

Package ‘AnglerCreelSurveySimulation’

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Title Simulate a Bus Route Creel Survey of Anglers

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Depends R (>= 3.0.2)

Description Create an angler population, sample the population with a user-specified survey times, and calculate metrics from a bus route-type creel survey.

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AnglerCreelSurveySimulation-package
Simulate a Bus Route Creel Survey of Anglers

Description

Create an angler population, sample the population with a user-specified survey times, and calculate metrics from a bus route-type creel survey.

Details

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Author(s)

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ConductMultipleSurveys

Conduct multiple simulations of a bus-route survey

Description

This function uses `MakeAnglers` and `GetTotalValues` to conduct multiple bus-route or traditional access point creel surveys (from the number provided to the `nsims` argument) of a population of anglers.

Usage

```
ConductMultipleSurveys(nsims, ...)
```

Arguments

<code>nsims</code>	The number of simulations to be conducted in the simulation of interest.
<code>...</code>	Arguments to be passed to other subfunctions

Details

Because this function is merely a wrapper for the [SimulateBusRoute](#) code, the user still needs to set `startTime`, `waitTime`, `nanglers`, `nsites`, and `samplingProb` as objects. These can be passed through the `...` argument or through setting `waitTime` and others outside of the function call itself.

Author(s)

Steven Ranney

See Also

[MakeAnglers](#) [GetTotalValues](#) [SimulateBusRoute](#)

Examples

```
#These objects are not used directly in the ConductMultipleSurveys() function
# but will be used in the SimulateBusRoute() function
startTime <- c(1, 2,3,4,5)
waitTime <- c(.5, .5, .5, .5, 2)
nanglers <- c(10,10,10,10,50)
nsites <- 5
samplingProb <- .5
meanCatchRate <- 3
nsims <- 100
tmp <- ConductMultipleSurveys(100, startTime = startTime, waitTime = waitTime,
                             nanglers = nanglers, nsite = nsites,
                             samplingProb = samplingProb, meanCatchRate = meanCatchRate)

#To change fishingDayLength used in the MakeAnglers function
ConductMultipleSurveys(nsims, startTime, waitTime, nanglers, nsites, samplingProb,
                      meanCatchRate, fishingDayLength = 9.5)
```

 GetTotalValues

Conduct a creel survey of a population of anglers at a site

Description

This function uses the output from MakeAnglers to conduct a bus-route or traditional access point creel survey of the population of anglers from MakeAnglers and provide clerk-observed counts of anglers and their effort.

Usage

```
GetTotalValues(ang = anglers, teffort = trueeffort, nanglers = length(anglers$starttime),
              startTime = NULL, endTime = NULL, waitTime = NULL, samplingProb = 1,
              meanCatchRate = NULL, ...)
```

Arguments

ang	This argument renames the output from the MakeAnglers function.
teffort	This argument renames the output from the MakeAnglers function.
nanglers	Defines the size of the angler population based upon the length of the anglers from the MakeAnglers function
startTime	The start time of the creel clerk at this site
endTime	The end time of the creel clerk at this site
waitTime	The wait time of the creel clerk at this site
samplingProb	The sampling probability for the survey. The default is 1 but will need to be changed if the survey is conducted during only half of the fishing day (.5) or over longer time periods (e.g., 9.5/12, if the survey is 9.5 hours long).
meanCatchRate	The mean catch rate for the fishery.
...	Arguments to be passed to other functions

Details

Catch rates are assigned to anglers based upon the Gamma distribution with a mean of meanCatchRate.

If both endTime=NULL and waitTime=NULL then waitTime will be 0.5 (one-half hour). If a value is passed to endTime, then waitTime becomes endTime - startTime.

If startTime=NULL, then a startTime is generated from the uniform distribution between 0 and 11.5 hours into the fishing day.

If endTime=NULL, then endTime = startTime+waitTime Incomplete trip effort is observed two ways: 1) by counting anglers that were at the site for the entire time that the surveyor was at the site and 2) counting anglers that arrived after the surveyor arrived at the site but remained at the site after the surveyor left. These anglers are counted and their effort calculated based upon surveyor startTime and endTime.

Completed trip effort is observed two ways: 1) by interviewing anglers that left while the surveyor was at the site. The surveyor can determine effort and catch. 2) by interviewing anglers that both arrived and departed while the surveyor was on site. When waitTime is short, these cases are rare; however, when waitTime is long (e.g., all day), then these cases are much more likely.

Trip lengths of observed trips (both incomplete and complete) are scaled by the samplingProb value. The samplingProb is used to estimate effort and catch.

Author(s)

Steven Ranney

References

Pollock, K. H., C. M. Jones, and T. L. Brown. 1994. Angler survey methods and their applications in fisheries management. American Fisheries Society, Special Publication 25, Bethesda, Maryland.

Examples

```
#The MakeAnglers() function must be run before GetTotalValues(); otherwise, there
# will be no data from which GetTotalValues() can calculate values.
#MakeAnglers(100)
startTime = .001 #start of fishing day
endTime = 12 #end of fishing day
meanCatchRate = 0.1 #this will cause VERY few fish to be caught!
#GetTotalValues()
#MakeAnglers(100)
startTime = .001 #start of fishing day
endTime = 6 #halfway through the fishing day
samplingProb = .5 #this needs to be .5 because we are sampling only 50% of the fishing day
meanCatchRate = 0.1 #this will cause VERY few fish to be caught!
#GetTotalValues()
```

MakeAnglers

Create a population of anglers

Description

Creates a population of anglers with trip length and fishing day length provided by the user.

Usage

```
MakeAnglers(nanglers = 100, meanTripLength = 3.88, fishingDayLength = 12)
```

Arguments

`nanglers` The number of anglers in the population

`meanTripLength` The mean trip length to be used in the function. 3.88 is the default. The default is from data from the 2008 Lake Roosevelt Fishing Evaluation Program.

`fishingDayLength` The fishing day length to be used in the function. Anglers are not be allowed to be fishing past this day length. The default here is set to 12 hours, which may not be a suitable day length for fisheries at higher latitudes (i.e., sunrise-sunset is > 12 hours) or during shorter seasons.

Details

All trip lengths will be limited so that anglers have finished their fishing trip by the end of the fishing day. The function uses a while loop to ensure that the number of angles = `nanglers` provided in the function argument. `fishingDayLength` is passed to the argument. The default is set to 12 hours. `starttimes` are assigned by the uniform distribution `triplengths` are assigned by the gamma distribution where the default mean value comes from the 2008 Lake Roosevelt Fisheries Evaluation Program data.

Author(s)

Steven Ranney

Examples

```
MakeAnglers(100, meanTripLength = 4, fishingDayLength = 10)
MakeAnglers(10000)
```

SimulateBusRoute	<i>Simulate a bus route survey</i>
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Description

This function uses the output from `MakeAnglers` and `GetTotalValues` to conduct a bus-route or traditional access point creel survey of the population of anglers from `MakeAnglers` and provide clerk-observed counts of anglers and their effort.

Usage

```
SimulateBusRoute(startTime, waitTime, nanglers, nsites, samplingProb = 1,
  meanCatchRate, ...)
```

Arguments

<code>startTime</code>	The start time of the surveyor at each site. This can be a vector of start times to simulate a bus route or one <code>startTime</code> to simulate a traditional access survey.
<code>waitTime</code>	The wait time of the surveyor at each site. This can be a vector of wait times to simulate a bus route or one <code>waitTime</code> to simulate a traditional access survey.
<code>nanglers</code>	The number of anglers at each site, either a vector or a single number.
<code>nsites</code>	How many sites are being visited?
<code>samplingProb</code>	What is the sampling probability for the survey? If all sites will be visited during the first or second half of the fishing day, <code>samplingProb=0.5</code> . If the survey will take the entire fishing day, then <code>samplingProb=1</code> .
<code>meanCatchRate</code>	The mean catch rate for the fishery.
<code>...</code>	Arguments to be passed to other subfunctions, specifically to the <code>MakeAnglers</code> function, including <code>meanTripLength</code> and <code>fishingDayLength</code> .

Details

Effort and catch are estimated from the the Bus Route Estimator equation in Robson and Jones (1989), Jones and Robson (1991) and Pollock et al. 1994. Catch rate is calculated from the Ratio of Means equation (see Malvestuto (1996) and Jones and Pollock (2012) for discussions). The Ratio of means is calculated by

$$\widehat{R}_1 = \frac{\sum_{i=1}^n c_i/n}{\sum_{i=1}^n L_i/n}$$

where c_i is the catch for the i^{th} sampling unit and L_i is the length of the fishing trip at the time of the interview. For incomplete surveys, L_i represents in incomplete trip. The bus route estimator is

$$\widehat{E} = T \sum_{i=1}^n \frac{1}{w_i} \sum_{j=1}^m \frac{e_{ij}}{\pi_j}$$

where E = estimated total party-hours of effort; T = total time to complete a full circuit of the route, including travelling and waiting; w_i = waiting time at the i^{th} site (where $i = 1, \dots, n$ sites); e_{ij} = total time that the j^{th} car is parked at the i^{th} site while the agent is at that site (where $j = 1, \dots, n$ sites).

Author(s)

Steven Ranney

References

Jones, C. M., and D. Robson. 1991. Improving precision in angler surveys: traditional access design versus bus route design. *American Fisheries Society Symposium* 12:177-188. Jones, C. M., and K. H. Pollock. 2012. Recreational survey methods: estimation of effort, harvest, and released catch. Pages 883-919 in A. V. Zale, D. L. Parrish, and T. M. Sutton, editors. *Fisheries Techniques*, 3rd edition. American Fisheries Society, Bethesda, Maryland. Malvestuto, S. P. 1996. Sampling the recreational creel. Pages 591-623 in B. R. Murphy and D. W. Willis, editors. *Fisheries techniques*, 2nd edition. American Fisheries Society, Bethesda, Maryland. Pollock, K. H., C. M. Jones, and T. L. Brown. 1994. Angler survey methods and their applications in fisheries management. *American Fisheries Society, Special Publication* 25, Bethesda, Maryland. Robson, D., and C. M. Jones. 1989. The theoretical basis of an access site angler survey design. *Biometrics* 45:83-98.

See Also

[MakeAnglers GetTotalValues](#)

Examples

```
# To simulate one bus route survey that takes place in the morning, these values are used
#start time at access sites
startTimeAM <- c(1, 2,3,4,5)
#wait time at access sites
waitTimeAM <- c(.5, .5, .5, .5, 2)
#the number of anglers that will visit access site throughout the day
nanglersAM <- c(10,10,10,10,50)
# the number of sites to be visited
nsitesAM <- 5
# the sampling probability. Here it is .5 because we are only conducting this
# survey during the first 50% of the fishing day
samplingProb <- .5
# the mean catch rate. Here it is 2.5 which equals 2.5 fish/hour
meanCatchRate <- 2.5
SimulateBusRoute(startTimeAM, waitTimeAM, nanglersAM, nsitesAM, samplingProb,
                  meanCatchRate)

# To simulate one traditional access point survey where the creel clerk arrives,
# counts anglers, and interviews anglers that have completed their trips
startTime = 0.001
waitTime = 8
#nanglers can be informed by previously-collected data
nanglers = 1000
nsites = 1
```

```
# sampling probability here is 8/12 because we are staying at the access site
# for 8 hours of a 12-hour fishing day. To adjust the fishing day length, an
# additional 'fishingDayLength' argument needs to be passed to this function.
samplingProb <- (8/12)
# the mean catch rate.
meanCatchRate <- 5
SimulateBusRoute(startTime, waitTime, nangers, nsites, samplingProb, meanCatchRate)
```

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