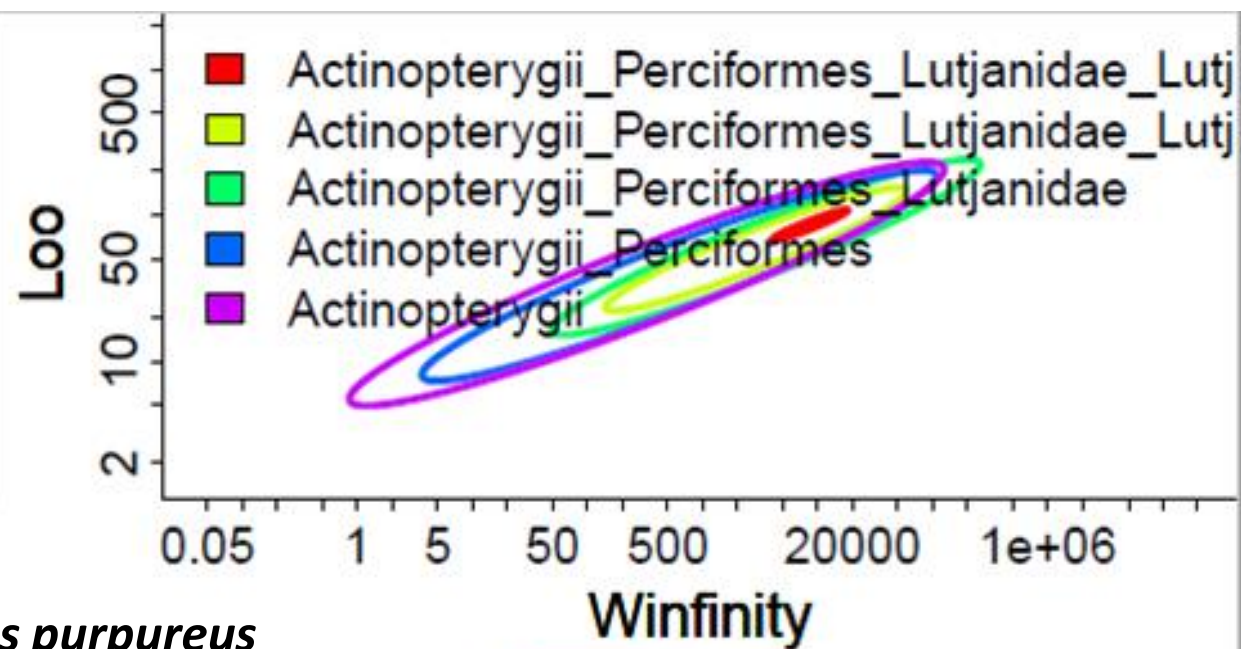
Benefits of new approach would include:

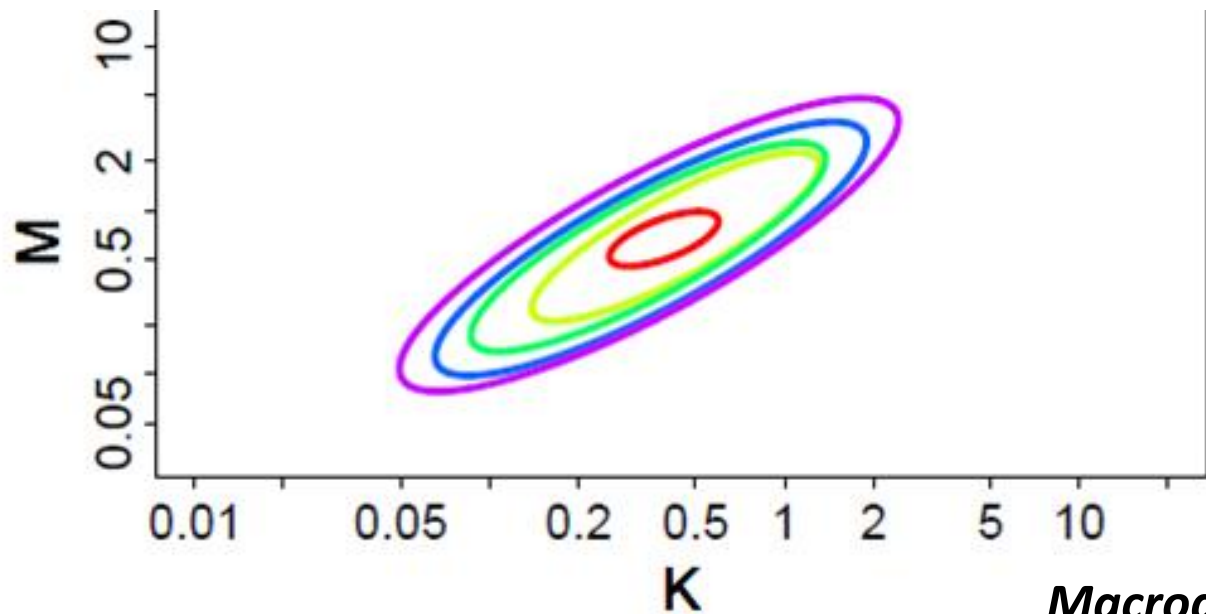
1. It predicts life-history variables probabilistically for species while using information about related taxa to inform predictions.
2. It predicts uncertainty for species based on the quantity of data that are available, so that species with many field-measurements of life-history variables have predictions that are more precise than species with only a few field measurements;
3. It uses the full set of life-history variables available for a given species to predict all unknown variables, e.g., rather than calculating natural mortality from a single variable (i.e., maximum age) and ignoring all others (e.g., individual growth rates).

| Species/Parameter | Loo | K | Woo | tmax | tm | M | Im |
|------------------------|------|-------|-------|------|------|------|-------|
| Lutjanus purpureus | 85.7 | 0.142 | 8,854 | 17.9 | 4.05 | 0.23 | 42.71 |
| Lutjanus synagris | 48.2 | 0.228 | 1,542 | 7.9 | 1.92 | 0.41 | 22.9 |
| Cynoscion acoupa | 93.9 | 0.217 | 7,613 | 12.7 | 3.27 | 0.37 | 46.0 |
| Cynoscion jamaicensis | 37.6 | 0.368 | 636 | 7.6 | 1.94 | 0.67 | 19.8 |
| Cynoscion virescens | 58.0 | 0.268 | 1,991 | 10.1 | 2.60 | 0.48 | 29.3 |
| Nebris microps | 50.9 | 0.345 | 1,320 | 9.1 | 2.32 | 0.60 | 27.1 |
| Macrodon ancylodon | 43.3 | 0.390 | 800 | 8.6 | 2.12 | 0.67 | 23.3 |
| Micropogonias furnieri | 61.9 | 0.176 | 2,462 | 10.5 | 3.02 | 0.45 | 27.7 |



Lutjanus purpureus





Macrodon ancylodon

