

Damage Composite Index R function

Description

Calculate the Damage Composite Index (DCI) described in Gehring et. al 2017.

dci() takes four vectors as arguments, calculate the dci, and return the result in a single vector.

dci_level() takes one vector with the dci value as argument and return the correspondent severity level in a single vector.

add_dci() add a column called damage_composite_index to the dataframe with dci values, optional with damage severity level

Usage

```
dci(alive_shoot, dead_shoot, reactivated_dormant_bud, gall_on_shoot)
```

```
dci_level(dci)
```

```
add_dci(data, dci_severity_level = FALSE)
```

Arguments

alive_shoot: numeric vector with the total number of shoots alive per sampled branch. An alive shoot is a sprout alive from the previous vegetative season with respect to the sampling date (i.e., sampling season = 2017, shoot = sprout that grew in 2016).

dead_shoot: numeric vector with the total number of shoots dead per sampled branch. A dead shoot is a sprout from the previous vegetative season with respect to the sampling date (i.e., sampling season = 2017, shoot = sprout that grew in 2016) that died after *Dryocosmus kuriphilus* attack or due to natural death.

reactivated_dormant_bud: numeric vector with the total number of reactivated dormant buds per sampled branch. A reactivated dormant bud is a freshly formed sprout that has grown during the current vegetative season from a dormant bud on a multiyear branch part that is older than the shoot.

gall_on_shoot: numeric vector with the total number of galls on shoot per sampled branch. A gall on shoot is a gall developed at the base or along the axis of a sprout. Technically, these should be called “galls on sprouts” but for consistency purposes with existing literature we refer to them as “galls on shoots”.

dci: numeric vector with damage composite index values.

data: a data.frame including the variables needed to calculate the dci: alive_shoot, dead_shoot, reactivated_dormant_bud, gall_on_shoot. Note: please

dci_severity_level: a logical indicating whether the column dci_severity_level should be added to the data.frame.

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Example

Create a dataframe

```
df <- data.frame(
  locality = c(rep("Lavorgo",9), rep("Stabio", 10), rep("Losone",2)),
  tree_id = c(rep(1, 3), rep(2, 3), rep(3, 3), 1, 1, 2, 2, 3, 3, 4, 4, 5, 5, 1:2),
  tree_height = c(18, 18, 18, 22, 22, 22, 25, 25, 25, 22, 22, 20, 20, 19, 19, 25, 25, 24, 24, 22, 28), # metre
  branch_id = c(rep(1:3, 3), rep(1:2, 5), rep(1, 2)),
  branch_height = c(18, 7, 4, 21, 16, 5, 7, 18, 25, 22, 15, 19, 14, 13, 19, 25, 18, 24, 17, 22, 27), # metre
  branch_max_length = c(75, 53, 112, 110, 100, 98, 65, 78, 51, 66, 58, 87, 81, 72, 67, 53, 89, 115, 59, 70, 52),#
  centimetre
  alive_shoot =c(15,10,17,22,8,12,14,15,9,10, 6, 7, 15, 12, 10, 10, 14, 11, 12, 20, 15),
  dead_shoot = c(1, 0, 5, 10, 2, 1, 1, 5, 1, 1, 7, 4, rep(0,5), 0, 3, 4, 4),
  reactivated_dormant_bud = c(1, 4, 0, 0, 0, 4, 1, 2, 2, 0, 0, 0, 1, 1, 2, 1, 0, 3, 5, 1, 5),
  gall_on_shoot = c(1, 14, 0, 12, 5, 5, 0, 0, 10, 15, 1, 1, 5, 5, 2, 1, 6, 0, 0, 4, 2))
```

add two columns to data.frame "df": damage_composite_index and dci_severity_level

```
df <- add_dci(data = df, dci_severity_level = T)
```

Reference

Gehring Eric, Quacchia Ambra, Bellosi Bruno, Marco Conedera. 2017. Assessing the impact of *Dryocosmus kuriphilus* on the chestnut tree: branch architecture matters. Journal of Pest Science. DOI 10.1007/s10340-017-0857-9