Atlantis supporting tools updates

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Adding to ShinyAtlantis

Estimation of Clearance

Calculation of Clearance based on ecology and and food availability This calculation presented here involves using the length of an individual and body shape, the speed of each individual, and an aproximation of the number of prey in the system using as a proxi the searching for food. Therefore it is assumed that the clearance rate is equal to the time taken and the speed at which individuals search for food. To expand on this idea, I'm considering factors related to foraging behavior and prey availability. Breaking down this idea and potential implications:

1. Length of the individual: The length of an individual, body size and physical dimensions, can influence various aspects of foraging. Larger or more active species may have higher energy requirements and need more food to sustain themselves. And they might also have different foraging strategies, for instance, they can spend more time looking for food. Also bigger species ussually have bigger gape size, there for are able to clear more water when foraging as well as having acces to biger preys

2. Speed of each individual: The speed of individuals can impact their foraging efficiency and success. Faster individuals may cover more ground in a given time period, potentially encountering more prey items.

Clearance rate approximation: Based on the previous points I assumme that the clearance rate, which is the rate at which individuals remove prey from a given area, can be approximated using the time spent and the speed at which individuals search for food. This approximation assumes that the effectiveness of prey removal is related to the time and speed of foraging. While this idea provides a conceptual framework for for calculating the clearance rate, it is important to note that the actual ecological processes involved in foraging and prey-predator interactions can be highly complex and this is just a vey rough aproximation. Many other factors, such as prey behavior, habitat structure, competition, handling time, and environmental conditions, can influence the foraging success and overall dynamics of a population.

Therefore the following equation can be used to calculate the reference clearance (d/m3) for aeach funtional group and different ages:

$$C_{fg,age} = S_{fg,age} * \pi * \frac{H_{fg,age}}{2} * \frac{W_{fg,age}}{2} * D * L_{fg,age} \tag{1}$$

Where : $S_{fg,age}$ is the top speed (m/h) of the functional group (fg) at age (age), H is the height, W is the width and D is the constant to scale the value per day (24) and L is the time that the functional group spend at that age looking for food.

When the speed of the species is known I used

```
library(ascii)
library(ggplot2)
source('/home/demiurgo/Documents/PhD/Atlantis_Model/tools/General_tools/Atlantis_tools.R')
options(asciiType = "org")
data <-
  read.csv('/home/demiurgo/Documents/PhD/Functional_groups/Clearance/c_data.csv')
## swimming speed
## from mm to  meters
data$length <- data$length  / 1000
cap         <- 'Clearance by cohort for some functional groups [m3d-1]'
C.out       <- clearance(fg        = data[, 1],
                         speed     = data[, 3],
                         len       = data[, 2],
                         ratio     = data[, 4],
                         time.l    = data[, 5],
                         max.speed = data[, 6],
                         alfa      = data[, 7],
                         beta      = data[, 8],
                         height    = data[, 9])
p.C <- C.out
p.C   <- na.omit(data.frame(FG= rownames(p.C), Cohort = sort(rep(1 : 10,
  nrow(p.C))), Clearance = c(p.C)))
png('img/clearance.png', height = 1000, width = 1000)
sp    <- ggplot(data=p.C, aes(Cohort, Clearance))+ geom_line()
sp + facet_wrap(~FG, ncol = 4, scales = 'free_y')
invisible(dev.off())
```

```r
b     <- ascii(C.out,header=T,  include.rownames = TRUE, include.colnames = TRUE, caption=cap)
print(b)
```

	1	2	3	4	5	6	7	8	9	10
ALF	60.63	103.65	162.00	220.38	275.70	326.34	371.68	411.51	446.29	476.03
ANG	2.35	5.40	15.31	27.69	41.03	54.57	67.63	79.87	91.07	79.94
BIR	0.41	2.18	5.28	9.24	13.61	18.04	22.28	26.20	29.72	32.81
BRC	6.48	10.71	16.42	23.56	32.69	45.00	60.26	74.35	88.78	104.92
CHO	1.46	4.65	8.43	12.19	15.63	18.64	21.19	23.31	25.05	26.46
DOL	8.61	28.21	52.40	77.46	101.36	123.08	142.24	158.78	172.86	184.71
GCR	0.52	1.74	3.65	6.16	9.14	12.25	15.07	17.38	19.85	22.03
LBF	91.93	113.55	141.53	163.87	191.05	235.31	272.21	295.86	331.94	370.96
LPF	14.39	101.53	172.50	213.82	235.53	246.48	251.90	254.56	255.86	256.49
MPF	9.81	13.06	13.66	13.76	13.78	13.78				
ORO	3.24	20.25	39.76	56.91	68.62	76.15	80.84	83.71	85.43	86.47
OTA	175.96	242.84	300.52	348.19	386.54	416.85	440.52	458.85	472.94	483.74
SBF	47.94	71.63	100.05	141.74	188.87	256.62	300.12	406.55	475.32	549.46
SPF	10.15	46.63	100.30	149.76	190.13	221.14	244.16	260.90	272.91	281.44
SPL	1.90	2.28	2.70	3.15	3.71	4.18	4.67	5.10	5.56	6.03
VID	67.01	88.68	120.00							

Estimation of growth rate

- Calculation of mum :

The growth rate (mum) calculation follows a straightforward logic. It is determined by the change in weight at each group's size or age. By having the weight values at each size and knowing when the species reach maturity, you can easily calculate the ratio of weight change to size change. When the species are mature, this ratio is multiplied by 1.4. The increase in the growth rate for mature individuals accounts for the fat accumulation that typically occurs during the reproductive stage. It is important to note that this approach does not consider the availability of food in the system; it assumes that there is a constant food supply for growth.

```r
## ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ ##
## ~          Estimation of mum      ~ ##
## ~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~~ ##
data  <- read.csv('/home/demiurgo/Documents/PhD/Functional_groups/mum/mum.csv')
library(ascii)
```

```r
library(ggplot2)
options(asciiType="org")
source('/home/demiurgo/Documents/PhD/Atlantis_Model/tools/General_tools/Atlantis_tools.R')
## estimation of the weight at each age class or cohort
data$Weight <- ifelse(is.na(data$Weight), alometric(data$Length, data$alfa, data$beta), data$Weight)
fg          <- split(data, data$FG)
spw.rate    <- 1.2
res         <- list()
for( i in 1: length(fg)) {
    res[[i]] <- with(fg[[i]], mum.f(length     = Length,   # Length in cm
                                    weight     = Weight,   # Weight
                                    metric     = 'g',      # metric for weight grams
                                    spw.rate   = 1.4,      # I asume that 40% of the reserve weight in going to reproduction
                                    mature     = Mature,   # Age at maturity
                                    AgeClass   = AgeClass))# Number year for earch Age class
}
## Arrangement for the output
m   <- as.vector(table(data[, 1]))
out <- matrix(NA, nrow = max(m), ncol = length(m))
dat <- array()
for(i in 1 : length(res)){
    out[, i] <- c(res[[i]], rep(NA, 10 - length(res[[i]])))
    if(length(res[[i]]) > 1){
        dat <- rbind(dat, cbind(rep(names(fg)[i], length(res[[i]])),res[[i]], seq(1 : length(res[[i]]))))
    }
}
dat             <- data.frame(FG = dat[-1, 1], Mum = as.numeric(dat[-1, 2]), Age = as.numeric(dat[-1, 3]))
out             <- t(out)
rownames(out) <- names(fg)
colnames(out) <- c(1 : (ncol(out)))
sp              <- ggplot(data=dat, aes(Age, Mum))+ geom_line()
png('img/mum.png', height = 1200, width = 1200)
sp + facet_wrap(~FG, ncol=4, scales = 'free_y')
invisible(dev.off())
## table with parameters
cap                 <- 'Values of growth rate (mum) for each functional group [mgN-1d-1]'
b                   <- ascii(out, header=T,  include.rownames = TRUE, include.colnames = T, caption = cap, digits = 3)
cat("#+ATTR_HTML: :style float:left;width:30%;margin:3ex\n")
print(b)
```