Package 'malariaAtlas'

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Title An R Interface to Open-Access Malaria Data, Hosted by the 'Malaria Atlas Project'

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Description A suite of tools to allow you to download all publicly available parasite rate survey points, mosquito occurrence points and raster surfaces from the 'Malaria Atlas Project' <https://map.ox.ac.uk/> servers as well as utility functions for plotting the downloaded data.

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BugReports https://github.com/malaria-atlas-project/malariaAtlas/issues

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R topics documented:

`as.MAPraster` *Convert Raster objects into MAPraster objects*

Description

`as.MAPraster` converts a RasterLayer or RasterStack object into a 'MAPraster' object (data.frame) for easy plotting with ggplot.

Usage

```
as.MAPraster(raster_object)
```

Arguments

`raster_object`	RasterLayer or Rasterstack object to convert into a MAPraster.

Value

`as.MAPraster` returns a MAPraster object (data.frame) containing the below columns.

1. `x` - x coordinates of raster pixels
2. `y` - y coordinates of raster pixels
3. `z` - value of raster pixels
4. `raster_name` - name of raster for which values are stored in z

See Also

`getRaster`:

to download rasters directly from MAP.

`as.MAPraster`:

to convert RasterLayer/RasterStack objects into a 'MAPraster' object (data.frame) for easy plotting with ggplot.

`autoplot.MAPraster`:

to quickly visualise MAPraster objects created using `as.MAPraster`.

Examples

```
# Download PfPR2-10 Raster for Madagascar in 2015 and visualise this on a map.

MDG_shp <- getShp(ISO = "MDG", admin_level = "admin0")
MDG_PfPR2_10 <- getRaster(surface = "Plasmodium falciparum PR2-10", shp = MDG_shp, year = 2015)
MDG_PfPR2_10 <- as.MAPraster(MDG_PfPR2_10)
autoplot(MDG_PfPR2_10)

#Download global raster of G6PD deficiency from Howes et al 2012 and visualise this on a map.

G6PDd_global <- getRaster(surface = "G6PD Deficiency Allele Frequency")
G6PDd_global <- as.MAPraster(G6PDd_global)
autoplot(G6PDd_global)
```

---

as.MAPshp *Convert SpatialPolygon objects into MAPshp objects*

Description

`as.MAPshp` converts a SpatialPolygon or SpatialPolygonsDataframe object downloaded using getShp into a 'MAPshp object (data.frame) for easy plotting with ggplot.

Usage

```
as.MAPshp(object)
```

Arguments

object	SpatialPolygon or SpatialPolygonsDataframe object to convert into a 'MAPshp'.

Value

as.MAPshp returns a MAPshp object (data.frame) containing the below columns.

1. country_id ISO-3 code of given administrative unit (or the ISO code of parent unit for administrative-level 1 units).
2. gaul_code GAUL code of given administrative unit.
3. admn_level administrative level of the given administrative unit - either 0 (national) or 1 (first-level division)
4. parent_id GAUL code of parent administrative unit of a given polygon (for admin0 polygons, PARENT_ID = 0).
5. country_level composite country_id_admn_level field.

See Also

autoplot.MAPshp

to download rasters directly from MAP.

Examples

```
#Download shapefiles for Madagascar and visualise these on a map.


MDG_shp <- getShp(ISO = "MDG", admin_level = "admin0")
MDG_shp <- as.MAPshp(MDG_shp)
autoplot(MDG_shp)
```

---

as.pr.points *Convert data.frames to pr.points objects.*

Description

Will create empty columns for any missing columns expected in a pr.points data.frame. This function is particularly useful for use with packages like dplyr that strip objects of their classes.

Usage

```
as.pr.points(x)
```

Arguments

x	A data.frame

Examples

```
#Download PfPR data for Nigeria and Cameroon and map the locations of these points using autoplot

library(dplyr)
NGA_CMR_PR <- getPR(country = c("Nigeria", "Cameroon"), species = "Pf")

# Filter the data frame then readd pr.points class so that autoplot can be used.
NGA_CMR_PR %>%
  filter(year_start > 2010) %>%
  as.pr.points %>%
  autoplot
```

---

as.vectorpoints *Convert data.frames to vector.points objects.*

Description

Will create empty columns for any missing columns expected in a vector.points data.frame. This function is particularly useful for use with packages like dplyr that strip objects of their classes.

Usage

```
as.vectorpoints(x)
```

Arguments

x	A data.frame

Examples

```
library(dplyr)
Brazil_vec <- getVecOcc(country = "Brazil")

# Filter data.frame then readd vector points class so autoplot can be used.
Brazil_vec %>%
  filter(sample_method1 == 'larval collection') %>%
  as.vectorpoints %>%
  autoplot
```

`autoplot.MAPraster` *Quickly visualise Rasters downloaded from MAP*

Description

`autoplot.MAPraster` creates a map of all rasters in a MAPraster object and displays these in a grid.

Usage

```
## S3 method for class 'MAPraster'
autoplot(object, ..., shp_df = NULL, legend_title = "",
  plot_titles = TRUE, fill_scale_transform = "identity",
  fill_colour_palette = "RdYlBu", printed = TRUE)
```

Arguments

`object`	MAPraster object to be visualised.
`...`	Other arguments passed to specific methods
`shp_df`	Shapefile(s) (data.frame) to plot with downloaded raster.
`legend_title`	String used as title for all colour scale legends.
`plot_titles`	Plot name of raster object as header for each individual raster plot?
`fill_scale_transform`	String givning a transformation for the fill aesthetic. See the trans argument in `continuous_scale` for possible values.
`fill_colour_palette`	String referring to a colorbrewer palette to be used for raster colour scale.
`printed`	Logical vector indicating whether to print maps of supplied rasters.

Value

`autoplot.MAPraster` returns a list of plots (gg objects) for each supplied raster.

See Also

`getRaster`:

to download rasters directly from MAP.

`as.MAPraster`:

to convert RasterLayer/RasterStack objects into a 'MAPraster' object (data.frame) for easy plotting with ggplot.

`autoplot.MAPraster`:

to quickly visualise MAPraster objects created using /codeas.MAPraster.

Examples

```
# Download PfPR2-10 Raster (Bhatt et al 2015) and raw survey points
#   for Madagascar in 2013 and visualise these together on a map.

# Download madagascar shapefile to use for raster download.
MDG_shp <- getShp(ISO = "MDG", admin_level = "admin0")

# Download PfPR2-10 Raster for 2013 & plot this
MDG_PfPR2_10 <- getRaster(surface = "Plasmodium falciparum PR2-10",
                          shp = MDG_shp, year = 2013)
p <- autoplot_MAPraster(MDG_PfPR2_10, shp_df = MDG_shp)

# Download raw PfPR survey points & plot these over the top of the raster
pr <- getPR(country = c("Madagascar"), species = "Pf")
p[[1]] +
geom_point(data = pr[pr$year_start==2013,],
           aes(longitude, latitude, fill = positive / examined,
               size = examined), shape = 21) +
  scale_size_continuous(name = "Survey Size") +
  scale_fill_distiller(name = "PfPR", palette = "RdYlBu") +
  ggtitle("Raw PfPR Survey points\n +
          Modelled PfPR 2-10 in Madagascar in 2013")


# Download global raster of G6PD deficiency (Howes et al 2012) and visualise this on a map.
G6PDd_global <- getRaster(surface = "G6PD Deficiency Allele Frequency")
autoplot_MAPraster(G6PDd_global)
```

`autoplot.MAPshp` *Create a basic plot to visualise downloaded shapefiles*

Description

`autoplot.MAPshp` creates a map of shapefiles downloaded using getShp.

Usage

```
## S3 method for class 'MAPshp'
autoplot(object, ..., map_title = NULL, facet = FALSE,
  printed = TRUE)
```

Arguments

`object`	A MAPshp object downloaded using /code/linkgetShp with format = "df" specified.
`...`	Other arguments passed to specific methods

map_title	Custom title used for the plot.
facet	If TRUE, splits map into a separate facet for each administrative level.
printed	Should the plot print to graphics device.

Value

autoplot.MAPshp returns a map (gg object) of the supplied MAPShp dataframe.

Examples

```
MDG_shp <- getShp(ISO = "MDG", admin_level = "admin0")
autoplot(as.MAPshp(MDG_shp))
```

---

autoplot.pr.points *Create a basic plot showing locations of downloaded PR points*

Description

autoplot.pr.points creates a map of PR points downloaded from MAP.

Usage

```
## S3 method for class 'pr.points'
autoplot(object, ..., shp_df = NULL,
  admin_level = "admin0", map_title = "PR Survey Locations",
  fill_legend_title = "Raw PR", fill_scale_transform = "identity",
  facet = NULL, hide_confidential = FALSE, printed = TRUE)
```

Arguments

object	a pr.points object downloaded using /code/linkgetPR
...	Other arguments passed to specific methods
shp_df	Shapefile(s) (data.frame) to plot with downloaded points. (If not specified automatically uses getShp() for all countries included in pr.points object).
admin_level	the administrative level used for plotting administrative boundaries; either /code"admin0"; /code"admin1" OR /code"both"
map_title	custom title used for the plot
fill_legend_title	Add a title to the legend.
fill_scale_transform	String givning a transformation for the fill aesthetic. See the trans argument in continuous_scale for possible values.

facet — if TRUE, splits map into a separate facet for each malaria species; by default FALSE if only one species is present in object, TRUE if both P. falciparum and P. vivax data are present in object.

hide_confidential — if TRUE, removes confidential points from the map

printed — Should the plot be printed to the graphics device.

Value

autoplot.pr.points returns a plots (gg object) for the supplied pr.points dataframe.

Examples

```
PfPR_surveys_NGA <- getPR(country = c("Nigeria"), species = "Pf")
autoplot(PfPR_surveys_NGA)

# Download PfPR2-10 Raster (Bhatt et al. 2015) and raw survey points for Madagascar in
#   2013 and visualise these together on a map.

# Download madagascar shapefile to use for raster download.
MDG_shp <- getShp(ISO = "MDG", admin_level = "admin0")

# Download PfPR2-10 Raster for 2013 & plot this
MDG_PfPR2_10 <- getRaster(surface = "Plasmodium falciparum PR2-10", shp = MDG_shp, year = 2013)
p <- autoplot_MAPraster(MDG_PfPR2_10)

# Download raw PfPR survey points & plot these over the top of the raster
pr <- getPR(country = c("Madagascar"), species = "Pf")
p[[1]] +
geom_point(data = pr[pr$year_start==2013,],
           aes(longitude, latitude, fill = positive / examined,
               size = examined), shape = 21) +
  scale_size_continuous(name = "Survey Size") +
  scale_fill_distiller(name = "PfPR", palette = "RdYlBu") +
  ggtitle("Raw PfPR Survey points\n + Modelled PfPR 2-10 in Madagascar in 2013")
```

---

autoplot.vector.points

Create a basic plot showing locations of downloaded Vector points

---

Description

autoplot.vector.points creates a map of Vector points downloaded from MAP.

Usage

```
## S3 method for class 'vector.points'
autoplot(object, ..., shp_df = NULL,
  admin_level = "admin0", map_title = "Vector Survey Locations",
  fill_legend_title = "Raw Vetor Occurrences",
  fill_scale_transform = "identity", facet = NULL, printed = TRUE)
```

Arguments

object	a vector.points object downloaded using /code/linkgetVecOcc
...	Other arguments passed to specific methods
shp_df	Shapefile(s) (data.frame) to plot with downloaded points. (If not specified automatically uses getShp() for all countries included in vector.points object).
admin_level	the administrative level used for plotting administrative boundaries; either /code"admin0"; /code"admin1" OR /code"both"
map_title	custom title used for the plot
fill_legend_title	Add a title to the legend.
fill_scale_transform	String givning a transformation for the fill aesthetic. See the trans argument in continuous_scale for possible values.
facet	if TRUE, splits map into a separate facet for each malaria species; by default FALSE.
printed	Should the plot be printed to the graphics device.

Value

autoplot.vector.points returns a plots (gg object) for the supplied vector.points dataframe.

Examples

```
Vector_surveys_NGA_NG <- getVecOcc(country = c("Nigeria", "Niger"))
autoplot(Vector_surveys_NGA_NG)

# Download the predicted distribution of An. dirus species complex Raster and
#  vector points for Myanmar and visualise these together on a map.

# Download Myanmar shapefile to use for raster download.
MMR_shp <- getShp(ISO = "MMR", admin_level = "admin0")
MMR_shp_df <- as.MAPshp(MMR_shp)

# Download An. dirus predicted distribution Raster & plot this
MMR_An_dirus <- getRaster(surface = "Anopheles dirus species complex", shp = MMR_shp)
MMR_An_dirus_df <- as.MAPraster(MMR_An_dirus)
p <- autoplot_MAPraster(MMR_An_dirus, shp_df = MMR_shp_df, printed = FALSE)

# Download raw occurrence points & plot these over the top of the raster
```

```
species <- getVecOcc(country = "Myanmar", species = "Anopheles dirus")
p[[1]] +
geom_point(data = species,
 aes(longitude,
  latitude,
  colour = species))+
  scale_colour_manual(values = "black", name = "Vector suvery locations")+
scale_fill_distiller(name = "Predicted distribution of An. dirus complex",
 palette = "PuBuGn",
  direction = 1)+
  ggtitle("Vector Survey points\n + The predicted distribution of An. dirus complex")
```

`autoplot_MAPraster` *Quickly visualise Rasters downloaded from MAP*

Description

`autoplot_MAPraster` is a wrapper for /code/linkautoplot.MAPraster that calls `as.MAPraster` to allow automatic map creation for RasterLayer/RasterStack objects downloaded from MAP.

Usage

```
autoplot_MAPraster(object, ...)
```

Arguments

`object`	RasterLayer/RasterStack object to be visualised.
`...`	other optional arguments to autoplot.MAPraster (e.g. shp_df, legend_title, page_title...)

Value

`autoplot_MAPraster` returns a list of plots (gg objects) for each supplied raster.

See Also

`getRaster`:

to download rasters directly from MAP.

`as.MAPraster`:

to convert RasterLayer/RasterStack objects into a 'MAPraster' object (data.frame) for easy plotting with ggplot.

`autoplot.MAPraster`:

to quickly visualise MAPraster objects created using /codeas.MAPraster.

Examples

```
#Download PfPR2-10 Raster (Bhatt et al 2015) and raw survey points for Madagascar in
#  2013 and visualise these together on a map.

# Download madagascar shapefile to use for raster download.
MDG_shp <- getShp(ISO = "MDG", admin_level = "admin0")

# Download PfPR2-10 Raster for 2013 & plot this
MDG_PfPR2_10 <- getRaster(surface = "Plasmodium falciparum PR2-10", shp = MDG_shp, year = 2013)
p <- autoplot_MAPraster(MDG_PfPR2_10)

# Download raw PfPR survey points & plot these over the top of the raster
pr <- getPR(country = c("Madagascar"), species = "Pf")
p[[1]] +
geom_point(data = pr[pr$year_start==2013,],
         aes(longitude, latitude, fill = positive / examined, size = examined), shape = 21) +
  scale_size_continuous(name = "Survey Size") +
  scale_fill_distiller(name = "PfPR", palette = "RdYlBu") +
  ggtitle("Raw PfPR Survey points\n + Modelled PfPR 2-10 in Madagascar in 2013")


# Download global raster of G6PD deficiency (Howes et al 2012) and visualise this on a map.

G6PDd_global <- getRaster(surface = "G6PD Deficiency Allele Frequency")
autoplot_MAPraster(G6PDd_global)
```

`convertPrevalence` *convert prevalences from one age range to another*

Description

convert prevalences from one age range to another

Usage

```
convertPrevalence(prevalence, age_min_in, age_max_in, age_min_out = rep(2,
  length(prevalence)), age_max_out = rep(9, length(prevalence)),
  parameters = "Pf_Smith2007", sample_weights = NULL)
```

Arguments

`prevalence`	Vector of prevalence values
`age_min_in`	Vector of minimum ages sampled
`age_max_in`	Vector maximum ages sampled.

age_min_out	Length 1 numeric or vector of same length as prevalence given the required age range upper bound
age_max_out	Length 1 numeric or vector of same length as prevalence given the required age range lower bound
parameters	Specifies the set of parameters to use in the model. This can either be "Pf_Smith2007" to use the parameters for *Plasmodium falciparum* defined in that paper, "Pv_Gething2012" for the *P. vivax* parameters used in that paper, or a user-specified vector givng the values of parameters ‘b‘, ‘s‘, ‘c‘ and ‘alpha‘, in that order. If specified,
sample_weights	Must be a vector of length 85 giving the sample weights for each age category (the proportion of the population in that age category) . If ‘NULL‘, The sample weights used in Smith et al. 2007 are used.

References

Smith, D. L. et al. Standardizing estimates of the Plasmodium falciparum parasite rate. Malaria Journal 6, 131 (2007).

Gething, Peter W., et al. "A long neglected world malaria map: Plasmodium vivax endemicity in 2010." PLoS neglected tropical diseases 6.9 (2012): e1814.

Code written by Nick Golding and Dave Smith

Examples

```
# Convert from prevalence 2 to 5 to prevalence 2 to 10
pr2_10 <- convertPrevalence(0.1, 2, 5, 2, 10)

# Convert many surveys all to 2 to 10.
pr <- runif(20, 0.1, 0.15)
min_in <- sample(1:5, 20, replace = TRUE)
max_in <- rep(8, 20)
min_out <- rep(2, 20)
max_out <- rep(10, 20)
pr_standardised <- convertPrevalence(pr, min_in, max_in,
                                     min_out, max_out)

plot(pr_standardised, pr)
```

---

extractRaster *Extract pixel values from MAP rasters using point coordinates.*

Description

extractRaster extracts pixel values from MAP rasters at user-specified point locations (without downloading the entire raster).

Usage

```
extractRaster(df = NULL, csv_path = NULL, surface = "PfPR2-10",
  year = rep(NA, length(surface)))
```

Arguments

df	data.frame containing coordinates of input point locations, must contain columns named 'latitude'/'lat'/'x' AND 'longitude'/'long'/'y')
csv_path	(optional) user-specified path to which extractRaster coordinates and results are stored. If not specified, tempdir() is used instead.
surface	string containing 'title' of desired raster(s), e.g. `c("raster1", "raster2")`. Defaults to "PfPR2-10" - the most recent global raster of PfPR 2-10. Check `listRaster` to find titles of available rasters.
year	default = `rep(NA, length(surface))`; for time-varying rasters: if downloading a single surface for one or more years, `year` should be a vector specifying the desired year(s). if downloading more than one surface, use a list the same length as `surface`, providing the desired year-range for each time-varying surface in `surface` or `NA` for static rasters.

Value

`getPR` returns the input dataframe (`df`), with the following columns apprended, providing raster values for each surface, location and year.

1. `layer` raster code corresponding to extracted raster values for a given row, check `listRaster` for raster metadata.
2. `year` the year for which raster values were extraced (time-varying rasters only; static rasters do not have this column).
3. `value` the raster value for the pixel in which a given point location falls.

See Also

`autoplot` method for quick mapping of PR point locations (`autoplot.pr.points`).

Examples

```
#Download PfPR data for Nigeria and Cameroon and map the locations of these points using autoplot

# Get some data and remove rows with NAs in location or examined or positive columns.
NGA_CMR_PR <- getPR(country = c("Nigeria", "Cameroon"), species = "Pf")
complete <- complete.cases(NGA_CMR_PR[, c(4, 5, 16, 17)])
NGA_CMR_PR <- NGA_CMR_PR[complete, ]

# Extract PfPR data at those locations.
data <- extractRaster(NGA_CMR_PR[, c('latitude', 'longitude')],
                      surface = 'Plasmodium falciparum PR2-10',
                      year = 2015)

# Data are returned in the same order.
all(data$longitude == NGA_CMR_PR$longitude)

# Some rasters are stored with NA encoded as -9999
data$value[data$value == -9999] <- NA
```

```
# We can quickly plot a summary
plot((NGA_CMR_PR$positive / NGA_CMR_PR$examined) ~ data$value)
```

---

getPR *Download PR points from the MAP database*

Description

getPR downloads all publicly available PR points for a specified country (or countries) and returns this as a dataframe.

Usage

```
getPR(country = NULL, ISO = NULL, continent = NULL, species,
  extent = NULL)
```

Arguments

country	string containing name of desired country, e.g. c("Country1", "Country2", ...) OR = "ALL". (Use one of country OR ISO OR continent, not combined)
ISO	string containing ISO3 code for desired country, e.g. c("XXX", "YYY", ...) OR = "ALL". (Use one of country OR ISO OR continent, not combined)
continent	string containing continent (one of "Africa", "Americas", "Asia", "Oceania") for desired data, e.g. c("continent1", "continent2", ...). (Use one of country OR ISO OR continent, not combined)
species	string specifying the Plasmodium species for which to find PR points, options include: "Pf" OR "Pv" OR "BOTH"
extent	2x2 matrix specifying the spatial extent within which PR data is desired, as returned by sp::bbox() - the first column has the minimum, the second the maximum values; rows 1 & 2 represent the x & y dimensions respectively (matrix(c("xmin", "ymin","xmax", "ymax"), nrow = 2, ncol = 2, dimnames = list(c("x", "y"), c("min", "max"))))

Details

country and ISO refer to countries and a lower-level administrative regions such as Mayotte and French Guiana.

Value

getPR returns a dataframe containing the below columns, in which each row represents a distinct data point/ study site.

1. COLUMNNAME description of contents
2. COLUMNNAME description of contents
3. COLUMNNAME description of contents

See Also

autoplot method for quick mapping of PR point locations (autoplot.pr.points).

Examples

```
#Download PfPR data for Nigeria and Cameroon and map the locations of these points using autoplot

NGA_CMR_PR <- getPR(country = c("Nigeria", "Cameroon"), species = "Pf")
autoplot(NGA_CMR_PR)

#Download PfPR data for Madagascar and map the locations of these points using autoplot
Madagascar_pr <- getPR(ISO = "MDG", species = "Pv")
autoplot(Madagascar_pr)

getPR(country = "ALL", species = "BOTH")
```

---

getRaster *Download Rasters produced by the Malaria Atlas Project*

Description

getRaster downloads publicly available MAP rasters for a specific surface & year, clipped to a provided bounding box or shapefile.

Usage

```
getRaster(surface = "Plasmodium falciparum PR2-10", shp = NULL,
  extent = NULL, file_path = tempdir(), year = as.list(rep(NA,
  length(surface))), vector_year = NULL)
```

Arguments

surface	string containing 'title' of desired raster(s), e.g. c("raster1", "raster2"). Defaults to "PfPR2-10" - the most recent global raster of PfPR 2-10. Check listRaster to find titles of available rasters.
shp	SpatialPolygon(s) object of a shapefile to use when clipping downloaded rasters. (use either shp OR extent; if neither is specified global raster is returned).
extent	2x2 matrix specifying the spatial extent within which raster data is desired, as returned by sp::bbox() - the first column has the minimum, the second the maximum values; rows 1 & 2 represent the x & y dimensions respectively (matrix(c("xmin", "ymin","xmax", "ymax"), nrow = 2, ncol = 2, dimnames = list(c("x", "y"), c("min", "max")))) (use either shp OR extent; if neither is specified global raster is returned).

file_path	string specifying the directory to which working files will be downloaded. Defaults to tempdir().
year	default = rep(NA, length(surface)) (use NA for static rasters); for time-varying rasters: if downloading a single surface for one or more years, year should be a string specifying the desired year(s). if downloading more than one surface, use a list the same length as surface, providing the desired year-range for each time-varying surface in surface or NA for static rasters.
vector_year	default = NULL for vector occurence rasters, the desired version as prefixed in raster_code returned using available_rasters. By default (NULL) returns the most recent raster version)

Value

getRaster returns a RasterLayer (if only a single raster is queried) or RasterStack (for multiple rasters) for the specified extent.

See Also

autoplot_MAPraster

to quickly visualise rasters downloded using getRaster.

as.MAPraster

to convert RasterLayer/RasterStack objects into a 'MAPraster' object (data.frame) for easy plotting with ggplot.

autoplot.MAPraster

to quickly visualise MAPraster objects created using /codeas.MAPraster.

Examples

```
# Download PfPR2-10 Raster for Madagascar in 2015 and visualise this immediately.

MDG_shp <- getShp(ISO = "MDG", admin_level = "admin0")
MDG_PfPR2_10 <- getRaster(surface = "Plasmodium falciparum PR2-10", shp = MDG_shp, year = 2015)
autoplot_MAPraster(MDG_PfPR2_10)

# Download global raster of G6PD deficiency from Howes et al 2012.
G6PDd_global <- getRaster(surface = "G6PD Deficiency Allele Frequency")
autoplot_MAPraster(G6PDd_global)

# Download a temporal raster by range
MDG_PfPR2_10_range <- getRaster(surface = "Plasmodium falciparum PR2-10",
                                shp = MDG_shp, year = 2012:2015)

# Download a mix of rasters
MDG_rasters <- getRaster(surface = c("Plasmodium falciparum PR2-10",
                                     'Plasmodium falciparum Incidence',
                                     'Plasmodium falciparum Support'),
                         shp = MDG_shp, year = list(2009:2012, 2005:2007, NA))
p <- autoplot_MAPraster(MDG_rasters)
```

getShp *Download MAPadmin2013 Administrative Boundary Shapefiles from the MAP geoserver*

Description

getShp downloads a shapefile for a specified country (or countries) and returns this as either a spatialPolygon or data.frame object.

Usage

```
getShp(country = NULL, ISO = NULL, extent = NULL,
  admin_level = c("admin0"), format = "spatialpolygon", long = NULL,
  lat = NULL)
```

Arguments

country	string containing name of desired country, e.g. c("Country1", "Country2", ...) OR = "ALL" (use either ISO OR country)
ISO	string containing ISO3 code for desired country, e.g. c("XXX", "YYY", ...) OR = "ALL" (use either ISO OR country)
extent	2x2 matrix specifying the spatial extent within which polygons are desired, as returned by sp::bbox() - the first column has the minimum, the second the maximum values; rows 1 & 2 represent the x & y dimensions respectively (matrix(c("xmin", "ymin","xmax", "ymax"), nrow = 2, ncol = 2, dimnames = list(c("x", "y"), c("min", "max")))). Note: getShp downloads the entire polygon for any polygons falling within the extent.
admin_level	string specifying the administrative level for which shapefile are desired (only "admin0","admin1","admin2","admin3", or "all" accepted). N.B. Not all administrative levels are available for all countries. Use listShp to check which shapefiles are available. If an administrative level is requested that is not available, the closest available administrative level shapefiles will be returned.
format	string specifying the desired format for the downloaded shapefile: either "spatialpolygon" or "df"
long	longitude of a point location falling within the desired shapefile.
lat	latitude of a point location falling within the desired shapefile.

Value

getShp returns either a dataframe or spatialPolygon object for requested administrative unit polygons. The following attribute fields are included:

1. id unique identifier for any given polygon/administrative unit.

2. iso ISO-3 code of given administrative unit (or the ISO code of parent unit for administrative-level 1 units).
3. admn_level administrative level of the given administrative unit - either 0 (national), 1 (first-level division), 2 (second-level division), 3 (third-level division).
4. name_0 name of admin0 parent of a given administrative unit (or just shapefile name for admin0 units)
5. id_0 id code of admin0 parent of the current shapefile (or just shapefile id for admin0 units)
6. type_0 if applicable, type of administrative unit or admin0 parent
7. name_1 name of admin1 parent of a given administrative unit (or just shapefile name for admin1 units); NA for admin0 units
8. id_1 id code of admin1 parent of the current shapefile (or just shapefile id for admin1 units); NA for admin0 units
9. type_1 if applicable, type of administrative unit or admin1 parent
10. name_2 name of admin2 parent of a given administrative unit (or just shapefile name for admin2 units); NA for admin0, admin1 units
11. id_2 id code of admin2 parent of the current shapefile (or just shapefile id for admin2 units); NA for admin0, admin1 units
12. type_2 if applicable, type of administrative unit or admin2 parent
13. name_3 name of admin3 parent of a given administrative unit (or just shapefile name for admin3 units); NA for admin0, admin1, admin2 units
14. id_3 id code of admin3 parent of the current shapefile (or just shapefile id for admin3 units); NA for admin0, admin1, admin2 units
15. type_3 if applicable, type of administrative unit
16. source source of administrative boundaries
17. country_level composite iso_admn_level field.

See Also

autoplot method for quick mapping of PR point locations (autoplot.pr.points).

Examples

```
#Download PfPR data & associated shapefiles for Nigeria and Cameroon

NGA_CMR_PR <- getPR(country = c("Nigeria", "Cameroon"), species = "Pf")
NGA_CMR_shp <- getShp(country = c("Nigeria", "Cameroon"))

#Download PfPR data & associated shapefiles for Chad
Chad_PR <- getPR(ISO = "TCD", species = "both")
Chad_shp <- getShp(ISO = "TCD")

#' #Download PfPR data & associated shapefiles defined by extent for Madagascar
MDG_PR <- getPR(country = "Madagascar", species = "Pv")
```

getVecOcc *Download Vector Occurrence points from the MAP database* getVecOcc *downloads all publicly available vector occurrence points for a specified country (or countries) and returns this as a dataframe.* country *and* ISO *refer to countries and a lower-level administrative regions such as French Guiana.*

Description

Download Vector Occurrence points from the MAP database getVecOcc downloads all publicly available vector occurrence points for a specified country (or countries) and returns this as a dataframe. country and ISO refer to countries and a lower-level administrative regions such as French Guiana.

Usage

```
getVecOcc(country = NULL, ISO = NULL, continent = NULL, species = "all",
  extent = NULL)
```

Arguments

country	string containing name of desired country, e.g. c("Country1", "Country2", ...) OR = "ALL". (Use one of country OR ISO OR continent, not combined)
ISO	string containing ISO3 code for desired country, e.g. c("XXX", "YYY", ...) OR = "ALL". (Use one of country OR ISO OR continent, not combined)
continent	string containing continent (one of "Africa", "Americas", "Asia", "Oceania") for desired data, e.g. c("continent1", "continent2", ...). (Use one of country OR ISO OR continent, not combined)
species	string specifying the Anopheles species for which to find vector occurrence points, options include: "Anopheles...." OR "ALL"
extent	2x2 matrix specifying the spatial extent within which vector occurrence data is desired, as returned by sp::bbox() - the first column has the minimum, the second the maximum values; rows 1 & 2 represent the x & y dimensions respectively (matrix(c("xmin", "ymin","xmax", "ymax"), nrow = 2, ncol = 2, dimnames = list(c("x", "y"), c("min", "max"))))

Value

getVecOcc returns a dataframe containing the below columns, in which each row represents a distinct data point/ study site.

1. COLUMNNAME description of contents
2. COLUMNNAME description of contents
3. COLUMNNAME description of contents

See Also

autoplot method for quick mapping of Vector occurrence point locations (autoplot.vector.points).

Examples

```
# Download vector occurrence data for Brazil and map the locations using autoplot.vector.points

Brazil_vec <- getVecOcc(country = "Brazil")
autoplot(Brazil_vec)

# Download vector data for Madagascar and map the locations using autoplot
Madagascar_vec <- getVecOcc(ISO = "MDG", species = "All")
autoplot(Madagascar_vec)

# Subset by extent.
extent_vec <- getVecOcc(extent = matrix(c(100,13,110,18), nrow = 2), species = 'all')
```

---

isAvailable *Available data to download from the MAP geoserver.*

Description

isAvaiable is a wrapper for isAvailable_pr and isAvailable_vec, listing data (PR survey point location data and vector occurrence locations available to download from the MAP geoserver.

Usage

```
isAvailable(sourcedata = NULL, full_results = FALSE, country = NULL,
  ISO = NULL, continent = NULL)
```

Arguments

sourcedata	One of 'pr points' or 'vector points'
full_results	Should the list be printed to the console?
country	string containing name of desired country, e.g. c("Country1", "Country2", ...) OR = "ALL" (use one of country OR ISO OR continent, not combined)
ISO	string containing ISO3 code for desired country, e.g. c("XXX", "YYY", ...) OR = "ALL" (use one of country OR ISO OR continent, not combined)
continent	string containing continent for desired data, e.g. c("continent1", "continent2", ...) (use one of country OR ISO OR continent, not combined)

Value

isAvailable returns a data.frame detailing the administrative units for which shapefiles are stored on the MAP geoserver.

See Also

link{isAvailable_pr} isAvailable_vec

Examples

```
available_pr_locations <- isAvailable_pr(ISO = 'IDN')
available_vector_locations <- isAvailable_vec(ISO = 'IDN')
```

`isAvailable_pr` *Check whether PR points are available for a given location*

Description

`isAvailable_pr` checks whether the MAP database contains PR points for the specified country/location.

Usage

```
isAvailable_pr(sourcedata = "pr points", country = NULL, ISO = NULL,
  continent = NULL, full_results = FALSE)
```

Arguments

`sourcedata`	by default this is "pr points", highlighting the dataset to be searched
`country`	string containing name of desired country, e.g. `c("Country1", "Country2", ...)` (use one of `country` OR `ISO` OR `continent`, not combined)
`ISO`	string containing ISO3 code for desired country, e.g. `c("XXX", "YYY", ...)` (use one of `country` OR `ISO` OR `continent`, not combined)
`continent`	string containing name of continent for desired data, e.g. `c("Continent1", "Continent2", ...)`(use one of `country` OR `ISO` OR `continent`, not combined)
`full_results`	By default this is FALSE meaning the function only gives a message outlining whether specified country is available, if `full_results == TRUE`, the function returns a named list outlining data availability.

Value

`isAvailable_pr` returns a named list of input locations with information regarding data availability.

if `full_results == TRUE`, a named list is returned with the following elements:

1. `location` - specified input locations
2. `is_available`- 1 or 0; indicating whether data is available for this location
3. `possible_match`- agrep-matched country names indicating potential mispellings of countries where is_available == 0; NA if data is available for this location.

Examples

```
isAvailable_pr(country = "Suriname")
x <- isAvailable_pr(ISO = "NGA", full_results = TRUE)
x <- isAvailable_pr(continent = "Oceania", full_results = TRUE)
```

`isAvailable_vec` *Check whether Vector Occurrence points are available for a given location*

Description

`isAvailable_vec` checks whether the MAP database contains Vector Occurrence points for the specified country/location.

Usage

```
isAvailable_vec(sourcedata = "vector points", country = NULL, ISO = NULL,
  continent = NULL, full_results = FALSE)
```

Arguments

`sourcedata`	by default this is "vector points", highlighting the dataset to be searched
`country`	string containing name of desired country, e.g. `c("Country1", "Country2", ...)` (use one of `country` OR `ISO` OR `continent`, not combined)
`ISO`	string containing ISO3 code for desired country, e.g. `c("XXX", "YYY", ...)` (use one of `country` OR `ISO` OR `continent`, not combined)
`continent`	string containing name of continent for desired data, e.g. `c("Continent1", "Continent2", ...)`(use one of `country` OR `ISO` OR `continent`, not combined)
`full_results`	By default this is FALSE meaning the function only gives a message outlining whether specified country is available, if `full_results == TRUE`, the function returns a named list outlining data availability.

Value

`isAvailable_Vec` returns a named list of input locations with information regarding data availability.

if `full_results == TRUE`, a named list is returned with the following elements:

1. `location` - specified input locations
2. `is_available`- 1 or 0; indicating whether data is available for this location
3. `possible_match`- agrep-matched country names indicating potential mispellings of countries where is_available == 0; NA if data is available for this location.

Examples

```
isAvailable_vec(country = "Suriname")
x <- isAvailable_vec(ISO = "NGA", full_results = TRUE)
x <- isAvailable_vec(continent = "Oceania", full_results = TRUE)
```

`listData` *List data available to download from the MAP geoserver.*

Description

`listData` is a wrapper for listPoints; listRaster and listShp, listing data (PR survey point data; raster data; shapefiles) available to download from the MAP geoserver.

Usage

```
listData(datatype, printed = TRUE, ...)
```

Arguments

`datatype`	One of 'pr points', 'vector points', 'raster' or 'shape'
`printed`	Should the list be printed to the console?
`...`	Other arguments to be passed to `list*` functions. (e.g. `admin_level` for `listShp`)

Value

`listData` returns a data.frame detailing the administrative units for which shapefiles are stored on the MAP geoserver.

See Also

`link{listPoints}` `listRaster` `listShp`

Examples

```
available_admin_units <- listShp()
available_pr_points <- listPoints(sourcedata = "pr points")
available_vector_points <- listPoints(sourcedata = "vector points")
available_rasters <- listRaster()
```

listPoints *List countries with available MAP Point data.*

Description

listPoints lists all countries for which there are publicly visible datapoints in the MAP database required.

Usage

```
listPoints(printed = TRUE, sourcedata)
```

Arguments

printed	Should the list be printed to the console?
sourcedata	String contining desired dataset within the Malaria Atlas database to be searched, e.g "pr points" OR "vector points"

Value

listPoints returns a data.frame detailing the countries for which PR points are publicly available.

Examples

```
listPoints(sourcedata = "pr points")
listPoints(sourcedata = "vector points")
```

listRaster *List all MAP Rasters available to download.*

Description

listRaster lists all rasters available to download from the Malaria Atlas Project database.

Usage

```
listRaster(printed = TRUE)
```

Arguments

printed	Should the list be printed to the console?

Value

listRaster returns a data.frame detailing the following information for each raster available to download from the Malaria Atlas Project database.

1. raster_code unique identifier for each raster
2. title abbreviated title for each raster, used as surface argument in getRaster()
3. title_extended extended title for each raster, detailing raster content
4. abstract full description of each raster, outlining raster creation methods, raster content and more.
5. citation citation of peer-reviewed article in which each raster has been published
6. pub_year year in which raster was published, used as pub_year argument in getRaster() to updated raster versions from their predecessor(s).
7. min_raster_year earliest year for which each raster is available
8. max_raster_year latest year for which each raster is available

Examples

```
available_rasters <- listRaster()
```

---

listShp *List administrative units for which shapefiles are stored on the MAP geoserver.*

Description

listShp lists all administrative units for which shapefiles are stored on the MAP geoserver.

Usage

```
listShp(printed = TRUE, admin_level = c("admin0", "admin1"))
```

Arguments

printed	Should the list be printed to the console?
admin_level	Specifies which administrative unit level for which to return available polygon shapefiles. A string vector including one or more of"admin0", "admin1", "admin2" OR "admin3". Default: c("admin0", "admin1")

Value

listShp returns a data.frame detailing the administrative units for which shapefiles are stored on the MAP geoserver.

Examples

```
available_admin_units <- listShp()
```

`listSpecies` *list all species which have occurrence data within the MAP database.*

Description

`listSpecies` lists all species occurrence data available to download from the Malaria Atlas Project database.

Usage

```
listSpecies(printed = TRUE)
```

Arguments

`printed`	should the list be printed to the database.

Value

`listSpecies` returns a data.frame detailing the following information for each species available to download from the Malaria Atlas Project database.

1. `species` string detailing species

Examples

```
available_species <- listSpecies()
```

`malariaAtlas` *An R interface to open-access malaria data, hosted by the Malaria Atlas Project.*

Description

`malariaAtlas` provides a suite of tools to allow you to download all publicly available PR points for a specified country (or ALL countries) as a dataframe within R.

malariaAtlas functions

1. `listAll` - lists all countries for which there are publicly visible PR datapoints in the MAP database.
2. `is_available` - checks whether the MAP database contains PR points for the specified country/countries.
3. `getPR` - downloads all publicly available PR points for a specified country (or countries) and returns this as a dataframe.

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