Package 'CTE'

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Type Package

Title Constant Temperature Equivalent

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Maintainer Donald T. McKnight <donald.mcknight@my.jcu.edu.au>

Description Under natural conditions, nest temperatures fluctuate daily around a mean value, whereas in captivity they are often held constant. The Constant Temperature Equivalent is designed to bridge the gap between the two by calculating a single temperature value for wild nests that corresponds with the amount of development that would occur in an incubator set to the same temperature. The theory and formulas behind this method were developed by Professor Author Georges and are implemented here as a single function.

License GPL (>= 3)

Encoding UTF-8

LazyData true

RoxygenNote 7.3.3

Suggests dplyr,knitr,rmarkdown

Depends R (>= 3.5)

VignetteBuilder knitr

NeedsCompilation no

Author Donald T. McKnight [aut, cre] (affiliation: Savanna Field Station)

Repository CRAN

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Contents

CTE *Calculate Constant Temperature Equivalent (CTE)*

Description

Calculate daily constant temperature equivalents

Usage

```
CTE(M, R, T0 = 0, t = pi, max.it = 10000)
```

Arguments

M	(integer) Mean temperature for a given day in degrees centigrade
R	(integer) Maximum deviation of temperatures from M for a given day in degrees centigrade (e.g., if the range of temperatures is 14–25 and M = 20, then R = 6)
T0	(integer) Temperature in degrees centigrade below which no development will occur. Default = 0.
t	(integer; 0 < t < 2pi) Starting seed for calculating the point along the curve above which half of development occurs. Any value > 0 and < 2pi will work. Default = pi.
max.it	(numeric) Maximum number of times the function will try to find a solution for a given day. In rare cases, no stable solution exists, in which case it will attempt to find a solution max.it number of times before returning NA. Default = 10000

Details

CTE takes input values for a given day and returns the CTE using the formulas in Georges (1989). It automatically selects the appropriate formula based on whether the minimum temperature (M-R) is less than T0. T0 may not be precisely known in all cases, but should be estimated based on knowledge of the species being studied. If you think your nest never dropped below T0 (i.e., there was not point at which development was not occurring) then set T0 lower than your minimum temperature. If M+R < T0 (i.e., all temps on a given day were less than T0, then T0 is returned as CTE). Because this function operates on data from a single day, in most cases you will want to loop it over your nests and dates to get a CTE per nest per date. You can accomplish this with a for loop or functions in packages like dplyr and plyr. See Vignette for details on the formulas and examples.

Value

Numeric value of the CTE for a given day (in degrees centigrade)

References

Georges, A. (1989). *Female turtles from hot nests: is it duration of incubation or proportion of development at high temperatures that matters?*. Oecologia, **81**, 323-328

Examples

```
CTE(M=20, R = 6, T0=10)
```

`example_temp_data` *Example temperature data*

Description

Example data set for two nests over one or two days.

Usage

```
data(example_temp_data)
```

Format

A data frame with 144 rows and 3 variables:

nest Nest ID

date Date (YYYY-MM-DD)

time Time (HH:MM:SS)

temp Temperature (degrees centigrade)

Source

Hypothetical data of two nests over 1 or 2 days

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